

The Effectiveness of PBL-based Research Methodology Course on EFL Master's Students' Research Skills

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Abstract

This mixed-methods study examines the applicability of Project -Based Learning (PBL) in EFL classes. Particularly, it scrutinizes PBL effectiveness in teaching Research Methodology (RM) content to EFL master's students through assessing their research skills. Additionally, it explores the main challenges that could face students while receiving a PBL-based RM course. To collect the needed quantitative and qualitative data, a non-randomized control group pretest design and a phenomenological methodology were used, respectively. In the first phase of this study, a PBL-based RM course was designed and administered to a group of forty-three master's students who were selected on a voluntary basis. On the other hand, forty-three control participants received the same RM content through lecturing. Research skills post-test results were statistically analyzed using a t-test. The second phase of this research involves the use of a focus group discussion to examine the difficulties encountered by sixteen experimental participants. Responses were thematically analyzed. The findings of both phases indicate that PBL can be an applicable and effective model to teach RM to Master's students in EFL classes. Besides, students' narratives revealed that the lack of time management skills, teamwork skills, resource deficiency, practice overload, and limited vocabulary are factors that might negatively influence learners' engagement in PBL-based RM sessions and research projects. Consequently, this study recommends a prior examination of students' linguistic proficiency, teamwork, and time management skills to ensure the effective design and implementation of PBL-based interventions that accommodate diverse learners' levels and styles.

Keywords: Project-based Learning; research skills; research methodology; challenges; EFL.

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1. Introduction

The implementation of Project-Based Learning (PBL) has garnered increasing scholarly interest across various disciplines in education (Lehmann et al., 2008; Harmer & Stoke, 2014). Its effectiveness in teaching science, engineering, mathematics and technology at primary, secondary and tertiary levels was explored and canvassed by a surge of studies attempting to capture its educational impact. In this vein, empirical evidences revealed that the proper integration of PBL in curricula could yield inevitable positive outcomes. Indeed, PBL can offer multiple and diversified learning opportunities which might significantly influence the active assimilation of the subject content (Boaler, 1997), mechanisms of knowledge construction (Guo et.al., 2020), engagement and motivation (Brewster & Fager, 2000). This would culminate in the improvement of tests' scores and overall academic achievement (Chen & Yang 2019; ELOB, 1999). Additionally, PBL was found to be one of the most effective instructional models that might help learners develop and nurture research-related competencies (Capraro et al., 2013) and some 21st century skills like critical thinking, collaboration, decision-making, time management and social communication skills (Kim Thu, 2018).

Despite the aforementioned potential benefits of PBL, its application and adaptability in the field of teaching English as a Foreign Language (EFL) at the Algerian tertiary level remains at a nascent stage with limited evidence. This formative phase requires ongoing integrative investigations to comprehensively bridge the critical gap and optimize the pedagogical potential of PBL in EFL classes. To this end, this study aims to examine the effectiveness of implementing PBL in Research Methodology classes on EFL students' research skills. Moreover, it inquires into the challenges faced by EFL students enrolled in a PBL-based Research Methodology course.

In the light of the previously identified problem, this study seeks to respond to the following questions:

1. To what extent is PBL applicable in a Research Methodology course offered to EFL master's students?
2. To what extent can a PBL- based Research Methodology course help students develop their research skills?
3. What challenges and obstacles do students encounter when engaged in PBL to learn Research Methodology content?

Furthermore, this study aims to test the following hypotheses:

H₁: Students who are taught research methodology course using PBL are likely to develop high proficiency in research skills than those who receive instruction in the same course using the traditional lecturing teaching method.

H₀: There is no difference in research skills between students who participate in PBL-based RM course and those who participate in traditional RM course.

2. Literature Review

This section aims to establish the theoretical foundation of this study by providing an overview of PBL principles, mechanisms, and effectiveness in research methodology classes.

2.1. Defining PBL

Project-based learning refers to the pedagogical learner-centered approach that promotes active and deep learning. Grounded in the constructivist theory, PBL endeavors to engage students in real projects to solve complex problems, learn specific content and develop particular skills (Stivers, 2010; Thomas, 2000). Thus, PBL involves problem-oriented, inquiry-based and learner-centered learning

(Thomas, 2000). In others words, learners are supposed to work collaboratively to solve complex problems which would permit them to become fully responsible for the processes of knowledge integration, application and construction (Guo et.al., 2020). Therefore, PBL is one of the instructional methods that does not rely on memorization and rote learning. Instead, it immerses learners in situations where they can actively construct, apply knowledge, and develop problem-solving and decision-making skills (Miller & Krajcik, 2019). Ultimately, this approach can effectively equip students with knowledge and skills that might enable them to integrate successfully into the real world.

2.2 Characteristics and principles of PBL

The review of the relevant literature accentuated the fact that different frameworks were put forward by various researchers to delimit the key features that distinguishes PBL from other approaches. Subsequently, no universal set of PBL characteristics was yet determined (Condcliffe et al., 2017; Hasni et al., 2016). The following table summarizes only the compromise features of PBL.

Table 1: PBL Features

Feature	Description
Active learning	Learners are the center of the learning process. They put theory into practice (Harmer & Stoke, 2014) They should actively do things to be able to learn (Stauffacher et al.; 2006) They should be responsible for their learning. Independent thinking (Lubis et al., 2019), iterative questioning, metacognitive monitoring, and adaptive decision-making (Mardi et al., 2021) are pivotal in PBL.
Real-world problem	Authentic content is the major focus of PBL (Thomas, 2000; Bell 2010) Learning opportunities and tasks should be meaningful to learners. Students should select topics that ignite their curiosity (Bell 2010) These topics should refer to real-world problems.
Teachers' Role	A guide-on -the-side (King 1993 cited in Harmer and Stoke, 2014) Facilitator/ Mentor/ Supervisor Teachers help “students in their learning process by initiating reflection processes and supporting them, if necessary, on substantive matters” (Stauffacher, 2006, p.255)
Interdisciplinary	PBL affords learning opportunities that requires the integration of knowledge from different disciplines like physical, natural and social sciences (Kim Thu, 2018). This key feature of PBL will help students develop flexibility and adaptability.
Cooperative and collaborative learning	Collaboration is integral for PBL (Stivers, 2010) Students are supposed to work together to find solutions (Guo et al., 2020) Students carry out research projects together (Krajcik, 2015; Tal et al.; 2006) Students can also collaborate with experts, companies and parents (Krajcik, 2015; Tal et al.; 2006)
An end product (artefact)	Creating an artefact that responds to the project deriving questions is imperative in PBL. The end product can be a dissertation, consultant report (Danford, 2006), or exhibitions like videos, music and board games (Hanney, 2013)

Essentially, as illustrated in table 1, PBL is a structured approach that requires authentic real-world problems. This can scaffold learners to bridge academic knowledge with real-world contexts, thereby fostering intrinsic motivation and engagement (Sholihah & Lastariwati, 2020). Additionally, PBL operates through a systematic and iterative cognitive process whereby learners are supposed to scrutinize the problem and evaluate evidence to generate valid and reliable conclusions (Akhdinirwanto et al., 2020). Moreover, PBL is predicated on metacognitive skills, adaptive decision-making skills (Mardi et al., 2021) and teamwork skills (Lubis et al., 2019). Consequently, the effective implementation of PBL principles can offer novel perspectives and practical outcomes for both teachers and learners.

2.3. PBL in Research Methodology Instruction:

Empirical findings demonstrate that PBL is among the instructional approaches that proved effective in, and applicable to different disciplines and educational contexts. Notably, research accentuates that the inherent mechanisms of PBL can significantly impact academic achievement (Karpudewan et al., 2016; Guo et al., 2020), critical thinking skills (Lu et al., 2025) and motivation (Zhang, 2022). Indeed, it can serve as a potent scaffold for promoting deeper understanding (Thomas, 2000), research competencies (Capraro et al., 2013), communication, collaborative and writing skills (Parrado-Martinez & Sanchez-Andujar, 2020). Thus, PBL can entail various pedagogical benefits relevant to learners' affective, cognitive, research and academic outcomes.

Specifically, PBL effectiveness is apparent when integrated into research methodology instruction. In this regard, research evidence suggests that PBL can improve students' understanding of abstract research methodology concepts through inquiry-based tasks. This can facilitate the operationalization of research methodology concepts and promote self-efficacy and engagement (Arantes do Amaral & Lino dos Santos, 2018; Khalaf & Alshammari, 2023). In other words, the implantation of PBL principles in research methodology curriculum is expected to enable learners to design studies and execute methodological plans in real-world contexts. Inevitably, this reinforces procedural knowledge and fosters reflection with all steps of research.

Moreover, Khalaf & Alshammari (2023) argued that PBL can improve postgraduates' scientific research skills and research proposal writing skills. They explained how the integration of PBL into research methodology and statistics course can help learners formulate adequate research problems and hypotheses, write the literature review, design the methodology and assess the validity and reliability of instruments. Likewise, PBL can substantially enhance students' ability to collect, analyze data and draw final conclusions (Khalaf & Alshammari, 2023). Therefore, PBL can positively influence self-regulation and decision-making.

Ultimately, the PBL underlying mechanisms can effectively support research methodology instruction. It allows practice and active operationalization of constructs. Also, it stimulates and nurtures the cognitive and metacognitive skills required for scientific research. Accordingly, the adoption of PBL principles to design the intervention of this study was justified.

3. Methodology

This section provides a clear and systematic description of the methodological framework employed in this study.

3.1. Approach and method

This study adopts a mixed-methods approach to appropriately answer the main research questions and statistically test the research hypothesis. Primarily, a non-randomized control group pretest design was opted for to scrutinize the cause-effect relationship between the independent variable (PBL to

teach Research Methodology) and dependent variable (Research Skills). Additionally, a phenomenological methodology was incorporated to thoroughly understand students' experiences with PBL, specifically the challenges and obstacles they faced while using PBL to learn research methodology content.

3.2 Participants

The targeted population of this study consists of 270 Master's students enrolled in different specialties namely Didactics, Language and Culture, and Linguistics at the Department of English, Batna 2 University. A group of 86 Didactics students was designated to receive Research Methodology (RM) content from the researcher. Thereafter, this group was divided into two sub-groups of forty-three each, acting as control and experimental groups. This division was made on a non-random-voluntary basis.

Likewise, voluntary sampling was the main sampling technique utilized to recruit a sample of 16 experimental students to collect the needed qualitative data. The decision on this sample size was made according to the principle of saturation.

3.3 Treatment

The treatment of this study was tailored and structured to align with PBL features (See table 1). In other words, PBL principles were implemented to design and administer Research Methodology content throughout the intervention sessions. Each session includes three key phases (See table 2). The table below portrays how the PBL-based research methodology sessions unfold.

Table 2: Treatment Description

Phase	Collaboration	Description	Teacher's role
<i>Phase 01 Theoretical Knowledge</i>	Group work	The experimental group is provided with snippets relevant to Research Methodology contents (Research Problem, Literature review, Research Hypothesis, Research Approaches and methods, Data gathering tools and Data analysis tools, sampling techniques and Research steps) They should actively read, analyze and synthesize the excerpts.	Guide / Facilitator Ask questions to help students understand better.
<i>Phase 2 Practice</i>	Group work	In this phase, the experimental group receives a set of activities relevant to the content they previously read about. Students are supposed to do the activities and justify their answers.	Guide / Facilitator. Asks questions to allow students identify their fallacies and flaws, if any.
<i>Phase 03 Project</i>	Group work	In this phase, students in the experimental are expected to think about their research projects and apply the knowledge they acquired previously to decide on and account for their research questions, hypotheses, methodology design, data	Supervisor

gathering, data analysis, and writing the final report.

Students are encouraged to select interdisciplinary and real-world topics.

3.4. Procedures and instrumentations

Both the experimental and control groups received a pre-test prior to the introduction of the treatment to determine and examine their research skills' starting level. It is noteworthy that research skills in this study encompasses the following:

1. Ability to precisely state a research problem, objectives, and questions.
2. Ability to formulate testable hypotheses
3. Ability to evaluate the relevance, significance and reliability of resources and cite them properly.
4. Ability to select and design the appropriate methodology for one's research problem.
5. Ability to execute the methodological plan through data gathering and data analysis.
6. Ability to write the final report and present it.

Then, the experimental group participated in twenty-three sessions of BPL- based RM content delivered once weekly. Meanwhile, the control group received the same number of sessions, during which the RM content was delivered in a traditional manner. During the intervention period, four progressive tests were administered to the experimental group to track its progress and identify the treatment's aspects that require adjustments and amelioration (See table 3). By the end of the experiment, both the experimental and control groups completed a research skills post-test. In other words, students were required to present orally the major findings of their research projects.

Following the quantitative assessment, a focus group discussion was conducted to gain in-depth insights into participants' experiences with PBL and pinpoint the major difficulties they encountered. A semi-structured interview guided the discussion and the overall qualitative data gathering process. This discussion lasted one hour and forty minutes. It was recorded with the consent of the participants and later transcribed for analysis.

Table 3: Data gathering tools

Instrument	Aim	Group
<i>Pretest</i> (Scored/20)	To evaluate the starting level of research skills. To test students' research methodology theoretical knowledge. To assess students' ability to apply the theoretical knowledge.	Both groups
<i>Progressive tests</i>	Test1: to evaluate students' ability to state a research problem and formulate hypotheses. Test 2: to evaluate students' ability to examine the relevance and reliability of resources. Test 3 to evaluate students' ability to plan their research methodology. Test 4 to evaluate students' ability to analyze and interpret quantitative and qualitative data.	Experimental group
<i>Treatment</i>	PBL-based RM content	Experimental group

Post-test (Scored/20)	To assess students' research skills through the evaluation of their final research report and oral presentation of the findings. (Written report and oral presentation)	Both groups
Focus discussion	To examine students' experiences with PBL and pinpoint the main challenges they faced when enrolled in PBL -based RM classes.	16 experimental participants

All tests used in this study were piloted. They were administered to a panel of 4 research methodology experts to evaluate the extent to which tests' items are accurate and relevant to tests' objectives. In addition, these tests were completed by a group of 10 master's students to examine the internal consistency of the tests' items. Validity universal index and Cronbach alpha were calculated, respectively. The results indicate that all tests were valid and reliable.

3.5 Data analysis tools

Quantitative data were analyzed through the use of both descriptive and inferential statistics with the help of SPSS. Means and standards deviation were calculated to summarize data and the independent t- test was performed to test the research hypothesis. Additionally, qualitative data gathered through the focus group discussion were thematically analyzed using Braun and Clarke model.

4. Results

This section presents the results obtained from the quantitative and qualitative data analysis.

4.1 Pretest

Table 4 points out that the scores obtained by the experimental group are slightly lower than those of the control group. However, the means difference is insignificant (0.39). This implies that the starting level of students' research skills is almost identical for both groups. Thoroughly, the participants' answers to the pre-test items indicate that despite having participated in a Research Techniques course during their 3rd year of licence program through which they should have established sound theoretical understanding of RM concepts, students failed to properly apply this knowledge in varied research situations. This pattern highlights a notable knowledge-performance gap which might be the result of surface and superficial learning, cognitive inflexibility and limited instructions that accentuate theory over practice. Consequently, the instructional approach used to teach research methodology for these students should target the skills that permit them to flexibly integrate, adapt and apply the knowledge acquired to diverse research scenarios.

Table 4: Pretest Means

Group	Pretest Mean
Control Group	7.62
Experimental Group	7.23
Difference in Means	0.39

4.2 Progressive tests

During the experiment, the researcher conducted a series of progressive tests to examine the extent to which the experimental participants are able to properly use the theoretical knowledge they established. Table 5 demonstrates that although the scores obtained were comparable with low standards deviation, they refer to nuanced progress across participants' research skills. Particularly, some participants struggled with problem statement and hypothesis formulation. They were unable to articulate

research questions and hypotheses and delimit the scope of the research topics proposed in progressive test 1. This might be potentially attributed to their limited vocabulary and lexicon which negatively influenced the clarity and precision of their answers, and led to variance in scores. Subsequently, the standard deviation of this test is higher when compared to other tests.

On the other hand, all participants showed improvement in evaluating the relevance and reliability of the resources and selecting the appropriate methodology to investigate particular research problems. Furthermore, they were able to analyze different sets of quantitative and qualitative data using the proper data analysis tool. This demonstrates an increasing precision in planning and executing various methodologies according to diversified research scenarios.

Table 5: Progressive tests results

Progressive test	Mean	Standard deviation
1	13.43	1.84
2	14.25	1.23
3	14.72	0.93
4	14.60	0.90

4.3 Post-test

After twenty-three sessions of PBL-based research methodology sessions, both the experimental and control groups completed the post-test. This latter aims at examining students' research skills through the evaluation of their collaborative research project' final report. Table 6 summarizes the results obtained. The experimental group post-test mean is significantly higher than the control group mean with a difference of 2.69. This indicates that the experimental participants' research skills are more advanced than those of the control participants.

In order to determine whether the observed difference is statistically significant and attributable to the implementation of PBL principles to teach RM content, it is essential to consider the independent t-test results.

Table 6 : Post-test results

Group	Post-test Mean	Standard Deviation
Control Group	12.28	2
Experimental Group	14.97	0.88
Difference in Means	2.69	

4.4. t-test

The normality of post-test scores was tested to ensure that t-test is the appropriate statistical tool to compare the means in this study. The results of Shapiro-Wilk test outline that the experimental post-test scores ($W(43) = 83, p = .000$) and control scores ($W(43) = 9, p = .001$) were normally distributed. These outcomes validated the use of t-test to compare the post-test means (See table 7).

Table 7: Independent samples t-test results

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						95 %confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std Error Difference		Upper	Lower
P	Equal Variances assumed	35,055	,000	-8,074	84	,000	-2,69767	,33413	-	3,36213	-2,03322
t	Equal variances not assumed			-8,074	57,820	,000	-2,69767	,33413	-	3,36655	-2,02879

The

independent sample *t*-test results demonstrate that the experimental participants who received the PBL-based RM course ($M=14.97$, $SD= .88$) obtained higher scores, in research skills post-test, than their control peers ($M=12.28$, $SD= 2$) with $t(86) = 8.074$, at $p > .005$. The interpretation of these results indicates that the difference between the means is statistically significant with a large effect size (eta squared= .43). Hence, the null hypothesis is rejected. In other words, the experimental participants succeeded to advance their research skills and this can be directly attributed to the implementation of the PBL treatment.

4.5Thematic analysis

The focus group discussion aims to explore students' overall experience with PBL to learn RM through canvassing the challenging aspects of this approach. The researcher guided the discussion with sixteen experimental group participants using a semi-structured interview. Data gathered were coded according to the inductive approach and analyzed thematically using Braun and Clarke model. The following are the key emerging themes alongside definitions.

Table 8 :Themes

Theme	Definition
Unfamiliarity with PBL	It captures students' familiarity with PBL
Teamwork challenges	It refers to the obstacles and challenges that stem from collaborative work.
Time management challenges	It refers to the difficulties, students encounter with creating timelines and respecting deadlines.
Practice overload	It refers to excessive practice.
Language barriers	It refers to the insufficient lexicon that might hinder the student from articulating his/her ideas
Resources limitation	It refers to a lack of resources.

The thorough analysis of students' responses unveiled 6 prominent themes (See table 8). These themes depict students' challenges with PBL.

Theme 1 Unfamiliarity with PBL

Many students posited that PBL was novel and new. Indeed, they were unfamiliar with PBL features and principles. This unfamiliarity entailed an ambivalence of feelings and attitudes that can be encapsulated by different subthemes such as resistance, anxiety, curiosity and engagement.

Evidence

"I'd never heard of PBL before" participant 3; *"for me, this approach is new...although we used to do projects throughout the previous years, this PBL is totally different"* Participant 11; *"At the beginning of the experiment, I resisted the use PBL as it was a new and challenging way to learn... after 3 months, I noticed that it drastically transformed my learning habits and made me more active..."* Participant 16; *"... I was unfamiliar with PBL and this made me anxious and curious at the same time"* Participant 9.

Interpretation

These insights highlight that unfamiliarity with the intervention could serve as a source of resistance and anxiety as well as an incentive for establishing new and effective habits. Therefore, being unfamiliar with the teaching model can either hinder or optimize the whole process of learning.

Theme 2 Teamwork challenges

All respondents agreed that working collaboratively was a challenging task that entailed complicated conflicts. They portrayed the issues they encountered while working on their project. These issues can be classified into the following subthemes and supported respectively: Lack of clarity and communication, Disengagement, Personality traits differences and conflicts.

Evidence

"I hate collaborative work as it introduces conflicts and misunderstanding..." Participant 9; *"Working with peers that do not bother themselves to share updates is terrible"* Participant 11; *"I think that personality traits play a great role when it comes to collaborative or teamwork,...working with people who have different objectives and traits will slow the process"* Participant 2 ; *"I do not like working with people who are not determined...they disconnect whenever they want... they are a source of apathy and disinterest.....this type could impede the progress of our project "* Participant 6.

Interpretation

Teamwork can generate complex hurdles which, if not addressed properly, they may lead to the failure of PBL. These hurdles are directly related to and with the versatile nature of the human being. As a result, various dimensions should be thoroughly considered when working collaboratively. Indeed, the interpretation of respondents' answers accentuates the importance of determining a clear frame of objectives and roles, and encouraging permanent communication and dialogues in a safe psychological space where personal differences are respected, in generating a fruitful collaborative experience.

Theme 03 Time management challenges

Some students reported that they encountered hardships with time management while receiving PBL- based RM course and working on their research project. The data indicated that these students struggled with establishing a timetable and consistently adhering to it in order to achieve a specific learning goal. This stems from distractions, excessive tasks, and poor prioritization.

Evidence

“In the first sessions, I had the impression that the time is running, particularly when we move from the phase of active reading and synthesis to the phase of practice... I felt like I have to speed up... This fatigued me and sometimes it demotivated me....” Participant 1; *“the major difficulty, I faced with my group is scheduling tasks and setting time lines.... We were always beyond the unscheduled schedule.....”* Participant 9; *“Each time I intend to work on my project I feel distracted... I can’t control my social media use....”* Participant 6.

Interpretation

The findings uncover profound meanings students attribute to the internal and external barriers to accomplish a PBL task within a specific timeframe. For instance, the pressure and stress that result from cognitive/task overload and negative behavioral patterns manifested by one’s team members could negatively influence motivation and the effectiveness of the PBL approach. Additionally, poor scheduling skills, distracters, and some personal habits could culminate in delays and projects derail. Consequently, self-regulation and discipline are prerequisites for effective implementation of PBL.

Theme 04 Practice overload

According to many students, the theme “practice overload” intersects with the previous one as it might initiate problems and difficulties with time management. The majority of students admitted that they were overwhelmed with the excessive amount of practice they received during their experience with PBL. Although it enhanced their understanding and equipped them with the toolkit that helped them to bridge theory with practice, some students found that it was stressful and led to difficulties in concentration.

Evidence

“Each time, the teacher introduces the practice phase , I feel swamped... sometimes the activities challenge my understanding and push me to think differently, the thing that I hate the most...each time I find a fallacy in my approach, I feel stuck and unable to proceed...” Participant 16; *“I feel that there is an endless row of practice during RM sessions, we start with reading, analyzing and synthesizing , then we should practice to implement what we learned from our reading , then we should reflect on our final project...”* Participant 7; *“Sometimes, I fail to concentrate with the second phase of the session,... I feel exhausted and I needed breaks....I wished we could have breaks between the three phases of the session...”* Participant 9.

Interpretation

Data unveil that practice might sometimes lead to undesirable outcomes. Particularly, complex tasks, multitasking and successive tasks could fatigue the mind and reduce the concentration span among students who are not accustomed to.

Theme 04 Language barriers

Some students conceded that their linguistic proficiency level was low and limited. This impeded their capacity to articulate their ideas and engage in PBL-based RM tasks effectively. Indeed, limited vocabulary can reduce learning opportunities and entail hesitation disengagement, and difficulties in understanding.

Evidence

“One of the major problems I had, was lack of vocabulary...I struggled with discussing my ideas freely during the practice phase” Participant 1 *“.....when it comes to research problem and hypothesis, I*

struggled to find the right word to precisely say what I mean, although I have perfectly understood the principles of writing a research problem and hypothesis,..." Participant 5 ; *"I thought I was fluent, but....I discovered that my vocabulary is very limited when it comes to research, and being precise..."* Participant 8.

Interpretation

Students narratives indicate that linguistic proficiency is intimately interrelated with some research skills such as problem statement and hypothesis formulation. Limited vocabulary might negatively affect students' engagement in PBL-based RM tasks and impede their research project progress. Thus, having a high level of linguistic proficiency is essential for research.

Theme 05 Resources limitation

Many students posited that they encountered some difficulties relevant to finding resources pertaining to their research topic. They reported that scarcity of books and articles in one's field of interest deprived them from valuable opportunities to understand their research topic from others' perspectives.

Evidence

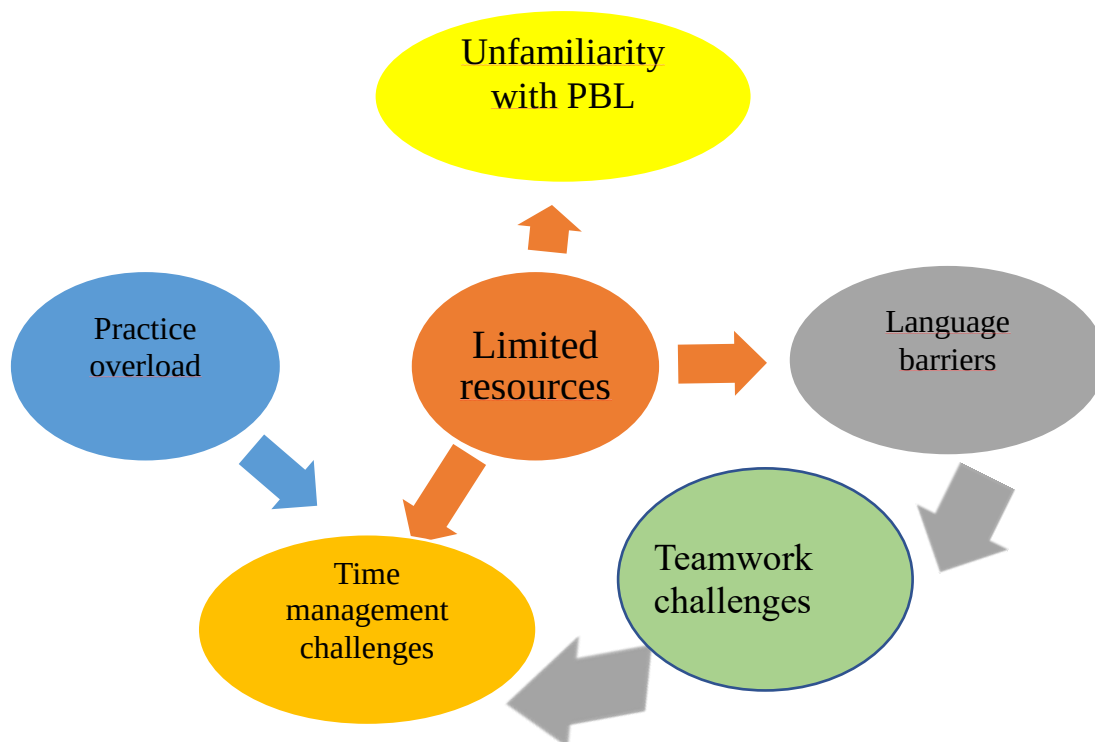
"Finding books and articles in the library was one of the barriers to finish my research project in the appropriate time..." Participant 5; *"I and my friends wasted a lot of time to find only few articles about our research topic."* Participant 16; *"I know how to look for resources and evaluate them, but I failed to find recent ones in our library..."* Participant 9; *"not finding enough resources hindered our understanding of our topic and delayed the progress of our research"* Participant 3.

Interpretation

Students' voices reflect that the availability of resources can significantly delimit and limit the process of research. Indeed, being unable to find relevant literature can constrain students from establishing strong foundations for their research. It might also negatively affect the timeline and progress of one's research project.

Ultimately, the six identified themes throughout students' narratives portrayed and accentuated multi-layered and interrelated barriers to effective implementation of PBL in RM sessions. A profound connection was observed between the themes (See Figure 01). Particularly, lack of resources can influence one's ability to establish knowledge and articulate ideas. Similarly, it might lead to challenges with adhering to one's set timeline. Thus, lack of resources is related to language barriers, familiarity with a particular topic and time management. This latter could be affected by practice overload and team spirit. In other words, excessive practice might overwhelm students and impact their schedules negatively. Additionally, working collaboratively could generate some barriers to effective time management.

Figure 01: Themes connections



5. Discussion

The present study attempts to examine the effectiveness of PBL-based RM course on EFL Master's students' research skills and inquire into the major challenges faced by these students during the intervention. Quantitative results demonstrated a statistically significant improvement in research skills post-test scores among experimental group participants, supporting the research hypothesis that maintained that PBL-based RM course can positively impact research skills. On the other hand, qualitative data from focus group discussion revealed that students were unfamiliar with PBL and faced different challenges to engage in PBL-based RM course and research project. These challenges are relevant to time management, teamwork, limited resources, practice overload, and language barriers.

The findings of this study align with previous studies highlighting that PBL is an effective instructional approach that can help students of various disciplines actively construct, integrate and apply knowledge (Boaler, 1997; Guo et.al., 2020). Additionally, the findings conform to those of Capraro and his colleagues (2013) who suggested that the use of PBL as a teaching model could positively impact the development of research skills among learners. In other words, the implementation of PBL in RM classes can yield satisfactory outcomes (Khalaf & Alshammari, 2023). Indeed, it enabled EFL master's students to become more responsible for the process of learning the content of research methodology and develop some research competencies. Particularly, the ability to select the relevant and reliable resources, the ability to plan research methodology, and the ability to analyze quantitative and qualitative data are the most effectively developed research skills among EFL master's students. Nevertheless, the challenges reported by students, specifically teamwork challenges, practice overload, and language barriers call for necessary adaptations in the intervention. In essence, linguistic proficiency, teamwork skills, resources availability and the load of practice are pivotal factors that should be considered to facilitate the effective implementation and application of PBL in RM sessions. Therefore, the benefits of a PBL-based intervention could be realized only if it is contextualized and tailored according to the aforementioned factors.

Although the employed mixed method approach expanded the spectrum of results interpretation, this study is limited by the fact that the sample was not selected randomly. Therefore, the generalization of this study findings is unfeasible. Likewise, self-reported and researcher biases might be the inherent limitations of the qualitative data collected via the focus group discussion. Despite the aforementioned limitations, this study contributes to the growing body of knowledge that aims to understand and explain the cause-effect relationship between PBL and research skills among EFL master's learners. Additionally, it opens doors for future research that might employ different methodologies and designs to scrutinize the feasibility and effectiveness of integrating PBL to teach other EFL subjects like Culture and Civilization, Study skills, Linguistics to undergraduates and master's students. Moreover, this study recommends the use of random sampling techniques, in future research, to mitigate self-selection bias and enhance external validity.

Conclusion

A posteriori, the mixed methods approach employed in this study permits a profound evaluation of the effectiveness and challenges associated with PBL implementation. Indeed, this methodology provides evidence that PBL can be applicable in EFL classes. Additionally, it can be an effective instructional model to teach research methodology to EFL master's students. However, prior to the implementation of this approach, teachers and instructors should examine students' linguistic proficiency, teamwork and time management skills to ensure effective accommodation to various levels and styles.

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