

Project-based language learning in the Middle East and North Africa: An AI-assisted systematic review

Apprendimento linguistico basato su progetti in Medio Oriente e Nord Africa:
una revisione sistematica assistita dall'intelligenza artificiale

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ABSTRACT Project-based language learning (PBL) is unarguably popular worldwide. However, how commonly is this approach implemented in the Middle East and North Africa (MENA)? To find out, a systematic review of research on MENA's PBL practices was conducted to shed light on the region. Using a qualitative analysis approach with the assistance of generative artificial Intelligence (GenAI), this article reviews PBL empirical research from 1980 to 2024 in MENA. Four themes emerged: PBL implementation and effectiveness, PBL form and function, PBL technological integration, and challenges implementing PBL. PBL, which slowly began to increase in popularity in the early 2000s in MENA, was found to enhance language teaching, learning, student engagement, and critical thinking across the MENA countries, despite varying degrees of challenges. The findings stressed the role of teacher professional development and the availability of technological resources for successful PBL implementation. The study concludes with recommendations for PBL in MENA.

KEYWORDS Project-Based Language Learning; Under-Resourced and Better-Resourced Contexts; Middle East and North Africa; Innovative Qualitative Data Analysis with AI; Systematic Review.

SOMMARIO L'apprendimento linguistico basato su progetti (Project-Based Language Learning, PBL) è indubbiamente molto diffuso a livello globale. Tuttavia, quanto è effettivamente comune questo approccio nel Medio Oriente e Nord Africa (MENA)? Per rispondere a questa domanda è stata condotta una revisione sistematica della ricerca sulle pratiche PBL nella regione, con l'obiettivo di fare chiarezza sulla situazione in

quel contesto. Utilizzando un approccio di analisi qualitativa, supportato dall'intelligenza artificiale generativa (GenAI), questo articolo esamina la ricerca empirica sul PBL nel MENA dal 1980 al 2024. Sono emersi quattro temi principali: l'implementazione e l'efficacia del PBL, la forma e la funzione del PBL, l'integrazione tecnologica nel PBL e le sfide legate alla sua attuazione. Il PBL, che ha iniziato a diffondersi gradualmente nei primi anni 2000 nella regione MENA, ha migliorato l'insegnamento e l'apprendimento linguistico, il coinvolgimento degli studenti e il pensiero critico nei vari Paesi della regione, nonostante differenze nel livello delle difficoltà riscontrate. I risultati hanno evidenziato il ruolo della formazione professionale degli insegnanti e della disponibilità di risorse tecnologiche per una implementazione efficace del PBL. Lo studio si conclude con una serie di raccomandazioni per l'adozione del PBL nella regione MENA

PAROLE CHIAVE Apprendimento delle Lingue Basato su Progetti; Contesti Didattici Poveri di Risorse; Medio Oriente e Nord Africa; Analisi Qualitativa dei Dati con Intelligenza Artificiale; Revisione Sistemica della Letteratura.

1. Introduction

In language education, project-based language learning (PBL) has proven to be highly engaging (Beckett, 1999; Thomas, 2000; Nami, 2021) due to real-life relevance of project work to students (Beckett et al., 2020b). This approach fosters linguistic skills (form and function) and cultivates critical thinking, collaboration, and digital literacy (Beckett, 2023). Beckett et al. (2020b) stress the importance of language form and function in PBL, emphasizing that “*there has been little research, especially experimental research, addressing how PBL promotes the development of language form and function, particularly in technology-mediated PBL contexts*” (p. 8). Over the past several decades, the implementation of PBL has gained enormous popularity, resulting in its application in many different contexts globally, including the Middle East and North Africa (MENA) region.

The MENA region, which is characterized by its linguistic diversity and an unfortunate lack of educational and professional resources (Akkari, 2004; Hos & Cinarbas), provides a rich context for understanding the application of PBL with or without the assistance of technology. However, the effectiveness and implementation of PBL in MENA, specifically in under-resourced contexts, have not been fully explored (Garib, 2022; 2024; Thomas & Yamazaki, 2021). To address this need, this article overviews PBL's global practices, sheds light on English language teaching in MENA and examines published research on PBL in MENA to understand how, over time, this pedagogical approach has been applied in various settings. Because the state-of-the-art generative artificial intelligence (GenAI) offers opportunities for novel methodologies in conducting qualitative systematic review studies (Hamilton et al., 2023; Hosseini et al., 2023; Morgan, 2023), this study takes

a step forward with its methodology by using GenAI as an assistant for the systematic review. The study contributes to the broader field of educational technology, teaching, and learning by exploring the challenges and opportunities of implementing PBL with or without educational technology in MENA, which can guide teachers, policymakers, and researchers in similar contexts globally.

1.1. Overviewing PBL's global practices

PBL's global practices reveal a diverse implementation spectrum. For instance, PBL has a decades-long history that can be traced back to several regions. In Asia, PBL has been adapted to enhance students' language engagement (Kelsen, 2018) and deepen their linguistic understanding through the integration of relevant cultural elements (Wang, 2020). In Europe, PBL gained attention for its cross-cultural communication and collaboration, preparing students for a globalized workforce (Lewin & McNicol, 2015; Sato & Horne, 2020). In North America, project work has been well-known for its effectiveness in general and language education (Beckett, 1999; Beckett et al., 2015; Beckett et al., 2020a; Beck & Kurt, 2022). These contextual variations in practice show the practicality of PBL in different well-resourced educational contexts. However, a shift towards the exploration of PBL in under-resourced contexts is needed (Garib, 2022; 2024; Thomas & Yamazaki, 2021).

The implementation of PBL in many under-resourced contexts, particularly within MENA, has not been explored adequately (Nasr & Wilby, 2017; Romanowski & Karkouti, 2021; Rahme & Altamimi, 2022). The discussion of PBL in MENA can uncover unique practices and contextual challenges. This region has endured continuous challenges, such as economic crises, political instabilities, natural disasters, wars, and politically motivated technological inaccessibility (Jahanshahi et al., 2020). Such factors can negatively impact the implementation of educational innovations like PBL. Highlighting the need for further exploration of PBL practices in MENA addresses future solutions and challenges. Before delving into PBL practices in MENA, reviewing language teaching practices in this region is necessary to understand how PBL fits in such contexts. The following section explores the region's English language teaching (ELT) norms and challenges.

1.2. ELT challenges and opportunities in the MENA region

The MENA region “*has been thinking high of the English language, since research-wise, English is perceived as the only way out...a country to receive international recognition and [for its universities to receive a] good ranking*” (Hidri 2019, p. 38). The status of this region can be viewed in two ways: better-resourced and under-resourced countries. According to the United Nations' Country Classification Report (2024), the oil-producing countries such as the UAE, Qatar, Bahrain, Kuwait, Oman, and Saudi Arabia fall into the better-

resourced category, which benefit from well-funded education systems, access to modern educational technologies, and an emphasis on English language learning as a component for global engagement. In contrast, countries like Yemen, Libya, Syria, Iraq, Lebanon, Tunisia, and parts of rural Egypt and Morocco are considered under-resourced (UN Report, 2024), facing challenges due to weak infrastructure, limited educational materials, and scarce teacher training within local contexts.

These contextual disparities can affect the implementation and outcomes of ELT across the region, with under-resourced contexts struggling to keep pace with their more affluent counterparts (Kuchah, 2018). For example, in MENA's under-resourced contexts, curriculum design often fails to meet students' needs due to outdated curricula and policymakers' resistance to adopt programs suitable for their local contexts (Abubaker et al., 2025; Farag & Yacoub, 2023; Hayes, 2012). Hayes adds that such practices are due to policymakers' overemphasis on international educational systems that were developed for other contexts. In light of this, Farag and Yacoub (2023) explained that such educational "*policy innovations unfortunately do not emanate from baseline research. They are most often borrowed from other contexts where they have worked well*" (p. 245). Another challenging factor is the limitation of teacher autonomy, with educators frequently operating under rigid curricular constraints that leave little room for innovation or adaptation to local contexts (Hos & Cinarbas, 2017). Additionally, professional development opportunities for teachers are scarce (Garib, 2022), preventing teachers from keeping up with the latest pedagogical strategies and research in language teaching. Moreover, issues with technology integration are common, as many schools lack the necessary infrastructure or resources to implement educational technology effectively (Daoud, 2019; Al-Jaro, 2023).

Such challenges can disrupt ELT, resulting in a failure to achieve language teaching and learning goals. However, despite these challenges, there is a growing recognition of the need for more interactive and engaging teaching approaches in the MENA region's ELT, more specifically the adoption of interactive approaches such as PBL (Abubaker et al., 2025; Garib, 2022; Garib & Schmidt-Crawford, 2025). To explore this need, a systematic review of PBL practices can assist in understanding PBL's practices in MENA, which is the goal of this study.

1.3. Focus of the study

Beckett and Slater (2020) discussed research gaps in PBL literature, including expanding the contextual exploration of PBL research beyond North America, PBL's development of English language form and function, technology integration and assessment, and teacher training for technology integration. In response to Beckett et al.'s (2020) call for a regional understanding of teachers' PBL practices, this study conducts a systematic review of research on MENA's PBL practices to explore this region's distribution of PBL research

publications and project implementation from 1980 until 2024. The guiding research questions for this exploration are:

What varying distribution (if any) are there in the implementation and publication of PBL research in the MENA region from 1980 to 2024?

What do MENA PBL research studies report on the implementation of PBL and its impact on the learning of language form and function?

What challenges and technology tools (if any) are commonly mentioned in the PBL MENA studies, and how do these factors differ between well-resourced and under-resourced contexts?

2. Research methodology

This systematic review employed a structured approach to gather, select, and synthesize empirical research on project-based language learning (PBL) in the Middle East and North Africa (MENA) region, covering the period from 1980 to 2024, because PBL work began to appear in the 1980's (Beckett, 1999; Beckett et al., 2025). This study is part of an ongoing larger study (Beck & Kurt, 2022; Beckett et al., 2025), which examines PBL research worldwide. The identification of MENA countries in this study follows the UN's Country Classification (2024).

Drawing on established methodological frameworks (Macaro et al., 2012; Page et al., 2021; Reinders et al., 2023) for systematic reviews, this qualitative study documents the various implementations of PBL for data collection and data analysis. This review takes an innovative initiative by using generative artificial intelligence (GenAI) in the analysis, namely AI-assisted analytical techniques, to examine the PBL literature within MENA, which enhanced the depth and breadth of the study's qualitative analysis.

2.1. Data collection

To ensure rigor in the selection of empirical research articles, the authors adhered to PRISMA's three guiding steps (Chong & Reinders, 2021; Page et al., 2021): identification, screening, and inclusion. Following such a process maintains a systematic procedure for a transparent, replicable, and methodologically sound research selection, which aligns with the standards for systematic reviews (Moher et al., 2009). Figure 1 outlines these three processes in this study.

1 Identification	
<p>To identify data for collection, the search was conducted across seven electronic databases covering educational and psychological literature (Beckett et al., 2025): Academic Search Complete, ERIC, MLA Full Texts, Linguistics and Language Behavior Abstracts (LLBA), MLA International Bibliography Full Text, Social Sciences Dissertation Abstracts, and PsycINFO. As pointed out in Beckett et al. (2025), these selected databases are recommended for scholarly communities in the U.S and Canada. Search terms included combinations of “technology-assisted learning,” “project-based learning,” “PBL,” “PBL,” “creativity and innovation,” “collaboration or cooperative work,” “digital literacy and disciplinary literacy,” “autonomy or self-management,” “independent decision making or independence,” “engagement or motivation,” “self or social awareness,” “ownership and agency,” “self-awareness or social awareness,” and “Middle East & North Africa/MENA.”</p>	
2 Screening	3 Inclusion
<p>The retrieved studies were screened for the selection process following the Cochrane systematic review criteria (Higgins et al., 2019), which focuses on the population (MENA region), phenomena of interest (PBL/TAPBL), and context (educational settings). The gathered articles were screened based on title, abstract, written in English language only, and full text to determine relevance in a Mother Folder, which was the main folder of all collected articles in the host university Box folder, as recommended by Booth et al. (2012).</p>	<p>All PBL journal articles about the MENA region were identified and included in a separate sub-folder. PBL studies were excluded due to limited/no focus on language learning. Out of 620 articles, the first author identified a total of 62 PBL empirical research articles that focused on the implementation of PBL in different micro contexts, including middle school, high school, and post-secondary in the macro context of MENA. Of these 62 studies, 61 were included for analysis in the current study (see Figure 2). These gathered articles are published in English only.</p>

Figure 1. PRISMA’s guiding steps

Figure 2 illustrates the steps taken in the PRISMA-guided data collection procedure.

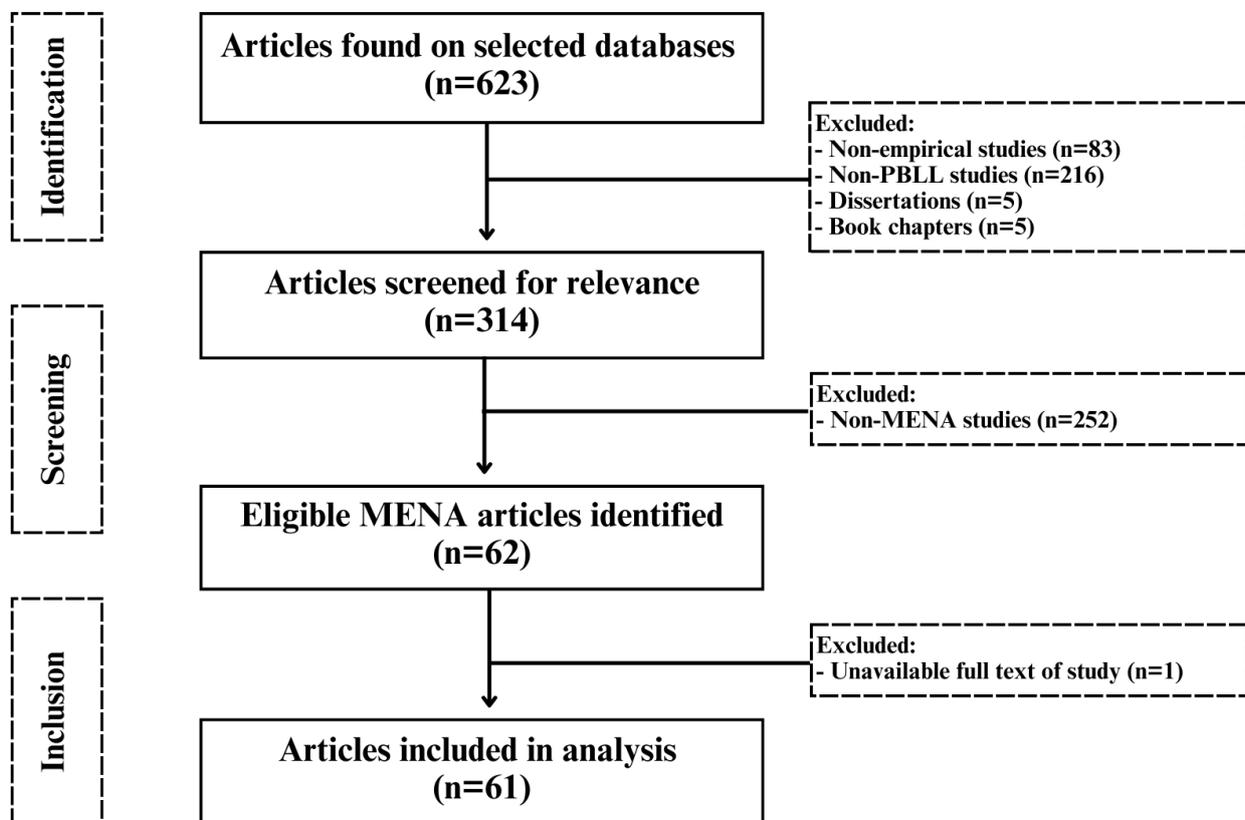


Figure 2. PRISMA-guided data collection procedure.

2.2. Data analysis

Once the selection of articles was completed, the researchers, following Macaro et al.'s (2012) framework, independently read and reviewed each article and recorded their summaries in an Excel spreadsheet. The spreadsheet prompted researchers to record details on each research study, including the type of the study, research foci, technology used, theoretical orientation, macro and micro contexts, participants, research methods, data sources, major findings, conclusions/implications, and general comments. Following the thorough manual summarization of the selected empirical research articles, the first author took two steps:

(1) used OpenAI's ChatGPT (version 4o, 2024) to conduct a human-led thematic analysis of the human-written summaries

(2) employed NVivo to analyze and validate the same dataset thematically. To adhere to research ethics, the text of the original research studies was not inputted into ChatGPT. Instead, the first author provided only the human-written summaries for ChatGPT to perform the data analysis in the temporary chat mode. The following provides detailed overview of both steps.

2.2.1. Step 1: Using OpenAI's ChatGPT for Thematic Analysis

Why was ChatGPT used as an analysis tool? The appearance of GenAI in all aspects of academic practices, including education and research, necessitates the adoption of new perspectives (Chapelle, 2024), which, in turn, can offer enhancements in human productivity (Khalifa & Albadawy, 2024) and efficiency in data analysis (Hosseini et al., 2023; Garib & Coffelt, 2024; Garib et al., 2024). For instance, Hamilton et al. (2023) stress that ChatGPT can “*supplement complex human-centered tasks such as qualitative research analysis*” (p. 13) by identifying emerging themes in data. Furthermore, Morgan (2023) highlights that GenAI tools “*have the power to disrupt the coding of data segments as a dominant paradigm for qualitative data analysis*” (p. 1), suggesting the use of GenAI can reduce the time and workload of traditional methods. However, such uses of GenAI should be ethically sound, as Hosseini et al. (2023) advocate for the responsible use of GenAI in research analysis to ensure research “*transparency, accountability, fair allocation of credit, and integrity*” (p. 462). To maintain such research integrity, human intervention is necessary (Castillo-González, 2023), as is the case in the current study.

Building on the recommendations for using GenAI for data, the current study takes an innovative initiative by employing ChatGPT in qualitative analysis. Guided by Braun and Clarke's (2019) thematic analysis, the first author prompted ChatGPT to analyze the data using several steps: initial coding, categorization, and theme development, which were followed by extensive human revisions. Due to ChatGPT's potential limitations in

conducting qualitative analysis (Morgan, 2023) and to avoid any possible GenAI hallucinations (Mahmoudi et al., 2024), the human revision step was integrated as a continuous process, occurring after each step of the analysis, to ensure the accuracy of the data throughout, rather than being conducted only at the end. The human revisions were guided by Braun and Clarke's overarching thematic analysis principles, which emphasize semantic coherence, relevance to the research questions, and representativeness across the dataset. More specifically, the themes were evaluated based on their internal consistency and alignment with the summaries' actual content. In cases where discrepancies arose, the first author prioritized the data-relevant meanings over abstract patterns. It is important to note that these judgments were not purely intuitive. That is, the first author followed the analytical logic of coding saturation, relevance of the categories to the codes, and the interpretive coherence of the dataset.

The first author prompted ChatGPT to generate initial codes by identifying recurring words and phrases across the human-written summaries of the articles. This was done using a prompting approach guided by Garib et al.'s (2024) framework of basic, detailed, and trained prompting techniques. In the initial coding phase, basic prompts were used, for example: "Identify recurring keywords or concepts in the summaries," which allowed ChatGPT to surface lexical patterns and frequently mentioned terms. In the categorization phase, the process moved to detailed prompting, where ChatGPT was asked to group related codes into conceptual categories. An example prompt included: "*Based on the summaries and the codes you just generated, cluster these codes into broader categories that reflect the PBL-related practices within the summaries.*" During this phase, discrepancies between the human and GenAI were observed then resolved through repeated review. The next step included developing these categories into emerging themes that represented the research findings within summaries. In the theme development stage, the first author used trained prompting to guide ChatGPT in generating thematic interpretations. For instance, a prompt example can be exemplified in: "*Based on the categories you generated, identify overarching themes that capture patterns in PBL implementation, instructional focus, and contextual barriers across the MENA studies within the summaries.*" These steps required constant back-and-forth prompting with ChatGPT as well as thorough revision and comparison with the original human-written summaries.

Although ChatGPT's theme identification was a helpful guide, its output cannot (and should not) be used as a final analysis version due to its limitations and tendencies to hallucinate. For example, ChatGPT's coding was precise and insightful, but a discrepancy of approximately 19% was observed when compared with the first author. While the AI-generated codes initially appeared clear and relevant, a closer examination revealed inconsistencies that warranted further analysis. These discrepancies were of two types:

- (1) hallucinations (made up or nonexistent details) and

(2) micro-coding (too precise that it lost track of actual representation of data).

ChatGPT initially generated a recurring category of “learning outcomes.” However, the human reviewer identified that “student engagement” was a relevant category because the focus was on the action of the learning, not the overall result. A key takeaway from these discrepancies is that, in certain situations, GenAI can be so precise that it paradoxically leads it to overlooking broader patterns, or at times, simply makes up information. Catching hallucinations was more manageable than micro-coding. Micro-coding can create confusion and distraction from the main focus. Therefore, the first author, who was also critical of all codes and themes that ChatGPT generated, repeatedly revised all ChatGPT’s output to assure accurate alignment with the data. For precise coding and analysis, human oversight of GeAI output is needed at all times.

2.2.2. Step 2: Using NVivo for Validation and Cross-Comparison

To further address the potential limitations of relying on GenAI as an only tool for the data analysis, and also to ensure the credibility and rigor of the qualitative analysis, the first author used the NVivo software to cross-validate the themes generated by ChatGPT. NVivo is a purpose-built tool for qualitative data analysis, which provides structured coding, visualization tools, and frequency analysis (Garib, 2024). The human-coded summaries were imported into NVivo and analyzed manually by the first author (see Figure 4). Through NVivo’s systematic coding functions, the themes reflected their frequency in the data (see Figure 3).

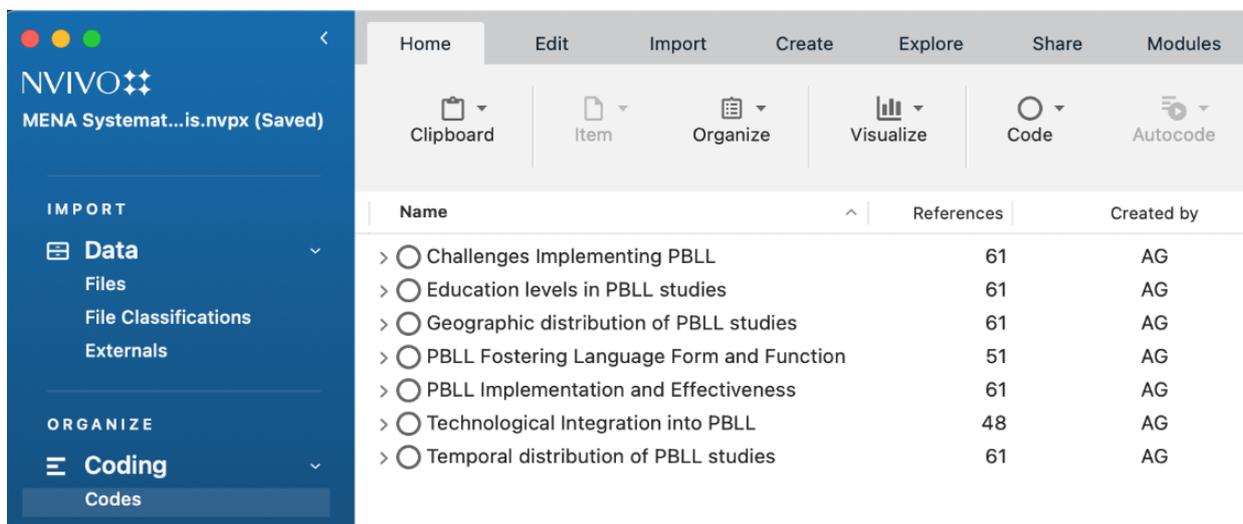
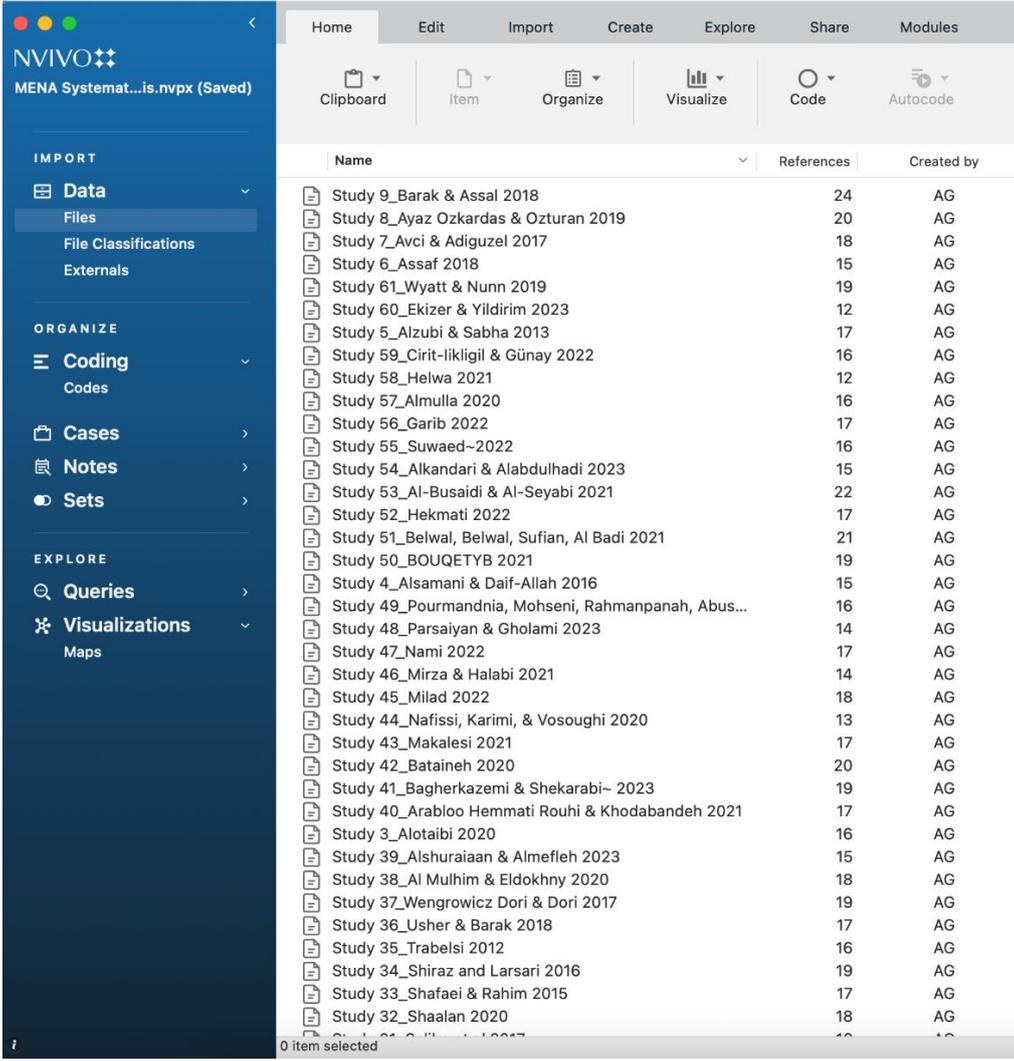


Figure 3. Frequency of Emerging Themes.



The screenshot shows the NVivo software interface with a list of study references. The interface includes a top navigation bar with options like Home, Edit, Import, Create, Explore, Share, and Modules. A left sidebar contains menu items for Import (Data, Files, File Classifications, Externals), Organize (Coding, Codes, Cases, Notes, Sets), and Explore (Queries, Visualizations, Maps). The main area displays a table with columns for Name, References, and Created by.

Name	References	Created by
Study 9_Barak & Assal 2018	24	AG
Study 8_Ayaz Ozkardas & Ozturan 2019	20	AG
Study 7_Avci & Adiguzel 2017	18	AG
Study 6_Assaf 2018	15	AG
Study 61_Wyatt & Nunn 2019	19	AG
Study 60_Ekizer & Yildirim 2023	12	AG
Study 5_Alzubi & Sabha 2013	17	AG
Study 59_Cirit-likligil & Günay 2022	16	AG
Study 58_Helwa 2021	12	AG
Study 57_Almulla 2020	16	AG
Study 56_Garib 2022	17	AG
Study 55_Suwaed~2022	16	AG
Study 54_Alkandari & Alabdulhadi 2023	15	AG
Study 53_Al-Busaidi & Al-Seyabi 2021	22	AG
Study 52_Hekmati 2022	17	AG
Study 51_Belwal, Belwal, Sufian, Al Badi 2021	21	AG
Study 50_BOUQETYB 2021	19	AG
Study 4_Alsamani & Daif-Allah 2016	15	AG
Study 49_Pourmandnia, Mohseni, Rahmanpanah, Abus...	16	AG
Study 48_Parsaiyan & Gholami 2023	14	AG
Study 47_Nami 2022	17	AG
Study 46_Mirza & Halabi 2021	14	AG
Study 45_Milad 2022	18	AG
Study 44_Nafissi, Karimi, & Vosoughi 2020	13	AG
Study 43_Makalesi 2021	17	AG
Study 42_Bataineh 2020	20	AG
Study 41_Bagherkazemi & Shekarabi~ 2023	19	AG
Study 40_Arabloo Hemmati Rouhi & Khodabandeh 2021	17	AG
Study 3_Alotaibi 2020	16	AG
Study 39_Alshuraiaan & Almeffeh 2023	15	AG
Study 38_Al Mulhim & Eldokhny 2020	18	AG
Study 37_Wengrowicz Dori & Dori 2017	19	AG
Study 36_Usher & Barak 2018	17	AG
Study 35_Trabelsi 2012	16	AG
Study 34_Shiraz and Larsari 2016	19	AG
Study 33_Shafaei & Rahim 2015	17	AG
Study 32_Shaalan 2020	18	AG
Study 31_Shaalan 2020	18	AG
Study 30_Shaalan 2020	18	AG

Figure 4. References to Codes in the Human-Written Study Summaries.

This approach to data analysis, along with the human expertise and GenAI precision, triangulated the data analysis and added richness and multifaceted understanding of the human-AI collaboration. Using ChatGPT certainly enriched the analysis and provided several benefits that might have been missed by the human reviewer alone. One observation was that ChatGPT’s ability to process large volumes of data quickly helped in identifying categories, patterns, and themes that might not have been apparent to the human reviewer using NVivo. For example, while the human reviewer noted “student engagement” as an important category, ChatGPT was able to identify nuanced codes within this category, such as “peer interaction” and “self-motivation,” which were initially overlooked. Additionally, ChatGPT’s suggestions prompted the human reviewer to reconsider and refine their categories, which led to a more thorough analysis. To further examine the alignment between the human-coded and ChatGPT-coded thematic analysis, the first author compared and calculated the simple percentage agreement for the coding outcomes for the four main emergent themes: PBL Implementation and Effectiveness, Fostering

Language Form and Function, Technological Integration, and Challenges. It is important to note that the other three emerging themes: Education Levels, Geographic Distribution, and Temporal Distribution, were not included in the percentage agreement analysis because they are descriptive or categorical themes rather than interpretive. That is, these themes were automatically identified in every study, since each article reported where and when the study took place and what education level was involved.

Based on the NVivo analysis of the 61 studies, the highest alignment between ChatGPT and the human coder was observed in PBL Implementation and Effectiveness (coded in 61 studies), followed by Technological Integration (coded in 48 studies), and Fostering Language Form and Function (coded in 51 studies). The lowest agreement occurred under the theme of Challenges Implementing PBL (coded in 61 studies), where interestingly ChatGPT struggled to distinguish between the nuanced contextual constraints, despite the fact that all the 61 studies reported some form of barriers (See Figure 3). With that being stated, the broad agreement rate across the four themes was 81%, with the most consistent coding appearing in categories that involved explicit language. For example, surface-level and clearly stated technologies or stated instructional outcomes were commonly agreed upon. In contrast, the other themes, Challenges Implementing PBL and Language Form/Function, relied on more abstract interpretations, especially where ChatGPT tended to misinterpret contextual or pedagogical nuance. These results are consistent with current literature (Garib & Coffelt, 2024; Nyaaba et al., 2025; Yan et al., 2024), which indicates that GenAI tools are suited for surface-level thematic identification but are less reliable in distinguishing or identifying complex and context-related meanings. These observations reinforce the importance of human oversight in qualitative analysis as well as highlight the complementary potential of GenAI to augment, but not replace, human judgment.

3. Findings

This section introduces the findings of our systematic review of PBL research in the Middle East and North Africa region from 1980-2024. This study sought to determine the distribution of PBL publications in the MENA region, what research studies in the region report on the implementation of PBL and its impact on the learning of language form and function, and the challenges and technology tools that are commonly addressed within well-resourced and under-resourced MENA contexts. These resulting findings provide a better sense of PBL publications and research in the region and help determine future directions. The results are presented in response to the three research questions in this study.

3.1. RQ#1: Distribution in the implementation and publication of PBL research in MENA from 1980 to 2024.

In response to RQ#1, three factors illustrated the varying distributions in the implementation and publication of PBL research among countries in MENA from 1980 to 2024. These factors include temporal distribution of PBL studies, geographic distribution of PBL studies, and education levels or grades investigated in PBL studies.

3.1.1. RQ#1: Temporal distribution of PBL studies

The included studies were not conducted evenly between 1980 and 2024. A noticeable increase in PBL research occurred in the mid-2000s. From 1980 to 2005, there were no known PBL studies published in the MENA region in English. Starting in 2006, the number of studies began to rise gradually, with one study each year in 2006, 2008, 2010, and 2012, except in 2013, where there was a slight spike with three studies. From 2014 to 2017, the number of studies fluctuated, with a notable increase starting in 2015, where four studies were published. This trend continued with five studies in 2016 and four studies in 2017. In 2018, there were four studies, followed by an increase to six studies in 2019. A sharper rise occurred in 2020 with seven studies, peaking in 2021 with ten PBL studies published. The number of studies slightly decreased to seven in 2022 and six in 2023. The absence of studies in 2024 might indicate that research for this year has not been published yet, but more studies may appear in the near future. This overall research progress suggests a growing interest and an accelerating pace of research in PBL practices within the MENA region (see Figure 5).

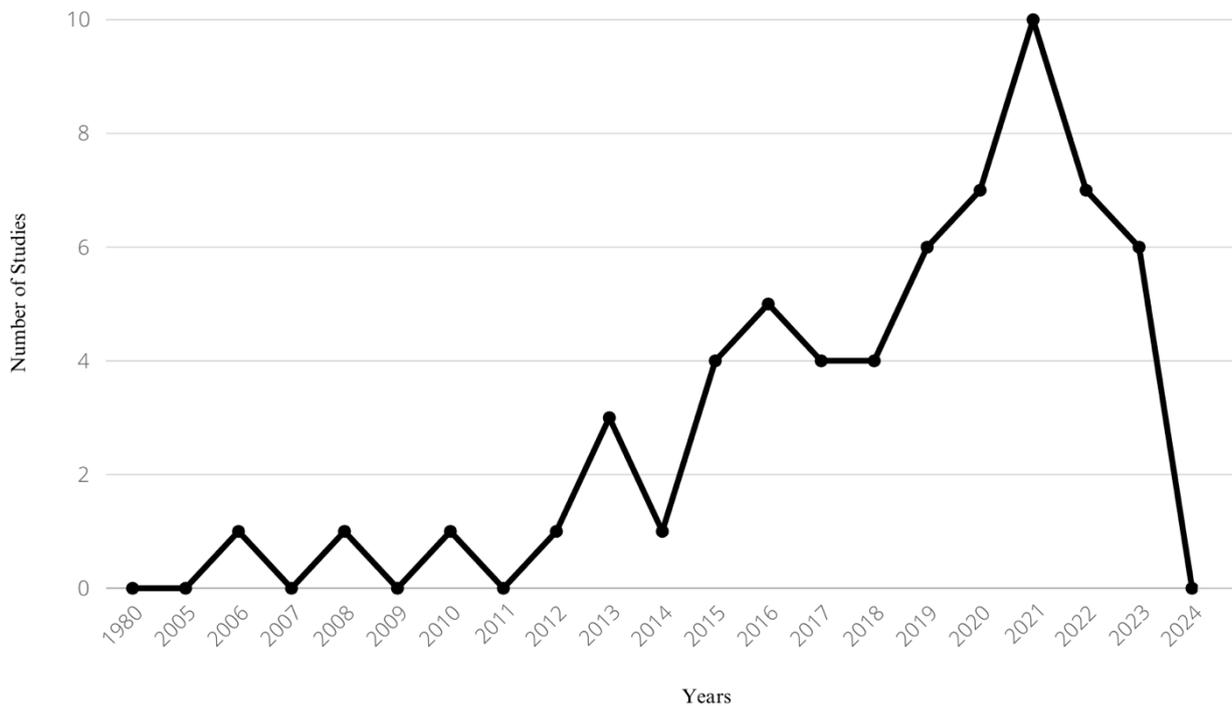


Figure 5. Number of PBL studies published in MENA between 1980-2024.

3.1.2. RQ1: Geographic distribution of PBL studies

Figure 6 illustrates the number of PBL studies included from each country to provide an overview of the research distribution across the Middle East and North Africa (MENA) region. However, our search did not yield any PBL empirical research articles in other MENA contexts, such as Bahrain, Djibouti, Mauritania, Somalia, Sudan, and Yemen. While it is noticeable that extensive research was conducted in Turkey and Iran, it was surprising that well-resourced MENA countries, such as Kuwait, Oman, Qatar, Saudi Arabia, and UAE, have relatively fewer studies published on PBL in English. Despite their advanced educational infrastructures, these countries seem to have less documented research on PBL, which could suggest either a less emphasis on this teaching approach or possibly underreporting in academic publications in English included in the databases we searched. Such limited PBL visibility highlights a potential area for further investigation into the implementation of PBL in the well-resourced MENA countries.

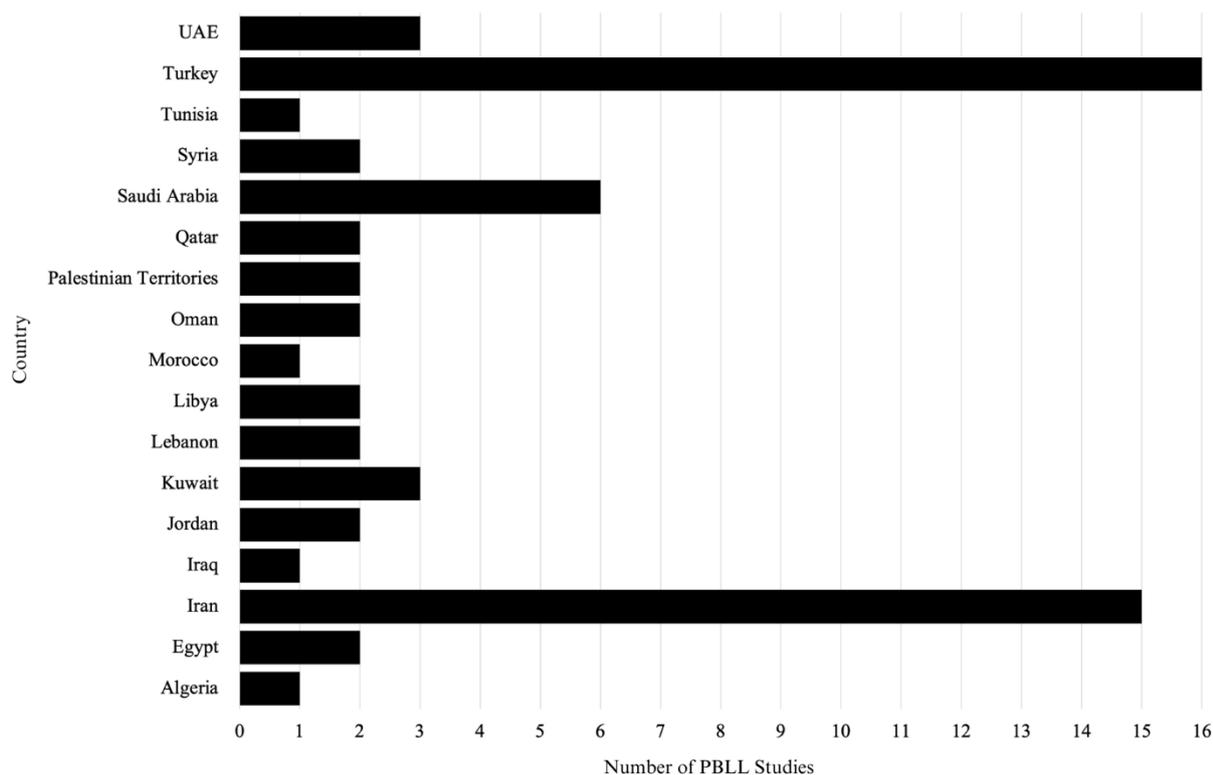


Figure 6. Number of PBL studies per country

For a specific reference to the collected studies, Table 1 complements Figure 6 by listing the studies analyzed. Such data aid in understanding the breadth and focus of PBL research within the MENA region.

Table 1. The analyzed PBL studies

Country	Analyzed PBL Studies
Algeria	Boudersa & Hamada, 2015
Egypt	Shaalán, 2020; Helwa, 2021
Iran	Alavinia & Qoitassi, 2013; Maftoon et al., 2013; Moghaddas & Khoshsaligheh, 2019; Mohamadi, 2018; Reisi & Saniei, 2016; Sadeghi et al., 2016; Shafaei & Rahim, 2015; Shiraz & Larsari, 2016; Arabloo et al., 2021; Bagherkazemi & Zahed Shekarabi, 2023; Nafissi et al., 2020; Nami, 2022; Parsaiyan & Gholami, 2023; Pourmandnia et al., 2021; Hekmati, 2022
Iraq	Kavlu, 2017
Jordan	Alzu'bi & Sabha, 2013; Bataineh et al., 2020
Kuwait	Koushki, 2019; Milad, 2022; Alshuraiaan & Almefleh, 2023
Lebanon	Mirza & Halabi, 2021; Garib, 2022
Libya	Garib, 2022; Suwaed, 2022
Morocco	Bouqetyb, 2021
Oman	Al-Busaidi & Al-Seyabi, 2021; Belwal et al., 2021

Palestinian Territories	Bakeer et al., 2023; Migdad et al., 2021
Qatar	Du et al., 2019; Saliba et al., 2017
Saudi Arabia	Alotaibi, 2020; Alsamani & Daif-Allah, 2016; Khodary et al., 2017; Madkour, 2016; AlMulhim & Eldokhny, 2020; Almulla, 2020
Syria	Assaf, 2018; Garib, 2022
Tunisia	Trabelsi (2013)
Turkey	Avcı & Adiguzel, 2017; Ayaz, et al., 2019; Bas & Beyhan, 2010; Bulu & Yildirim, 2008; Demir, 2019; Duman & Yavuz, 2018; Erdoğan & Dede, 2015; Gülbahar & Tinmaz, 2006; Cirit-Işikligil & Günay, 2022; Ekizer & Yildirim, 2023; Yılan & Konca, 2021; Saricaoglu & Geluso, 2020; Ürün et al., 2014; Yuzlu & Dikilitas, 2021; Kemaloglu-Er & Sahin, 2022; Şahin & Kiliç, 2023
UAE	Alami, 2014; Nunn et al., 2015; Wyatt & Nunn, 2019

*Note that multi-country studies are reported in each relevant country in Table 1.

3.1.3. RQ1: Education levels in PBL studies

As Figure 7 shows, the studies in Table 1 included four micro contexts: elementary school (n=4), middle school (n=6), high school (n=16), and college-level education (n=43). Some studies included multiple education levels.

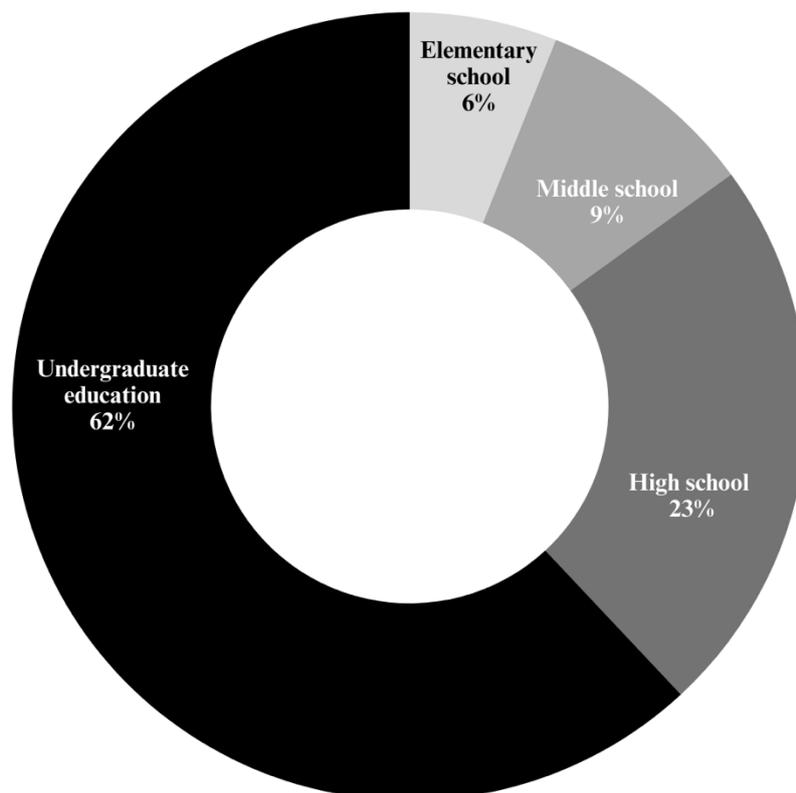


Figure 7. Distribution of education levels in MENA PBL studies.

The systematic review of PBL studies across the MENA region identified four major themes: (RQ#2) PBL implementation and effectiveness, PBL fostering language form and function, (RQ#3) technological integration into PBL, and challenges implementing PBL. These themes provide a detailed overview of the various, yet unique, implementations of PBL across the different countries in MENA.

3.2. RQ#2: Implementation of PBL in MENA PBL research and its impact on learning of language form and function.

3.2.1. RQ#2: PBL Implementation and Effectiveness

In all the 61 studies, PBL was consistently found to enhance student engagement, motivation, and language skills within the various MENA contexts. In Algeria, for instance, Boudersa and Hamada (2015) reported that PBL increased students' engagement and practical application of knowledge. In Egypt, Shaalan (2020) found that PBL played a major role in developing dental vocabulary among ESL students by creating a more interactive, student-centered learning environment. Similarly, in Egypt, Helwa (2021) found that Multiple Intelligences-supported PBL improved EFL receptive skills and learning satisfaction using digital tools. In Egypt's neighboring country, Libya, Garib (2022) and Suwaed (2022) provided further evidence of PBL's effectiveness. Garib (2022) explored Technology-Assisted Project-Based Language Learning (TAPBL) across Lebanon, Libya, and Syria, finding that despite challenges like technology access and curriculum integration, TAPBL enhanced learning autonomy, real-world connections, and reduced teacher workload. Suwaed (2022) focused on raising environmental awareness through PBL among Libyan EFL undergraduate students, demonstrating improvements in English language skills, content knowledge about the environment, soft skills, autonomy, and self-confidence.

A broader range of studies in Iran (e.g., Maftoon et al., 2013; Moghaddas & Khoshsaligheh, 2019) highlighted PBL's positive impact on motivation, cognitive development, and language skills, as is the case for studies in Turkey. In Iraq, Kavlu (2017) noted improvements in English language proficiency and 21st-century skills such as critical thinking and teamwork due to PBL. In Jordan, both Alzu'bi and Sabha (2013) and Bataineh (2020) found that PBL improved writing and speaking skills using mobile-based email and Web 2.0 tools. Studies in Kuwait (Alshuraiaan & Almfleh, 2023; Koushki, 2019; Milad, 2022), Saudi Arabia, Qatar, and UAE further reinforced PBL's efficacy in various educational settings. In Qatar, Saliba et al. (2017) used PBL to enhance information literacy and research skills among pre-medical students, while Du et al. (2019) study of elementary EFL classrooms explored how newspaper PBL projects, supported by digital tools, improved language, personal, interpersonal, and affective skills. In Saudi Arabia, Alsamani and Daif-Allah (2016) showed vocabulary gains in

ESP classes; Alotaibi (2020) enhanced persuasive writing in secondary students and Khodary et al. (2017) found Edmodo-supported PBL fostered self-directed learning. In the UAE, Alami (2014) demonstrated improved student communicative competence through literature-based PBL, and Wyatt and Nunn (2019) highlighted how PBL in engineering communication courses fostered teamwork, critical thinking, and communication skills through a socially-situated, community-of-practice approach. Surprisingly, such benefits were also highlighted in under-resourced contexts such as the Palestinian Territories, where Migdad et al. (2021) found that third-grade students in Gaza improved their vocabulary acquisition with PBL compared to traditional methods. More recently, Bakeer et al. (2023), in the West Bank, showed that combining PBL with smartphone technology enhanced undergraduate EFL students' speaking skills, self-confidence, and engagement. Many of these studies recommended integrating PBL with modern technology for more effective and engaging language learning, which segues into the next theme technology integration into PBL.

3.2.2. RQ#2: PBL Fostering Language Form and Function

While not directly addressed in some studies, the language form and function theme emerged repeatedly in the collected studies in line with Beckett et al. (2020b), where PBL had impacted both students' structural and practical use of English language, which facilitated students' grasp of grammatical structures and their ability to use language effectively in real-life contexts. For instance, in Algeria, Boudersa and Hamada (2015) found that PBL increased student engagement and practical application of knowledge, improving both language form and function through structured learning of content where grammatical accuracy is implicitly emphasized and the functional aspect was "*to help students apply the knowledge gained inside the classroom by applying it on their own in other different, but related, situations*" (p. 35). In Egypt, Shaalan (2020) emphasized PBL's role in the development of learners' dental vocabulary, highlighting improvements in language form, while Helwa (2021) reported enhanced EFL receptive skills through Multiple Intelligences-supported PBL, showcasing both form and function. However, these studies failed to explicitly make a direct connection between students' learning of language form and function through PBL. Instead, they focused on the traditional approach of examining the learning of the language form rather than its practical application.

In Iran, a few studies (Alavinia & Qoitassi, 2013; Shafaei & Rahim, 2015) reported that PBL improved vocabulary acquisition and retention, enhancing language form. However, more recent studies, such as Bagherkazemi and Zahed Shekarabi (2023) examined students' learning of form and function through PBL and emphasized that "*learning should be project-based as project accomplishment guarantees focus on meaning rather than form*" (p. 452). Bagherkazemi and Zahed Shekarabi further added that PBL, when integrated into the

Neurolinguistic Approach (NLA), can impact students' learning of language form and function, particularly in the development of both implicit and explicit grammar knowledge.

Parsaiyan and Gholami (2023) stressed the issue of form and function in Iran's English language education. They noted that, like other EFL settings, the emphasis on test-driven, teacher-centered, memorization-based, and traditional grammar-focused methods in the Iranian public sector has greatly limited opportunities for using English in real-life situations and for developing practical, self-directed learning strategies. This emphasis reflects how governmental fundings on English textbooks and classroom practices fail to provide students with activities that extend beyond the textbook content. As a result, Parsaiyan and Gholami found that students had difficulty moving from traditional learning practices such as rote learning and memorization to PBLT-related practices such as inquiry and autonomy, initially finding the new learning approach "confusing, even frustrating."

To examine the effects of PBLT on learning word structure and function, Reisi and Saniei (2016) found that learners who used word webbing with PBLT outperformed those who did not. This highlights the effectiveness of combining structured vocabulary learning with practical, functional use of language. Reisi and Saniei added that PBLT "*can give the students the opportunity to practice their understanding of the instructed words through interacting and communicating with their peers in the groups*" (p. 1195), aligning with Shafaei and Rahim (2015).

Kavlu (2017) in Iraq noted improvements in both grammatical competence (form) and communicative abilities (function) through PBLT since this approach fosters "*authentic language materials and improves communication skills*" (p. 77). Jordanian researchers, Alzu'bi and Sabha (2013) and Bataineh (2020), reported enhancements in writing and speaking skills, addressing both structural and practical language aspects. Furthermore, in Kuwait (Milad, 2022) and Libya (Suwaed, 2022), PBLT was found to enhance both language skills and student engagement. The theme extends to Lebanon (Garib, 2022), and Morocco (Bouqetyb, 2021) that highlighted improvements in speaking skills and real-life application. Oman's studies (Al-Busaidi & Al-Seyabi, 2021; Belwal et al., 2021) indicated improved English proficiency in both form and function. In the Palestinian Territories, Bakeer et al. (2023) and Migdad et al. (2021) reported improvements in speaking skills and vocabulary acquisition through smartphone-integrated PBLT, showcasing language form in its functional use. In Qatar (Du et al., 2019; Saliba et al., 2017) and Saudi Arabia (Alotaibi, 2020; Alsamani & Daif-Allah, 2016) stressed that PBLT's effectiveness in enhancing advanced research skills and persuasive writing, addressing both form and function in academic contexts. Assaf (2018) in Syria found improvements in linguistic skills and communication abilities through PBLT, while extensive research in Turkey (e.g., Avcı & Adiguzel, 2017; Gülbahar & Tinmaz, 2006) highlighted PBLT's role in improving functional language via tools like WhatsApp.

3.3. RQ#3: Challenges and technology tools commonly mentioned in the PBL MENA studies in well-resourced and under-resourced contexts.

3.3.1. RQ#3: Challenges Implementing PBL

Despite the positive outcomes, all 61 studies highlighted challenges to PBL implementation. One common challenge among 54 studies is the need for teacher training. For instance, in Algeria, Boudersa and Hamada (2015), who identified issues with teacher project assessment and time constraints, concluded that since project work “*needs due attention and follow up to achieve the intended goals*” (p. 29), authentic assessment techniques and more support and resources for teachers are needed. In Iraq, Kavlu (2017) noted the need for extensive planning and teacher training to overcome resistance to student-centered approaches because “*if teachers are not properly trained..., they might not be able to help their students learn*” (p. 72) through project work. In the same vein, Suwaed (2022) added that “*in-service training courses should be provided for teachers because PBL is still a new method of teaching and not yet familiar to most Libyan EFL teachers*” (p. 120). Due to the urgent need for teacher training, Bakeer et al. (2023) proposed that educational institutions impose “*compulsory workshops and training courses,*” hoping that this would result in a “*cascading knowledge*” effect (p. 84).

Similarly, in Lebanon, Libya, and Syria, Garib (2022) reported disruptive challenges like technology access, restrictive curriculum, and assessment issues, emphasizing the need for teacher training and contextual adaptation. Most of the studies (88.52%) across the region called for teacher professional development and structured support to maximize the benefits of PBL. For instance, Al-Busaidi and Al-Seyabi (2021) in Oman recommended providing more examples of successful projects and structured support to improve course design skills. Ekizer and Yildirim (2023) concluded that in Turkey there is a “*need for schools to invest in technology and to provide training for teachers*” to effectively integrate PBL (p. 126). In Saudi Arabia, several studies (e.g., Alsamani & Daif-Allah, 2016; Khodary et al., 2017) emphasized the need for better technological support and professional development to sustain PBL’s positive impacts.

In Morocco, Bouqetyb (2021) highlighted the lack of technological tools and insufficient teacher support as major barriers to effective PBL implementation stating that “*time constraints, the number of students, students’ linguistic competence, and the necessity to follow the textbook are obstacles that hinder the use of project work*” (p. 470). Commitment to the curriculum was another major challenge for teachers to innovate—such restrictions leave no room for teachers to create interactivity for students. Even in well-resourced countries, such as Qatar, Du et al. (2019) stressed that PBL is viewed as “*an add-on to other curricular requirements*” (p. 13), which reflects

the cultural resistance to incorporating any teaching methods not explicitly dictated by the curriculum. In Turkey, the issue with the curriculum was summed up by Ayaz et al. (2019), who stated that “*high schools in Turkey suffer from various challenges regarding the implementation of the curriculum...in practice, though everything seems to be quite successful in theory*” (p. 53).

3.3.2. RQ#3: Technological Integration into PBL

Of the 61 PBL studies, 13 studies did not integrate technology into their projects, including one in Algeria (Boudersa & Hamada, 2015), one in Egypt (Shaalán, 2020), five in Iran (Maftoon et al., 2013; Nafissi et al., 2020; Pourmandnia et al., 2021; Reisi & Saniei, 2016; Sadeghi et al., 2016), one in Kuwait (Koushki, 2019), one in Palestinian Territories (Migdad et al., 2021), one in Saudi Arabia (Almulla, 2020), one in Tunisia (Trabelsi, 2013), one in Turkey (Bas & Beyhan, 2010), and one in the UAE (Alami, 2014). The remaining majority (n=48) reported that technology played, to varying degrees, a crucial role in enhancing the effectiveness of PBL in their project implementation. For example, in Iran, Alavinia and Qoitassi (2013) used SMS technology to improve vocabulary acquisition, while other studies incorporated tools like WhatsApp, wikis, blogs, and online courses (e.g., Arabloo et al., 2021; Nami, 2022; Parsaiyan & Gholami, 2023).

When comparing the technological integrations in well-resourced contexts with under-resourced in MENA, interesting findings emerged. The expected finding was that well-resourced contexts used more advanced technologies, whereas the under-resourced contexts used basic technologies. What is interesting, however, is that under-resourced contexts repurposed particularly low-bandwidth apps such as SMS, mobile phones, basic online forums, and mobile-based applications like WhatsApp, Facebook Messenger, Microsoft Office to overcome internet access issues (see Tables 2 and 3). For instance, social media apps were commonly used as LMSs to facilitate student-student and teacher-student interaction, submission of project components, project showcases, among others.

While “*the lack of technology is one of the most severe challenges that hamper the use of project work*” (Bouqetyb, 2021: p. 462), the studies that incorporated technology reported that these tools added interactivity and enriched the learning process. For instance, Bakeer et al. (2023) found that integrating PBL with smartphone technology and social media tools improved students’ speaking skills and engagement, as it encouraged students to collaborate in and out of the class. Similarly, Du et al. (2019) emphasized the role of digital technology in implementing PBL in EFL classrooms, though teachers had to adapt to contextual challenges.

Table 2 shows common reliance on WhatsApp and Facebook Messenger/Groups as LMSs while other technologies were described vaguely as computers and Internet access. To compare these tools with well-resourced contexts, see Table 3.

Table 2. PBL technologies used in Algeria, Egypt, Iran, Iraq, Jordan, Lebanon, Libya, Morocco, Palestinian Territories, Syria, Tunisia.

Studies	Technology Used	Studies	Technology Used
Helwa, 2021	WhatsApp, Microsoft Teams, Zoom	Hekmati, 2022	Online class, Adobe Connect software
Alavinia & Qoitassi, 2013	SMS (Mobile phones), ebooks.	Kavlu, 2017	Electronic devices, mobile phones
Moghaddas & Khoshsaligheh, 2019	Internet, online forum	Alzu'bi & Sabha, 2013	Mobile-based email
Mohamadi, 2018	Internet, online forum	Bataineh, 2020	YouTube, Facebook Messenger, Weebly, Wikipedia
Shafaei & Rahim, 2015	Computers, Internet	Mirza & Halabi, 2021	Computers, mobile phones, survey questionnaire
Arabloo et al., 2021	WhatsApp, wikis, blogs, Word, dictionary apps	Garib, 2022	WhatsApp, Facebook
Bagherkazemi & Zahed Shekarabi, 2023	Online (unspecified technology)	Suwaed, 2022	Internet, presentations, video production
Nami, 2022	WizIQ, online courses, technology-review projects	Bakeer, Dweikat, & Smith, 2023	Smartphones, social media (Messenger, WhatsApp)
Parsaiyan & Gholami, 2023	Internet, WhatsApp, SHAD app	Assaf, 2018	Video-making equipment, WhatsApp, Facebook
Shiraz & Larsari, 2016	Computers, Internet	Bouqetyb, 2021	Internet

As outlined in Table 3, the technologies used for project implementation in well-resourced countries included more advanced technologies such as LMS, Smartboards, advanced software for animations and e-portfolios, Web 2.0 tools, digital platforms like Google Classroom, Atlas, among others. Notably, of all the well-resourced countries, WhatsApp was used in three studies, all in Turkey, and specifically focused on examining WhatsApp for learning with PBL.

Table 3. PBL technologies used in Kuwait, Oman, Qatar, Saudi Arabia, Turkey, UAE.

Studies	Technology Used	Studies	Technology Used
Milad, 2022	LMS, PowerPoint/Prezi, Kahoot, Quizlet, Grammarly	Duman & Yavuz, 2018	Internet, websites
Alshuraiaan & Almfleh, 2023	General reference to digital resources	Erdoğan & Dede, 2015	Computer technologies (software for portfolios, Word, PPT)
Al-Busaidi & Al-Seyabi, 2021	PowerPoint presentations	Gülbahar & Tinmaz, 2006	Animation software, e-portfolios
Belwal. et al., 2021	Atlas.ti 8, mobile apps	Cirit-İşikligil & Günay, 2022	Web 2.0 tools (Zoom, WhatsApp, Discord, Skype)

Du et al., 2019	Digital technology, mobile devices, online resources	Ekizer & Yildirim, 2023	Online platforms and digital tools (LMS, social media, Google Docs, Zoom)
Alotaibi, 2020	Videos, blogs	Yilan & Konca, 2021	Google Classroom, digital platforms
Alsamani & Daif-Allah, 2016	Computers and online resources	Saricaoglu & Geluso, 2020	Skype, FaceTime, WhatsApp, Facebook Messenger, multiple apps, computers, phones
Khodary et al., 2017	Edmodo	Duman & Yavuz, 2018	Internet, websites
Madkour, 2016	Multimedia tools, OmegaT (machine translation software)	Nunn et al., 2015	Video-recordings
AlMulhim & Eldokhny, 2020	Internet, computers	Wyatt & Nunn, 2019	Internet
Ayaz et al., 2019	Smart boards	Saliba et al., 2017	LMS, online presentations, video tutorials, digital resources
Bulu & Yildirim, 2008	Online platform (LTTS), communication tools	Avci & Adiguzel, 2017	WhatsApp
Demir, 2019	Digital technology, internet	Yuzlu & Dikilitas, 2021	Dictionaries, picture dictionaries, translation apps, websites, and word walls with bilingual terms/visuals
Kemaloglu-Er & Sahin, 2022	Internet, videos, English texts online, smart boards, PowerPoint presentations, eTwinning platform, and Skype	Şahin & Kiliç, 2023	Distance education platform and Google Classroom

The advanced tools were used to facilitate interactivity, multimedia use, and sophisticated affordances for project work, which reflects how advanced contextual infrastructure can diversify teachers' choices and practices to encourage student innovation and creativity. In contrast, the reliance on low-bandwidth applications in under-resourced settings, while limiting, highlights the resilience, adaptability, and resourcefulness of teachers in these regions. As Garib (2022) stated, contextual “*challenges forced the teachers to repurpose the use of technology, leading them to adapt alternative methods, such as WhatsApp, and making inaccessible technologies accessible via VPN. This type of perseverance exemplifies: ‘where there is a will, there is a way!’*” (p. 1454). Despite teachers' grit, there surely is a digital divide between the well-resourced and under-resourced countries. Nevertheless, the findings presented in this section exhibit the many positive impacts of educational technology on students' learning through PBL. They also show the affordances of technology tools for implementing innovative educational approaches such as PBL helping teachers and students to teach and learn creatively and expansively. With digital literacy training, teachers and students can utilize technology tools, especially GenAI tools, to generate project ideas, plan projects in alignment with content curriculum standards, project implementation, and project reports, multimodally addressing the time issue and managing the complex nature of

projects efficiently, effectively, and holistically. They can also utilize GenAI to create assessment instruments for their projects to bridge the gap identified in our review.

4. Discussion

The current systematic review of PBL studies in the MENA region provided the depth and breadth of unique practices in the region. This discussion synthesizes the key findings with the themes explored in the literature review.

The literature highlights the role of PBL in enhancing student engagement and motivation (Beckett, 1999; Slater & Beckett, 2019; Thomas, 2000). Such impacts of PBL align with the findings across several MENA studies, as pointed out in the PBL implementation and effectiveness theme. For instance, several studies (e.g., Boudersa & Hamada, 2015; Kavlu, 2017) reported that PBL increased students' engagement and interest in their learning. Other research (Bataineh, 2020; Bouqetyb, 2021; Helwa, 2021; Shafaei & Rahim, 2015; Suwaed, 2022) found that PBL enhanced students' learning experiences and boosted their language use and autonomy, aligning with the literature's emphasis on learner autonomy and interactive learning environments despite challenges (Guo, 2006). While a handful of studies directly addressed PBL's impact on language form and function (e.g., Bagherkazemi & Zahed Shekarabi, 2023; Parsaiyan & Gholami, 2023), the majority did not explicitly examine these aspects, which leads back to Beckett et al.'s (2020b) emphasis on the scarcity of research on language form and function within PBL, and MENA is no exception.

Besides the positive impacts of PBL, implementing this approach in MENA poses challenges. The literature shows that the MENA region's economic status, political instability, educational infrastructure, technological inaccessibility, and restrictive curricula can negatively affect the implementation of educational innovations like PBL (Nasr & Wilby, 2017; Rahme & Altamimi, 2022; Romanowski & Karkouti, 2021). This review identified similar barriers, such as the need for teacher training, curriculum constraints, and limited technological resources (e.g., Boudersa & Hamada, 2015; Farag & Yacoub, 2023; Garib, 2022; Hayes, 2012; Kavlu, 2017; Suwaed, 2022). Such challenges echo Beckett's (2024; 2025), Beckett et al.'s (2020b) and Beckett and Pae's (2024) raised concerns for needing adequate teacher training and support for PBL practices. Without training or support, these challenges impede the progress of ELT. Moreover, the literature emphasizes the adaptability of PBL to different educational and cultural contexts (Kelsen, 2018; Sato & Horne, 2020; Wang, 2020). This review found that MENA teachers adapted PBL to fit their specific contexts, often repurposing low-bandwidth technologies like WhatsApp and Facebook Messenger to facilitate project work (Bakeer et al., 2023;

Garib, 2022). This innovative use of technology, despite resource limitations, demonstrates the flexibility and resilience of educators in the region.

The integration of technology into PBL, as found in this review, aligns with global practices where digital tools are used to enhance learning experiences (Alavinia & Qoitassi, 2013; Nami, 2022). The studies highlighted the importance of technology in facilitating interactive and engaging learning, even in under-resourced contexts (Bakeer et al., 2023; Du et al., 2019). Such findings support the literature's claim that PBL can be tailored to available resources effectively, thereby enhancing its applicability in diverse settings (Beckett et al., 2020b; Beckett & Miller, 2006; Thomas & Yamazaki, 2021). Beckett et al. (2020b) speculated that technology-mediated PBL can be effective in diverse settings, and with the current findings, it is also possible with limited resources. Therefore, findings of this study spoke to Beckett et al.'s concerns and showed their proposals for PBL adaptability and technology integration to be viable in all contexts. However, while this review reported MENA's increasing research interests in PBL, more research is needed in both under-resourced and better-resourced MENA countries. Future reviews could focus on reviewing articles published in languages other than English and housed in databases other than the ones used in the current study. Additionally, the current findings revealed that 54 studies analyzed stated the need for teacher training, suggesting that MENA teacher professional development programs are urgently needed due to the overwhelming demands and calls.

Besides these pedagogical and infrastructural considerations, the current study also highlights a methodological innovation in the use of GenAI in qualitative research analysis. Even though this study carefully accounted for GenAI hallucinations in the analysis process, another area for further exploration that is deserving of attention is considering the potential for bias in GenAI's interpretation of qualitative data. For example, although the use of ChatGPT was human-led and cross-validated with NVivo in the current study, it is important to acknowledge that GenAI models could potentially produce varying thematic outcomes, even when analyzing the same dataset. Such differences may occur due to variations in the training data, algorithms, or even simply prompt interpretation (Chapelle, 2025; Garib, 2024). Therefore, future research could benefit from comparing multiple GenAI models to evaluate the thematic consistency and explore how interpretative bias might influence the outcomes of AI-assisted analysis, which could also add further depth to the reliability and validity of the assessment of AI-assisted qualitative research practices.

5. Conclusion and future directions

As with other parts of the globe, PBL can enhance language learning in the MENA region. However, the challenges identified highlight the need for ongoing support, professional development, and infrastructural improvements for effective PBL implementations. Teachers need practical training and enough resources to navigate their contextual challenges. Additionally, addressing technological limitations and curriculum constraints is another step forward to 'free' teachers from their restrictive curriculum requirements, which in turn, can encourage more innovative and interactive learning. By investing in these areas, the definition of learning for MENA students can be fundamentally transformed. Such investments will empower teachers to implement more effective projects while providing students with more meaningful and relevant educational experiences. This shift towards a more interactive approach to language learning will equip MENA students with critical thinking, creativity, collaboration, communication, and competencies in digital literacy necessary for success in the 21st century (Beckett, 2023).

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