Review article

Effects of Project-Based Learning on Employability Skills

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A B S T R A C T

This study is a systematic review of the literature investigating the effects of project-based learning on the employability skills of higher education students. Project-based learning focuses on experience to solve problems in a real-life context. It can help students relate learning experiences to real situations and conditions. Employability skills are skills that every worker must have to adapt to the workplace, increase competitiveness, and be successful in increasing productivity and profits. 6 papers from 2018 to 2022 that were relevant to the topic of this paper were selected for the review process. The findings of this review indicate that project-based learning affects the employability skills of students in higher education so that they can meet the needs of the workspace with communication skills, collaboration skills, critical thinking and problem-solving skills, applying knowledge to practice, self-awareness and reflectivity, and self-confidence which are the dominance of project-based learning that has an impact on work skills.

1. Introduction

The job market is highly competitive and requires a diverse set of skills beyond those acquired in academia. In recent years, higher education institutions have responded to the demands of the job market and government standards (Sokhanvar et al., 2021) by offering courses and programs that help students develop both "hard" skills (technical expertise) and "soft" skills (communication, teamwork, etc.). Employability skills, such as the ability to adapt to new work environments and think critically, are essential for success in the job market. Research has shown that these skills can increase the competitiveness of job seekers and improve their chances of being hired (Munadi et al., 2018). Therefore, educational institutions need to ensure that their curricula prepare students with the skills needed to succeed in the job market (Munadi et al., 2018).

The rapid development of science and technology has posed a challenge to the job market (Chinoracký & Čorejová, 2019). To keep up with these developments, workers must have the skills and qualifications to adapt to new technologies and processes (Kolb & Kolb, 2009; Wolf et al., 2018). This is particularly important in the era of economic, industrial, and information globalization, which has accelerated the transfer of technology in countries like Indonesia.

To prepare workers for these changes, educational institutions need to adapt their curricula and learning models. One approach that has been effective in this regard is experiential learning, as proposed by John Dewey. Experiential learning involves students collaborating on projects that involve design, problem-solving, and decision-making (Kolb & Kolb, 2009). This active, interactive, and collaborative learning process helps students to develop critical thinking and analytical skills, as well as motivation and self-direction (Parrado-Martínez & Sánchez-Andújar, 2020). Project-Based Learning, supported by the Merdeka curriculum design, is one specific example of an experiential learning model that has the potential to meet the current needs of the job market.

Assessing the effectiveness of learning models is crucial for ensuring that students are receiving an education that prepares them for the changing demands of the job market (Rojewski, 2002). One way to do this is to use a range of cognitive, affective, and psychomotor assessments (Rovai et al., 2009). Cognitive assessments measure students' knowledge and understanding of course material, while affective assessments evaluate their attitudes, values, and beliefs. Psychomotor assessments, on the other hand, measure physical skills and abilities. By using a combination of these assessments, teachers can get a more complete picture of their students' progress and identify areas where they may need additional support. In addition, training students to think critically and analytically can help them to better understand and apply the material they are learning, and to adapt to the changing demands of the job market (Oliveira & de Souza, 2022).

Integrating technical skills into the learning process through work placements can prepare students for the challenges of the job market and help them to succeed in their careers. This is supported by research conducted by Khampirat (2021) on the effectiveness of work-integrated learning in improving learning outcomes that is relevant to work skills. Data collected from students, lecturers, and industry partners demonstrated the

benefits of this approach. Similarly, Reedy et al. (2020) found that work-integrated learning models are effective in building relevant work skills and preparing students for the demands of the job market. These findings suggest that incorporating work placements into the curriculum can help to ensure that graduates are well-equipped to succeed in their chosen careers without facing any difficulties on the job.

This review aims to answer the following research questions:

RQ1: What is the overall impact of project-based learning on employability skills among vocational students?

RQ2: What is the individual effect of different types of project-based learning on employability skills?"

In this systematic review, we seek to address the following questions: What is project-based learning, and what are employability skills? What is the relationship between project-based learning and employability skills? To answer these questions, we first provide an overview of project-based learning in Section 2.1 and an overview of employability skills in Section 2.2. In Section 2.3, we examine the relationship between these two concepts. In Section 3, we describe the methodology we used to conduct the systematic review. In Section 4, we present the main themes that emerged from the review, highlighting how project-based learning activities can contribute to students' employability skills. Finally, in Section 5, we offer a summary of our findings and conclusions.

2. Literature Review

2.1. *Project-Based Learning*

Project-based learning (PBL) is a teaching method that involves students in designing, planning, and carrying out a project that addresses a real-world problem or challenge. PBL is often centered on an open-ended, authentic task or question that requires students to apply their knowledge and skills to solve a problem or create a product. This approach to learning emphasizes student-centered, hands-on, and experiential learning, with a focus on problem-solving, critical thinking, collaboration, and communication (Habib et al., 2021).

One of the most widely cited definitions of PBL is provided by the Buck Institute for Education (BIE), a leading organization in the field of PBL:

"Project-Based Learning is a teaching method in which students gain knowledge and skills by working for an extended period to investigate and respond to an engaging and complex question, problem, or challenge" (Buck Institute for Education, 2022).

One of the key features of PBL is that it requires students to work on a project for an extended period, typically several weeks or months. This allows students to engage deeply with the material and develop a more thorough understanding of the subject matter. It also encourages students to develop important skills such as time management, organization, and self-motivation.

PBL is designed to be rigorous and challenging, requiring students to apply their knowledge and skills in meaningful and authentic contexts. By working on a project that addresses a complex question or problem, students are able to learn important content and practice 21st Century Skills such as collaboration, communication, and critical thinking. These skills are increasingly important in today's globalized,

technology-driven society, and are essential for success in the job market.

Project-based learning (PBL) is a teaching method that has the potential to help students develop the skills and knowledge they need to succeed in the job market. PBL involves students in designing, planning, and carrying out a project that addresses a real-world problem or challenge. This approach emphasizes student-centered, hands-on, and experiential learning, with a focus on problem-solving, critical thinking, collaboration, and communication.

PBL can be particularly effective in preparing students for the job market through its association with work-integrated learning (WIL). WIL is a form of experiential learning that combines academic study with structured work experience in a real-world setting. This can include internships, co-op programs, apprenticeships, and other forms of hands-on learning. By combining PBL with WIL, students are able to learn in a more authentic and contextualized manner, applying their knowledge and skills to real-world problems and challenges. This helps them to develop the relevant skills and expertise they need to succeed in their chosen careers and to adapt to the changing demands of the job market.

PBL associated with WIL has the potential to help students meet the challenge of adapting their skills to the needs of the world of work. This approach to learning can inspire students to become actively involved in their education, take ownership of their learning, and prepare for the challenges and opportunities of the job market.

There are several key characteristics of Contextual Teaching and Learning (CTL) that are important to consider when implementing Project-based Learning (PjBL). These include:

1. Relating: This involves learning in a context that is relevant and meaningful to students, using real or initial life experiences as a starting point for knowledge acquisition.
2. Experiencing: This involves providing students with firsthand exposure to the topic or concept being studied, through hands-on activities or field experiences.
3. Putting ideas into practice: This involves learning by doing, with a focus on active engagement and the application of knowledge in real-world contexts.
4. Cooperating: This involves students sharing, responding, and communicating with one another as they work together to solve problems or complete projects. This is a key aspect of CTL, as it encourages students to collaborate and learn from one another.
5. Transferring: This involves the use of knowledge in new contexts or situations, helping students to develop the ability to apply their learning to unfamiliar situations.
6. Authentic assessment: This involves measuring, monitoring, and assessing all aspects of learning outcomes, including those that result from the learning process and those that reflect changes and developments in activities and learning gains during the learning process, both inside and outside the classroom (Susiloningsih, 2016).

Project-based learning (PBL) is a teaching method that integrates the application of knowledge with student development through problem-solving. It aims to provide students with hands-on, experiential learning opportunities that enable them to develop skills related to collecting information, solving problems, making decisions, and working in a team, as

well as other important abilities such as writing reports, making presentations, and taking responsibility for challenging and real-world situations. PBL is designed to inspire students to learn and make new concepts and existing ideas more accessible and can be an effective way to train and develop experiences that are relevant and meaningful to students (Parrado-Martínez & Sánchez-Andújar, 2020).

2.2. *Employability skills*

Employability skills are essential for success in today's job market. These skills, which include the ability to adapt to the workplace and be competitive, can help workers to increase productivity and profits (Aliu et al., 2021) Some specific examples of employability skills include communication skills, problem-solving skills, teamwork skills, and leadership skills. These skills are important for workers to have to be able to work effectively with others, handle challenging situations, and take on leadership roles in the workplace. In addition to these skills, job skills, which are defined as the ability to move between roles and the ongoing development of the skills and attributes needed to secure employment (Gilbert et al., 2022a), are also important for success in the job market. In today's fast-changing job market, workers need to prioritize the development of strong employability skills to succeed.

The Conference Board of Canada (2000) states that employability skills consist of (1) Fundamental skills, a basic form of developing skills. These skills consist of communication, the ability to manage information and use numbers; (2) personal management skills, namely personal skills, attitudes, and behaviors that encourage one's potential constantly to be developed. These skills consist of being able to have a positive attitude and behavior, with a sense of responsibility, being able to adapt, wanting to continue learning, working carefully, and thinking and solving problems; and (3) teamwork skills, which are the skills and attributes needed to increase work productivity. These skills consist of the ability to work in teams and being able to participate in work.

Developing employability skills is critical for success in the modern job market. According to (Gilbert et al., 2022a), there are three key components to consider when developing these skills: ownership, position, and process. Ownership refers to the skills, knowledge, and experience that workers have acquired. Position refers to factors such as the worker's network of connections, social class, and the ranking of their university. The process of career building and self-regulation is also important for developing employability skills. By focusing on these three components and continually improving and expanding their skills and expertise, workers can increase their chances of success in the job market and be better prepared to adapt to the changing demands of the modern workplace.

2.3. *Effect of Project-based learning on Employability skills*

Work-integrated learning (WIL) is a form of experiential learning that combines academic study with structured work experience in a real-world setting. This can include placements, practicums, action learning, apprenticeships, service learning, and project-based learning (Reedy et al., 2020). PBL is a form of non-placement WIL that gives educators more control over the quality of student learning compared to the highly varied experiences gained during apprenticeships.

Research has shown that WIL can contribute to employability (Gilbert et al., 2022a). This is because WIL is not exclusively industry-based, but can also be simulated or class-based with the support of industry mentors. Studies have found that non-professional or generalist graduates in fields such as humanities, arts, and social sciences have lower perceived employability (PE) compared to engineering graduates and majors who are more specialized due to their higher employment opportunities in the labor market.

It is important to consider students' perfectionism in the workplace, particularly in terms of self-presentation. Perfectionism is the pursuit of perfection accompanied by excessive self-criticism and fear of others' judgment (Cowie et al., 2018a). Perfectionist self-presentation is related to imposter syndrome, or the feeling of inadequacy despite achieving success. Individuals with imposter syndrome often hold high standards for their performance and critically evaluate perceived failures. The desire to appear perfect and hide flaws in front of others has been found to independently predict feelings of greater fraudulence, as a way to maintain the appearance of perfection.

3. The method

To ensure the rigor and transparency of this review, we followed standard procedures for conducting a systematic review. This process involved searching relevant databases, selecting studies that met our defined inclusion and exclusion criteria, and analyzing and coding the selected studies using the PRISMA guidelines (Sokhanvar et al., 2021). PRISMA is a widely-recognized set of guidelines for developing and reporting systematic reviews and meta-analyses, which helps to ensure that the review process is systematic, transparent, and reproducible. Through this process, we were able to identify and select relevant studies for inclusion in the review, providing a comprehensive overview of the literature on the topic.
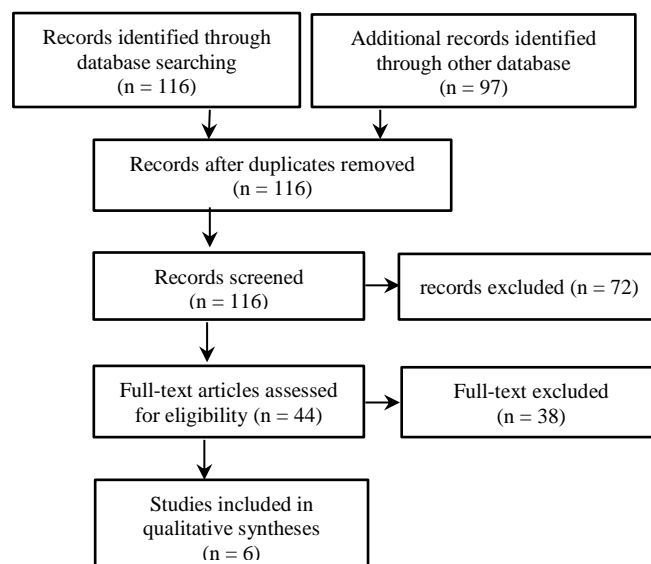

Fig. 1 PRISMA Flow Diagram

3.1. *Literature search*

This systematic review aims to examine the impact of project-based learning on employability skills in higher education. To identify relevant studies, we searched the ScienceDirect database using the keywords "project-based learning," "PJBL," "lecture teaching," "employability skills," "higher education," "undergraduate student," and "graduate

student." The results of this search will be used to inform our analysis and conclusions about the relationship between project-based learning and employability skills in higher education

3.2. *Study selection*

In this review, we conducted a literature search in the ScienceDirect database to identify relevant studies on the topic of project-based learning and employability skills in higher education. The search resulted in 116 selected articles, and after examining the abstracts, we determined that 44 of these articles were relevant for full-text screening. After applying the inclusion and exclusion criteria (outlined in Table 1), we ultimately selected seven articles for inclusion in the review. No additional articles were identified through the references section of the selected articles. The selection process ensured that we included only high-quality, relevant studies in our review.

3.3. *Study analysis and coding*

This analysis aimed to examine the impact of project-based learning on employability skills in higher education. To do this, we conducted a systematic review of the literature, searching the ScienceDirect database and identifying 116 selected articles. After examining the abstracts and applying our inclusion and exclusion criteria, we selected seven articles for full-text analysis. Using inductive content analysis, we coded for similar themes and grouped them into the categories of "Project-Based Learning" and "Employability Skills," as presented in Table 2. The four authors then extracted relevant information about the selected articles, including the year of publication, author, country of study, academic field, program, number and academic level of participants, and research findings. Our analysis revealed insights into the relationship between project-based learning and employability skills in higher education.

Overview of categories and sub-categories

Categories	Sub-categories	Definition
Project-based learning	Reflection	Thinking process that allows for analysis and interpretation (Sandars, 2009).
	Research	Theory search, theory testing or problem solving (Firmadani, 2017).
	Application	the use or implementation of knowledge, concepts, and skills in practical, real-world situations. It involves transferring knowledge using problem-solving and critical thinking skills to find solutions (Youngerman & Culver, 2019).
	Communication	Process where an idea is transferred from a source to one or more recipients, with the aim of changing their behavior (Roger, 1986).
Employability skills	Communication skills	Sharing information through appropriate written and oral means to convey a message (Metusalem, Belenky, & DiCerbo, 2017).
	Collaboration skills	Interacting with others, whether as individuals or in groups, involves respecting differences, sharing

		knowledge and working cooperatively (Baidowi, 2019).
	Critical thinking and problem-solving skill	Identifying weak points and strong points of alternative solutions to a problem through logical procedures; (Burrus et al., 2013); finding and utilizing suitable means to develop creative solutions to problems (Yorke & Knight, 2006).
	Applaying knowledge to practice	Use of "disciplinary" knowledge (Yorke & Knight, 2006).
	Self-awareness and reflectiveness	Awareness of strengths, weaknesses and goals; critical reflection on performance (Yorke & Knight, 2006).
	Self-confidence	Confidence in handling challenges in real-life (Yorke & Knight, 2006).

4. Results and Discussion

Seven articles were selected for a full review based on

Criteria	Inclusion	Exclusion
Date	Papers that were published from 2018 to 2022 were included.	Papers that were published before 2018 were excluded.
Participants	Participants in the studies should range from college students to doctoral students.	Papers with participants that were not in higher education institutions were excluded.
Type of record	Only peer-reviewed journal articles were included.	Non-peer-reviewed articles, technical reports, guidelines, research synthesizes, books and book chapters were excluded.
Setting	Papers that focused on project-based learning and employability skills in higher education institutions were included.	Papers that focused on project-based learning in other educational settings such as primary and secondary schools were excluded

inclusion and exclusion criteria presented in Table 1, and the findings were analyzed and grouped into categories and subcategories shown in Table 2. The characteristics of the seven articles reviewed are outlined in Table 3. The analysis findings are summarized as numbers and percentages in Tables 4 and 5. We describe our results in sections 4.2 and 4.3, with themes that appear mentioned at the end of each section. Overall, the results of our review provide insights into the role of project-based learning and employability skills in higher education.

Author(s) and year	Country	Journal	Academic field	Focus	Sample	methods
(Reedy et al., 2020)	Colombia	Education for Chemical Engineers	Education	Improving employability skills through non-placement work-integrated learning in chemical and food engineerin	26 Students	Survey

				g: A case study		
(Megan E. Cowiea, dkk. 2018)	Canada	Personality and Individual Differences	Education	Perfectionism and academic difficulties in graduate students: Testing incremental prediction and gender moderation	269 Students	Quantitative
(Parrado-Martínez & Sánchez-Andújar, 2020)	Spain	International Review of Economics Education	Education	Development of competences in postgraduate studies of finance: A project-based learning (PBL) case study	28 Students	Experiment
(Gilbert et al., 2022b)	Australia	Project Leadership and Society	Education	Working up to work: Perceived employability of students commencing a project management degree	94 Students	Mix (Survey, Quantitative, Qualitative)
(Speare, 2018)	Canada	The Journal of Academic Librarianship	Education	Graduate Student Use and Non-use of Reference and PDF Management Software: An Exploratory Study	183 Students	Survey
(Yang, He, et al., 2021)	China	Cities	Education	Disentangling residential self-selection from the influence of built environment characteristics on adiposity outcomes among undergraduate students in China	20.227 Students	Survey

4.1. *Study characteristics*

The percentage of articles reviewed is 42.8% conducted in Latin America and Canada, 28.6% conducted in Asia, and 28.6% conducted in Spain and Australia. Most of the published articles are about project-based management education with industry collaboration. 85.7% of the graduate students were the sample in this study. 72.4% of the issues discussed were about project-based learning, while the rest discussed the relationship between PjBL and employability skills. The methods used in most of these articles were 57.1% obtained from survey methods, in addition to using quantitative, qualitative, experimental, and systematic literature review methods.

4.2. *RQ 1*

This category consists of four subcategories related to project-based learning. In this section, we will describe these subcategories.

4.2.1. *Reflection*

Reflection is essential for students to fully engage in project-based learning and achieve their learning goals. Reedy et al (2020) found that the process of engagement with industry while developing a solution to an industry problem is highly motivating for students, especially when there is the prospect that the industry will implement their solution. This suggests that reflection can help to enhance student motivation and engagement in project-based learning. In the following paragraphs, we will explore how reflection can also help students to improve their planning and organizing skills.

A reflection is a useful tool for helping students to develop their planning and organizing skills. (Gilbert et al (2022) found that students in their study perceived improvements in these skills, which may have been due to elements of reflection incorporated into the learning experience. This suggests that reflection can be a useful tool for helping students to develop important skills that are relevant to their learning and future careers. In addition to these benefits, reflection can also help students to rise to the challenge when they are treated as employees and have real-world expectations placed on them.

Reflection can help students to rise to the challenge when they are treated as employees and have real-world expectations placed on them. (Cowie et al (2018) found that when students are treated as employees and have real-world expectations placed on them, they excel. This demonstrates the powerful effect that reflection can have on student performance and achievement. In conclusion, ongoing reflection throughout the project-based learning experience is essential for students to fully engage in the process and achieve their learning goals. It can help to enhance motivation and engagement, improve planning and organizing skills, and enable students to rise to challenges when faced with real-world expectations.

4.2.2. *Research*

The integration of disciplinary knowledge with work-based problems, also known as Work-Integrated Learning (WIL), can help students to understand the real work of a chemical engineer and prepare for their future careers, as found by Reedy et al (2020). This study discovered that linking students to the real work of a chemical engineer through this integration process had a positive impact on their learning and development. This suggests that the integration of disciplinary knowledge with work-based problems can be an effective approach to helping students to understand and prepare for the real work of a chemical engineer. However, it is worth noting that there may be other factors that influence the extent to which students develop certain skills and knowledge through this process.

The perceptions of students, lecturers, and the industry partner may vary regarding the extent to which creativity and teamwork are developed through the integration of disciplinary knowledge with work-based problems. This is according to the findings of Cowie et al (2018), who discovered that the perceptions of these stakeholders varied in this regard. This suggests that the impact of the integration process on creativity and teamwork may not be uniform across all stakeholders.

In a separate study, Speare (2018) explored the use of reference managers by graduate students and found that these

tools can be useful for organizing and managing large amounts of information. This suggests that reference managers can be a valuable resource for graduate students, especially when working with large amounts of information. Reference managers can help graduate students to keep track of their research, organize their sources, and properly cite their work, which can save time and reduce the risk of errors. Additionally, reference managers can be useful for collaborating with other researchers and sharing information with colleagues. Overall, the use of reference managers can be an important part of the research process for graduate students and can help to improve the quality and efficiency of their work.

4.2.3.Application

Project-based learning (PBL) is a pedagogical approach that is effective in helping students apply their knowledge to real-world situations and prepare for their careers. This has been supported by research conducted by Reedy et al (2020), who found that students who were allowed to solve real industry challenges as part of their PBL experiences were able to more effectively put their knowledge into practice as engineers. The purpose of PBL is to encourage students to engage in active, hands-on learning that allows them to apply their knowledge and skills in authentic contexts, and it is a valuable and effective approach for helping students develop the skills they need to be successful in their future careers.

In addition to developing professional skills, PBL has also been found to be beneficial in developing a range of other competencies. Parrado-Martínez and Sánchez-Andújar (2020) conducted a study that found that PBL improved students' planning and organizing skills, teamwork and cooperation competence, information management ability, oral communicative competence, and creativity and innovation competencies. These results demonstrate that PBL can be an effective way to help students develop important skills that are valued in a variety of professional contexts. Furthermore, PBL's emphasis on hands-on, real-world problem-solving activities allows students to apply their knowledge and skills in authentic contexts, which can facilitate the development of these professional competencies.

PBL can provide students with knowledge and experience related to funding sources and the business world, even in challenging circumstances. PBL also offers numerous benefits, including practical, efficient, and motivating learning; greater independence and autonomy; a constructive perspective; and the chance to understand the application of theoretical concepts in real business. More than 96% of students who have experienced PBL recommend its implementation due to these benefits (Parrado-Martínez & Sánchez-Andújar, 2020). PBL allows students to apply their knowledge and skills in authentic contexts and encourages them to take a more active and independent role in their learning. It can provide students with valuable opportunities to learn more practically and engagingly, which can be beneficial for their future careers.

4.2.4.Communication

Project-based learning (PBL) is effective in helping students develop professional skills and reduce perfectionistic self-presentation. This approach allows students to engage in active, hands-on learning and apply their knowledge and skills in authentic contexts. By solving real-world problems and working on projects that have practical applications, students can develop a range of professional competencies, such as

planning and organizing skills, teamwork and cooperation competence, information management ability, oral communicative competence, and creativity and innovation competencies (Parrado-Martínez & Sánchez-Andújar, 2020).

PBL can also provide students with valuable knowledge and experience about funding sources and connecting with the business world. Cowie et al (2018) found that the viability of non-placement work-integrated learning (WIL) was evident, even during the SARS-CoV-2 pandemic. These findings suggest that PBL can be an effective way for students to learn about funding sources and make connections with the business world, even in challenging circumstances such as a pandemic.

PBL can help students develop professional skills, increase knowledge, and reduce perfectionistic self-presentation (Cowie et al., 2018b). This approach has been shown to be effective in reducing academic stress and impostor syndrome. PBL's focus on practical, hands-on learning can provide students with valuable career preparation. By taking a more active role in their learning, students may be less likely to engage in perfectionistic self-presentation. Research has shown that over 96% of students who have experienced PBL recommend its use due to the numerous benefits it offers.

PBL can help students reduce perfectionistic self-presentation, which has been linked to negative outcomes such as academic stress and impostor syndrome (Parrado-Martínez & Sánchez-Andújar, 2020). PBL's emphasis on real-world problem-solving and hands-on learning can provide valuable career preparation. By taking a more active and independent role in their learning, students may be less likely to engage in perfectionistic self-presentation (Cowie et al., 2018b). PBL can help students develop professional skills, acquire knowledge about funding sources and the business world, and reduce perfectionistic self-presentation. Over 96% of students who have experienced PBL recommend its implementation due to the numerous benefits it offers.

4.3. RQ 2

This category consists of six subcategories related to employability skills. In this section, we will describe these subcategories.

4.3.1.Communication skills

Multiple studies, including Reedy et al. (2020), Cowie et al. (2018b), Parrado-Martinez & Sanchez-Andujar (2020), and Gilbert et al. (2022b), have found that PBL can improve students' oral communicative competence. These studies found that students perceived an improvement in their oral communicative competence after using PBL, and this improvement was correlated with reduced communication anxiety and perfectionistic self-presentation. PBL may be effective at improving oral communicative competence because it involves students working in teams to solve problems and present solutions, which provides opportunities for practicing communication skills with peers and lecturers. The process-based support provided by lecturers during PBL courses may also contribute to the development of these skills, which are important for employability.

Yang et al. (2021) found that the relationship between built environments and obesity may vary among different socio-demographic subgroups. These researchers conducted stratified analyses to test this heterogeneous effect. It's possible that the relationship between built environments and obesity may vary due to differences in access to resources and

opportunities, as well as cultural and social factors that may influence health behaviors. These findings are relevant to the topic of public health and the impact of environmental factors on health outcomes.

Midwifery students in a study reported that teamwork and peer learning helped them develop communication skills with patients. Working in teams and learning from peers can provide opportunities for practicing communication skills and receiving feedback, which can help students communicate effectively with patients. These findings are relevant to the topic of student learning and communication skills in healthcare education.

In a study, nursing students had a positive view of practicing communication skills with patients and other nurses in an electronic role (Sokhanvar et al., 2021). Practicing communication skills in an electronic role may provide opportunities for students to learn how to communicate effectively with patients and other nurses through electronic means, such as email, video conferencing, and text messaging. These skills may be particularly important in today's digital age, where electronic communication is increasingly common in healthcare settings. The positive views of nursing students suggest that practicing communication skills in an electronic role can be beneficial.

4.3.2. Collaboration skills

Several studies, including Gilbert et al. (2022b) and Parrado-Martinez & Sanchez-Andujar (2020), have found that PBL can improve students' teamwork and cooperation skills. These studies found that students perceived an improvement in their teamwork and cooperation competence after using the PBL method and that the support provided by lecturers and industry during PBL courses enabled teams to better understand their projects and put more effort into them. PBL may be effective at improving these skills because it involves students working in teams to solve problems and present solutions, which provides opportunities for practicing teamwork and cooperation with peers and lecturers. The process-based support provided by lecturers during PBL courses may also contribute to the development of these skills, which are highly valued by industry.

Studies on the use of reference managers by graduate students have shown mixed results. Speare (2018) found that some studies only focused on specific disciplines, while another study found comparable results across different disciplines. These findings suggest that reference managers may be beneficial for graduate students in a variety of disciplines, as they can help them organize and manage their research sources more effectively. However, the effectiveness of reference managers may vary depending on individual students' needs and preferences.

Collaborative work ability is especially important in a project management context, where there is a high degree of interdependence among team members and a need for collaboration. It's possible that students with strong collaboration skills self-select into project management degrees. Reflective approaches to supporting students in working in groups and learning to collaborate with others, especially when facing challenges and negative emotions, are important components of project management curricula (Gilbert et al., 2022b). These findings suggest that developing collaborative skills is crucial for project management education and can help students succeed in their careers.

Graduate students often hold professional and leadership roles after entering the workforce, and it's important to explore perfectionism in this population and help them cope with academic demands in a supportive way. Research supports the use of intervention programs for perfectionist students (Cowie et al., 2018b). These findings suggest that addressing perfectionism in graduate students may be important for their success in both academia and their professional lives, and that intervention programs may be effective in helping them develop more adaptive coping strategies.

4.3.3. Critical thinking and problem solving skills

In higher education and work-integrated learning contexts, the development of critical thinking and problem-solving skills is a key focus of project-based learning courses. According to a review by Reedy et al. (2020), the role of lecturers and industry partners is crucial in supporting students' development of these skills. The review found that lecturers played a particularly important guiding role when issues arose, such as when there was less contact between a project group and industry partner than was optimal. However, the review also identified inconsistencies in the level of support provided to each team by industry partners, with some providing a large amount of feedback and support while others provided minimal support.

Based on these findings, it can be concluded that the support provided by lecturers and industry partners is essential for helping students to develop their critical thinking and problem-solving skills in project-based learning courses. To enhance the effectiveness of this support, the authors of the review propose that explicit connections should be made between problem-solving and the creative process (Lopez-Malo et al., n.d.; Schmidt & Charney, 2018). They also suggest the use of well-defined rubrics to establish performance standards for creativity, and the incorporation of these rubrics into student self-assessment to clarify desired performance standards and encourage the development of reflective practice (Felder & Brent, 2010; Lopez-Malo et al., n.d.).

The review also highlights the potential benefits of using the IPPD tool and scaffolding, supported by lecturers and industry partners, to solve authentic problems in a guided learning environment. According to the review, this approach can effectively support students' development of critical thinking and problem-solving skills (Reedy et al., 2020). In conclusion, these findings underscore the importance of structured support in helping students to achieve excellent academic standards in the development of critical thinking and problem-solving skills as part of project-based learning.

4.3.4. Applying knowlege to practice

PBL and WIL approaches can help students apply their knowledge to real-world situations, encouraging critical thinking and problem-solving. These methods have been found to benefit students in various fields, including nursing, engineering, and management. For example, a study by Craft and Ainscough (2015) showed that a role-playing game helped nursing students apply bioscience theory in clinical practice, and Reedy et al. (2020) found that the PO/PBL model improved engineering students' connections to future careers. Parrado-Martinez and Sanchez-Andujar (2020) also found that PBL improved students' planning and organizing skills. However, it's important to design and implement WIL and

PBL experiences that meet the needs and goals of students and the educational context.

WIL and PBL can improve student learning and development, helping students acquire valuable skills like critical thinking, problem-solving, communication, and teamwork, which are valued by employers. These approaches also help students understand the relevance and importance of their studies, improving motivation and engagement. However, these methods may not work for all learners or in all situations, and students may need extra support or accommodations if they have difficulty with WIL or PBL. In these cases, alternative approaches may be necessary.

Despite their potential benefits, WIL and PBL have limitations and challenges. They can be time-consuming and resource-intensive, and may not be feasible or appropriate in all contexts. They may also require specialized resources or expertise that may not be available in all educational settings. Additionally, the quality of the WIL or PBL experience depends on how it is designed and implemented, so it's important to ensure students receive high-quality experiences that meet their needs and goals.

In conclusion, WIL and PBL have been shown to be effective in enhancing student learning and development across various fields. These approaches give students opportunities to apply their knowledge and skills in real-world contexts and encourage critical thinking and problem-solving. While WIL and PBL can be powerful tools, it's important to consider their limitations and challenges and design and implement them in a way that maximizes their potential benefits. By doing so, educators and policymakers can support students in achieving academic standards and developing the knowledge and skills needed for success in their chosen fields.

4.3.5. Self-awareness and reflectiveness

Self-awareness and reflectivity are crucial components of employability skills, according to a study by Sokhanvar et al. (2021). In this study, postgraduate literacy education students developed reflective reporting of their growth during a project-based learning program by tracking their progress and reflecting on their progress throughout the process. This gave them the opportunity to view themselves as professional teachers and to engage in successful discussions about the impact of research on their teaching decisions and their growth as professionals in their field.

However, there are several reasons why students may not use reference management software. According to the study, the main reasons are a lack of knowledge about available options (55%) or a lack of time to study the programs (40%). Some students also mentioned that they found the learning curve steep or that they were already using a manual system that was effective for them. In addition, some students reported difficulties in tracking specific PDFs that they had read in the past or moving their information between different programs.

Overall, it is important for educators and policymakers to consider the role of reference management software in supporting student learning and development. By providing students with access to these tools and resources, and by helping them to develop the skills and knowledge needed to effectively use these tools, educators and policymakers can support students in achieving excellent academic standards and in preparing for success in their chosen fields.

4.3.6. Self-confidence

Self-confidence is an essential component of employability skills, and research suggests that work-integrated learning (WIL) and problem-based learning (PBL) approaches can be effective in enhancing students' self-confidence in various fields. For example, a study by Reedy et al. (2020) found that engineering students who participated in WIL using the PO/PBL model reported increased confidence in their ability to connect their knowledge to future careers. Similarly, Raymond et al. (2013) found that midwifery students' confidence in their ability to perform clinical tasks increased as a result of assessing authentic clinical simulations. This increased self-confidence empowered students to act as a catalyst for change in their classrooms and in their schools.

Motivation is another factor that can influence students' self-confidence. In their study, Reedy et al. (2020) also found that students were motivated by recognition from industry partners, particularly when it was a well-known organization, as well as by the knowledge that their solutions could be implemented by the industry. These findings suggest that WIL and PBL approaches can be effective strategies for enhancing students' self-confidence and motivation in higher education and beyond. As students strive to achieve excellent academic standards, it is important for educators and policymakers to consider the role of WIL and PBL in supporting students' development of self-confidence and other employability skills.

5. Conclusion

The review of the literature suggests that project-based learning can significantly contribute to the development of student employability skills in higher education. Multiple studies have found that PBL can improve students' oral communicative competence, self-confidence, and teamwork skills. However, the impact of PBL on these skills may vary based on various factors, such as the specific context and the needs and goals of the students. Additionally, the integration of disciplinary knowledge with work-based problems, also known as Work-Integrated Learning (WIL), can be an effective approach for helping students to understand and prepare for the real work of a chemical engineer. Reflective practices throughout the PBL experience can also be beneficial for students, as they can enhance motivation and engagement, improve planning and organizing skills, and enable students to rise to challenges when faced with real-world expectations. In the context of healthcare education, practicing communication skills with patients and other healthcare professionals in an electronic role, as well as engaging in teamwork and peer learning, can be valuable for developing communication skills. Overall, it is evident that PBL can be a powerful tool for enhancing student employability skills and preparing them for success in their future careers.

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