Umbrella review

The Power of WIL: Advancing Work-Integrated Learning in Discipline-Based Higher Education Programs

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Abstract: Profession-oriented and discipline-based higher education programs differ significantly in implementing work-integrated learning (WIL). Discipline-based programs in fields like mathematics, biological and social sciences have only recently begun to integrate WIL and often lack comprehensive development. This umbrella review examines pedagogical strategies and key stages for advancing WIL in discipline-based curricula. Systematic searches across several databases yielded 1,651 abstracts published January 2000 to November 2023. These were screened, focusing on WIL in discipline-based programs. An in-depth review and thematic analysis of 11 selected reviews revealed an underrepresentation of discipline-based programs in WIL literature. Themes include curriculum design, assessment, learning outcomes, employability, satisfaction, internship stakeholders, international placements, and Indigenous students. The findings address barriers and promotors to WIL and can be used to support educators, practitioners, leaders, and researchers in enhancing WIL. Specifically, WIL should be integrated, relevant, and authentic, and it should involve all stakeholders, focus on pedagogics through constructive alignment, and emphasize learning as crucial for success.

Keywords: Work-Integrated Learning, Higher Education, Discipline-Based Programs, Curriculum Design, Internship Stakeholders

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1 Introduction

Work-integrated learning (WIL) has emerged as a vital component of contemporary pedagogy in higher education (HE), enabling students to engage in real-world experiences as an integrated part of their degree, thereby powering learning by doing (Cooper et al., 2010; Ferns et al. 2024). WIL is often seen as an overarching term encompassing various forms such as cooperative education, work placements, internships and field work (Cooper et al., 2010; Jackson 2015). Despite extensive research, misconceptions about its nature and implementation persist, partly because there is no universally accepted definition of WIL (Ferns et al. 2024). In this review, WIL is understood as an educational approach that incorporates authentic work-focused experiences as an intentional component of the curriculum. These experiences are undertaken in partnership with external industry, business or community partners, with students actively engaging in purposeful work activities. This integration of theory with meaningful practice is relevant to students' discipline of study and/or professional development (Campbell et al., 2021; Zegwaard et al., 2023; Ferns et al., 2024).

This article provides an overview of research on WIL within discipline-based higher education programs. To achieve this, we have focused on reviewing existing reviews rather than individual empirical studies, with a particular emphasis on pedagogical strategies and key stages of WIL curriculum development and design in these programs. Overarching reviews that synthesize findings from multiple reviews and meta-studies to address specific questions are often called “reviews of reviews”, “meta-reviews”, “overviews of reviews”, or “umbrella reviews” (Faulkner et al., 2022). In this study, we have adopted the term “umbrella reviews”, following a structured, transparent, and reproducible methodology, to identify and highlight overarching trends within the field.

1.1 Working to learn, learning to work

Universities are expected to contribute to society by educating students that are employable and ‘work ready’ (Oliver, 2015). However, this is not an easy task in a rapidly changing world of work. WIL can be seen as a means of preparing students for employment by integrating theory and practice in workplace settings (Oliver, 2015; Jackson, 2015). Employability can be defined as the ability of students and graduates to recognize, acquire, adapt and continually enhance their skills, understanding and personal attributes. This increases the likelihood of finding and creating meaningful work that benefits themselves, the workforce, the community and the economy (Oliver, 2015). Oliver (2015) suggests a refined definition of WIL that includes *learning tasks* resembling those expected of graduates in early career stages or closely related to professional workplaces. These tasks should be spread throughout the degree programs, mapping assessments with more high-level tasks in the final years to emphasize skills, understanding and personal attributes, enhancing students’ likelihood of finding and creating work. Therefore, WIL should not merely be an *add-on* course but well integrated and developed throughout the degree.

1.2 Crossing contexts

WIL builds on the idea of transferring theoretical competence and practical skills from university to work-life and *vice versa*. The goal is for graduates to be work-ready and capable of transferring their learning into their future workplaces. Transfer of learning is applying competence, such as knowledge and skills, acquired in one context to solve a problem in another context (Castillo et al., 2018). Opportunities for students to transfer learning can be created within many different authentic platforms including laboratories, field work, expeditions, and within WIL (Rowe & Zegwaard, 2017). When crossing contexts, students need to re-contextualize and re-interpret what they have learned. Typically, work-experience in WIL programs includes *off-campus* activities such as work-placements, practicums, internships, service learning, and cooperative education, but may also include *on-campus* activities like student entrepreneurships. On-campus mock projects can simulate real workplace contexts, allowing students to work as if they were working on a real project within the industry (Edwards et al., 2015). Students learn through active engagement in purposeful work tasks, enabling the integration of theory with meaningful practice relevant to the students' discipline of study. Learning is broadly dependent on the context in which the students are situated (Lave & Wenger, 1991), and development of transferable skills (e.g. communication, problem-solving, teamwork) can be promoted when learning occurs in a social context through co-operative methods with feedback on performance (Billing, 2007). Positive WIL experiences within such learning environments may increase students' motivation to transfer learning, although few studies exist on students' motivation to transfer learning from the workplace to the higher education context and *vice versa* (Bredenkamp et al., 2023).

1.3 Profession-oriented versus discipline-based higher education programs

Professional training, preparing students for careers such as nurses, dentists, and teachers, has a long tradition of incorporating WIL as an essential component of the curriculum. These programs are characterized by specific professional goals, and the incorporation of WIL is often mandated by accreditation or diploma requirements (Berndtsson et al. 2019). The contexts of the future professions are clear and learning outcomes are tailored to meet the integrated competences needed for the professions.

Disciplinary and multi-disciplinary programs, on the other hand, offer more generalist degrees within academic disciplines such as biology, geology, fishery and aquaculture, chemistry, mathematics and physics, social and political sciences, arts and humanities. They are designed around a continually evolving body of knowledge (Tight, 2020) and aim to provide a broad theoretical foundation for advanced studies and academic careers. But they also need to prepare students for diverse career paths outside academia. Their broader and more theoretical foci often face distinct challenges in effectively integrating WIL (Roberts et al., 2023; Rowland & Blundell, 2021). Despite the growing emphasis on labor market involvement in the development and delivery of WIL across *all* HE programs over the recent decades (Sutherland & Symmons, 2013; Dorland et al., 2020; Lloyd et al. 2022), disciplinary and multi-disciplinary educations have only just recently started incorporating WIL into their curricula.

1.4 Barriers to WIL in discipline-based programs

There are significant differences in how profession-oriented and discipline-based HE programs implement WIL (Sunnemark et al., 2023). While WIL appears relatively easily integrated into profession-oriented educations, discipline-based programs often require discursive maneuvers to incorporate WIL's principles with their theoretical focus (Sunnemark et al., 2023). The program curriculum may have been developed over time, highly influenced by academics within a theory-based system, and often detached from market signals (Pavlin, 2016). Additionally, academics may prefer theoretical classroom learning over practical assignments and resist updating curricula and assessment practices to incorporate WIL (Simola, 2009).

Barriers to adopting WIL also include lack of professional roles directly related to the discipline, undefined career outcomes, and insufficient resources for researching and developing WIL experiences that benefit students, industry partners, and the curriculum (Sutherland & Symmons, 2013). The literature on WIL predominantly focuses on instrumental and economic objectives, reflecting neoliberal reforms. However, it offers limited philosophical and empirical inquiries aligned with liberal education, and there is a notable absence of critical, emancipatory perspectives (Milley & Kovinthan, 2014). This highlights a tension between the traditional view of scholarship as knowledge for its own sake and the objective of 'producing' work-ready graduates (Macleod & Chamberlain, 2012).

To ensure that WIL is well embedded, authentic and relevant so that students acquire relevant skills that enhance their employability, curriculum development requires partnership and dialogue among teaching staff at the educational institution, students, graduates and external stakeholders (Cammilleri et al., 2013; Zegwaard et al., 2023). Developing and running WIL with authentic internships in discipline-based courses and programs demands commitment, extra resources and funding, all of which can be difficult to find in a climate of tightening budgets (Sutherland & Symmons, 2013).

1.5 Objectives

The overall objective of this umbrella review is to explore and identify pedagogical strategies and key stages in the development and design of WIL curriculum across various discipline-based programs in higher education. Specifically, we address the following research questions:

- What are the key research streams and findings highlighted in reviews on WIL within academic, discipline-based programs?
- How can these findings support educators new to WIL, WIL practitioners, education leaders and WIL researchers in their endeavors to enhance WIL within different HE discipline-based programs?

2 Methodology

2.1 Review process

The umbrella review process included these steps: 1) determining the objectives and the research questions of the study; 2) identifying search terms for database queries; 3) conducting database searches to identify relevant records; 4) removing duplicates; 5) screening records by reading titles and abstracts, and selecting relevant articles based on inclusion and exclusion criteria; 6) reading and assessing full-text articles for eligibility; and 7) conducting a qualitative synthesis, which included thematic analysis of the selected articles, followed by collating, summarizing and reporting of results. These steps are illustrated in Figure 1. The process was iterative, with repeated stages to ensure a thorough literature search, and robust evidence synthesis and analysis. Where appropriate, the reporting adheres to the updated Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) (Page et al., 2021) as outlined in Appendix 1.

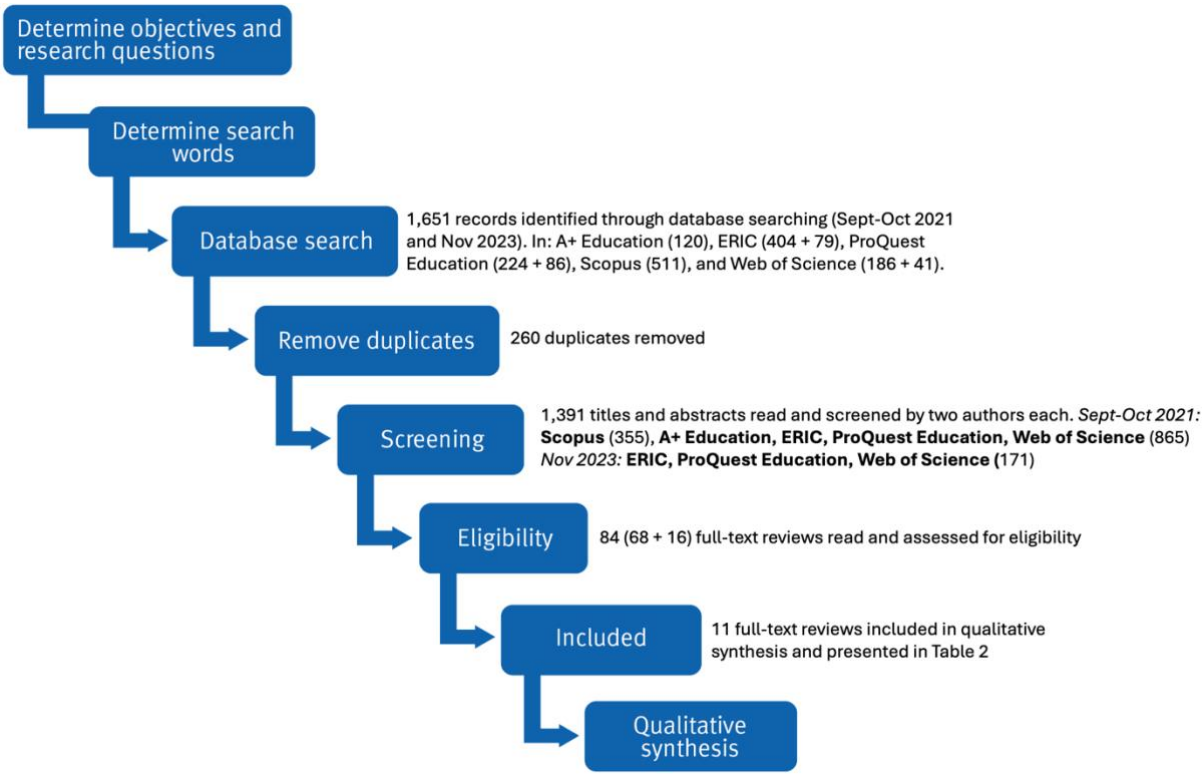

Figure 1. *Flowchart showing the different steps of the umbrella review process.*

2.2 Information sources and search strategies

Five electronic databases (A+ Education, ERIC on EBSCOhost, ProQuest Education Database, Scopus, and Web of Science) were searched in September and October 2021. Three of these databases were searched again using the same strategies in November 2023 (limited to publication years 2021-2023). The search strategy was developed for

ERIC and adapted to the other databases. Detailed search strategies for all searches are available in Appendix 2.

2.3 Selection process

The screening and selection process followed the guidelines suggested by Polanin et al. (2019). After removal of duplicates, 1220 records from the initial searches in September and October 2021 were screened for relevance based on titles and abstracts using Abstrackr (Wallace et al., 2012). To calibrate our application of the eligibility criteria, a sample of 100 papers was screened independently by each author, and inclusion decisions discussed. All records were then independently screened by two authors, with all three authors discussing and resolving any discrepancies (Figure 1). In total, 68 records were selected for full-text eligibility assessment. All three authors assessed these independently for eligibility, resolving discrepancies through discussion. The same procedure was applied to the records retrieved from the second set of searches in November 2023, with 171 records screened in EndNote based on title and abstract and 16 assessed for eligibility (Figure 1). Our inclusion and exclusion criteria (Table 1) were established in line with the focus of the umbrella review and research questions and used in the screening of the records as outlined in Figure 1. Papers reviewing electronic WIL (eWIL) not integrating students' academic studies *within* a physical workplace or practice setting were excluded. Only reviews on WIL in higher education programs were included. Studies focusing on WIL in profession-oriented programs leading to specific professions were excluded (Table 1).

Table 1. *Inclusion and exclusion criteria*

Criteria	Inclusion	Exclusion
Timeframe	Published Jan 2000 – Nov 2023	Published before 2000
Language	English	Other languages
Publication type	Reviews of empirical studies	Empirical studies, Conceptual papers, Editorials, Opinion pieces
Level of education	Higher education study programs	Other than higher education study programs
Programs	Work-integrated learning (WIL) in discipline-based programs such as mathematics, biology, social sciences etc.	WIL in profession-oriented programs with a long tradition in WIL leading to specific identifiable careers such as medical doctors, nurses, dentists, teachers, social workers etc.
Authentic work-focused experiences	Integrating students' studies within a workplace or practice setting	Online, digital WIL (eWIL)

2.4 Data extraction and data items

During the assessment process, the following information was extracted using a standardized coding scheme: 1) article citation identity (author(s), year of publication), 2) title of the paper, 3) terminology used; 4) methodology employed; 5) number of records identified and included; 6) information regarding country and study programs included or investigated; 7) objective or theme of the study; 8) key findings; and 9) recommendations.

2.5 Thematic analysis of the included full-text articles

An important aim of this umbrella review was to identify research streams and key findings from existing reviews. Given the variation in how the included reviews presented and worded their results, thematic analysis was deemed an appropriate approach. This method involves identifying, comparing, analyzing, and reporting patterns within the data from the selected studies (Braun & Clarke, 2012).

All authors read all the included articles, with the first author conducting a particularly thorough review of all the articles, while the second and third authors each conducted an in-depth reading of half of the articles. This ensured that every article was reviewed by at least two authors and that all authors maintained an overview of all articles. Through repeated readings, combined with data extracted in earlier steps, each author initially categorized the content into preliminary thematic areas. These categories were informed by the main themes presented in the articles and the recommendations mentioned regarding pedagogical strategies and key steps for WIL curriculum development and design. These initial categorizations were discussed among authors, and in cases of disagreement, the articles were revisited for further review and reflection. Consensus on the categories was reached through iterative discussions. The authors then collaboratively refined these categories, merging and organizing them into overarching themes. To support the analysis, a draft of a figure (Figure 2) was developed to visually help the authors to get an overview of the findings.

The thematic analysis was an iterative and dynamic process, involving repeated readings, discussion, and alignment to the research questions. This approach facilitated the identification of central themes and the synthesis of recommendations relevant to WIL curriculum development and design, which are presented in the results section.

3 Results

3.1 Study characteristics

To the best of our knowledge, this paper represents the first umbrella review focusing on WIL within discipline-based higher education programs. Out of 1,651 records identified through database searches, only 11 met our study's inclusion criteria (Table 2). The most recent review included was published in 2022, and only one of the reviews was published prior to 2010. Table 2 provides a detailed breakdown of the scope and focus of these reviews, including the diversity of terminology used to describe WIL initiatives, including learning through participation (LTP), co-op, internship, work-based learning (WBL) and work placement. All terms are used to describe efforts that integrate theoretical learning with practical work experience within curricula, undertaken in collaboration with industry, business, or community partners.

Table 2 also reveals that four of the reviews focus on specific disciplines: Science and technology (Coll & Eames, 2007), Business (Vélez & Giner, 2015; Govender & Vaaland, 2020), and Hospitality (Zopiatis et al., 2021). Two reviews address indigenous-specific WIL (Nielsen et al., 2022) and WIL in U.S. Community and Tribal College Internships, covering programs within STEM, Geoscience, Parks and recreation, Marketing, Biomedicine, and Health professions (Lucero et al., 2021).

The remaining five reviews synthesize various aspects of WIL across disciplines and topics. While our exclusion criteria aimed to omit reviews from profession-oriented programs, we included some that covered both profession-oriented and discipline-based programs. This decision was based on two factors: the number of studies focusing on profession-oriented education was smaller than those addressing discipline-based education, and the valuable perspectives these reviews provide on WIL in education. For example, Mackaway et al. (2011) reviewed approximately 60 publications on the assessment of student learning in various forms of learning through participation (LTP) across disciplines, noting a dominance of fields such as engineering, tourism and business, hospitality, education, law, health and clinical sciences. Conversely, they identify other disciplines as under-represented in the LTP (WIL) literature. Feldmann (2016) examined factors promoting students' skills and competences leading to employability in WBL settings across disciplines. Similarly, Lasen et al. (2018) investigated the quality of WIL assessment design in higher education, including findings from Natural & Physical sciences, Society & Culture, Engineering & related Technologies, IT, and Management. Inceoglu et al. (2019) conducted an in-depth review of 40 studies on the effects of work placements on career outcomes across disciplines, excluding highly structured compulsory placements (e.g., medical or teaching degrees), and part-time casual work experiences not integrated in the curriculum. Finally, Di Pietro (2022) reviewed research on the types of skills students gain through participating in international internships, covering disciplines such as Languages, Engineering, Computer sciences, Tourism & Hospitality, Business, Education, and Medicine.

The insights summarized in Table 2 not only highlight the breadth of WIL research but also emphasize the need for further exploration of underrepresented disciplines and the diverse ways WIL is conceptualized and implemented in higher education.

3.2 Thematic mapping

The key themes revealed through thematic mapping of the reviews included are presented in Figure 2 and Table 3. Curriculum design of WIL emerged as a central theme, encompassing teaching and learning activities, assessment design, and learning outcomes, all tied to employability and satisfaction. Stakeholder engagement, international placements, and issues concerning Indigenous and minority students were also significant themes, interconnected with curriculum design. Promoters and inhibitors were discussed across these overlapping themes, which are detailed in relation to each study below.

Table 2. *Article citation identity (author(s), year of publication), title of the paper, numbers of citations according to Google Scholar (September 16th, 2025), terminology used, information regarding study programs included or investigated, and number of records identified and included by the different authors.*

Article citation	Title of the paper	Numbers of citations	Terminology used	Study programs	Records identified and included
Coll & Eames (2007)	Learning science and technology through cooperative education	23	Co-op, WIL	Science & technology	Not reported
Mackaway et al. (2011)	Practical and pedagogical aspects of learning through participation: the LTP assessment design framework	55	LTP	Across disciplines	60
Vélez & Giner (2015)	Effects of business internships on students, employers, and higher education institutions: A systematic review	239	Internship	Business	57 / 360
Feldmann (2016)	Considerations in the design of WBL settings to enhance student´s employability: A synthesis of individual and contextual perspectives	40	WBL	Across disciplines	26
Lasen et al. (201. 8)	Quality of WIL assessment design in higher education: a systematic literature review	48	WIL	Across disciplines	20 / 458
Inceoglu et al. (2019)	(How) Do work placements work? Scrutinizing the quantitative evidence for a theory-driven future research agenda	119	Work placements	Across disciplines	40 / 2394
Govender & Vaaland (2020)	Business students and work-life: mind the gaps!	10	WIL	Business	46 / 159
Lucero et al. (2021)	Structure and characteristics for successful outcomes: A review of community college internship programs	14	Internship, WBL	Community and Tribal College Internship Programs	12 / 116
Zopiatis et al. (2021)	A systematic review of literature on hospitality internships	61	Internship	Hospitality	69
Di Pietro (2022)	International internships and skill development: A systematic review	41	Internship	Across disciplines	31 / 2373
Nielsen et al. (2022)	The Indigenous work-integrated learning resource hub: A needs-based approach to addressing barriers and opportunities for Indigenous students	21	WIL	Indigenous WIL	Not reported

Abbreviations: WIL = Work-integrated learning; Co-op = Cooperative education; LTP = Learning through participation; WBL = Work-based learning.

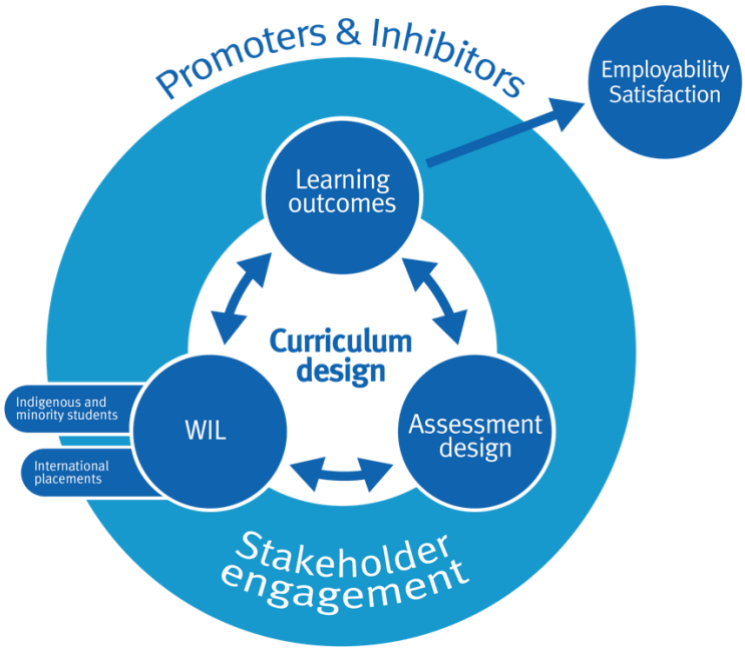

Figure 2. *Thematic mapping of research on WIL in discipline-based programs*

3.2.1 Curriculum design

Curriculum design is here understood as a broad term encompassing aspects to consider when planning, implementing, and conducting WIL (Figure 2). Our findings are categorized into sections on *stakeholder engagement*, *teaching and learning activities* (WIL), *assessment design* and *learning outcomes*, presented separately related to other themes identified (Figure 2).

3.2.2 Stakeholder engagement in WIL

Primary stakeholders in WIL include students, universities and practical partners such as companies, industry or community service units. Several articles emphasize the importance of engaging these stakeholders to enhance WIL, as outlined in Table 3. Feldmann (2016) discusses the complex interplay between students as learners and the working environment established by the university and the practical partner. The importance of involving all internship stakeholders to systematically improve WIL settings, thereby enhancing learning and employability, is highlighted. By developing a framework for work-based learning based on two central learning theories for WIL, experiential and situated learning theory, Feldmann (2016) advocates for a holistic and systematic approach to WIL. Other studies address stakeholder involvement in developing WIL assessment.

In summary, the engagement and collaboration of stakeholders are essential for improving learning, assessment and employability in WIL.

Table 3. *Research streams on work-integrated learning (WIL) in discipline-based higher education programs. Article citation identity (author(s), year of publication), themes identified, key findings and recommendations from the included reviews.*

Article citation	Theme(s)	Key findings	Recommendations
Coll & Eames (2007)	*Stakeholder engagement; Curriculum design; Learning outcomes; Assessment design; Indigenous and minority students*	While WIL benefits students, universities, and employers, its design in science programs is poorly understood. Understanding student learning during WIL is crucial for curriculum design, but assessing outcomes is challenging due to diverse placements, goals, and expectations.	WIL should be a genuinely cooperative effort. Learning outcomes and assessment should be collaboratively determined by all stakeholders, addressing the challenge of accommodating diverse workplace situations, which are associated with differences in learning aims and expectations.
Mackaway et el. (2011)	*Assessment design*; *Curriculum design; Learning activities; International placements*	The complexity of assessment of WIL includes questions of validity, objective verification of learning, stakeholder roles and expectations in the assessment process, and the role and purpose of reflection in both learning and assessment.	Educators must create assessment strategies for WIL that address holistic learning, outcomes, context, logistics, and stakeholder expectations to ensure its success, legitimacy, and academic rigor in higher education. Presents a framework to develop effective assessment strategies with a placement profile and guiding questions.
Vélez & Giner (2015)	*International placements; Learning outcomes; Satisfaction; Curriculum design*	Business internships benefit students, employers, and higher education institutions by enhancing skills, career prospects, and collaboration. Key factors for success include autonomy, challenging assignments, and mentoring. While generally positive, improvements are needed in meeting job expectations and addressing skill gaps. International programs and technology offer opportunities to expand access and impact.	WIL can be improved by fostering autonomy, challenging tasks, quality mentoring, and addressing skill gaps in initiative, writing, and communication. Promoting international internships enhances intercultural competence, while technology expands access for remote learners. Key efforts include increasing internship availability, highlighting benefits to stakeholders, and ensuring resources for effective implementation and management.
Feldmann (2016)	*Stakeholder engagement; Curriculum design*; *Learning outcomes; Employability*	Internships facilitate transfer and creation of knowledge; enhance personal, professional and social skills; deepen discipline-related understanding; and prepare students for work and further studies. However, it remains unclear why some WIL settings boost skills and competencies more than others.	WIL settings should be improved and optimized by stakeholders, taking into account promotive factors from university, internship partners, and students. Further research is needed to systematically evaluate these promotive factors in greater depth.

Lasen et al. (2018)	*Assessment design*	High quality WIL assessment design promotes student´s learning and engagement, ensuring relevance, flexibility and feedback. WIL assessment should be better aligned with WIL tasks and experiences.	Resources are needed for research-active WIL academics, partners and students to design and engage in assessment practices that integrate student learning and achieve higher-order learning outcomes.
Inceoglu et al. (2019)	*Learning outcomes; Curriculum design*	WIL has a (small) positive effect on career outcomes. Employment is found more quickly. Students' perceptions of self-efficacy, knowledge, skills, and attitude changes. Findings indicate that proposed social learning processes and identity changes positively affect career resources.	More theory-driven, methodologically robust research will lead to a better understanding of the mechanisms and processes by which work placements and similar career transitions affect career outcomes. They present a framework to understand existing findings and guide future research.
Govender & Vaaland (2020)	*Curriculum design*	WIL challenges and pitfalls result from a lack of institutional support and mentoring and assessment deficiencies, as well as insufficient student readiness, curriculum relevance, and host motivation.	Fostering awareness and mindfulness can help stakeholders avoid and manage these challenges to ensure efficient and successful WIL experiences.
Lucero et al. (2021)	*Indigenous and minority students; Curriculum design; Learning outcomes; Stakeholder engagement*	There is limited consensus on key internship outcomes, scant details on program structures, characteristics and outcomes, and a lack of information on elements crucial for sustaining U.S. Community and Tribal College Internship Programs.	An in-depth assessment, to develop a best practice framework for these programs, is needed.
Zopiatis et al. (2021)	*Curriculum design*; *Stakeholder engagement; Learning outcomes; Satisfaction; Employability International placements*	Research themes include internship-specific characteristics, career expectations, internship satisfaction, stakeholder benefits, pedagogy, experiential learning, legal landscape, and sexual harassment. International experience was also noted as relevant to internship stakeholders.	Safeguarding the pedagogical integrity of WIL is crucial. Promoting international collaborations and larger sample sizes can enhance research validity and reliability in hospitality internships.
Di Pietro (2022)	*International placements; Learning outcomes;*	Through internships abroad, students develop intrapersonal skills (open mindedness, self-confidence), practical knowledge and language proficiency.	A future research agenda, to improve research methodology, is presented.
Nielsen et al. (2022)	*Indigenous and minority students; Stakeholder engagement; International placements*	*International WIL exchanges for Indigenous students* (IIWIL) strengthen relationships with community and identity but also face many barriers.	Partnership with local communities and stakeholders is crucial to enhance IIWIL.

3.2.3 WIL teaching and learning activities

According to Coll & Eames (2007), WIL can be organized in several ways. Students can find their own placement, placements can be managed by a central group securing placements, or the university can secure placements, monitor learning, and strive to strengthen the links with practical partners. Matching students with practical partners requires specialist scientists within the discipline-based program with in-depth understanding of what the students need to learn and skills needed by employers. Coll & Eames (2007) also stress that WIL is a cooperative effort involving all three parties, when e.g. deciding learning outcomes in terms of graduate competencies.

Analyzing challenges, risks, and barriers associated with WIL curriculum design, Govender & Vaaland (2020) reveal five major gaps including lack of institutional support, unauthentic mentoring and assessment, poor student readiness, lack of curriculum relevance and lack of host motivation. WIL may suffer from unclear learning objectives and teaching methods. Govender & Vaaland (2020) recommend curriculum development as a collaborative effort rather than a solo intra-faculty task. This requires collaboration among faculty, practical partners, part-time lecturers, adjunct professors and mentors to ensure the relevance and application of theoretical knowledge and analytical tools when designing WIL as a structured learning process. Additionally, they recommend addressing discrepancies in time frames and scheduling between academic and practical partners because it can cause constraints. Universities can benefit from hiring business professionals as part-time lecturers and compensating host-firm mentors, to recruit firm involvement in the learning process, designing and formulating tasks. WIL must also be tailored to fit the size and characteristics of the host firm. Assignments should benefit the host firm and involve their input in preparing students in both soft and hard skills. A company's involvement in WIL is a trade-off between the perceived benefits from hosting and mentoring the student against the costs of doing so. This underscores the importance of students solving real business problems to gain knowledge and skills and aligns with the intended learning outcome.

Mackaway et al. (2011) developed a *placement profile* for *WIL curriculum design,* identifying key variables that influence placements: 1) **Duration** – Short or long placements; 2) **Structure** – Either interrupted (e.g., weekly) or in blocks; 3) **Location** - Local or distant (including *international internships*); 4) **Communication** – Ease and regularity of contact between academic teacher and student; 5) **Preparation** – Extent of necessary student preparation; 6) **Support –** Availability of mentoring and feedback from academics; 7) **Autonomy** – Degree of control by the practical partner in determining the work to be done versus the student or the academic; 8) **Control –** Does the student control own work execution and output – or others; 9) **Supervision** - Practical partner´s interest, experience and availability for supervision; 10) **Program stage** – Whether the student is early or late in their degree program; 11) **Requirement** – if the placement is a mandatory or elective; 12) **Accessibility** - whether placements are for all students or selected students; 13) **Pedagogy** - Teacher´s knowledge of pedagogical theory on WIL and assessment; and 14) **University support** - Training and administrative support provided by the university. Placement profiles can vary widely, thus understanding these factors is crucial for designing WIL assessment.

Emphasizing learning and pedagogical integrity is crucial in developing work-integrated learning (WIL), with the primary goal of enhancing student learning. Coll & Eames (2007) report that research on WIL programs in science primarily focuses on learning from students' perspective, identifying barriers and enablers, and examining the link between learning and assessment. They argue that successful WIL programs require a robust curriculum, theory-based pedagogy, and objectives relevant to all stakeholders, while noting a general lack of focus on the specifics of student learning. The importance of understanding the learning aspects of WIL before designing curricula and choosing pedagogies is stressed. Similarly, Zopiatis et al. (2021), in their review of WIL in hospitality programs, caution against neglecting pedagogical integrity. They warn that without a strong pedagogical foundation, WIL programs risk producing graduates who are inadequately prepared to meet industry challenges.

Summarizing the data on the theme "*WIL teaching and learning activities"*, we found that effective WIL design requires collaboration among key stakeholders to align learning outcomes with graduate competencies and industry needs. Challenges such as lack of institutional support, curriculum relevance, and student readiness underscore the need for cooperative curriculum development. Placement profiles can emphasize key variables like duration, structure, supervision, and university support, all of which are critical for designing effective WIL assessments. Ensuring pedagogical integrity and aligning theoretical knowledge with practical application are essential for preparing students to meet industry demands.

3.2.4 WIL assessment design

Designing assessment for WIL is challenging due to the holistic nature of the learning outcomes and involvement of multiple stakeholders (Coll and Eames, 2007; Mackaway et al., 2011; Lasen et al., 2018).

Coll and Eames (2007) report that assessment methods for WIL vary, with longer and more complex placements often employing full grading, although pass-fail grading is also common. Assessment strategies may include evaluation of a report or limited feedback, or more complex arrangements with learning objectives and outcomes negotiated between the three internship stakeholders. Additionally, determining adequate, fair, reliable and valid evidence of learning outcomes requires more than just completing a checklist or marking conventional reports. Accommodating diversity in workplace situations, which may involve varying learning aims and expectations, presents challenges, especially in advanced assessment models that include negotiated portfolios. These portfolios can incorporate outcomes agreed upon by the three stakeholders and may include elements of student self- and peer- assessment.

Discussing different types of WIL assessment, Mackaway et al. (2011) question whether it should be based on a learning product, skills practice, or the process of learning. While learning products like reports or portfolios are familiar and often simpler to assess, they may not fully capture all intended learning outcomes, such as skills and competencies. Mackaway et al. (2011) also emphasize the importance of reflection in both learning and assessment, suggesting that assessment prompts students to reflect – a valuable skill for learning. They suggest that practitioners should decide whether students should include doubts, biases, and non-cognitive reflections like emotions, and how to assess these aspects. Performance assessment during work placements,

involving observations by practical partners or academic teachers, can present dilemmas such as insufficient evaluation time or conflicts of interest when mentors also assess. To mitigate this, host supervisors often support objective learning verification, while universities retain overall assessment responsibility (Mackaway et al., 2011).

To help select the appropriate assessment tools or approaches for placements, Mackaway et al. (2011) developed an *Assessment Design Framework* with guiding questions as a checklist and a roadmap to aid decision-making. Key steps of the framework include: 1) Identifying desired *learning outcomes* and corresponding *learning activities*; 2) Considering practical aspects of placements affecting assessment design implementation; 3) Evaluating the use of formative assessment to support learning; 4) Addressing whether there is place for professional judgment (by the academic or host supervisor) in evaluating the WIL course and its assessment methods; 5) Determining what constitutes valid and reliable evidence of learning (for the planned WIL course); 6) Designing assessments flexibly to accommodate variables according to the placement profile and ensure fairness and consistency; 7) Deciding whether to include reflection in the assessments and how to implement it; and 8) Evaluating the effectiveness of the assessment design and tools used.

Assessment must promote student learning and engagement as emphasized by Lasen et al. (2018). Their systematic review utilizes the *Authentic Assessment Framework* by Bosco & Ferns (2014) to investigate the quality of WIL assessment design. This framework includes four key criteria: 1) Active student engagement in a workplace or with an authentic audience; 2) high-quality intellectual engagement by the student, involving analysis, evaluation, creation, and performance; 3) reflexive evaluation of performance by the student; and 4) involvement of the practical partner in the assessment process, including setting marking criteria and direct marking. Lasen et al. (2018) find that most of the included studies scored highly in terms of assessment design quality . However, they call for stronger WIL assessment partnerships between key internship stakeholders to enhance collaborative design, professional learning, dialogic review, student agency and self-reflection, as a crucial step forward in developing high-quality WIL assessment practices.

Summarizing the data on the theme "*WIL assessment design"*, we found that designing effective WIL assessments is inherently complex due to the diversity of learning outcomes, workplace contexts, and the involvement of multiple stakeholders. Assessment methods range from straightforward pass-fail grading to advanced negotiated portfolios, all of which demand fair, valid, and reliable evidence of learning. High-quality assessment practices rely on reflection, active student engagement, and a strong collaboration among stakeholders.

3.2.5 Learning outcomes, satisfaction and employability

WIL in science and technology programs offers multiple benefits for students. These include academic advantages, such as increased motivation and a more positive perception of their studies, personal benefits such as enhanced autonomy and communication skills, and career advantages, including higher employability, clearer career paths and international opportunities (Coll & Eames, 2007). Additionally, WIL benefits practical partners by reducing recruitment costs and enhancing public image,

while universities gain through improved student recruitment, the integrating of stakeholders into program development and fostering industry collaborations. Significant competency and professional development opportunities for students through real-world experiences and networking is also emphasized by Zopiatis et al. (2021).

Students and companies often have differing expectations and perceptions regarding actual value, benefits and learning outcomes from WIL (Vélez & Giner, 2015; Zopiatis et al., 2021). Students value qualified supervision, good relationships with supervisors, frequent feedback, and challenging and meaningful work tasks. Employers expect internships to develop interpersonal skills and skills relevant for the job, which can aid in full-time hiring.

Vélez & Giner (2015) explore factors affecting students' learning outcomes from WIL, highlighting the quality of mentoring from the internship partner as a key predictor of success. Challenging assignments, formative feedback, and autonomy during the work placement also impact learning outcomes. Academic supervision enhancements include keeping a journal, engaging with academic assignments, having a dedicated instructor, and establishing appropriate prerequisites. Above all, a positive student attitude is the most important predictor of an effective internship.

Inceoglu et al. (2019) evaluate work placement's impact on career outcomes, emphasizing its role in facilitating social learning and the transition into work life. Their comprehensive review of 40 studies concludes that placement slightly enhances career outcomes by improving self-efficacy, knowledge, skills, and attitudes, leading to quicker employment. The authors highlight that social learning and identity changes positively influence career resources (e.g., knowledge, skills and abilities, and career attitudes) and propose a framework to interpret existing findings and guide future research. Furthermore, they note the importance of autonomy and support in identity development, which boosts self-esteem and self-assessment of abilities following WIL, although research in this area remains limited.

Employability is the focus of the review by Feldmann (2016), arguing that the enhancement of employability depends directly on the student (from an experiential learning perspective) and indirectly on the support provided by the university and the practical partner (from a situational learning perspective). Consequently, as previously mentioned, all WIL stakeholders need to be involved to systematically maximize WIL settings, thereby increasing learning and employability outcome (Table 3). Feldmann (2016) identifies several factors promoting employability from students' perspective, including self-efficacy, learning approach, a proactive attitude, perceived impact on work outcomes, and the personal significance of the WIL settings. Employability can also be enhanced through support from the university, particularly through case studies, reflection, WIL-related courses, supervision and mentoring, as well as through role models and supervision from the practical partner.

Inceoglu et al. (2019) call for more rigorous theoretical and methodological studies to better understand how WIL processes affect career outcomes. They recommend implementing theoretically informed and tailored evaluation programs for work placements. Zopiatis et al. (2021) argue that research focusing on internship benefits and discrepancies between expectations and actual perceptions is approaching a point of saturation, urging WIL researchers to expand their research to other areas such as developing and utilizing custom-made empirical tools to measure specific elements of

the internship experience (e.g. students´ engagement level during WIL and its effect on related learning outcomes). Furthermore, Zopiatis et al. (2021) call for more in-depth investigations of the practical partner and educators at the University (the neglected stakeholders), using mixed methods designs to look at internship dynamics and complexities.

Summarizing the data on the theme "*Learning outcomes, satisfaction and employability"*, we found that WIL in science and technology programs benefits students by boosting academic motivation, autonomy, communication skills, and employability, while also aiding practical partners through reduced recruitment costs and universities through stronger industry collaborations. Successful WIL outcomes rely on quality mentoring, challenging tasks, feedback, and student autonomy, with a positive attitude being crucial. Work placements enhance career outcomes by fostering social learning, identity development, and self-efficacy. Employability is shaped by experiential and situational learning, requiring collaboration among all stakeholders. Future research should address neglected stakeholders, develop tailored evaluation tools, and explore internship dynamics.

3.2.6 International placements

International WIL placements abroad emerge as a distinct theme in several of the included reviews (Table 3). As already mentioned, Mackaway et al. (2011) consider location as a key variable in WIL curriculum design and assessment, emphasizing the importance of whether placements are local, distant, national or international.

Vélez and Giner (2015) examine variables influencing learning outcomes and satisfaction in business internships, highlighting how international experiences improve intercultural competences, including intercultural communicative skills, intercultural work experience, and intercultural understanding. Similarly, Zopiatis et al. (2021) recognize international experience as a significant research stream relevant to internship stakeholders, though without detailed elaboration.

Di Pietro (2022) reviews research on various skills gained through participation in international internships (cognitive, intrapersonal and interpersonal skills). A substantial body of evidence supports the hypothesis that WIL organized with internships abroad is linked to enhanced employability for graduates. These internships provide valuable learning opportunities in an intercultural context, meeting employers' demand for graduates with a global mindset. Furthermore, participating in international internships can expand students' global networks and job search radius, particularly beneficial for those pursuing international careers post-graduation. The most frequently cited skills learned by participants during international internships were intrapersonal skills including open-mindedness and self-confidence. Learning gains in terms of practical knowledge and language proficiency are also reported, while less evidence suggests that cognitive skills and leaderships skills are enhanced. Notable, Di Pietro (2022) points out that most studies of international internship are conducted in HE institutions from wealthier countries, with 29 % of the studies focusing on profession-oriented programs that offer a more straightforward career trajectory. However, the research approach itself can affect the findings related to learning outcomes from international internships. A major methodological issue is the reliance on data from student self-reports.

In summarizing the data on the theme "*International placements"*, we found that international WIL placements enhance intercultural competencies, employability, and global networks, fostering skills like open-mindedness, self-confidence, practical knowledge, and language proficiency. However, evidence for the development of cognitive and leadership skills remains limited. Existing research mainly focuses on wealthier countries and profession-oriented programs, often relying on student self-reports, revealing methodological gaps.

3.2.7 Indigenous and minority students

Three of the included reviews discuss WIL for Indigenous and minority students (Table 3). Coll & Eames (2007) argue that WIL can enhance equity in HE, particularly in the sciences and technology fields, for underrepresented groups such as women and Indigenous peoples. They highlight culturally appropriate support structures, such as mentorship from graduate students, face-to-face interactions during lab sessions, and regular meetings. These elements help Māori students in New Zealand gain a better understanding of science, their role in the scientific community, and an enhanced sense of belonging.

Lucero et al. (2021) review literature on U.S. Community and Tribal College Internship Programs, which serve diverse demographics, including a significant number of minority and often first-generation college students. Internships vary in duration from two weeks to six months, with one program extending up to three years, and involve activities like professional shadowing, hands-on learning with community projects, and lab work. Common elements across 12 programs include mentorship and professional development activities. The review highlights positive outcomes such as degree completion and skills acquisition, commitment to their field of study, continued employment in research, matriculation to four-year institutions, and improvements in confidence, communication skills, and knowledge. Programs for Native American students feature culturally relevant curricula addressing community needs. The review suggests that understanding the unique structures and historical context of tribal colleges is crucial for developing internships that respect cultural backgrounds and prepare students for the workforce. The authors call for best practices that integrate Native American culture into workforce development, recommending case studies to explore these context-specific nuances further.

Nielsen et al. (2022) also underline that effective Indigenous WIL requires sustained partnerships with local communities, focusing on relationship building, community needs, and integrating community knowledge into WIL resources and programs. They highlight opportunities for enhancing Indigenous WIL, such as fostering reciprocal learning and support for Indigenous identity, while also identifying barriers like financial constraints, inadequate tracking of Indigenous enrollment, and gaps in university preparation. Additionally, they note a lack of awareness about WIL among Indigenous students and insufficient culturally relevant support in higher education. The authors also discuss the benefits of international WIL exchanges for Indigenous students, suggesting that such programs can strengthen students´ community ties and identity. They recommend involving Elders to enrich these experiences and suggest that Indigenous centers serve as vital spaces for cultural connection and coordination during these programs.

Summarizing the data on the theme "*Indigenous and minority students"*, we found that WIL supports Indigenous and minority students by promoting equity, fostering belonging, and improving representation through culturally relevant approaches and mentorship. Positive outcomes include degree completion, skill development, and workforce readiness, though barriers like financial constraints and limited resources persist. Sustained community partnerships and Indigenous identity support are crucial, with international WIL programs offering opportunities to strengthen community ties. Involving Elders and Indigenous centers is recommended for enriched experiences.

4 Discussion

This umbrella review examines pedagogical strategies and key stages of WIL curriculum development, primarily within discipline-based programs in higher education. It highlights stakeholder engagement, teaching and learning activities, assessment design, and learning outcomes. Stakeholder collaboration is identified as essential for aligning learning outcomes with graduate competencies and industry needs, while addressing challenges like institutional support, curriculum relevance, and student readiness. Effective WIL design emphasizes the importance of placement profiles, pedagogical integrity, and the integration of theoretical knowledge with practical application. Assessment design in WIL is particularly complex due to the diversity of learning outcomes and workplace contexts, requiring fair, valid, and reliable methods such as negotiated portfolios, reflection, and active student engagement. WIL enhances learning outcomes by boosting academic motivation, autonomy, communication skills, and employability. It also benefits universities and practical partners through stronger collaborations and reduced recruitment costs. Additionally, work placements promote social learning, identity development, and self-efficacy, with mentoring, feedback, and student autonomy identified as critical for success. International WIL placements further expand intercultural competencies, global networks, and employability, although evidence for cognitive and leadership skill development remains limited. For Indigenous and minority students, WIL fosters equity, belonging, and representation through culturally relevant approaches, mentorship, and sustained community partnerships. Overall, the development of WIL curriculum requires collaborative efforts, tailored strategies, and a focus on equity and global perspectives.

Curriculum design emerged as a major theme in the thematic analysis of the reviews included, alongside assessment design and learning outcomes (Figure 2). Curriculum design is broadly defined here to encompass various aspects necessary for planning, implementing, and executing WIL. This aligns with the principle of constructive alignment, which integrates learning outcomes, learning activities and assessment to create a coherent structure that supports students in achieving intended learning outcomes through appropriate activities and assessments (Biggs, 1996; Biggs & Tang, 2011). Developing and ensuring high-quality WIL through a formal, intentional curriculum is crucial. Despite advancements, misunderstandings persist about the nature of WIL and its practical implementation. A recent framework proposed by Ferns et al. (2024) divides the WIL curriculum into three components: pre-WIL (preparing students for WIL), WIL (the educational approach whereby students engage with external stakeholders in authentic, meaningful tasks) and post-WIL (synthesizing learning /reflecting/de-briefing

from the experience during or after WIL). Pre- and post-WIL learning supports optimal learning through WIL. Eady et al. (2024) underline that, to enhance the quality of WIL, higher education institutions, educators, and employers must prioritize students' perspectives and reflections on what constitutes a meaningful and high-quality WIL experience when designing curricula. Encouragingly, the quality of study design in WIL has improved over time, although progress has been uneven across disciplines (Lasen et al., 2018).

Barriers and promoters of WIL development were also discussed by the authors of the included reviews (Table 3). Study programs vary by discipline, with local and contextual differences complicating the ability to draw general conclusions about barriers and enablers. Proper integration of WIL into courses or degrees, with respect to relevance and authenticity, is considered a key aspect of the curriculum design. In STEM programs, WIL is often applied to existing traditional curricula as "add-ons", though some institutions fully embed and permeate WIL into programs (Edwards et al., 2015). Coordinated, multidisciplinary WIL courses for diverse student groups across disciplines can help boost course value and efficiency for existing programs (Sutherland & Symmons, 2013). A generic theoretical and pedagogical framework for these WIL courses enables effective participation, integrating WIL into different courses while balancing generic content with discipline-specific relevance (Sutherland & Symmons, 2013). Young et al. (2017) advocate a collaborative approach to developing a WIL-centered curriculum in STEM-disciplines at an Australian University, where WIL experts introduced tailored frameworks, concepts and assessment examples. These were discussed by a collegial team of experienced WIL teachers and teachers new to WIL. Experienced WIL teachers acted as innovators and change agents, facilitating curriculum transformation and encouraging colleagues to incorporate context-specific and discipline-based WIL experiences into the curriculum (Young et al., 2017). In our analysis, stakeholder engagement and joint collaborative effort was also identified as an overarching theme important for the design of the WIL curriculum, assessment, and learning outcomes (Figure 2).

Exploring *inclusive WIL,* Lasrado et al. (2024) present key recommendations to enhance WIL experiences for all students and promote greater equitable access and participation in these valuable learning opportunities. Indigenous and minority students' perspectives and participation were also themes in three of the reviews included in this paper, highlighting the need to address students' diversity to achieve wider participation in WIL (Table 3). This aligns with the increasing global interest in engaging all HE students in WIL, urging universities to carefully consider barriers and challenges faced by different student cohorts (Jackson et al., 2023; Lasrado et al., 2024). Jackson et al. (2023) report on an Australian-wide survey with 151,000 bachelor graduates, confirming that access to WIL varies across disciplines. They found no significant differences in WIL participation for Indigenous and Non-Indigenous graduates, though it is important to note that only a very small percentage of the graduates were Indigenous. International placements also emerged as a theme in some of the included reviews (Table 3). For example, Di Pietro (2022) discusses aspects of curriculum design, examining how internship length can influence learning outcomes, particularly by enhancing language-learning and cultural immersion.

This study aimed to provide a relevant and comprehensive overview of research on WIL in discipline-based programs, with a particular focus on pedagogical strategies and key stages of WIL curriculum development. A notable limitation of umbrella reviews is their potential to overlook significant and novel findings from recently published primary studies that have not yet been incorporated into existing reviews, leading to gaps in the overall understanding of the field. Our systematic database searches and screening process yielded only 11 reviews published between 2007 and 2022 that met the inclusion criteria. This limited number of reviews, coupled with the relatively small number of empirical studies underpinning them (Table 2), highlights the fragmented and underrepresented nature of research on WIL in discipline-based educations. Another limitation is the variable methodological rigor and reporting quality of the included reviews, which prevented us from stating strict methodological requirements as part of our eligibility criteria.

Despite these challenges, several of the included reviews have been well cited, with citation counts reaching 237 at the time of finalizing this paper (Table 2), reflecting a growing interest in this area of research. Our findings indicate a broad consensus that WIL in discipline-based programs enhances students' skill sets and strengthens their employability (Table 3). However, while the development of employability skills has been a dominant focus in WIL research, less attention has been directed toward understanding the processes through which students acquire skills and knowledge during WIL, including the roles of educators, peers, and industry partners (Jackson, 2015).

In conclusion, future research on WIL in disciplinary and multi-disciplinary programs should address neglected stakeholders, with robust qualitative studies exploring the perspectives of both students and external partners. Collaborative projects incorporating more rigorous quantitative studies with larger sample sizes should also be prioritized. Such efforts will contribute to a deeper and more nuanced understanding of WIL across diverse contexts, ultimately supporting the development of more effective and inclusive WIL practices across *all* HE programs.

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