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Management and Cross-Disciplinary Skill Development in Higher Education Design Diplomas: A Systematic Review

(Pembangunan Kemahiran Pengurusan dan Rentas Disiplin dalam Diploma Reka Bentuk di Institusi Pengajian Tinggi: Ulasan Sistematik)

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ABSTRACT

Design diploma programs in higher education are increasingly expected to equip graduates not only with technical skills but also with essential soft skills such as communication, collaboration, critical thinking, and adaptability to meet the evolving demands of the global workforce and complex professional environments. This systematic literature review (2010–2024) synthesises findings from empirical research, curriculum frameworks, and assessment methodologies to evaluate how these competencies are developed and measured in design education. Pedagogical strategies such as Project-Based Learning, Problem-Based Learning, and Design Thinking are commonly employed to foster these skills, with a strong emphasis on core competencies. However, gaps persist in areas like business acumen, entrepreneurial thinking, and strategic management, particularly at the postgraduate level. Assessment practices remain largely self-reported and lack standardisation or objectivity, although emerging multimodal tools using AI and emotion recognition offer future promise. The review highlights the urgent need for curricula to systematically embed soft skill development and align with industry expectations through performance-based, longitudinal, and mixed-method assessment models, ensuring that graduates are prepared for interdisciplinary and managerial challenges.

Key Words: Soft Skills, Design Education, Project-Based Learning, Curriculum Framework, Assessment Tools, Graduate Employability

ABSTRAK

Program diploma reka bentuk dalam pendidikan tinggi kini semakin diharapkan untuk melengkapkan graduan bukan sahaja dengan kemahiran teknikal, tetapi juga dengan kemahiran insaniah yang penting seperti komunikasi, kerjasama, pemikiran kritikal dan kemampuan menyesuaikan diri bagi memenuhi keperluan tenaga kerja global yang sentiasa berubah serta persekitaran profesional yang kompleks. Kajian literatur sistematik ini (2010–2024) mensintesis penemuan daripada penyelidikan empirikal, kerangka kurikulum dan metodologi penilaian untuk menilai bagaimana kompetensi ini dibangunkan dan dinilai dalam pendidikan reka bentuk. Strategi pedagogi seperti Pembelajaran Berasaskan Projek (PBL), Pembelajaran Berasaskan Masalah dan Pemikiran Reka Bentuk digunakan secara meluas untuk memupuk kemahiran ini, dengan penekanan kuat terhadap kompetensi teras. Namun begitu, masih wujud jurang dalam aspek seperti pengetahuan perniagaan, pemikiran keusahawanan dan pengurusan strategik, khususnya di peringkat pascasiswazah. Amalan penilaian pula masih banyak bergantung pada data kendiri yang kurang piawai dan objektif, walaupun pendekatan multimodal yang menggunakan AI dan pengecaman emosi menunjukkan potensi. Kajian ini menekankan keperluan mendesak untuk kurikulum yang secara sistematik membangunkan kemahiran insaniah dan diselaraskan dengan keperluan industri melalui penilaian berasaskan prestasi, longitudinal dan pendekatan kaedah campuran bagi memastikan graduan bersedia menghadapi cabaran rentas disiplin dan pengurusan.

Kata Kunci: Kemahiran Insaniah, Pendidikan Reka Bentuk, Pembelajaran Berasaskan Projek, Kerangka Kurikulum, Alat Penilaian, Kebolehpasaran Graduan.

INTRODUCTION

The contemporary global workforce is undergoing rapid transformation, demanding a broader set of competencies beyond traditional disciplinary expertise. Professionals are increasingly expected to possess cross-disciplinary or transversal skills often termed soft skills, such as critical thinking, problem-solving, adaptability, communication, teamwork, leadership, and ethical reasoning (World Economic Forum, 2020; OECD, 2018; Robles, 2012). These competencies are now considered essential for ensuring graduate readiness to meet real-world challenges and interdisciplinary collaboration (Davies, Fidler, & Gorbis, 2011; Jackson, 2016). However, higher education institutions, including those offering design-related programs, have come under scrutiny for failing to address these evolving needs adequately. A significant skills gap is frequently reported between industry expectations and the actual capabilities of new graduates, resulting in unfilled positions and underprepared professionals (Andrews & Higson, 2008; Suleman, 2018; Jackson, 2016). This disconnect highlights persistent limitations in existing university curricula, which often reinforce disciplinary silos and passive learning approaches that hinder students from acquiring the soft skills necessary for the demands of today's dynamic work environments (Kolmos et al., 2021; Billett, 2011).

In the domain of design education, this issue is particularly critical. The field has evolved beyond conventional product development to include complex socio-technical and strategic challenges (Norman & Stappers, 2015; Findeli, 2001). As such, design graduates are increasingly expected to demonstrate systems thinking, ethical awareness, interdisciplinary collaboration, stakeholder engagement, business literacy, and entrepreneurial mindsets (Tonkinwise, 2011; Dorst, 2015; AIGA, 2017). While internationally ranked institutions have begun integrating these competencies into their curricula, inconsistencies persist, especially in areas such as business logic, management skills, and strategic communication (Buchanan, 2019; Liedtka, 2015). Moreover, despite growing emphasis on active learning approaches such as experiential learning, project-based learning (PBL), and co-creation practices, there remains a lack of standardised, reliable methods for assessing soft skills development in design education (Kolmos et al., 2021; Winberg et al., 2020). The absence of consensus on the classification and measurement of these skills further complicates curriculum development and comparative evaluation across institutions (Kim & Lee, 2021; Succi & Canovi, 2020).

This Systematic Literature Review (SLR) aims to critically examine how diploma-level design programs in higher education institutions currently incorporate and assess cross-disciplinary and management-related skills. Specifically, it aims to investigate the pedagogical strategies, curriculum frameworks, and assessment tools employed to foster the development of soft skills crucial for professional success in complex, interdisciplinary design contexts (AIGA, 2017; Norman & Stappers, 2015; Tonkinwise, 2011). By synthesising findings from 2010 to 2024, this review identifies key gaps, emerging practices, and proposes pathways for more holistic and industry-relevant design education (Buchanan, 2019; Dorst, 2015; Kim & Lee, 2021).

METHODOLOGY

RESEARCH DESIGN

This systematic literature review was conducted to evaluate interventions aimed at developing soft skills across all levels of education, focusing on their design, implementation quality, and reported outcomes. The review adhered to the PRISMA 2020 (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines to ensure a rigorous, transparent, and unbiased synthesis of existing literature (Page et al., 2021). The review protocol was prospectively registered with PROSPERO (Registration ID: CRD42022309833), in alignment with internationally recognised standards for conducting and reporting systematic reviews.

SEARCH STRATEGY

A rigorous and systematic search strategy was developed in collaboration with an academic librarian specialising in education-focused databases to identify peer-reviewed studies on the integration and assessment of soft skills across educational levels. Searches were conducted across four major databases from ERIC, Scopus, Google Scholar, and Scispace, using Boolean operators ("AND," "OR") to ensure both comprehensive coverage and targeted retrieval. The strategy was informed by the PICO framework (Population, Intervention, Comparison, Outcome), incorporating key terms such as "soft skills," "life skills," "transversal skills," "transferable skills," "21st century skills," and "non-cognitive skills," in combination with "curricul*" and population descriptors including "university student," "tertiary student*," "college student*," "primary student*," "elementary student*," "high school student*," "secondary student*," and "middle school student*."

The review was restricted to peer-reviewed journal articles published in English between 2012 and 2022, specifically focusing on soft skills interventions within formal education curricula. To ensure comprehensiveness and minimise selection bias, multiple iterative searches

were conducted until thematic saturation was achieved. EndNote 20 was used to manage references and facilitate systematic duplicate removal. In alignment with best practices for educational systematic reviews, outcome variables were intentionally excluded from the search terms to maximise the inclusion of studies across all levels of educational outcomes (Gough et al., 2017).

INCLUSION STRATEGY

To ensure the relevance, quality, and methodological consistency of this systematic review, explicit eligibility criteria were established to guide the selection of studies. Only peer-reviewed journal articles published between 2012 and 2022 were included, ensuring the review focused on contemporary educational practices and research developments. Eligible studies were required to present empirical evidence on interventions targeting soft skills commonly referred to as life skills, transversal skills, or non-cognitive skills embedded within formal education curricula. Studies had to be conducted within primary, secondary, or tertiary education contexts and involve student populations from these respective levels. Acceptable research designs included quantitative, qualitative, and mixed-method approaches. For example, a study employing mixed methods to assess the development of communication and teamwork skills in secondary students through project-based learning would qualify for inclusion. These criteria ensured the inclusion of robust, evidence-based research with direct applicability to educational practice, curriculum enhancement, and policymaking.

EXCLUSION CRITERIA

To uphold the methodological rigour of the review, exclusion criteria were also clearly defined. Studies that did not present empirical findings were excluded, as the review focused solely on interventions that had been tested and evaluated in practice. Specifically, this included conceptual and theoretical papers, descriptive accounts, grey literature, study protocols, review articles, and narrative commentaries. For example, articles that merely discussed the theoretical importance of soft skills without presenting original data or outcome measurements were not considered. By excluding non-empirical works, the review ensured that all included studies were grounded in evidence, thereby enhancing the reliability and practical relevance of the synthesised findings.

DATA ANALYSIS

A total of 1,303 records were identified through database and manual searches. After removing 213 duplicates, 1,090 records underwent title and abstract screening, with 875 excluded for not meeting eligibility criteria. 165 full-text articles were assessed, and 135 were excluded due to methodological or relevance issues. Ultimately, 30 studies met all criteria and were included in the final synthesis, ensuring methodological rigour aligned with PRISMA 2020 guidelines.

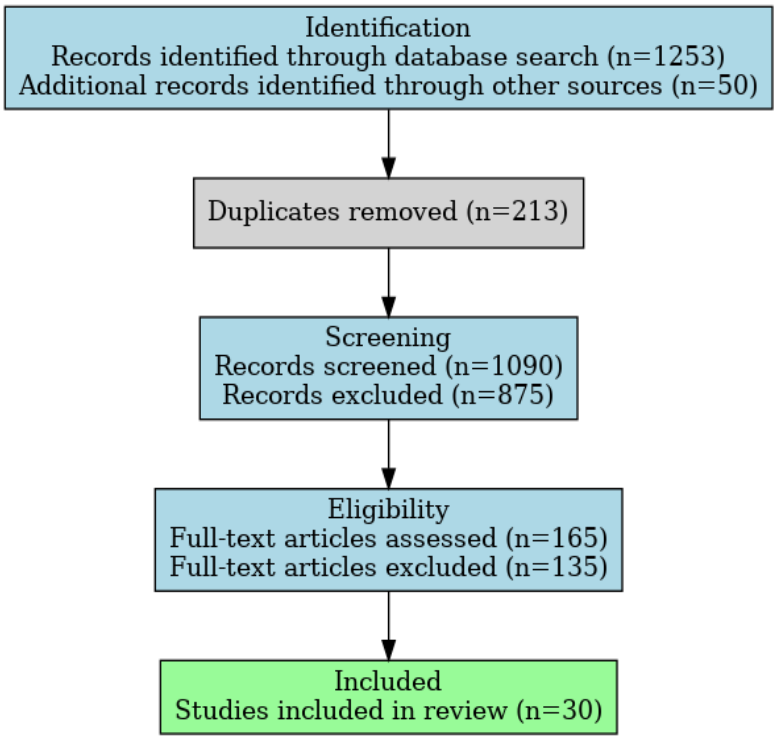

FIGURE 1: Systematic literature review procedure.

After a careful reading of the papers and the deletion of duplicates, the search results were reduced from 135 to 30 papers. Keywords were checked by an automated document scan in the title and abstract of articles. The results were approved, with the corresponding discussion, as concentrated and precise material for this paper after the hunt. These records are chronologically presented in Table 1.

RESULTS

TABLE 1: Systematic Literature Review (SLR) Summary Table: Design Diploma Programs and Soft Skills Development.

Theme	Key Findings	Challenges Identified	Recommendations	Supporting Evidence / Citations
1. Soft Skills Integration & Program Delivery	Common use of Project-Based Learning (PBL), Problem-Based Learning, and Design Thinking (DT) methodologies. - 81.6% of student projects involved real-world scenarios. - Emphasis on communication, collaboration, and critical thinking.	Limited integration of business and entrepreneurial competencies. - Rigid and traditional curriculum structures hinder dynamic learning.	Introduce soft skills training early in programs. - Apply learning through real-life projects and internships.	AIGA (2025); Regueiro et al. (2021); Crespi & García-Ramos (2023)
2. Assessment Methodologies & Challenges	Soft skills are often assessed through student self-reports. - Few validated tools exist for accurate assessment. - Innovative AI and multimodal analysis approaches emerging (e.g., NLP, emotion recognition).	Subjectivity and bias in self-reporting. - Lack of psychometric and standardised tools. - Varying definitions across institutions.	Develop robust, mixed-method, and longitudinal tools. - Leverage multimodal and AI-based assessment techniques.	Crespi & García-Ramos (2023); Regueiro et al. (2021)
3. Impact & Effectiveness of Interventions	Notable improvements in intrapersonal skills (e.g., self-awareness, effect size d = 0.580). - Teamwork skills improved less significantly, and sometimes declined.	Many programs lack rigorous evidence of impact. - Only 3 of 38 studies classified as "best practice" RCTs.	Use mixed methods for deeper evaluation. - Align program outcomes with employability indicators.	Systematic review studies (multiple sources)
4. Identification & Importance of Skills	Core soft skills: problem-solving, critical thinking, communication, and teamwork. - Employers value collaboration, self-motivation, and verbal communication. - 59% of essential early-career skills for engineering/design grads are soft skills.	Inconsistent categorisation and terminologies across literature. - Business and management skills are not consistently emphasised.	Establish a unified soft skills taxonomy. - Embed business/ project management in the curriculum.	AIGA (2025); Frontiers in Education (2021); Various employer surveys
5. Industry-Academia Alignment & Gaps	Misalignment between graduate competencies and job market needs. - Collaborative curriculum design with industry is increasingly adopted. - Strong focus on practical skills: Lean, Six Sigma, transversal soft skills.	Business logic and entrepreneurial thinking are underrepresented. - Industry still sceptical of certain academic approaches (e.g., "risk communication").	Strengthen industry-academic partnerships. - Enhance curriculum responsiveness to market trends and employer needs.	Design Council Reports; Engineering Education Reform Studies

INTEGRATING SOFT AND CROSS-DISCIPLINARY SKILLS

Design diploma programs in higher education are increasingly integrating soft and cross-disciplinary skills through active learning methods such as Project-Based Learning and Design Thinking, often implemented in real-world contexts. Over 80% of such courses report doing so (Syahril et al., 2022). These programs emphasise collaboration, communication, and critical thinking, but frequently under-emphasise critical areas like business acumen and entrepreneurial thinking.

ASSESSMENT PRACTICES

Assessment practices remain predominantly self-reported and lack robust psychometric tools, although emerging technologies such as AI-driven multimodal evaluations show potential for more objective measurement.

INTRAPERSONAL SKILLS

Empirical evidence suggests that interventions are particularly effective in enhancing intrapersonal skills, such as self-awareness, while teamwork skills tend to show less consistent improvement.

SOFT SKILLS

Despite strong industry demand for soft skills, especially in design and engineering fields, no universally accepted framework currently exists for defining or categorising these competencies (Radhakrishnan & Zakkariya, 2022). This persistent gap between graduate competencies and employer expectations is driving increased collaboration between academia and industry to embed practical, managerial, and future-ready skills directly into design curricula.

DISCUSSION

Previous literature has long emphasised the rising significance of soft skills and interdisciplinary competence in preparing graduates for the complexities of an evolving job market. Many scholars have advocated for moving away from the ambiguous term "soft skills," instead proposing alternatives such as "core competencies" or "critical skills." Recent studies have further advanced this discourse by offering more precise definitions, improved assessment methods, and insights into effective development strategies.

STRATEGY 1 - REFINEMENT OF SOFT SKILLS TAXONOMY AND ASSESSMENT

Previous research often struggled with inconsistent classifications and the lack of standardised tools for evaluating cross-disciplinary competencies. Recent developments, such as the *Inventory for Critical Managerial Soft Skills (ICMS)*, offer a validated psychometric instrument capable of measuring seven key managerial soft skills, including communication, leadership, and decision-making, which were previously difficult to quantify. Additionally, new empirical work involving STEM students has identified a more structured understanding of soft skills through a four-factor model for "Values" (e.g., Research and Writing, Memorization, Conceptual and Data Application, Nature of the Discipline) and a two-factor model for "Experiences" (Interactive/ Evidence-Based Experiences, Procedural and Quantitative Experiences), offering a more refined framework than earlier two-dimensional models.

STRATEGY 2 – EVALUATING INTERVENTION EFFECTIVENESS

While the question of whether soft skills can be explicitly taught has been debated, a systematic review of 38 studies confirms the effectiveness of various pedagogical interventions. These include workshop-based, creative, and project-based methods, which have demonstrated positive outcomes in enhancing soft skills, employability, and overall well-being. Nevertheless, the review also points to a methodological limitation: only three of the studies employed rigorous randomised controlled trials (RCTs), indicating that most existing evidence stems from "emerging" or "promising" practices rather than fully validated models.

STRATEGY 3 – PEDAGOGICAL STRATEGIES AND INSTRUCTIONAL MODEL (DESIGN THINKING)

Earlier literature recognised DT as an effective pedagogical tool for fostering problem-solving, collaboration, and critical thinking. Recent studies have deepened this understanding by defining DT-based teaching and learning through three key constructs: Discovery and Ideation, Team Formation and Functioning, and Prototyping and Experimentation. Five outcome domains have also been identified, including Psychological Motivation, Relationship Building, Implementation Support, Adaptability, and Real-World Application. Innovative applications of DT in curriculum development, particularly in engineering, demonstrate how co-design with industry

stakeholders can align educational outcomes with real-world needs, including both soft skills and technical competencies (e.g., Lean, Six Sigma), challenging the limitations of top-down curriculum design models.

STRATEGY 4 – PEDAGOGICAL STRATEGIES AND INSTRUCTIONAL MODEL (INTERDISCIPLINARY EDUCATION)

Although research on interdisciplinary teaching has historically been limited, recent findings reveal strong positive correlations between interdisciplinary curricula and students' self-reported competence. Participation in co-curricular activities such as study-abroad programs, non-engineering clubs, and humanitarian engineering initiatives further strengthens these skills. Notably, one large-scale study showed statistically significant gains in students' self-efficacy following interdisciplinary learning experiences. However, a key gap remains: students frequently interpret these efforts as cross- or transdisciplinary rather than fully interdisciplinary, as knowledge synthesis tends to occur late or remain superficial.

STRATEGY 5 – VALUES IN LEADERSHIP AND INSTITUTIONAL CULTURE

Literature reviews consistently highlight that effective educational leadership is grounded in core values, including social justice, equity, cultural awareness, and collegiality. Institutional leaders play a crucial role in shaping these values through continuous dialogue and interaction. However, emerging evidence from NGO-related research challenges the assumption that all values lead to positive outcomes. For instance, the prioritisation of traditional "survival values" (e.g., self-help, conservatism, and adherence to tradition) has been linked to reduced innovation and competitiveness in some organisations. Similarly, in the higher education context, financial surplus generation does not automatically reflect effective value creation, as excessive operational or non-operational expenditures can offset actual gains.

STRATEGY 6 – ADAPTING TO GLOBAL SHIFTS AND EMERGING CHALLENGES

The global labour environment is becoming increasingly unstable and unpredictable, transitioning from the VUCA (Volatile, Uncertain, Complex, Ambiguous) model to a BANI (Brittle, Anxious, Nonlinear, Incomprehensible) framework. This shift amplifies the urgency for developing soft skills, particularly in emotional intelligence, adaptability, and experiential learning. Consequently, higher education institutions must undergo a paradigm shift, moving beyond content delivery to prioritise the cultivation of adaptable, emotionally intelligent graduates equipped for lifelong learning and interdisciplinary problem-solving. While significant progress has been made in understanding the importance and some aspects of the development of soft skills and interdisciplinary competence, the field still requires more rigorous and diverse research to fully grasp their complexities, refine pedagogical practices, and effectively prepare students for an increasingly unpredictable future.

CONCLUSION

This study aimed to examine the increasing importance of soft skills and interdisciplinary competencies in enhancing graduate employability and professional readiness in a rapidly evolving global landscape. The findings affirm that soft skills such as communication, teamwork, leadership, and time management are consistently recognised by employers across diverse sectors as essential for workplace success, organisational productivity, and individual adaptability (Robles, 2012; Succi & Canovi, 2020). Interdisciplinary teaching approaches and transversal competencies were also identified as crucial for preparing students to address complex, real-world challenges through critical thinking, creativity, and collaboration (Andrews & Higson, 2008; OECD, 2018).

A key implication of this review is that higher education institutions must shift from treating soft skills as ancillary components to embedding them as core competencies within the curriculum (Jackson, 2016). Pedagogical strategies such as Design Thinking, team-based projects, and individual mentoring have shown notable effectiveness in fostering these competencies (Rauth et al., 2014; Meinel & Leifer, 2011). Moreover, the development of validated assessment tools such as the Inventory for Critical Managerial Soft Skills (ICMS) and the Multiple Soft Skills Assessment Tool (MSSAT), alongside emerging multimodal evaluation techniques, presents promising advancements for the objective and comprehensive measurement of soft skills (Caballero et al., 2011; Ahmad et al., 2023).

However, this review is not without limitations. Much of the current literature is derived from single-discipline or single-institution case studies, which limit the generalizability of the findings. In addition, the heavy reliance on self-reported measures introduces subjective bias and fails to capture long-term skill retention or transferability to workplace contexts (Chelliah et al., 2017; Heckman & Kautz, 2012).

To address these limitations, future research should prioritise longitudinal, cross-disciplinary, and multi-

institutional studies using mixed-method approaches to triangulate findings and reduce bias. There is also a pressing need to develop culturally responsive, performance-based assessment frameworks and to investigate the impact of co-curricular experiences, such as internships, service learning, and industry partnerships, on the development of soft skills (Tran, 2020; Crawford et al., 2016). Furthermore, research in emerging fields, such as design education, should explore the integration of interdisciplinary pedagogy and the development of soft skills through theoretically grounded frameworks, thereby contributing to evidence-based curriculum innovation and educational policy reform.

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