



Exploring Innovation Skills Development in Design Education through External Partnerships

Kothari Ashwini Jayantilal, Research Scholar, Department of Commerce, Sabarmati University, Gujarat

Dr. Akash Deepak Agarwal, Associate Professor, Department of Commerce, Sabarmati University, Gujarat

Abstract

The increasing integration of industry practices into design education has raised critical questions about measurable learning outcomes and competency development. While many institutions adopt industry collaboration models, there is limited empirical evaluation of how these interventions translate into student competency gains. This study evaluates the effectiveness of industry-embedded learning in developing core design competencies such as problem-solving, adaptability, digital proficiency, and professional communication. Using a mixed-method approach combining survey analysis, competency mapping, and qualitative stakeholder interviews, the research assesses student learning outcomes across multiple design institutions. Findings reveal that industry-embedded learning significantly improves applied competencies but shows uneven impact on theoretical depth and critical reflection abilities. The study proposes a competency assessment framework to systematically evaluate learning outcomes in industry-integrated design education.

Keywords: competency-based education, design learning outcomes, industry-embedded learning, mixed-method research, skill assessment

Introduction

Design education is currently undergoing a profound transformation shaped by rapid technological advancements, the globalization of creative industries, and the increasing complexity of professional design practice. In contemporary contexts, designers are expected not only to possess strong conceptual and aesthetic capabilities but also to demonstrate adaptability, interdisciplinary thinking, digital fluency, and the ability to respond to real-world constraints. These evolving expectations have significantly challenged traditional pedagogical models in design education, which have historically emphasized studio-based learning, individual creativity, and theoretical exploration as the primary modes of instruction. In response to these shifts, higher education institutions have progressively incorporated industry-embedded learning experiences into design curricula. These include internships, live projects, consultancy-based assignments, collaborative workshops with industry professionals, and participation in real-time design challenges. Such initiatives are intended to bridge the gap between academic learning and professional practice by exposing students to authentic work

environments and industry expectations. The underlying assumption is that direct engagement with industry enhances employability, improves practical skill acquisition, and fosters a deeper understanding of professional workflows. Despite the widespread adoption of these approaches, a fundamental issue continues to persist within design education research and practice: the absence of a systematic and reliable method to measure the actual competencies developed through industry-integrated learning experiences. While institutions often report positive outcomes in terms of student engagement and industry satisfaction, these claims are frequently based on descriptive observations rather than empirically validated assessment frameworks. As a result, there remains uncertainty regarding the extent to which such collaborations genuinely contribute to long-term competency development in students.

A review of existing literature reveals that most studies on design education and industry collaboration primarily focus on structural and procedural dimensions of engagement. These include the design of collaboration models, partnership frameworks between academia and industry, curriculum integration



strategies, and the organizational challenges associated with sustaining such initiatives. Although these contributions are valuable in understanding how collaboration is implemented, they often overlook a critical dimension of educational effectiveness—learning outcomes and competency measurement. There is limited consensus on what constitutes “competency” in the context of design education. Competencies in design are multidimensional, encompassing cognitive abilities such as critical thinking and problem-solving, technical skills including digital tool proficiency and prototyping, as well as professional attributes such as communication, teamwork, and adaptability. However, without a structured evaluation framework, it becomes difficult to determine how effectively these competencies are developed through industry exposure, or whether certain competencies are prioritized at the expense of others. This study is positioned within this identified research gap and seeks to shift the discourse from structural implementation to outcome-based evaluation. Specifically, it focuses on competency development as a measurable outcome of industry-integrated design education. Rather than examining how collaboration models are designed or implemented, this research critically investigates what students actually learn through these experiences and how such learning can be systematically assessed. By adopting this outcome-oriented perspective, the study aims to contribute to a more evidence-based understanding of the effectiveness of industry-embedded learning in design education. It also seeks to provide a foundation for developing more robust assessment frameworks that can help educators, institutions, and industry partners better evaluate the educational impact of collaborative learning models. Ultimately, this shift in focus is essential for ensuring that design education not only aligns with industry expectations but also maintains its academic integrity and long-term developmental objectives.

Literature Review

Kuys, Al Mahmud, and Kuys (2021) the integration of sustainability principles within design education through the lens of university–industry collaboration. The study emphasizes that embedding sustainability into design curricula is no longer optional but essential, given the increasing global focus on environmental responsibility and sustainable development goals. The authors argue that collaboration between academic institutions and industry partners plays a critical role in translating abstract sustainability concepts into practical, real-world design applications. Through such partnerships, students are exposed to authentic environmental challenges, enabling them to develop systems thinking and a deeper understanding of the ecological, social, and economic dimensions of design decisions. The study further highlights that industry involvement helps align academic learning with current sustainability standards and professional expectations, thereby enhancing curriculum relevance.

Chen, Lu, and Wang (2020) the role of university–industry collaboration in strengthening Building Information Modelling (BIM) education within higher education institutions. The study highlights that BIM, as a rapidly evolving digital technology in the construction and design industries, requires continuous alignment between academic curricula and industry practices. The authors argue that traditional teaching methods are often insufficient to equip students with the practical and technical competencies required for BIM-based workflows. Through their analysis, they emphasize that collaboration with industry partners provides students with exposure to real-world BIM tools, project standards, and collaborative working environments, thereby enhancing their technical proficiency and employability. The study further notes that industry involvement contributes to curriculum modernization by ensuring that course content reflects current professional practices and technological advancements.



Wright and Wrigley (2019) the future directions of design education in response to rapid technological change, evolving industry requirements, and the growing complexity of global challenges. The study emphasizes that traditional design education models, which are largely studio-based and discipline-specific, are no longer sufficient to prepare students for contemporary professional practice. Instead, the authors argue for a shift toward more flexible, interdisciplinary, and industry-connected learning environments that reflect real-world design contexts. A key focus of the paper is the integration of design thinking, innovation practices, and collaborative learning approaches into higher education curricula.

Erkarlsan and Aykul (2018) focus on curriculum development strategies aimed at strengthening the integration of industry collaboration within design education. The study emphasizes that traditional curriculum structures in design schools often remain static and disconnected from the rapidly evolving requirements of professional practice. To address this gap, the authors argue for a systematic curriculum redesign approach that incorporates active participation from industry stakeholders at multiple stages, including planning, implementation, and evaluation. This participatory model ensures that learning outcomes are aligned with contemporary design practices, technological advancements, and market expectations. The study highlights that embedding industry input into curriculum development enhances the relevance of academic programs and helps students gain exposure to real-world tools, workflows, and design constraints.

Fleming and Haigh (2017) the role of reflective practice in Work-Integrated Learning (WIL) and its significance in enhancing student learning outcomes in higher education. The study emphasizes that reflection is a critical pedagogical component that enables students to connect theoretical knowledge with practical workplace experiences. Within the context of WIL, reflective practice is positioned as a structured process through which students critically analyze their professional experiences, identify learning gaps, and develop deeper self-awareness of their competencies and performance. The authors argue that without systematic reflection, experiential learning risks becoming task-oriented rather than learning-oriented, thereby limiting its educational value.

Research Methodology

Research Design

The present study is based on a convergent mixed-method approach, where both numerical measurement and interpretive understanding are combined within a single research framework. This design is selected because competency development in design education is a multidimensional construct involving measurable skill gains as well as subjective learning experiences. The quantitative strand is used to examine patterns in skill acquisition and competency levels among students exposed to industry-integrated learning environments, whereas the qualitative strand explores how stakeholders interpret the effectiveness, limitations, and educational value of such experiences. By integrating both forms of data at the interpretation stage, the study aims to generate a more holistic understanding of learning outcomes in design education.



Figure 1 Design Competency Assessment Framework (DCAF)



Data Collection

Data for the study is gathered through both direct engagement with participants and analysis of existing academic and institutional materials.

Primary Data Sources:

Primary information is obtained from design students who have participated in industry-linked learning activities, where their experiences and competency development are documented through structured instruments. A standardized questionnaire is used to capture measurable indicators of skill enhancement, while a rating-scale based instrument is applied to assess self-perceived growth across different competency areas. In addition, in-depth conversations with educators and professional mentors are conducted to understand how industry exposure influences student performance, learning behavior, and skill application in real contexts.

Secondary Data Sources:

Supporting evidence is drawn from published academic literature in the fields of design education and experiential learning. Institutional documentation such as internship reports, student performance records, and curriculum outlines are also reviewed. These materials help establish a broader understanding of how educational institutions structure industry engagement and define expected learning outcomes.

Sample Framework

Participants are selected through a targeted sampling strategy to ensure that only relevant stakeholders with direct experience of industry-integrated education are included. The sample consists of learners from various design programs across different institutions who have undergone practical industry exposure. Alongside students, teaching staff responsible for coordinating practice-oriented courses are included to provide insights into academic delivery and assessment practices. Professionals from industry organizations who have supervised student work or collaborated on academic projects are also included to represent workplace expectations and evaluation standards. This combination

ensures representation from all key dimensions of the learning ecosystem.

Analytical Techniques

The analysis of data is carried out using both quantitative and qualitative procedures to ensure depth and accuracy in interpretation. Numerical data is examined using basic statistical measures to identify trends and variations in competency levels among respondents. Differences between expected and achieved skill levels are studied using a structured comparison approach to identify competency mismatches. Qualitative responses obtained from interviews are processed through systematic categorization to extract meaningful themes and insights. Furthermore, a scoring-based evaluation system is applied to assign relative importance to different skill areas and to assess overall competency development in a structured and comparative manner.

Key Competencies Assessed

This study focuses on a structured evaluation of student competencies developed through exposure to industry-integrated design learning environments. The competency framework is divided into four distinct but interrelated dimensions, each representing a critical aspect of professional capability in contemporary design practice.

Cognitive Competencies

This dimension refers to the intellectual and analytical abilities required in the design process. It includes the capacity to understand complex problems, interpret user needs, and generate meaningful design solutions. The competencies assessed under this category involve the ability to apply design thinking approaches in structured and creative ways, identify and clearly define core problems within ambiguous situations, and demonstrate logical and analytical reasoning while evaluating alternative design solutions.

Technical Competencies

Technical competencies focus on the practical and tool-based skills necessary for executing design tasks in modern professional environments. This includes proficiency in industry-relevant software applications, the ability to develop physical and digital



prototypes, and effective use of contemporary digital design tools. These competencies reflect how efficiently students can translate conceptual ideas into tangible outputs using appropriate technologies and technical processes.

Professional Competencies

This dimension evaluates interpersonal and workplace-related skills essential for functioning in professional design settings. It includes the ability to communicate design ideas clearly and effectively across different stakeholders, collaborate efficiently within multidisciplinary teams, and interact appropriately with clients to understand requirements and deliver suitable design solutions. These competencies are critical for ensuring successful integration into professional environments.

Adaptive Competencies

Adaptive competencies refer to a student's ability to respond effectively to changing conditions and uncertain design contexts. This includes flexibility in modifying and refining design solutions during iterative development processes, the ability to work within real-world constraints such as time, budget, and resource limitations, and the capacity to make informed decisions in situations involving uncertainty or incomplete information. These skills are essential for handling dynamic and unpredictable professional scenarios in the design industry.

Findings and Analysis

Enhancement in Applied Skill Sets

The analysis indicates a noticeable improvement in applied competencies among students who have participated in industry-embedded learning experiences. Exposure to real-world design environments appears to strengthen their ability to execute tasks with greater precision and efficiency. In particular, students demonstrate improved capability in translating conceptual ideas into workable design outputs, solving practical problems under realistic constraints, and communicating their design intentions more effectively in professional contexts. These outcomes suggest that experiential exposure contributes significantly to the development

of job-ready skills and practical design proficiency.

Restricted Development in Theoretical Understanding

In contrast to the strong gains in applied skills, the development of theoretical and conceptual understanding shows relatively limited improvement. Students tend to perform better in task-based environments but exhibit moderate progress in areas requiring deep reflection, abstract reasoning, and critical conceptual analysis. This imbalance suggests that while industry exposure enhances operational competence, it does not always sufficiently reinforce theoretical depth unless explicitly integrated with academic reflection and structured learning components.

Differences in Competency Development Among Students

The findings also reveal considerable variation in competency development across individual students. Not all learners benefit equally from industry exposure, indicating that learning outcomes are influenced by multiple contextual factors. The quality of mentorship provided by industry professionals plays a significant role in shaping student learning experiences. Similarly, the nature and complexity of assigned projects affect the level of skill engagement, with more challenging tasks leading to greater competency gains. Additionally, the duration of industry exposure is found to be a key determinant, as longer engagement periods tend to produce more consistent and comprehensive skill development.

Gap Between Academic and Industry Expectations

A notable divergence is observed between academic objectives and industry expectations. Industry stakeholders primarily emphasize efficiency, timely delivery, and practical output-oriented performance, whereas academic institutions continue to prioritize conceptual understanding, theoretical depth, and structured learning outcomes. This difference creates an expectation gap that influences both teaching approaches and student performance

assessment. As a result, students often experience a shift in learning priorities when transitioning between academic environments

and professional settings, highlighting the need for better alignment between the two domains.

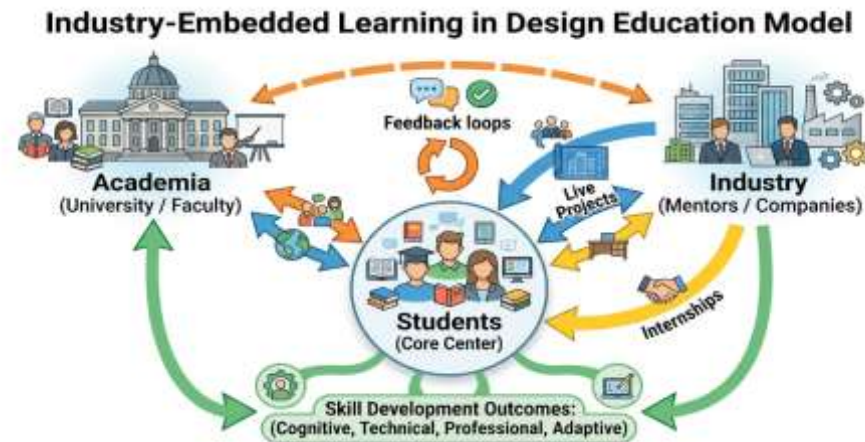


Figure 2 Industry-Embedded Learning in Design Education Model

Proposed Competency Evaluation Framework

The study introduces a structured evaluation model titled the Design Competency Assessment Framework (DCAF), developed to systematically measure and track competency development in design students engaged in industry-integrated learning. The framework is designed to move beyond traditional subjective assessment methods by incorporating a staged and evidence-based evaluation process that captures both initial skill levels and progressive learning outcomes.

Stage 1: Baseline Competency Mapping

The first stage involves establishing a clear baseline of student abilities prior to any exposure to industry environments. This pre-assessment identifies existing strengths and weaknesses across cognitive, technical, professional, and adaptive skill areas. The purpose of this stage is to create a reference point against which future improvements can be accurately measured, ensuring that competency growth is objectively evaluated rather than assumed.

Stage 2: Exposure Indexing

In this stage, the nature and intensity of industry engagement are systematically categorized. Different forms of exposure such as internships, live projects, consultancy assignments, and studio collaborations are classified based on their complexity, duration, and level of professional interaction. This

indexing process helps in understanding how varying degrees of industry involvement influence competency development.

Stage 3: Performance Tracking

The third stage focuses on continuous observation and monitoring of student performance throughout the duration of their industry-related activities. Rather than relying on final outputs alone, this stage emphasizes ongoing assessment of learning behavior, skill application, adaptability, and problem-solving approach during active project engagement. This ensures that learning progression is captured in real time.

Stage 4: Multi-Stakeholder Evaluation

At this stage, evaluation is conducted through a collective assessment mechanism involving multiple stakeholders, including faculty members, industry supervisors, and peer reviewers. This triangulated evaluation approach ensures that student performance is analyzed from diverse perspectives, reducing individual bias and increasing assessment reliability. It also provides a more balanced understanding of both academic and professional expectations.

Stage 5: Competency Gain Index

The final stage involves quantifying overall learning improvement through a Competency Gain Index, developed using a weighted scoring system. This index measures the extent of skill enhancement by comparing baseline competencies with post-exposure performance levels. Different competency



domains are assigned weights based on their relevance to professional practice, enabling a structured and comparable evaluation of overall student development.

Discussion

The analysis of findings indicates that industry-embedded learning plays a significant role in strengthening students applied and professional competencies within design education. Exposure to real-world projects, professional workflows, and collaborative environments enables students to develop practical skills more effectively than traditional classroom-based instruction alone. These improvements are particularly evident in areas such as technical execution, communication within professional contexts, and problem-solving under real constraints. This confirms that experiential learning contributes strongly to preparing students for immediate industry requirements. The findings also reveal a clear limitation in terms of theoretical and conceptual development. While students demonstrate notable growth in practical abilities, their engagement with abstract reasoning, critical reflection, and conceptual analysis remains comparatively moderate. This imbalance suggests that industry exposure, when implemented in isolation, tends to prioritize task-oriented learning over deeper academic understanding. As a result, students may become proficient in execution but less strong in theoretical interpretation unless additional academic reinforcement is provided. These observations further imply that industry collaboration, although essential, cannot function as a standalone pedagogical strategy. Its effectiveness depends on its integration with structured academic mechanisms such as reflective learning activities, guided analysis, and continuous assessment frameworks. Without such integration, there is a risk of creating a disconnect between practical skills and theoretical knowledge, which may affect long-term academic and professional development.

The proposed Design Competency Assessment Framework (DCAF) offers a more structured and balanced approach to

evaluating learning outcomes. By incorporating baseline measurement, continuous tracking, multi-stakeholder evaluation, and a competency gain index, the framework reduces reliance on subjective judgment and introduces a more systematic method of assessment. It enables educators and institutions to clearly identify learning progress across multiple competency dimensions while also highlighting areas requiring further academic support. The discussion suggests that the true value of industry-embedded learning lies not only in exposure to professional practice but in how effectively such exposure is integrated with academic reflection and structured evaluation systems.

Conclusion

This study set out to examine the role of industry-embedded learning in shaping competency development within design education, with a particular focus on how learning outcomes can be more systematically understood and evaluated. The findings clearly indicate that while exposure to industry environments significantly strengthens students' practical and professional competencies, the overall impact on holistic skill development is uneven and highly dependent on how such experiences are structured, guided, and integrated within the academic curriculum.

One of the most important observations emerging from this research is that industry-based learning, in its current form across many institutions, tends to prioritize applied skill acquisition over balanced intellectual development. Students who engage in internships, live projects, and industry collaborations often demonstrate improved technical proficiency, better communication abilities, and stronger problem-solving capabilities in real-world contexts. However, these gains are not always matched by equivalent development in theoretical understanding, conceptual depth, and critical reflection. This imbalance suggests that experiential learning, when not sufficiently supported by academic frameworks, may lead



to partial rather than comprehensive competency development.

Another significant issue identified in the study is the lack of standardized and reliable tools for evaluating student competencies in industry-integrated design education. At present, assessment practices are largely inconsistent, often relying on subjective judgments, portfolio reviews, or informal feedback from industry mentors. While these methods provide useful qualitative insights, they do not offer a structured or comparable measure of learning outcomes across different students, institutions, or learning contexts. This limitation makes it difficult to assess the true effectiveness of industry collaboration in educational terms and restricts the ability of institutions to systematically improve curriculum design.

In response to this gap, the study proposes the Design Competency Assessment Framework (DCAF) as a structured and systematic approach for evaluating learning outcomes. The framework introduces a multi-stage process that includes baseline competency mapping, exposure indexing, continuous performance tracking, multi-stakeholder evaluation, and the computation of a competency gain index. By integrating both qualitative and quantitative dimensions of assessment, the framework aims to provide a more balanced and objective understanding of student development. It also helps bridge the divide between academic learning expectations and industry performance requirements by offering a common evaluation structure that can be applied across different contexts.

The significance of this framework lies in its potential to shift competency evaluation from a largely descriptive process to a more measurable and evidence-based system. It enables educators to identify not only whether students are improving, but also how and to what extent specific competencies are being developed. This, in turn, can support more informed curriculum planning, better alignment with industry expectations, and improved pedagogical strategies within design education.

Despite these contributions, the study acknowledges certain limitations. The proposed framework has been developed conceptually and requires further empirical validation across diverse institutional settings, disciplines, and industry environments. Variations in educational infrastructure, industry engagement models, and student backgrounds may influence the effectiveness and adaptability of the framework. Therefore, its application should be tested and refined through longitudinal studies and cross-institutional research.

Future research should focus on validating the Design Competency Assessment Framework through large-scale implementation studies involving multiple design institutions and industry partners. Comparative studies across different disciplines within design education—such as communication design, industrial design, and digital design—would also provide deeper insights into its scalability and adaptability. Additionally, further investigation into the integration of digital assessment tools and learning analytics could enhance the precision and efficiency of competency measurement systems.

In conclusion, this study contributes to the growing discourse on experiential learning in design education by emphasizing the need for structured competency evaluation mechanisms. It highlights that while industry-embedded learning is a powerful pedagogical approach, its true effectiveness can only be realized when supported by systematic assessment frameworks that ensure balanced, measurable, and holistic student development.

References

1. Ankrah, S., & Al-Tabbaa, O. (2015). Universities–industry collaboration: A systematic review. *Scandinavian Journal of Management*, 31(3), 387–408.
2. Billett, S. (2009). Work-integrated learning. *Studies in Continuing Education*, 31(3), 225–239.
3. Bridgstock, R. (2009). The graduate attributes we've overlooked. *Higher Education Research & Development*,



- 28(1), 31–44. Bruneel, J., D’Este, P., & Salter, A. (2010). Investigating barriers to university–industry collaboration. *Research Policy*, 39(7), 858–868.
4. Camacho, M., & Alexandre, R. (2019). Design education and industry collaboration. *The Design Journal*, 22(sup1), 1317–1332.
5. Chan, C. K. Y. (2012). Exploring experiential learning. *Higher Education Research & Development*, 31(4), 605–617.
6. Chen, K., Lu, W., & Wang, J. (2020). BIM education collaboration. *Industry and Higher Education*, 34(6), 401–409.
7. Cross, N. (2001). Designerly ways of knowing. *Design Studies*, 3(4), 221–227.
8. Etzkowitz, H., & Leydesdorff, L. (2000). Triple helix model. *Research Policy*, 29(2), 109–123.
9. Erkarlan, Ö., & Aykul, Z. (2018). Curriculum development in design education. *Design and Technology Education*, 23(2), 45–58.
10. Fleming, J., & Haigh, N. (2017). Reflective practice in WIL. *Asia-Pacific Journal of Cooperative Education*, 18(1), 1–13.
11. Glen, R., Suci, C., & Baughn, C. (2014). Teaching design thinking. *Journal of Product Innovation Management*, 31(3), 437–450.
12. Harden, R. M. (2001). AMEE guide: Curriculum mapping. *Medical Teacher*, 23(2), 123–137.
13. Jackson, D. (2015). Employability skills and WIL. *Higher Education Research & Development*, 34(2), 350–367.
14. Kuys, J., Al Mahmud, A., & Kuys, B. (2021). Sustainability in design education. *Sustainability*, 13(19), 1–18.
15. Oxman, R. (2008). Digital design pedagogy. *Design Studies*, 29(2), 99–120.
16. Perkmann, M., et al. (2013). Academic engagement review. *Research Policy*, 42(2), 423–442.
17. Plewa, C., et al. (2013). University–industry relationships. *Journal of Business Research*, 66(10), 2028–2036.
18. Rowe, A. (2017). Work-integrated learning. *Higher Education Research & Development*, 36(2), 1–15.
19. Smith, C. (2012). Evaluating WIL. *Higher Education Research & Development*, 31(2), 247–261.
20. Wright, N., & Wrigley, C. (2019). Design education futures. *International Journal of Technology and Design Education*, 29(2), 1–20.
21. Yorgancıoğlu, D., & Tunali, D. (2020). Studio learning. *Design Studies*, 67, 1–18.
22. Helyer, R. (2015). Learning through reflection. *Journal of Work-Applied Management*, 7(1), 3–13.
23. Celio, C. I., Durlak, J., & Dymnicki, A. (2011). Service learning outcomes. *Journal of Higher Education*, 82(2), 149–164.
24. Sims, R., & Sinclair, C. (2008). Collaborative learning. *Educational Media International*, 45(2), 123–135.
25. Jackson, D. (2016). Reframing employability. *Studies in Higher Education*, 41(1), 1–15.
26. Kolb, A. Y., & Kolb, D. A. (2017). Experiential learning theory. *ELT Journal*, 71(4), 1–10.
27. Kennedy, A., et al. (2015). Situated learning in design. *Journal of Learning Sciences*, 24(3), 1–25.
28. Amaral, C., & Polson, D. (2020). Collaborative design learning. *Journal of Design Education*, 12(2), 1–14.
29. Alhusban, A., et al. (2021). Design studio interaction. *Design Studies*, 72, 1–16.