

*Innovative Technologies for Multidisciplinary Design Teaching and Learning in  
Higher Education*

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**Abstract**

This research delves into the innovative integration of two emergent digital collaborative platforms, Miro and Padlet, within higher education pedagogy, concentrating on their application in design-centric courses at Sunway University, Malaysia. The study encompasses two distinct student cohorts: one, a collective of seventy-three students from the Design Enterprise module, engaging with Miro and enrolled in either BA (Hons) in Design Communication or BA (Hons) in Interior Architecture; the other, a group of thirty-eight Design Communication pupils utilizing Padlet in a Design and Typography course. The purpose of this research is to explore how these technologies influence student engagement, communication, and the acquisition of multidisciplinary skills within a social constructivist framework. Utilizing methodological triangulation encompassing student surveys, interviews, and observations, the study assesses the platforms' effectiveness through various collaborative activities. Principal results indicate that while both platforms enhance engagement and skill acquisition, students' initial reception differs due to the perceived complexity of the tools; Padlet's user-friendly nature facilitates immediate utilization, whereas Miro's sophisticated functionality sometimes initiates reluctance, emphasizing the importance of formal orientation sessions. The integration of such digital tools represents a transformative potential for pedagogical strategies in design-related fields in higher education. However, the research underscores the necessity of proper guidance and support in their implementation to ensure optimal student experience and learning outcomes, thereby influencing curriculum evolution both within Sunway University and globally. This study's findings are pertinent not only for curriculum enhancement but also for broader pedagogical innovation in higher education sectors worldwide.

Keywords: Social Constructivism, Higher Education, Design Education, Padlet, Miro

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## **Introduction**

This study underscores the imperative in higher education to nurture individual prowess, teamwork, and cross-disciplinary approaches, vital for success in the rapidly evolving, interconnected global market. These skills are paramount in Design Communication and Interior Architecture, fields demanding innovation, effective communication, and visionary execution.

Centered on BA (Hons) Design Communication and Interior Architecture programs, the research investigates the employment of cutting-edge technologies like Miro and Padlet in courses including Design Enterprise and Design and Typography. Within the social constructivist pedagogy context, it examines how these digital tools can enhance learning, address students' distinct requirements in specialized design disciplines, and ready them for prosperous careers in a digitally forward, interconnected environment (Vygotsky & Cole, 1978).

Social constructivism posits that learning is a socially facilitated process, with knowledge constructed through interaction. This theory champions learner independence, reflective cognition, problem resolution, cooperative learning, scaffolding, and open discourse elements profoundly advantageous in the creative and fluid realms of higher education.

The paper explores how collaborative digital platforms can revolutionize higher education by augmenting student involvement, nurturing multifaceted skills, and refining pedagogical techniques, particularly in fields necessitating teamwork and visual inventiveness. It recognizes the demand for comprehensive training for diverse platform proficiencies and posits that these technologies can significantly modernize global curriculum design and teaching methodologies.

The burgeoning role of technology in education offers avenues for the efficacious application of social constructivist tenets. Tools like Miro and Padlet support instantaneous, visual teamwork, boosting student interaction and engagement. Their strategic utilization fosters an immersive learning milieu that encourages active involvement, analytical thought, and artistic freedom.

Analyzing Miro and Padlet's application in Sunway University, Malaysia's design courses, the study assesses their influence on student engagement, cooperative interaction, and the development of multidisciplinary capabilities. It concludes that these digital resources, when integrated with social constructivism, can deeply enrich academic syllabi, advocating their adoption to substantially innovate educational practices in our digital era.

## **Theoretical Framework**

In design education, social constructivism posits learning as a socio-cultural process birthed from dialogue, collaboration, and critical reflection, aligning perfectly with design's interactive, iterative, and people-centric ethos.

Under this approach, design education should nurture spaces where students dive into active discussions and joint projects, reflecting Vygotsky's theory of learning through social engagement. It's a realm where peer-to-peer learning thrives, with ideas consistently

evolving, being challenged, and reformulated through group brainstorming and problem-solving (Vygotsky & Cole, 1978).

Instructors in this landscape act more as facilitators than traditional teachers. They pinpoint each student's Zone of Proximal Development (ZPD); the space between solo achievements and potential accomplishments with help and customize their mentorship to bridge this divide. This tailored guidance enables students to grasp advanced design concepts or skills beyond their independent reach.

Furthermore, educators employ scaffolding, offering varying degrees of support that escort students toward deeper understanding and skill mastery in design. This method involves guided practice, demonstrations, or feedback, with the support receding as students gain autonomy, reflecting the skill mastery process in Vygotsky's theory.

Social constructivism in design education also propels students toward reflective practice, where they critically assess their work and their peers'. This collaborative, social exercise involves students, mentors, and industry professionals exchanging critiques and insights to polish and iterate design solutions (Bamberger & Schön, 1983).

Recognizing that design operates within broader cultural, social, and economic spheres, this approach underscores real-world projects that immerse students in these diverse contexts. It urges them to contemplate the end-user and societal repercussions, molding designers who are more conscious, empathetic, and adaptable.

This paper delves into the intricate role digital collaborative tools play in higher education, framed by social constructivism, advocating for learning experiences that are socially vibrant and intellectually stimulating. As these platforms weave into the educational fabric, educators are prompted to embrace social constructivism principles to cultivate an educational climate that is inclusive, dynamic, and reflective. The insights presented seek to influence curriculum development at Sunway University and elsewhere, proposing a revolutionary shift in teaching methodologies, especially within design and entrepreneurship disciplines.

## **Literature Review**

In today's digital age, with the prevalence of multimedia tools, learning is not only more accessible but also enhanced in quality, accommodating a broader spectrum of individuals. Education hinges on two elements: information dissemination and communication skills development, with technology being central to boosting these aspects. Online platforms like Padlet and Miro, pivotal in higher education, facilitate robust collaboration among educators and students.

Studies have evaluated Padlet's efficacy in higher education, yet few have focused specifically on design education. Research encompassing 16 journals from 2017 to 2022 indicated positive impacts of Padlet on class dynamics, performance, and student perceptions (Musayaroh, 2022). Zainuddin (2020) found Padlet beneficial for augmenting student engagement. Likewise, Padlet enhanced critical reading skills in higher education (Prastya, 2019). Investigations into Miro's use, particularly by Ahmmad et al. (2022), identified it as a superior Online Collaborative Whiteboard Platform (OCWP) after analyzing several platforms' educational benefits.

Kabil and Ilyas (2023) demonstrated Miro's effectiveness in nurturing innovative idea generation, critical thinking, and negotiation skills, while also bolstering students' digital proficiency. These findings echo Magen-Nagar and Shonfeld (2018), who documented reduced technology-related anxiety and increased confidence among students engaged in online collaborative learning.

The role of educators in technology integration is crucial. Herrington and Kervin (2007) argued for purposeful technology integration in education, seeing it as a cognitive tool that engages students in authentic learning experiences. Hew and Cheung (2013) stressed that the positive impacts of Web 2.0 technologies stem not from the tools themselves, but their strategic use within learning contexts. Similarly, Bower et al. (2015) highlighted the need for advanced multimedia synchronous technologies in traditional classrooms, considering communication needs and cognitive load.

Numerous scholarly investigations have focused on the transition towards online learning, primarily employing technology as a medium of communication between educators and learners. Nevertheless, an important gap exists in the existing body of scholarly work concerning the imperative nature of adapting the educational framework in order to align with the rapid progressions in technology within the realm of design higher education. To address this gap, it is crucial to investigate how adopting online collaborative platforms for higher education impacts the learning environment for students in the design fields. In consideration of this need, our ongoing research endeavours to elucidate instructional approaches that successfully integrate technological resources within the framework of social constructivism theory, with the aim of establishing and maintaining student-centred learning environments.

By undertaking this study with a specific focus on design higher education, our objective is to address a notable gap in the existing literature, while underscoring the integration of technology within the framework of social constructivism. Our aim is to contribute to the advancement of innovative educational practices that harness the transformative potential of technology within the design higher education context. Through this approach, we aspire to provide educators with valuable insights and strategies to create student-centred, technology-enriched learning environments within design education, thereby promoting active participation and success among higher education students within the realm of social constructivist principles.

### **Using Technology for Engaged Student-Centered Learning Environments**

In modern education, lecturers evolve into facilitators and leaders, essential in design higher education that forms the next generation of creatives. Central to this is guided learning, blending self-directed learning with instructor assistance (Zimmerman, 2002).

This method is lecturer-focused, with educators shaping experiences and steering course trajectories. They adhere to a set curriculum with clear goals, illustrated in the Design and Typography module's inaugural hybrid class using Padlet. Students follow a distinct path, with materials, tasks, and evaluations guiding them.

Lectures impart crucial insights, punctuated with hands-on tasks for sustained interest and deeper comprehension. For example, a typography lesson featured a kerning game, offering students practical application and a platform for sharing on Padlet. This engagement

enhances learning and supports task fulfillment. Guided learning maintains a harmony between independence and systematic aid, prompting students to take charge of their learning under comprehensive supervision. They transition into self-regulated learners, establishing objectives, strategizing, tracking their advancement, and introspecting on their journey. Feedback underscored the structured and efficient course design, with comments like, “The subject is well organized and structured,” and gratitude for prompt, insightful feedback, applicable even for online attendees. This methodology received a 92% approval rating, surpassing traditional in-person classes by 4%.

Nonetheless, design education grapples with 21st-century market demands for extensive, flexible expertise. Stressing quick prototyping and repetitive processes can address this need (Meyer & Norman, 2020), a goal pursued by both Design and Typography and Design Enterprise through practical project implementation within guided learning. Inherent in design is creative problem resolution, necessitating organized, inventive methods. Guided learning bestows these abilities, with instructors offering essential, immediate critiques, and promoting cross-disciplinary inquiry to broaden outlooks and enrich the design voyage.

Integrating PBL and social constructivism, guided learning in design academia nurtures artistic superiority. It transforms students from mere audience members to proactive, self-regulated learners, preparing them for the dynamic realm of design with emphasis on active involvement, decisive critiques, and readiness for professional triumph. As design adapts, guided learning persists as a key educational approach in nurturing future creative experts.

## **Guided Learning**

In contemporary education, lecturers transcend traditional roles, becoming facilitators and leaders in student learning, critical in design higher education, which moulds future creative minds. Guided learning, merging self-directed learning with instructor support, is central to this process (Zimmerman, 2002).

This approach is lecturer-centered, with educators structuring experiences, guiding, and setting course directions. They follow a fixed curriculum with defined objectives, as exemplified in the Design and Typography module's first hybrid classroom setting using Padlet. Students navigate a clear path with specific materials, assignments, and assessments directing their progress.

Lecture sessions deliver key knowledge, interspersed with practical activities to maintain engagement and deepen understanding. For instance, a kerning game was integrated into typography lessons, allowing students to apply concepts practically and share experiences on Padlet. This interactive approach scaffolds learning, aiding assignment completion.

Guided learning balances autonomy and structured support, encouraging students to assume responsibility for their education while benefiting from established guidance. They become self-regulated learners—setting goals, planning, monitoring progress, and reflecting on outcomes.

Student feedback highlighted course organization and effective structure, with remarks like, “The subject is well organized and structured,” and appreciative notes regarding timely, constructive feedback, even in online settings. The approach yielded a 92% positive response, outperforming pre-pandemic face-to-face sessions by 4%.

However, design education faces the 21st-century challenge of aligning with market complexities, necessitating broad, adaptable knowledge. Emphasizing rapid prototyping and iterative practices can bridge this gap (Meyer & Norman, 2020), an aspect both Design and Typography and Design Enterprise classes strive for through real-world project execution in guided learning.

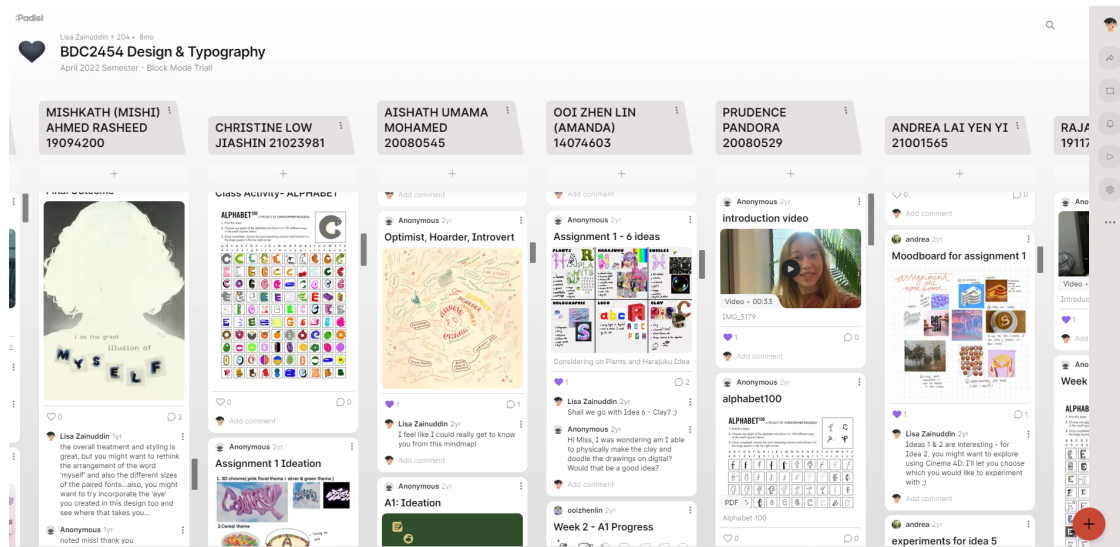


Figure 1: Padlet interface showing various students' progress and feedback

As a field rooted in creative problem-solving, design demands systematic, innovative approaches. Guided learning equips students with these skills, with lecturers providing crucial, timely feedback, urging interdisciplinary exploration to expand viewpoints and enrich the design journey.

Combining PBL with social constructivism, guided learning in design education fosters creative excellence, enabling students to evolve from passive listeners to self-regulated learners. This framework is instrumental in preparing students for the ever-evolving design field, emphasizing active participation, critical feedback, and a mindset poised for industry success. As design progresses, guided learning stands as an essential pedagogy in cultivating the upcoming creative professionals.

## Active Learning

Active learning involves students actively participating in their education rather than passively receiving information. It's a student-centered approach, emphasizing tasks like reading, writing, discussing, and engaging in higher-order cognitive activities (Lee, 2018) (Bonwell & Eison, 1991). This method aligns with social constructivism theory, underscoring the importance of engagement and collaboration in learning. Incorporating technology, especially in blended learning environments, has been effective in enhancing these engaged experiences (Sahni, 2019).

Teaching strategies promoting active learning include problem-solving, cooperative learning, project-based tasks, and simulations, all of which have shown positive impacts on student attitudes and academic achievement. The use of digital tools like Miro and Padlet supports these strategies by offering spaces for real-time, collaborative problem-solving and idea-

sharing, fitting within the constructivist learning environments as described by Wilson (1996).

The COVID-19 pandemic accelerated the adoption of such tools in courses like Design Enterprise. Miro, for instance, facilitated hands-on learning experiences, consistent with social constructivist principles, in a virtual space. It allowed students from different programs to interact, collaborate, and co-design, fostering a sense of community and joint ownership over projects. Initial activities on Miro included creating mind maps and analysing movie themes to encourage familiarity with the platform and peer connectivity.

Throughout the semester, Miro's features were integral for students to conduct design sprints, develop business concepts, and engage in market analyses. The approach was personalized, acknowledging individual student inputs while emphasizing collective effort. For accountability, students attached their names to contributions, enhancing critical thinking and team skills.

The pedagogy employed was grounded in Social Constructivism and Vygotsky's Zone of Proximal Development (ZPD), offering incremental support and underscoring the role of social interaction in cognitive development. Activities were structured into manageable segments to facilitate gradual competence building.

This strategy aimed to foster autonomy and self-directed learning, enabling students to actively navigate their educational paths and deeply engage with the design process. It recognized the essential role of social interaction, aligning with Vygotsky's theory, and harnessed technology to facilitate this interaction amidst modern challenges (Papert, 2020).

Digital technologies, like Miro and Padlet, offer substantial capabilities for promoting collaborative learning (Jeong & Hmelo-Silver, 2016). These platforms embody constructivist learning environments, where learners collaboratively use various tools and resources to achieve learning goals and problem-solve (Wilson, 1996).

This study examines the outcomes of using Miro for group work in active learning, a key aspect of collaborative learning in social constructivism, and Padlet for guided learning in hybrid classrooms. It focuses on their application in activities like ice-breaking, brainstorming, flipped classrooms, peer learning, and project-based learning in design higher education.

### **Ice-Breaking Activity on Padlet**

Amidst transitioning to hybrid teaching post-COVID-19, Sunway University faced the challenge of nurturing connectivity in a Design and Typography class of thirty-eight students who had previously never met in person. Employing Padlet as an ice-breaking tool proved instrumental. Under the lecturer's real-time guidance, students learned to construct their Padlet walls, populating them with multimedia content that encapsulated their weekly activities, research, and design progress.

Students introduced themselves through videos, sharing their names, origins, and aspirations in design, bridging the divide between online and in-person participants. This innovative approach not only alleviated the disconnect stemming from a lack of physical interaction but also established a vibrant platform for peer engagement. By visually communicating their

motivations for pursuing design, students enhanced their sense of community, pivotal to social constructivism.

This exercise unearthed common interests, forging camaraderie and a sense of belonging, crucial for comfortable participation in discussions. Moreover, it honed students' digital literacy, with a significant 90.3% acknowledging Padlet's user-friendliness despite occasional technical setbacks. Such digital proficiency is indispensable for future academic and collaborative ventures.

### **Brainstorming With Miro**

Incorporating interactive strategies such as discussion forums and group brainstorming in education spurs active participation, enhancing critical thinking and subject comprehension, reflecting constructivist theories by Piaget, Vygotsky, and Dewey that underscore active, reflective, and communal learning facets (Azhari et al., 2020).

Particularly in social constructivism, brainstorming is potent, echoing Dewey's practical learning and Vygotsky's emphasis on social interactions for cognitive expansion, viewing knowledge construction as an interplay of personal experiences and social interactions (Mascolo & Fischer, 2005).

In the realm of hybrid education, Miro emerges as a crucial asset, providing a cohesive digital environment for collaborative endeavors, essential for cognitive growth as theorized in Vygotsky's Zone of Proximal Development. However, hurdles like technological proficiency, internet connectivity, and session management persist, prompting Design Enterprise educators to facilitate Miro orientations to alleviate apprehensions.

Students responded affirmatively, with 80% endorsing their educational journey. Metrics reflected a 73% satisfaction rate in instructional quality and a 77% recognition of substantial intellectual engagement, noting an 11% uptick in contentment relative to the pre-social constructivism and Miro era.

This data attests to the efficacy of the hybrid format, augmented by Miro and social constructivism principles, in fostering a vibrant and productive learning milieu, preparing pupils for entrepreneurial ventures. In essence, when adeptly applied, interactive techniques anchored in social constructivism and facilitated by platforms like Miro have significant impact, propelling a dynamic educational experience in hybrid frameworks, provided potential barriers are conscientiously navigated.

### **Flipped Classroom for Collaborative Learning**

The flipped classroom is a progressive educational strategy that deviates from conventional lecture-based teaching. Rather than being passive recipients, students in this model access learning materials, such as online video lectures, before class. This advance preparation allows class time to be dedicated to more interactive and experiential activities, fostering active learning and effective collaboration among peers (Playfoot, 2023).

This method is particularly impactful in multidisciplinary design education, emphasizing collaborative learning. Technology is vital here, offering platforms for interaction, group discussions, and shared reflection. Peer learning emerges as a significant advantage, enabling



students to collectively deepen their understanding of design principles, thereby enhancing productivity and sharpening crucial skills such as communication and problem-solving (Pawson, 2016).

Within this framework, tools like Miro are game-changers for group projects. For instance, in a Design Enterprise course, students prepared for classes by studying materials like the Business Model Canvas, a strategic management template. This approach transformed them from passive listeners to active learners, ready for in-depth, application-based class sessions.

Miro, an interactive platform, enriched the in-class experience. Students used specific templates from Miroverse to apply their theoretical understanding to practical scenarios, crafting detailed startup concepts. Miro's dynamic features supported real-time feedback and discussion, enabling students to visually draft business ideas, and engage deeply with all aspects of the Business Model Canvas, from value propositions to customer interactions.

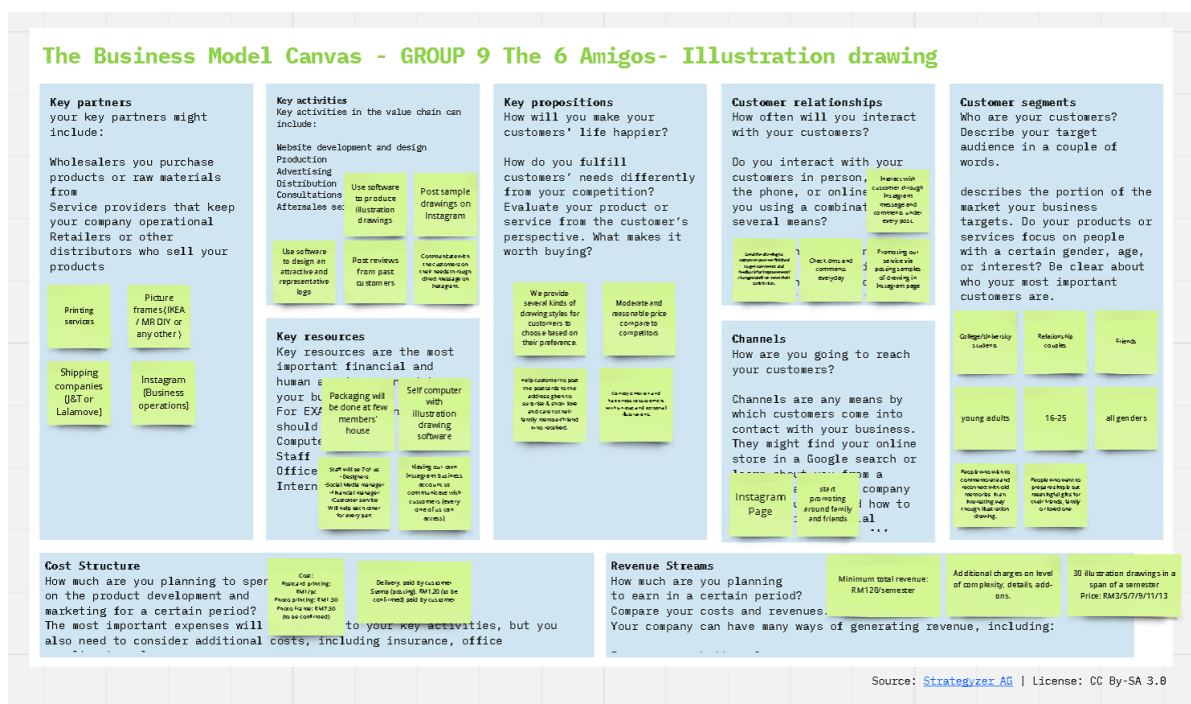


Figure 2: Business Model Canvas on Miro used to assist group brainstorming session

Through these methods and tools, the flipped classroom and collaborative learning are redefining the landscape of modern education, making learning more interactive, student-centred, and aligned with the demands of contemporary fields.

Utilizing Padlet in educational settings aligns with social constructivism theory, emphasizing knowledge construction through social interaction (Vygotsky & Cole, 1978). Padlet's user-friendly interface allows students and lecturers easy access to work and feedback, fostering collaborative learning. From a survey, 93.5% of students acknowledged Padlet's convenience for tracking progress and receiving feedback. However, a limitation is its lack of notifications for recent interactions. This platform, similar to Miro, serves as a digital archive, documenting students' design processes throughout a course. It enables critical analysis of progress and identification of areas needing improvement, resonating with social constructivism's emphasis on introspection and understanding one's learning processes (Vygotsky & Cole, 1978).

Moreover, the visibility of work on Padlet encourages accountability, responsibility, and active participation, crucial elements of social constructivist learning. Survey feedback highlighted the motivational aspect of this transparency, with one student noting the communal display of work fostered a sense of class unity. Furthermore, continuous lecturer feedback on these platforms enhances learning management effectiveness (Kryukov & Gorin, 2017) and promotes a shift from isolated to dynamic, continuous learning processes, increasing student engagement beyond traditional classrooms (Borba et al., 2016).

Padlet's role in compiling weekly progress engages students in knowledge construction through sharing, interaction, and peer feedback, core tenets of social constructivism. In a survey, one-third of participants reported increased inspiration and motivation from viewing peers' progress, emphasizing the platform's positive impact on student development and the overall learning experience in design classes. This method not only supports individual growth but also fosters a collaborative and socially interactive educational environment, substantiating the principles of social constructivism in practical application.

### **Project-Based Learning**

Project-based learning (PBL) is a dynamic educational strategy characterized by student-centered learning through real-world projects (Krajcik & Shin, 2014). PBL, especially when augmented by digital tools like Padlet and Miro, facilitates active, experiential learning and collaboration beyond geographical constraints—a crucial adaptation amid the pandemic's hybrid classroom models. These platforms enable diverse forms of student expression, enhancing comprehension and engagement.

PBL's significance in higher education is undeniable, promoting deep learning, critical thinking, and skill acquisition (Vygotsky & Cole, 1978). Through a social constructivism lens, PBL bridges theoretical learning with practical application, emphasizing collaborative knowledge construction and "learning by doing" (Jonassen, 1994).

During the COVID-19 crisis, Design Enterprise students engaged in an ambitious experiential project, creating socially responsible startups. The hybrid learning model, necessitated by the pandemic, provided an unconventional opportunity to apply social constructivism, blending physical and digital interactions to foster collaborative learning. Miro facilitated this, offering a shared space for idea exchange and project development, accommodating synchronous and asynchronous contributions.

This methodology actualized social constructivism principles, with students collaboratively navigating challenges, refining ideas, and learning through social interaction, akin to Vygotsky's "Zone of Proximal Development" (Vygotsky & Cole, 1978). Despite facing pandemic-induced challenges, students acquired practical skills, balancing academic knowledge with real-world application.

The integration of PBL, digital tools, and social constructivism enriched the learning experience, developing students into adept, socially conscious individuals. Reflecting on the course, student feedback was positive, with all meeting sales targets in a condensed timeframe, showcasing this educational approach's efficacy.

Contrastingly, traditional learning is more rigid, focusing on unilateral knowledge transfer. PBL, however, encourages practical application of learned concepts, as evidenced in design assignments where students applied theoretical knowledge creatively and pragmatically.

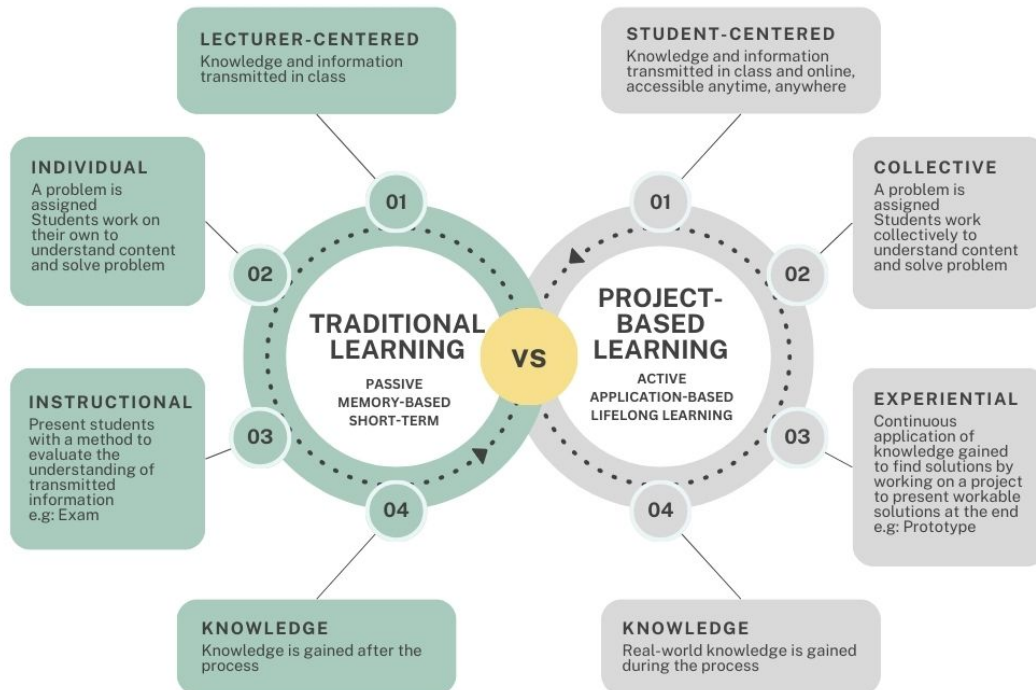


Figure 3: Comparison chart between traditional learning and project-based learning

PBL encourages skill integration, cooperative problem-solving, and iterative development based on feedback and self-reflection. Tools like Padlet and Miro not only document this journey but also stimulate motivation through peer inspiration. A survey revealed that 32.3% of students felt encouraged by their peers' progress on Padlet.

In summary, PBL, supported by social constructivism, fosters critical thinking and problem-solving through social interaction, effectively bridging academic learning with practical industry demands (Jonassen, 1994). This approach prepares students not just as skilled individuals, but as innovators aware of the societal contexts of their discipline.

## Conclusion

Integrating Padlet and Miro in education, influenced by social constructivism, project-based, guided, and active learning, is pivotal for modern education, meeting evolving needs and the specific demands of future design education. Implementing Miro in Design Enterprise and Padlet in Design and Typography proved effective in hybrid classrooms for Design Communication and Interior Architecture students, as reflected in high student satisfaction surveys. These platforms facilitate dynamic interaction, idea sharing, and collective knowledge building, essential for digital-era community and collaboration. They enable practical, industry-linked project work, promoting self-regulated learning and skill development for future workforce complexities.

Key future steps involve crafting assessments aligned with social constructivism in collaborative design learning spaces and promoting interdisciplinary cooperation to boost creativity and problem-solving. However, ensuring educator training in project-based, guided, and active learning is vital for successful integration and meeting learning objectives. Sharing specialized strategies and best practices will enhance technology and pedagogy use, preparing design students for a future-ready education (Kryukov & Gorin, 2017).

By adopting these measures, educational institutions can fully exploit technology and innovative teaching methods, navigating the shifting educational terrain and equipping students with a comprehensive, forward-thinking education.

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