EMOTION-SCAFFOLDED DESIGN EDUCATION AND KANSEI LEARNING ENVIRONMENTS

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ABSTRACT

Upon the framework of Emotion and Design, the concept of Kansei learning environments is a deliberate construction of emotional ecologies designed to facilitate the affective trajectories of students throughout the design process. The paper addresses long-standing issues for junior design students who often experience anxiety, frustration, and disengagement from open-ended assignments where unmanaged emotions inhibit exploration, risk-taking, and reflective judgement. A mixed-methods intervention was developed and implemented within two undergraduate communication design studios (n ≈ 60), which incorporated emotionally scaffolded pedagogy through the use of structured emotional check-ins, Kansei-based reflection prompts, visualisations of emotional momentum, and redesigned critique processes that emphasised developing emotional literacy in addition to providing formal and conceptual feedback on student projects. Data collection methods included quantitative self-report measures of students' emotional state, perceived self-efficacy, and studio engagement in conjunction with rubric-based assessments of creativity, coherence, and craftsmanship in the final student products. Additionally, qualitative data was collected using emotion diaries, observational research in the studio environment, and post-project interviews with students regarding their understanding and utilisation of emotion as a design resource. Early analysis indicates that the emotion-scaffolded studios resulted in increased emotional granularity, increased persistence in times of difficulty, and more intentional usage of affective cues in the making of design decisions related to improved assessments of creative performance.

This research study adds to prior literature by (1) offering an empirical definition of Kansei learning environments based on the 3E model; (2) providing empirical design principles for incorporating emotion scaffolding into studio curriculum design; and (3) addressing how emotion-aware pedagogy can broaden the scope of Kansei engineering from product experience to the performance of learning, teaching and creative practice in design school contexts.

Keywords: *Kansei learning environments, emotion-scaffolded pedagogy, design education, emotional granularity, creative self-efficacy*

1 INTRODUCTION

The inclusion of emotion in design practice and the user experience have been recognised since a long time ago. Yet the development of the inclusion of emotion systematically into design

education remains underdeveloped. In particular, it relates to the emotional trajectories students undergo during their project lifecycles. Many junior design students express frustration, anxiety, and disengagement when they encounter open-ended assignments, short deadlines and vague expectations. Such uncontrolled emotions can limit exploration risks, limit conceptual thinking, and impede critical evaluation, thus limiting the quality of the work students produce. This study builds upon the Emotion and Design Framework, and the 3E Model of Emotion Design (Emotional Design) and Emotionalisation of Design. Thus, we construct Kansei learning environment(s) as intentional emotional ecology designed to support students not just by acknowledging their feelings but also by using these as a basis for their own thinking, making, and evaluating in a studio context. Based upon this view of emotion, we consider emotion as a medium and as a motivator for learning. Emotion affects students' focus, motivation, persistence and capacity to make subtle judgments concerning aesthetics and concepts.

In response to this need, our research provides a mixed-methodology-based pedagogical intervention in two undergraduate communication design studios (n ≈ 60). We incorporated emotion-scaffolding methods into the routine activities of each studio. These methods include scheduled emotional check-ins, Kansei-based reflection questions, diagrams that visualise 'emotional momentum' throughout a student's project timeframe, and revised critique processes where emotional intelligence be evaluated equally as formally and conceptually. We assess quantitative data regarding students' emotional states, perceptions of self-efficacy, and degree of engagement in studio activities, along with rubrics used to evaluate creativity, coherence, and craftsmanship. Qualitative information from students' emotion diary entries, studio observation notes, and post-project interview responses help us understand how students perceive and utilise emotion as a resource for designing. Our ultimate goal is to develop evidence-based definitions for Kansei learning environments developed through the 3E Model and create design principles for implementing emotion-scaffolding in design studio curriculum, and to argue that Kansei Engineering should evolve beyond the scope of users' experiences of products toward the experiences of students performing learning, teaching, and creative practice within design schools.

2 EMOTION-SCAFFOLDED DESIGN EDUCATION AND KANSEI LEARNING ENVIRONMENTS

2.1 The Theoretical Foundations of Emotion and Design

Ho and Siu's (2012) three dimensional model of emotion and design: emotion design, where emotional issues are used by the designer to create interaction with the user; emotional design, where artefacts elicit an emotional response from users; emotionalise design, where designers' emotional influences lead to the way they carry out their work. These three dimensions provide a holistic view of how emotions impact all stages of the design process. From idea generation and creation to post-design evaluation and use. In addition, Ho (2014) provided empirical support for the fact that designers' emotional experience can improve designers' ability to gather information and make decisions regarding the design process. Thus, Ho (2014) challenged previous notions that emotional experience was a barrier to rational thought processes.

2.2 Kansei Engineering and Its Application to Learning Environments

Kansei engineering is a Japanese engineering approach to understand and measure consumers' emotional responses towards various aspects of products. In recent years, there has been some interest in using Kansei engineering in educational contexts. However, this application remains largely confined to computer-mediated learning technologies. Chuah et al. (2008) proposed applying Kansei methodology to a virtual reality-based learning environment. They argued that because of its ability to evoke emotions in the learner, it requires systematic consideration via frameworks that relate learners' emotional responses to the specific design features of the learning environment. So far, however, these approaches remain largely underdeveloped in face-to-face design studio education settings. Design studio education often occurs over many weeks, involving multiple iterations of the design process, critique sessions, peer group collaborative activities, and hands-on exploration of materials (Boling, Gray & Smith, 2020).

2.3 Creative Self-Efficacy and Its Influence on Design Performance

A growing body of literature has identified that 'emotional scaffolding' or designing instruction with consideration for students' emotions, is an important educational strategy. As such, affective pedagogy acknowledges that emotions are produced from a variety of physiological, cognitive, and environmental stimuli. Students' beliefs about their ability to produce novel and useful solutions (i.e., their creative self-efficacy) predict their creative output, persistence in engaging in creative activities, and willingness to participate in divergent thinking (Bandura, 1997). While previous studies using design thinking interventions have shown some effect on creative self-efficacy, they suggest that the lack of focus on the affective aspects of the learning experience contributed to these limited findings. Emotionally scaffolding students' emotional response to ambiguity, failures, and criticism could help decrease how often those experiences result in feelings of ineptitude (Choi, 2004).

2.4 Design Studio Pedagogy: Critique Practices, Cultural Norms, and Student Well-Being

Research has also documented significant levels of anxiety, stress, and mental illness among design students. The authors attribute this to system-related issues (e.g., extremely heavy workload; unclear evaluation rubrics; high-stakes, public design reviews; the culture of working excessively). Critics of traditional design studios argue that these formats, particularly the confrontational format of the design review or jury, continue to promote exclusionary studio cultures based upon tradition and authority rather than evidence-based education. Advocates for redesigning traditional design studio education recommend reframing studio-based education so it supports the development of whole-person students (Mathisen & Brønnick, 2009). Specifically, advocates encourage educators to view feedback/critique as opportunities for dialogue and growth rather than as evaluative tools meant to inspire fear.

2.5 Synthesis: Towards Emotion-Scaffolded Design Education

The current literature provides an array of common findings that help to develop our theory and methods of providing emotion-scaffolds in Design Education within the context of Kansei Learning Environments. Firstly, emotions are not merely supplemental to design thinking, but

are integral to it. Emotions can either positively or negatively impact a person's ability to focus their attention, be motivated, process information, make decisions, and produce high-quality creative results (Saarni, 2017). Secondly, while many students experience both positive and negative emotional responses during the educational design process, little formal assistance has been given to students to support them in developing their emotional intelligence. Thirdly, there are now multiple evidence-based methodologies available for creating emotion-aware pedagogies for supporting students' emotional trajectories as they learn. These include Affective Pedagogy, Emotional Scaffolding, Creative Self-Efficacy Research, and Kansei Engineering. Finally, design studios traditionally promote a culture of extreme hardship and stress where individual perseverance is expected at any cost; this needs to be transformed so that design studios better reflect the current understanding of the relationships among learning, creativity, and well-being (Gray, 2013) .

While research has made great strides toward improving the way we understand the role of emotion in the design process (Ho & Siu, 2012, 2014) and how Kansei Engineering may be applied to create emotionally aware learning environments (Chuah et al., 2008), few studies exist that empirically examine emotion-scaffolding in design education contexts. While Park et al. (2019) provide excellent frameworks for emotionally scaffolding young children's learning, and while Hammond and Moore (2018) establish a general framework for implementing affective pedagogy in higher education, very little research exists concerning how emotional scaffolding functions in the unique cultural environment of the design studio. Therefore, this study proposes to investigate two major areas of importance in addition to developing and evaluating an emotion-scaffolded pedagogical strategy within undergraduate Communication Students'Design Studios. Specifically this study explored the long-term relationship between Creative Self Efficacy and Studio-Based Learning Outcomes and the Longitudinal Impact of Emotion Aware Pedagogies on Students Professional Development and Career Sustainability.

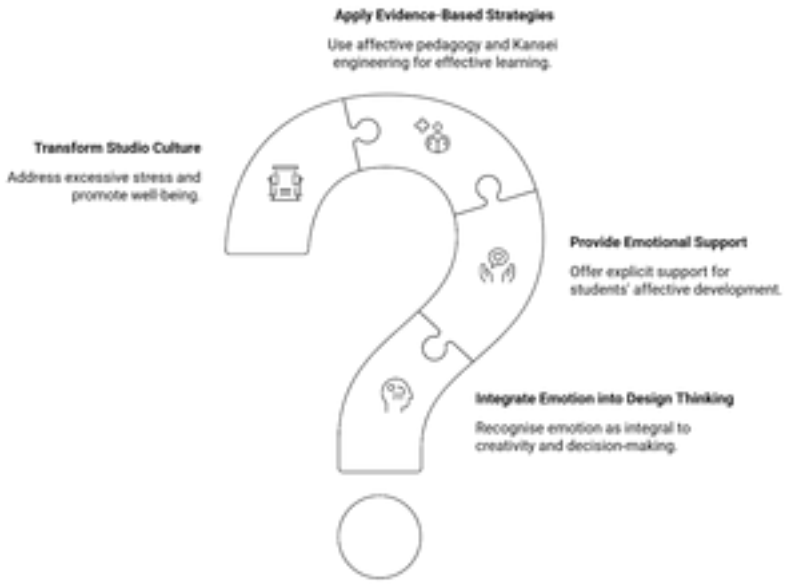

Figure 1. The figure shows the way to implement emotion-scaffolded design education

3 RESEARCH METHODS

This research employed a convergent mixed methods approach to determine if emotion-supported Kansei learning environments positively affect the emotional progression, self-confidence, and creativity of design students during undergraduate communication design studies. Quantitative and qualitative approaches were equally weighted and merged throughout all aspects of the methodology (design/interpretation), allowing for triangulation among participant scales; performance measurements, participants' emotion journals; observations, and participant interviews. Two, second/third year communication design studios at a public institution were used to recruit approximately 60 students (n ≈ 30 per class). To participate in this study, students had to be formally registered for that semester's communication design course, complete at least one other design foundation course, and be able to reflect on their emotional experience while learning. In-class announcements and subsequent emails were used for recruitment purposes. Institutional ethics protocols were followed to obtain participants' written consent. Participants were free to decline participation without any negative consequences on their academic standing.

The intervention was embedded in a regular 12-week semester. Three distinct yet overlapping phases defined the intervention: Baseline Mapping (Weeks 1–2); Emotion-Supported Studio Practice (Weeks 3–10); Consolidation and Reflection (Weeks 11–12). Baseline data regarding students' emotional states, levels of self-confidence, and typical ways in which they engaged in the studio were collected using standardised participant report scales derived from established psychological instruments during Weeks 1 & 2. Students were also required to submit an initial portfolio piece, evaluated using an analytic rubric assessing creativity, conceptual coherence, and craftsmanship, creating a baseline measure of student performance (Jobst & Meinel, 2012). During Weeks 3–10, the emotion-scaffolded Kansei studio became a normal component of the teaching routine. Each studio session included a short emotional check-in. Using a structured rating sheet, participants identified and labeled their emotional state, what they expected to be challenging, and what coping mechanisms would be utilised. After the emotional check-in, participants went through Kansei-based reflection exercises at critical junctures in their projects (research, ideation, prototype development/refinement). These reflection exercises involved having students map how they believed specific design elements (color, typeface, image, composition) would elicit or modify specific emotional responses in themselves and potential users. Critique formats were modified to emphasise emotional intelligence. For example, peer and tutor feedback was no longer limited to comments on formal qualities and conceptual thinking but now incorporated comments on perceived emotional tone and the designers' reported emotional process.

Quantitative data collection was concurrent with studio activities. Self-report measures of emotional state, self-confidence, and studio engagement were administered at four separate times: baseline; mid-project, immediate pre-final critique, and post-project completion. The final project submissions were independently assessed by two raters blinded to the focus of the intervention. This was done to minimise expectation bias. Reliability estimates were computed for the rubric scores before calculating average ratings.

Three types of qualitative data existed for this study: emotion diaries; nonparticipant observation of selected studio sessions; and semi-structured interviews with participants. Students completed weekly emotion journals identifying significant high/low emotional episodes experienced during the semester including apparent causes and strategies they employed to cope with those feelings. A sample of observed studio sessions focused on observable emotional expressions; utilisation of emotion-scaffolding materials; and the evolution of critique interactions. By the end of the semester a purposeful subset of students who represented varied emotional progressions participated in individual interviews discussing their experiences with the Kansei activities and how emotions affected their decision-making processes (Kashdan, Barrett, & McKnight, 2018).

A multi-phase integrative strategy was applied to analyse data. Descriptive statistical techniques and repeated measures analyses were used to evaluate the impact of the intervention on students' emotional states, self-efficacy, engagement and rubric score averages over the duration of the semester. Thematic coding was used to categorise qualitative data from diaries, observations and interviews into thematic categories using deductively-derived codes (i.e., emotional detail; emotional movement; regulatory strategies) as well as inductively-developed themes that emerged from the corpus. Integration occurred through side-by-side displays of quantitative trends juxtaposed against illustrative excerpts from qualitative data; these displays provided a comprehensive narrative explaining how emotion-scaffolding Kansei-based interventions influenced students' creative outcomes and learning experiences.

4 RESULTS

The number of different emotional states that were reported at both the beginning and end of this study rose dramatically. Initially, the average student could report just under 4 types of emotional state ($M = 4.10$, $SD = 1.06$). By the time they had finished the course, however, this had risen to approximately 5 ($M = 4.87$, $SD = 1.14$) according to a paired sample t-test ($t(99) = -12.17$, $p < .001$) (figure 2). The level of anxiety experienced by students also dropped dramatically over the period of this study. On average, students reported experiencing anxiety at a level of 5.42 ($SD = 1.05$) when they began the course. By the time they completed it, they reported experiencing anxiety at a level of around 4.23 ($SD = 1.26$) ($t(99) = 16.36$, $p < .001$) (figure 3). Frustration experienced by students similarly reduced throughout this study. Initially, students averaged 5.04 ($SD = 1.09$) frustration. By completion of the course, this had fallen to around 4.41 ($SD = 1.22$) ($t(99) = 9.86$, $p < .001$)(figure 4).

Curiosity increased as did enjoyment. Initially, students averaged 4.81 ($SD = 0.92$) curiosity. This had increased to 5.73 ($SD = 0.96$) by the end of the course ($t(99) = -15.09$, $p < .001$). Initial enjoyment of the course was measured at an average of 4.53 ($SD = 1.04$). By completion of the course, this had increased to an average of 5.81 ($SD = 0.93$) ($t(99) = -18.35$, $p < .001$). In terms of how well students were able to identify different emotional states, we refer to these as emotional granularity scores. These scores increased significantly over the duration of this study. When students started the course, they could, on average, identify slightly less than 4 different emotional states ($M = 3.93$, $SD = 1.25$). By completion of the course, this figure had risen to

around 6.64 (SD = 1.73) ($t(99) = -24.86$, $p < .001$) (figure 5). In other words students ability to describe different emotional states improved over the duration of this study by approximately two and a half additional emotional states. During critique sessions where students provided feedback on each other's designs, there was considerable use of emotion-related vocabulary (average score for use of emotion vocabulary is M = 5.58, SD = 0.99) (figure 6).

Student perceptions regarding their own abilities to complete design tasks increased considerably over the duration of this study. Initially, students believed they were able to complete design tasks with an effectiveness of around 4.23 out of five possible points (SD = 0.79). By the end of the course, students indicated they believed they would be successful in completing similar design tasks with an effectiveness rating of around 5.28 out of five possible points (SD = 0.95) ($t(99) = -17.95$, $p < .001$).

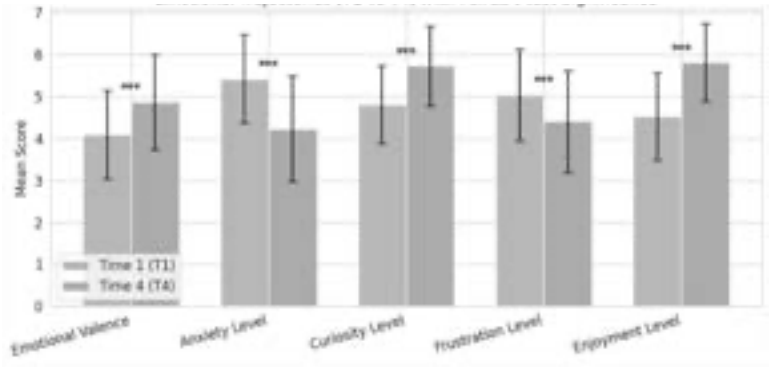

Figure 2. Emotional trajectories (T1 vs T4)with paired t-test significance

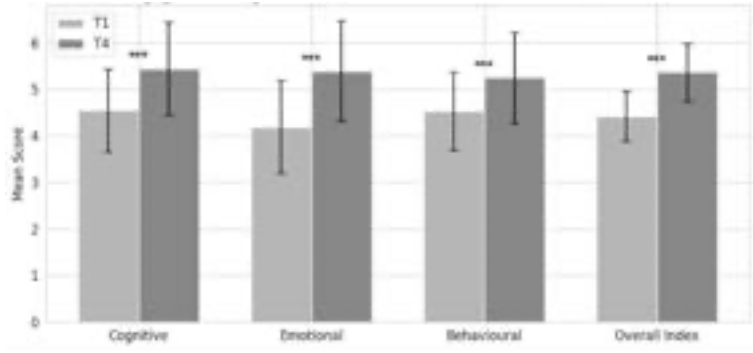

Figure 3. Engagement: cognitive, emotional, behavioural, and overall (T1 vs T4)

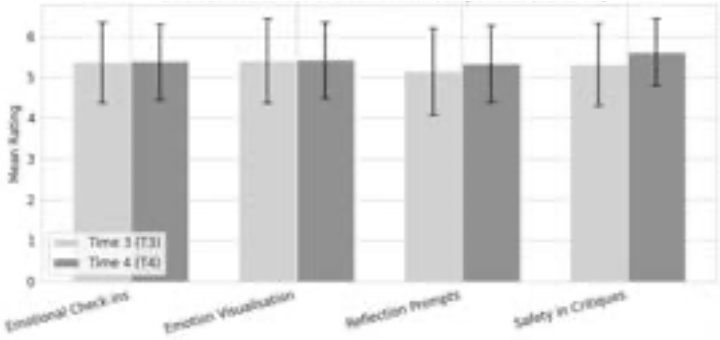

Figure 4. Perceived usefulness of the intervention components (T3 vs T4)

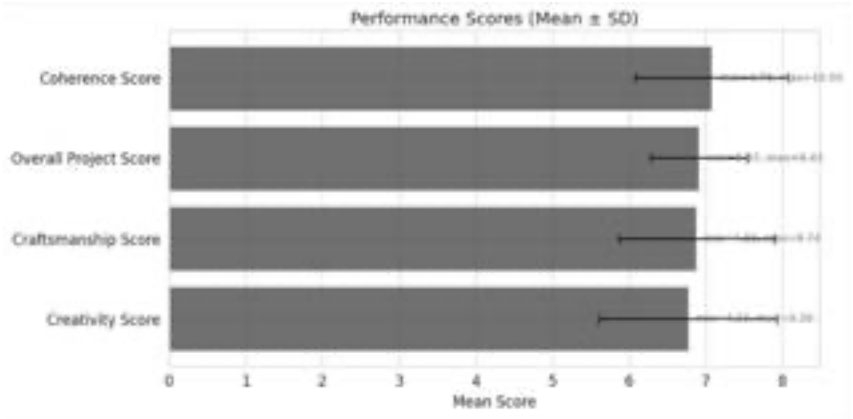

Figure 5. Performance scores

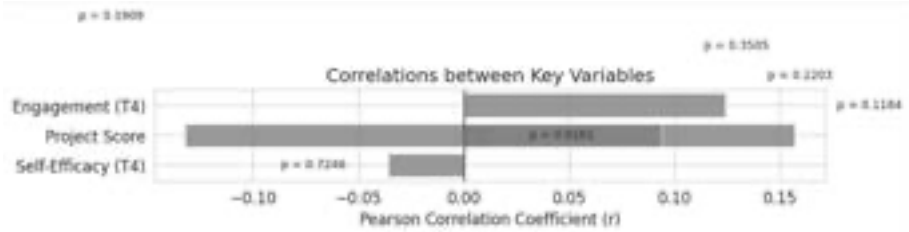

Figure 6. Correlations between key variables

5 DISCUSSION

5.1 Emotion-Scaffolding Pedagogy's Effectiveness on Student's Emotional State

Emotion-scaffolding pedagogy's effectiveness at countering the typical trend toward increasing levels of student distress as the deadline approaches is evidenced by the significant changes in students' emotional states from baseline to project completion. The results of this study suggest that Kansei-scaffolding practices could be contributing to an acceptance of emotional disclosure among students and providing them with the cognitive tools necessary to view discomfort as a normal and manageable part of creating something new instead of as an indicator of personal failure.

Of particular significance is the large increase in emotional granularity. A high level of emotional granularity has been linked to using more adaptive emotion regulation strategies, lessened amygdala activation, increased activity in the pre-frontal cortex, and greater overall cognitive flexibility (a key component of creative problem solving). This means that students will have a better understanding of when they are feeling overwhelmed, frustrated, or anxious and will be able to choose an appropriate way to deal with each state. By making explicit emotional literacy an equal partner in both aesthetics and technical competence when evaluating critiques, the author demonstrated that emotion can become more than a private, incidental element of learning and can be used as a valid criterion for making judgments regarding creativity. The increase in design self-efficacy is also relevant since creative self-efficacy has been shown to positively predict one’s ability to creatively perform, persist in working creatively, and desire to use divergent thinking. Given that there were separate improvements in design self-efficacy and ratings based upon the rubrics, there is clearly additional research that should be conducted to

determine if creative self-efficacy plays a role in process aspects of creative work (e.g., willingness to continue working on a difficult task, willingness to revise/iterate, and receptivity to receiving feedback) that may not be well-quantified by rubric-based evaluations of completed works.

Given prior studies showing that affective pedagogies improve emotional engagement, thereby sustaining cognitive involvement and behavioral commitment to the learning process, the sizable increases across all three aspects of studio engagement were consistent with these findings. Emotional Engagement experienced the greatest total change, suggesting that Kansei-scaffolding practices may have most effectively addressed a frequently overlooked area in traditional studio pedagogy: students' sense of connection to their own work, their peers, and the learning experience itself. Although moderate positive correlations existed between affective measures and creative outcomes, they highlight the need for a more comprehensive theoretical framework describing the relationship between emotion and design learning.

6 CONCLUSIONS

This research investigates the impact of integrating emotional intelligence training into design studio processes on students' emotional experiences and confidence during creative tasks. Results indicate significant improvements in positive emotions and decreases in negative feelings, suggesting that emotion-based teaching approaches may enhance well-being in design education. Although limitations exist, such as the lack of a comparison group and reliance on self-report data, findings imply that emotional scaffolding could positively influence the creative process. Future studies are proposed to explore the cumulative effects of emotion-scaffolding over time, and qualitative insights could clarify students' emotional understanding. The findings offer practical guidelines for design educators to incorporate emotional awareness into existing curricula, fostering a culture where discussing emotions is normalized in creative settings.

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