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Critique's Role in the Development of Design Literacy in Beginning Design Education

El rol de la crítica en el desarrollo de la alfabetización en diseño en la educación inicial del Diseño

Abstract. This study examines the development of design literacy for first-year architecture students in their beginning design education phase. It focuses on the contribution of design critique in the formation of repertoires for design thinking and doing for first-year students. The inquiry is based on the findings of a qualitative case study involving 26 first-year design students and six design studio tutors in a Bachelor of Architecture degree programme. Data was collected through focus groups, in-depth interviews, and studio observations, and was analysed using content analysis technique. Research findings indicate that design critiques initiate a transformation process in first-year design students in which they begin to grasp how designers think and act. The collaborative effort of the tutor and students, sharing their ideas and re-constructing design knowledge, is realized through the development of new communication methods in design critique sessions. We suggest that when the development of interactive and critical communication skills is embedded in the formation of a community of learners during their first year in a design studio setting, 'learning to criticize' becomes a component of design literacy.
Keywords: Community of learners, design critique, design education, design literacy.

Resumen. Este estudio examina el desarrollo de la alfabetización en diseño por parte de estudiantes de arquitectura de primer año durante la fase inicial de su educación en diseño. Se centra específicamente en la contribución de la crítica de diseño para la formación de repertorios de *design thinking and doing*. La investigación presenta los resultados de un estudio de caso cualitativo que involucra a 26 estudiantes y seis tutores de un programa de licenciatura en Arquitectura. Los datos fueron recolectados a través de grupos focales, entrevistas en profundidad y observaciones de clases prácticas, y fueron analizados utilizando técnicas de análisis de contenido. Los resultados de la investigación indican que la crítica de diseño inicia un proceso de transformación de los estudiantes de primer año, a través del cual ellos comienzan a comprender cómo los diseñadores piensan y actúan. El esfuerzo de colaboración del tutor y los estudiantes, al compartir sus ideas y reconstruir el conocimiento de diseño, se realiza mediante el desarrollo de nuevos métodos de comunicación en la sesión de crítica de diseño. Sugerimos que cuando el desarrollo de habilidades de comunicación interactivas y críticas se integra desde el primer año en un taller de diseño, el "aprender a criticar" se convierte en un componente de la alfabetización en diseño.
Palabras clave: Alfabetización en diseño, comunidad de estudiantes, crítica de diseño, educación en diseño.

Introduction

The beginning design education phase offers grounds to develop a form of design literacy shared by the members of a community of learners in the design studio. Design critique –a principle pedagogical method in the design studio– plays an important role in the development of design literacy among first-year students. This study examines the development of design literacy for first-year architecture students in the beginning design education phase. The paper discusses how design literacy is developed in first-year design studio crit (in the form of desk or peer review) and reiterated in the crit-associated studio learning culture. It attempts to identify the factors that generate communication between the tutor and the students, and to inquire into the possible contribution of this interaction in the formation of a community of learners in the studio environment.

Design thinking as a 21st century skill

In the 21st century, the act of design is being redefined as a way of establishing a proactive and reflective relationship with the world (Cross, 2011; Nelson & Stolterman, 2012). Christensen, Hjorth, Iversen & Blikstein (2016) note: "designerly ways of engaging with the world enable individuals to act as agents of change and creators of preferred futures, abilities that are echoed in the descriptions of the 21st century skills" (p. 128). In this perspective, the designer is considered an individual equipped with the abilities needed to approach "problematic situations by engaging with these situations through reflective conversations with stakeholders, the design situation, and its artefacts" (Christensen et. al., 2016, p. 126). Such reflective conversations are enabled by design thinking – "a way to frame and address the challenges characterizing design" (Tosca & Ejsing-Duun, 2017, p. 244). Design thinking is not limited to the professional or disciplinary field of design or to people who are academically engaged in these fields. Brown (2008) explains design thinking as a "holistic and human-centred" activity, with the characteristic features of "empathy", "integrative thinking", "optimism", "experimentalism" and "collaboration." According to this perspective, designerly ways of thinking have considerable impact on people's lives and the environment since design skills help people enhance their performance in their personal and daily lives (Baynes, 2010).

In this respect, design education has gained more importance in all fields, and the cultivation of design thinking skills is emphasized as a major educational challenge. It is considered that design thinking skills can help students go beyond the knowledge and application limits of disciplinary fields by approaching the problems they encounter through more holistic and interdisciplinary frameworks. The contributions of design thinking to the formation of design literacy are underscored in the field of design research (Pacione, 2010; Christensen et. al., 2016). Scholarly arguments criticize any attempt to consider design education as narrow vocational training (Buchanan, 2001; Stables, 2013). Instead, the focus is on how design education, by stimulating a breadth of understanding and deeper insight into the world, supports the development of students as open-minded, socially responsive, and creative individuals.

Design literacy

Given the view that designers and the design act are engaged with problems related to daily life practices, it becomes clear that design should be legible

and inclusive. Rather than a field of highly specialised knowledge, design literacy covers varied means of communication, information, and exercises that support the formation of a discourse performed by "like-minded individuals, programs and practices" (Poggenpohl, 2008, p. 217). In the view of Poggenpohl (2008), design literacy encompasses "all kinds of artefacts that support the development of a community of practice and shared ideas and attitudes" (p. 217). The design studio becomes a shared learning environment that supports the development of design literacy, in which the students become engaged in the production of design artefacts, partake in the formation of a shared vocabulary and new methods of communication, and start to shape their identity as designers and like-minded individuals. It should be underlined that although Poggenpohl (2008) addresses a more comprehensive definition of "discourse" as a foundation for developing design literacy, with a special focus on a graduate education context, the focus of this paper is limited to the use of design critique in first-year design studios and the conversations between the tutor and the students based on a shared design-oriented vocabulary as elements of design literacy.

Beginning design education

Design education is pedagogically different and challenging for students who come from high school education. In high school, the education system is usually based on the transfer of information from the teacher (expert) to the student (novice), where the student acts as a passive receiver of knowledge. Design education, instead, aims to involve the students as active participants in the learning process, who question, investigate, observe, and criticize. In first-year design studios, where students encounter design education, they learn the basic principles of design and develop a new formal language by using two-dimensional and three-dimensional design elements. They are encouraged to develop new ways of looking, seeing, observing, analysing, and visualising, by exploring and using different media (Ledewitz, 1985). For students who are unfamiliar with the process of designing, first-year design education is the starting point to develop "designerly ways of knowing" (Cross, 2004; McDonnell, 2016). The design projects in beginning design education help students to develop abstract, analytical, diagrammatic, and creative thinking skills, combined with skills of doing through hands-on experiences. Beginning design education invites first-year design students to go beyond the familiar perceptions of space, look at alternate perspectives, explore relationships, and design the tools necessary to express what has been explored in new and creative ways. Temple (2006) explains the major learning goals of the first-year design studio as follows:

> "Learning at the foundation level (let alone learning to design) involves issues related specifically to perceptions, processes, and definitions but also necessitates the formation of habits of mind, habits of hand, habits of reflection, and habits of communication, as a basis for continued learning, exploration, and development." (Temple, 2006, p. 5)

Design studio critique

Design critique or feedback is the main in-studio evaluation technique (Wilkin, 2005; Gray, 2013; Belluigi, 2016). Design critique/feedback is facilitated "in-the-

making" of a design project; it proceeds from the definition of a design problem to the finalization of the design proposal, addressing both "problem-setting" and "problem-solving" (Christensen & Ball, 2016; McDonnell, 2016). The student reframes the design problem and develops alternative strategies to solve it, acknowledging a multiplicity of solutions. Design critique is process-oriented and iterative. It depends on one-on-one dialogue between the tutor and the student, generating an "interactive session" with the active participation of all actors (Goldschmidt, 2002). Design critique helps "to catalyse the pursuit of new lines of creative inquiry" for students (Christensen & Ball, 2016, p. 116). Design critique is realized not only between the tutor as the more experienced designer and the student as novice designer (Schön, 1985; Cross, 2004). It is also realized between students themselves in the form of peer critique. When providing feedback on each other's projects, students start to shape their own position as designers and also learn from others. In this way, the process generates subjective and inter-subjective experiences of learning. Peer critique occurs in an environment in which meaning is constructed and shared by all participants, paving the way for "the social construction of normative behaviours and beliefs" in the design studio (Gray, 2013, p. 709). Students learn how to act as designers, use practice-oriented discourse and criticise other students' projects by using this discourse (Vowles, 2005, p. 223).

Taking crit-associated studio learning as its starting point, the major research question addressed in this paper is: What is the contribution of design critique to the formation of design literacy in the first-year architectural design studio?

In its attempt to identify the factors that generate communication and interaction between the tutor and the students, and the possible contribution of this interaction to the formation of a community of learners in a design studio setting, the paper draws on the findings of qualitative case study research into the teaching and learning experiences in a first-year design studio.

Methodology

The research at hand was undertaken in the Bachelor of Architecture degree programme at a university, with the approval of the ethics committee. Studio tutors and students participated in the research voluntarily. Before attending the interviews, all participants were provided with project information and assured anonymity and confidentiality of data. In the reports of research findings, participant names and quotes taken from transcripts of the recordings of in-depth and focus group interviews and studio observations have been anonymised. The study was composed of data collection processes with the following number of participants from the Bachelor of Architecture degree programme: four first-year architecture students in focus group interviews, four studio tutors in in-depth interviews, and a studio observation with the participation of two tutors and 22 first-year architecture students. One of the limitations in the research was the relatively small number of participant tutors, due to the number of academic staff in the Bachelor of Architecture program. The homogeneous composition of tutors by age and the lack of senior academics can also be considered limitations. This study is based on qualitative research with phenomenological aspects that derive from research procedures. As mentioned above, this paper examines a phenomenon that is experienced by a group of people involved in a

Bachelor of Architecture degree programme, and studio tutors and students who had common teaching and learning experiences in design studios constituted the data sources (van Manen, 1990; Kvale & Brinkmann, 2009). Data collection procedures included four digital voice records of in-depth interviews with studio tutors, a digital voice record of focus group interviews with first-year architecture students, and a two hour videotape of a first-year design studio. These procedures were chosen to elucidate how different actors involved in the same phenomenon approach it from their own perspectives. Interviewing people who have experienced the phenomenon is central in the procedures of phenomenological qualitative research (Creswell, 2015). Interviews are usually designed as semi-structured and open-ended to allow participants to elaborate on their opinions about their experiences (Marshall & Rossman, 2010). In focus group interviews, first-year students were asked semi-structured and open-ended questions about the design studio as a learning environment and the pedagogical methods they encountered for the first time in the design studio. Focus group interviews were audiotaped and transcribed. One-on-one in-depth interviews were held with studio tutors. The tutors were asked open-ended questions about the design studio as a learning environment and the pedagogical methods they apply in the design studio. The interviews were audiotaped and transcribed. Data collection in phenomenological qualitative research can be supported by observations of the context in which the phenomenon takes place (Creswell, 2015). The paper addresses findings derived from the observation of a desk critique session that took place at a first-year design studio with the participation of two tutors and 22 students. The video record focused on the physical and social contexts of the design studio, the pedagogical methods of the tutors, and the means of communication between tutor-student and student-student. The inclusion of studio observations provided triangulation based on multiple data sources for the same research phenomenon. The transcript of the recording was done in Turkish, the researchers' and participants' native language. After the interviews and studio observations were audiotaped and transcribed, they were translated to English for analysis.

Phenomenological qualitative research encourages individuals to reflect on their experience and helps them unfold the effect of their experience on their understanding of the phenomenon and the meaning they distil from it. In the view of Padilla-Díaz (2015), phenomenological data analysis enables "the transference of explicit information (what the participants say) to implicit information (how it is told...)" (p. 105). This transference underpins the "scaffolding" asset of phenomenological qualitative research, in which descriptive analysis of the data evolves into an interpretive analysis in order to uncover the meaning that participants attribute to the phenomenon. After a thorough reading of the interview transcripts, the data gathered from focus group and in-depth interviews and studio observations was analysed through qualitative content analysis. Qualitative content analysis was selected as an appropriate methodology for reviewing the data and deriving themes to exemplify the identified categories (Weber, 1990; Schreier, 2012; Neuandorf, 2017). Transcript analysis was carried out in a two-phase process. In the first phase, rigorous reading of the transcripts allowed to derive numerous themes according to what participant tutors and students highlighted and how these two groups of actors defined their positions in their own design studio experiences. In the second

phase of data analysis, the grouping, revising, and re-grouping of the analysed data led to sub-themes that specifically addressed the potentials and problems related to the critique method specific to the design studio. Themes from individual transcripts were examined and grouped together with similar themes from other transcripts. Thus, new and extended theme sets were created.

Results and Discussions
In this study, patterns grounded in the analysis of tutor and student responses, as well as studio observations, are thematised according to the similarities and differences of their first-year design studio experiences. The three main themes that emerged from the responses to the research question are:

- Alternative thinking skills.
- One-on-one conversation in design critiques.
- Design critique as the signature pedagogy of design education.

Alternative thinking skills
Students encounter a different teaching and learning paradigm when they enter a school of architecture. Student 1SEN mentions that when students first enter the university to study architecture, and especially in the design studio, they are challenged to take responsibility for their own learning. They were introduced to the design problem and were then told to "think, do, and present", which was a new way of learning for them. At this point, the tutor plays an important role guiding the students to learn how to learn.

Beginning design education is the first step in the development of alternative ways of thinking. 1SEN explains: "I can think differently, so I can look at different perspectives rather than a single point." These new ways of thinking are analytical, based on the observation of existing situations, the properties of objects and spaces; but they also are critical and creative, addressing something they have not yet experienced as tangible. Student 1BİR explains, referring to a design problem they were given: "We're supposed to design an open volume, yet the volume was supposed to be enclosed by intangible features." In the view of 1BİR, this design problem entailed thinking out of the box and searching, not for the first thing that comes to mind, but looking for alternatives that were once unthinkable. Students were encouraged to free themselves of preconceived ideas. For 1SEN, this was related to the desire "to look for something different than everyone knows, to be different from anyone." The tutor is observed to guide this process by asking questions that aim "to disclose the alternative known answers, and to generate the unknown possible ones," which for Cardoso, Eris, and Badke-Schaub (2004) is a characteristic of "divergent thinking" (p. 5). 1ŞEV notes that, such alternative ways of thinking also entail an integrative view: "... for example, when designing a house, it requires not only drawing the house itself, but also taking into consideration its environment; I have learned that even psychology is related to the process." The following interview excerpt supports this understanding:

> "I learned many things about materials in ARCH 101 course. In fact, I understood the relationship between materials; we tried to use materials together before examining them but it didn't work because one was soft and the other was hard. I learned about

the materials and recognized the relationships between them. I learned how to use them together." (1RUM, first-year student)

Since the first-year design studio encourages thinking out of the box, and inquiring into alternative ways of thinking, it is supporting a freedom of mind that is engendered in the creative act. This results in a desire to express oneself creatively. Design is seen as a form of self-expression. 1RUM notes: "What ARCH 101 first helped me develop was the ability to think freely." When freedom in design thinking was encouraged, students were also given more responsibility for their design decisions, which triggered them to take more active roles in the learning process. 1RUM continues: "...because it depends on us; we will think and we will design and give to the tutor... What the tutor can add is his/her comments, feedback; we are shaped accordingly." The participant students mention their active engagement in the learning process as one of the main features of their first-year design studio experiences. They are cognisant of their responsibilities in both the intellectual dimension of the design process and the physical dimension of production.

One-on-one conversation in design critiques
In the design studio, students design various artefacts (in the form of drawings or models) according to the design brief given to them by tutors. These artefacts initiate a conversation between the tutor and the students, and between the student and the work itself. Therefore, the design artefacts have "a mediating function within review systems" (McNair et al., 2014, p. 5). The students' active engagement with the project transforms the project into a "rhetorical instrument" that enables them to develop the tools needed to translate design concepts into diverse media of communication (McDonnell, 2016). The communication modalities in the studio dwell on discipline-specific concepts and are employed through a "designerly talk" that is practiced by all designers (Wong, 2011; Scagnetti, 2017; Bevins & Howard, 2020). The act of design and the evaluation of design (through desk critiques, peer critiques, jury, etc.) support the development of dialogical interaction between tutor-student and student-student.

The dialogue presented below, between a tutor and students in the first-year design studio, illustrates how a student's poster project becomes a "rhetorical instrument" of communication in the critique session:

> **Tutor 5NOI:** What do you show in your poster?
> **Student 3:** I used solid letters to emphasize my wall. I put my cognitive map, the steps of my design... where I found the example of pattern, how I analysed the rule of geometric pattern...
> **Tutor 5NOI:** Any critiques for this poster?
> **Student 4:** It is a wall by itself.
> **Tutor 5NOI:** Anything else? It's our job to criticize, we're designers. Where is your unit? Where is your wall? Where are your design ideas? You need to tell us the highlights of your design. What is the essence of your project? What are the steps of your design?
> **Student 5:** We cannot understand how your design developed.
> **Tutor 5NOI:** After this critique, he's going to improve his poster. It is a good idea, but the idea needs to be improved. (first-year studio observation, group critique session, 00:36:12-00:40:57)

As exemplified above, one-on-one conversations in design critiques allow the tutor to explain the potentials/constraints of a project, not by saying what is right or wrong, or what should be done, but rather by asking questions to encourage the student to think of alternative perspectives. Goldschmidt (2002) notes, the good tutor "appears to know how to engage the student in a conversation" (p. 434). Such conversations encourage students to explain the design process, how they responded to the design problem, and which features were considered when developing alternative solutions. Design feedback goes beyond one-way communication from the expert to the novice designers and evolves into a collaborative interaction among all actors in the design studio (Goldschmidt, 2002; Wong, 2011). The conversation between the tutor and students demonstrates a component of design literacy that is developed in a first-year design studio.

Design critique as the signature pedagogy of design education
In beginning design education, the communication modalities that are practiced in the design studio between tutor-students and student-student have a direct influence on students' learning experiences. A design studio should enable students to gain experience as active subjects of learning processes because, as underlined by Crowter (2013), the design studio has a "'unique' status … as a dominant learning environment and mode of delivery within design education" (p. 18). The studio and design critique sessions establish the signature pedagogy of design education (Shreeve, Sims & Trowler, 2010; Schrand & Eliason, 2012). Shulman (2005) highlights that the teaching and learning strategies specific to a discipline and/or profession constitute their signature pedagogies. In terms of the teaching and learning strategies employed by tutors and students, the design studio supports the students' abilities with regard to "knowing about design, being able to design, and becoming a professional" (Crowther, 2013, p. 20), which are the three main features of a signature pedagogy as defined by Shulman (2005).

In this study, participant students highlight the characteristics of critique as a feedback method specific to design education. 1ŞEV explains that the critique method helps students understand the problems and potentials of their projects. While offering feedback to a project, both the tutor and the students see how the design idea in a student's mind is translated into a product –such as a 2D drawing or a 3D model- and how others perceive this idea. 1BİR explains:

> "You've been working all night on an idea that … you tried to apply to the model, you understand how well you did with the models. However, the tutor or the students may not understand what you tried to do all night. At this point, the critique helps to improve your idea…"

In a similar vein, 1SEN notes: "the critiques are contributions to us because we can see the problematic aspects of our projects. The tutor guides us and we continue that way." It is revealed that design critique also supports the possibility of learning from mistakes and taking responsibility for design decisions (Yilmaz & Daly, 2016). Feedback from the tutor regarding incomplete or problematic features in the project motivate the student to look at something in an alternative way. This is manifested in the words of 1RUM first-year student as follows:

> "At the beginning, it's a little sad to hear about the missing/ problematic parts of your project. However, after you receive feedback, I don't know how it all happens, the problematic situation gradually becomes solved… The tutor mentions one thing at that moment, then turns to something else, paving the way for an alternative design solution."

When students are given an opportunity to fail and learn from their mistakes, they can be encouraged to extend their limits to generate further learning; this approach enables self-directed or self-regulated learning. According to tutor 3DCI, the formation of students' own identities as designers is facilitated in an environment of freedom and variety, where they are encouraged to take responsibility for their learning and learn from their mistakes. Such an environment of freedom and variety helps students comprehend the unique value of their projects, and the evaluation of their projects according to that value. This eventually creates, on the part of students, a sense of belonging to a community of learners. On the one hand, design studio critique depends on one-on-one dialogue between the tutor and the student. On the other hand, while the tutor gives feedback to one student's project, other students are also able to listen to the feedback. Thus, individual work becomes a tool for interpersonal educational engagement. This is apparent in the words of 1SEV first-year student:

> "… [W]e can see a lot of people. We're gathering, the tutor gives feedback about everyone's model. I can compare what my friend did with my own project. I think it can be good to look at everyone's project through the framework of our own project."

Tutor 2AAK emphasizes the role of ill-defined problems in design education, mentioning how important it is for students to realize that there is not one single solution to a design problem, but rather different proposals can develop according to their personal interpretations and creativity. As ill-defined problems initiate a research process, students start to inquire into possible concrete manifestations of concepts or theoretical discussions. Students analyse how similar design problems were solved; the resulting spatial organizations are transformed into physical realities, a building for example. Students can relate or situate the knowledge they gathered into a concrete context; thus, the learning experience becomes relational and continuous (Brown, Collins & Duguid, 1989).

In this study, the video analysis of a critique session in the first-year design studio unfolds a continuous communication and interaction between tutor-students and student-student. By asking questions and inviting students to speak, the tutor initiates a discussion and the students participate in the discussion of student projects by sharing their own insights. All actors in the design studio play a role in the formation of a social environment in which design knowledge is shared and re-constructed through one-on-one and group communication about the design products, paving the way for a "negotiation of habitus in the design studio" (Gray, 2013). In this way, the design critique is realised as a "public act" to generate "a synergy of interaction between peers, individual design artefacts" (Gray, 2013, p. 703). The tutors' role

changed from "a source of expertise" as she shared her know-how through example drawings, models, or posters, to that of a "facilitator" as she invited each student to explain her/his project to the audience (Goldschmidt, 2002; McDonnell, 2016). The student as presenter is encouraged to initiate "self-critique" of his/her project when the project is opened to group discussion. In the second half of the critique session, one-on-one critiques were replaced with a group discussion. The studio tutors continued to work with the individual students and give students feedback in their study areas. The students continued to work on their projects, either by drawing or model making, after they received feedback from the tutor. It was observed that the social environment continued among the students after the tutor left the studio. The video analysis revealed that the first-year studio environment supports the formation of a community of learners that differs from the classic communication in a teacher-centred classroom. Unlike a one-way transfer of knowledge from the teacher to students, in this first-year studio the students actively participated in the learning process by explaining the features of their own design project, and also by giving feedback to their peers' projects. The explanation by tutor 2AAK supports the studio observations: she mentions that she purposefully gathered the students around a large table to initiate a group discussion about their projects, asked questions to encourage them to think critically, and then focused on issues that the students had not yet considered. In 2AAK's view, once the tutor initiated feedback and then stepped back, students felt more comfortable to express their ideas freely regarding their peers' projects. Students themselves began to act as evaluators of their projects.

Conclusion

This study attempted to re-contextualize the pedagogical virtues of beginning design education in a broader framework of discussions on design literacy. Through the analysis of tutor and student perceptions, as well as the observations of a design studio critique session, the study focused on the ways in which the conversation between studio tutors and students supports the formation of a learning culture and community in the studio environment. This study showed that when the development of interactive and critical communication skills is embedded in the formation of a community of learners in a first-year design studio setting, 'learning to criticize' becomes a component of design literacy.

The study revealed that design critique, as a new method that first-year design students encounter upon entering a school of architecture, initiates a process of transformation in which students begin to grasp how designers think and act through design. According to the research findings, the collaborative effort of tutor and students to share their ideas and re-construct knowledge is realized through the development of new communication methods in design critique sessions. This interactive and collaborative effort, in turn, supports the formation of "negotiation" and "trust" between the studio tutor and the students (Schrand & Eliason, 2012; Gray, 2013). As revealed in the study, the use of the critique method continues even when tutors leave the studio. The learning strategies observed in the first-year studio setting have strong implications for the formation of a community of practice.

Wenger (1998) defines the three main aspects of a community of practice as follows: (1) it is comprehended, re-evaluated and developed by its members, (2) it generates a sense of belonging for its members on a social ground, and (3) it depends on a repertoire of common thoughts and practices developed by its members over time. The results of this study showed: first, that learning to design is understood and continually negotiated by students in the first-year design studio; second, that students are socially engaged in the learning process, which enhances their sense of belonging; and third, that they cultivate and use a repertoire of designerly ways of thinking and doing. In the first-year design studio, learning becomes a "situated" process and a process of participating in "communities of practice," echoing the ideas of Lave and Wenger (1991). It revealed the contribution of the pedagogical method of critique in the formation of design literacy in the beginning design education phase. It can be concluded that during this phase, the formation of design literacy serves not only to prepare students for the profession of architecture, but also to cultivate habits of thinking and doing that are shared by all members in the studio environment. This approach will help them become involved in any creative problem-solving process in their future practice through experimentation and collaboration.

In this study, results reflect the context-specific data gathered at a specific institution with a limited number of tutors and students. Results could suggest similarities with other institutions; however, they cannot be generalized across contexts. Despite the limitations and cautions regarding generalization, the findings may have implications for the processes of design-studio teaching and learning. This study lays the groundwork for future research that would help unfold other pedagogical devices that support the development of design literacy in the first-year studio environment, and how the awareness of design literacy grows in succeeding levels of undergraduate architecture education.

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