Design-Activity-Sequence: A Case Study and Polyphonic Analysis of Learning in a Digital Design Thinking Workshop

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Abstract: In this case study, we report on the outcomes of a one-day workshop on design thinking attended by participants from the Computer-Supported Collaborative Learning conference in Philadelphia in 2017. We highlight the interactions between the workshop design, structured as a design thinking process around the design of a digital environment for design thinking, and the diverse backgrounds and interests of its participants. Data from in-workshop reflections and post-workshop interviews were analyzed using a novel set of analytical approaches, a combination the facilitators made by possible by welcoming participants as co-researchers.

Keywords: Design thinking, polyphony, design learning

Designing and running the workshop

We present here some results of the experience had by facilitators and participants in a design thinking workshop held before the Computer-Supported Collaborative Learning conference in Philadelphia in 2017. In structuring the workshop, the facilitators drew on some of the multiple cognitive and procedural strategies that are interwoven in designerly ways of knowing. Each stage of the design thinking process - framing, ideation, prototyping, deploying, and iteration - was structured as a step in the workshop schedule, and each stage was closed by the participants reflecting on their experiences. After the workshop, the facilitators interviewed each participant using a semi-structured interview protocol, and subsequently invited them to join as research partners in the project described here.

Methodological approaches

The collaborative analysis of data from the one-day workshop combined insights from the analytical methods used by the different team members: design case, case study, thematic analysis, and polyphony.

Design case (Howard & Myers, 2011): The ideation stage of the design thinking process takes participants through divergent thinking (idea generation) and convergent thinking (pattern recognition, synthesis, and integration of ideas). Solutions are individually generated and then categorized, synthesized, and integrated by the group, leading to the selection of a target solution. For this workshop, the ill-structured problem of the design case was translating this process from a physical to a digital setting. The design move to use all stages of the design thinking process did create some difficulties, including blurring where the boundary of the problem was set. Similarly, the design decision of ensuring that the participants experienced the affordances of physical tools was made at the expense of using the affordances of digital media that would be a necessary part of a virtual environment solution.

Case study methodology (Merriam & Tisdell, 2016): The experiences of workshop participants can be taken as one case, and, at the next level, the phases of the design thinking process present multiple cases.

Thematic analysis: Transcripts of the interviews and the reflections were entered into the Dedoose qualitative data analysis software (www.dedoose.com/). Three members of the research team each coded all the written data. The codebook and the work of other coders was available to the whole team.

Polyphony analysis: Built on natural language processing, an analysis of the polyphony of discourse was used on the interviews only. Collaborating groups sometimes display a kind of spontaneous choreography (Trausan-Matu, 2013) in their interactions, including convergent and divergent inter-animation patterns (Trausan-Matu, Stahl, & Sarmiento, 2007). The interactions of the members of the group consist in individual and group knowledge construction cycles (Stahl, 2006) and this socially built discourse can be considered as containing several parallel threads (voices) in a discourse, where a voice is a group of one to three words that appear semantically connected in the text. These voices demonstrate divergent/convergent inter-animations in moving towards a shared goal (Trausan-Matu, Stahl, & Sarmiento, 2007).

Findings

Each of the methodologies highlight different aspects of the participants' responses to the workshop and their findings illustrate different implications for replicating or adapting the workshop on digital design thinking for other groups.

Thematic coding analysis showed the ties of the design thinking process to group dynamics, identity, and distributed cognition. The cycles of divergent and convergent thinking were linked with the affordances of a physical environment (silent individual and group processes) and with productive struggle. Each interviewee recognized the diversity of the group's backgrounds, along with the challenges and the benefits of group diversity in enhancing the design thinking process and developing better solutions. The analysis confirms the caution that Boon, Chappin, & Perenboom (2014, p. 59) draw from the literature that team members should be different, but not too different.

Polyphonic analysis highlighted divergent and convergent cycles between the "voices". The most prominent voices, labelled "think, design, thing" and "think, idea, design", were woven throughout the interviews, along with voices on participation ("talk, communicate, express"; "participate, introduce, enter").

Participant reflections and interviews also indicated the importance of the *tools used* in the design thinking process. Tools are important supports first for knowledge discovery and then for communicating and persuading others in the design team. Focusing in on the imagined learning environment, both analyses highlighted in different ways the participants' conceptions of a multi-part, configurable space, and their assessments of the costs and benefits of physical and virtual environments, including the quality of communication in each environment, and the emotional liberty that an online design thinking space might support.

Implications

Knowledge production, according to Barry, Born, & Weszkalnys (2008), happens through the dialogue of ideas as much as through their synthesis, and our analysis of this design thinking workshop bear this out. Diversity can provoke dialogue, and we therefore encourage the organizers of future workshops to seek out the opportunities that diversity provides; to recruit participants from different backgrounds, languages, disciplines and motivations and connect them through a design thinking process which uses digital tools to build a digital design thinking environment. Diversity can also power the balance between convergence and divergence in a project design (Boon et al., 2014).Despite the special analytical challenges that collaborative design presents (Kapur, Voiklis, & Kinzer, 2011; Strijbos & Fischer, 2007), the divergence-convergence cycle emerged in this workshop as an anchor for a group whose members were new to each other and new to design thinking. Representing and analyzing the divergence-convergence cycle over time was enhanced by combining qualitative and design perspectives with newer analytical models, methods, and tools such as computer systems based on polyphony (Trausan-Matu, Dascalu, & Rebedea, 2014).

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