

Teacher Agency in Learning Sciences Co-design: Dubious or Undocumented?

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Abstract: Frequent mentions of co-design in the learning sciences (LS) reflect an increasing effort to create resources through partnerships where researchers and educators share agency. Whether these partnerships meaningfully lead to new, teacher-shaped innovations depends on the dynamics of cross-role collaborations, including who gets to make design choices. We use Bratteteig and Wagner’s (2016) conceptual framework for the types of decision-making in co-design to evaluate LS research that involves co-designing with teachers. Our review reveals substantial gaps in descriptions of teacher decision-making, indicating either insufficiently described or insufficiently empowering co-design practices. We advocate for more transparent and egalitarian approaches to co-design at all phases of the design process, to increase the equity, robustness, research contributions, and potential real-world impact of co-design.

Introduction

Over the last decade co-design has gained popularity in the learning sciences (LS), reflecting a growing desire to increase teachers’ agency in the development of educational resources. Co-design’s central commitment is to value all participants as expert co-creators who collaboratively develop educational resources (Sanders & Strappers, 2008). It reflects an ethic of sharing power between researchers and teachers, and a rejection of longstanding hierarchical power relations between us (Brattegeig & Stolterman, 2007). Practically, incorporating teacher expertise into the design of educational innovations may help avoid “lethal mutations” (Design-Based Research Collective, 2003), particularly when teachers and researchers work together to spread innovations (Coburn et al., 2013a) between sites that may have different contextual needs (Fishman et al., 2013).

However, as readers of LS research, we often cannot see teachers’ agency in many of the papers we read that refer to co-design, leading us to suspect that something might be seriously wrong with LS’s practice of it. To better understand teacher agency in LS co-design, we reviewed works emphasizing co-design that were published by the International Society of the Learning Sciences (ISLS). Papers that do not report on the nature and depth of teacher decision-making risk misrepresenting the power relationships between researchers and teachers, and their respective contributions to designs. The findings we present below indicate an opportunity for learning scientists to improve on the conduct and reporting of co-design.

Background and related work

Co-design in the learning sciences

Co-design, derived from participatory design, is a methodological approach where teachers participate in the co-creation of an educational innovation with researchers (Walsh et al., 2013; Sanders & Strappers, 2008). Learning scientists have applied co-design to the development of curricula (Peters & Slotta, 2009), technology tools, (Penuel et al., 2007), and teacher professional development (Voogt et al., 2015), with the stated aim to expand teacher professional agency while enhancing research outcomes (Severance et al., 2016). While the term “co-design” is often used interchangeably with “participatory design” (Ehn, 2008), it is “a highly-facilitated, team-based process in which teachers, researchers, and developers work together in defined roles to design an educational innovation, realize the design in one or more prototypes, and evaluate each prototype’s significance for addressing a concrete educational need” (Penuel et al., 2007, p. 53), in which teachers often assume the role of pedagogical and content knowledge experts. Other LS approaches derived from participatory design such as *design-based implementation research* (DBIR) (Penuel et al., 2011), *researcher-practitioner partnerships* (Coburn et al., 2013b), *participatory design research* (PDR) (Bang & Vossoughi, 2016), *social design experiments* (Gutiérrez & Vossoughi, 2010), and *community-based design research* (Bang et al., 2016), each have subtle distinctions in scope, aims, and practices. Claims of using co-design signal attention to educational justice and equitable relations between researchers and practitioners meaning that researchers empower teachers to have agency as equal design members (Yip et al., 2017) and enact equity in co-design during shared decision-making.

Conceptual framework

We use Bratteteig and Wagner's (2016) conceptual framework for decision-making within co-design to analyze teachers' agency via their reported contributions to co-design processes. In this framework, design is conceptualized as a process of iterative decision-making, described as observing something, making decisions to change it, and then evaluating the outcome, which are encapsulated into the following four dimensions:

Creating choices: Exploratory decisions that 'widen the design space' are the most important for power sharing and are categorized as *creating choices*. This dimension encompasses the significant decisions that impact the project's trajectory, or *design vision* (Bratteteig & Stolterman, 2007). Decisions that ratify an existing choice or trivially widen a choice are not considered creating. For example, teachers who actively generate new possibilities are creating choices, while teachers who provide binary feedback on an existing tool are not.

Selecting choices: While creating choices widen the design vision, *selecting choices* narrow it. These are choices that concretize commitments to a design pathway after considering alternatives, e.g., choosing to create a piece of custom software, rather than using Google Docs, to support a new curriculum module.

Concretizing choices: Once ideas are selected, abstract ideas must be turned into concrete artifacts. The choices involved in materializing these are *concretizing choices*. Unlike creating or selecting choices, concretizing choices neither expand nor narrow the design goals, but realize the choices already made. For instance, co-designers turn learning objectives and assignment proposals into lesson plans.

See/Evaluating choices: After a design artifact is developed, participants engage in *seeing/evaluating choices* by testing the design and reflecting on its features, values, and use implications while negotiating with researchers and one another whether to apply it to an existing design or reject it. For instance, a teacher who provides feedback on a language translation feature for a website based on their experience using the tool.

Methods

To evaluate teacher agency in recent co-design research in LS, we reviewed papers published in ISLS venues within the last three years (January 2022 to June 2025) that use co-design with teachers, coding each for their description of the types of decision-making choices described above.

Literature search criteria

We constrained our search to papers published in ISLS venues (ICLS, CSCL, JLS, and ijCSCL). We conducted a keyword search for publications with titles or abstracts that include the terms "co-design" and "teacher" or their synonyms, "participatory design", "collaborative design", "cooperative design", "co-creation", "educator", and "instructor", resulting in N=111. From this set of results, we excluded 45 posters, resulting in N=66 papers. We then selected those that explicitly used co-design as a methodology to create innovations directly with practitioners, resulting in N=41 publications. Two papers referenced co-design that was described in a prior non-ISLS publication which we included as they met our other criteria. In total, we analyzed N=43 papers (13 long and 30 short conference papers, plus 1 journal article) using the decision-making framework.

Paper content analysis

We analyzed each paper for clear evidence of each decision-making dimension. Initial coding was performed independently by the first author; then the second author blindly coded a random subset of papers (8). All discrepancies were minor and were negotiated, agreed upon, and applied in a second cycle of coding by the first author. To determine the presence of a dimension, we used deductive analysis (Fife & Gossner, 2024) to identify explicit descriptions of decision-making where we could clearly discern the design choices, who made them, and how they were included in the design process (i.e., incorporated or rejected). If a design choice was attributed ambiguously between researchers and teachers, using vague language such as "we", "researchers and teachers", "co-design team", etc., we labeled it as "*unclear*". If there were no descriptions of co-design choices by teachers, we labeled them as "*does not exist*". We also noted the types of artifacts being created in each co-design process, as well as whether the co-design process built upon an existing tool or started from scratch.

Results

We found that descriptions of teachers' decision-making within co-design was alarmingly limited, that co-design in LS is almost exclusively focused on STEM education, that researchers conducting co-design are almost always located in North America, and that most co-design focuses on the production of curriculum.

Figure 1

Coded Characteristics.



Each column represents one paper. The presence of a colored box indicates the given dimension or attribute was present while (?) within a box indicates that we coded this attribute as “unclear.” Full conference papers are denoted with (*) and journal articles are denoted with (**). The remainder are short conference papers.

Decision-making dimensions

Figure 1 (A) shows the decision-making dimensions described in each of the papers. Fewer than half of the papers (19/43) included clear descriptions of teachers *creating choices*. Even fewer papers (14/43) clearly described teachers *seeing/evaluating choices*, many of which overlapped with the papers where teachers *created choices* (7/43). Over a third of papers (17/43) either did not describe any teacher choices (8/43), had unclear descriptions (6/43) or only included one of either *concretizing choices* or *selecting choices* (3/43). While the presence of multiple dimensions is not required for successful co-design, a greater breadth of teacher decision-making does indicate deeper and more equitable teacher involvement. Around 37% (16/43) of the papers included multiple dimensions—all of which included *seeing/evaluating choices* or *creating choices* as one of the dimensions.

Co-designed resources

Researchers and teachers designed four kinds of resources: curricula, technologies, professional development programs, and teacher frameworks, visualized in Figure 1 (B). Most projects (32/43) were curricula. Four curriculum projects also included another type of artifact (2 technologies and 2 professional development programs). The other 11 papers reported on the co-design of technologies (5), teacher frameworks (4), and professional development programs (2). We also characterized whether the co-design aim was discipline-related and, if so, whether it was STEM or non-STEM. As shown in Figure 1 (C), nearly all the projects (39/43) were disciplinary, with 37/39 being STEM-related. More than half of the projects (22/43) began from an existing prototype or artifact. Only one project topic was initiated by teachers and brought to researchers for co-design.

Discussion and conclusion

The use of the term “co-design” signals to readers that the researchers have elevated and valued teachers’ perspectives. However, not all LS papers that claim to utilize co-design truly reflect egalitarian design processes. As we showed above, we find limited evidence of teachers exercising choice, and thus limited teacher agency. Bratteteig and Wagner (2016) stress the primary importance of *creating choices*, followed by *seeing/evaluating choices* (p. 466), both of which are evident in fewer than half of the papers we reviewed. Still, several papers in our review have successfully reported teachers making either or both types of choices and describe how those

choices shape design products: Billings and Linn (2024) report on *creating choices* saying, “the teacher, Gregory initiates the idea of integrating the story of Henrietta Lacks into an existing genetics unit” (p. 683). Dadkhahfard and Takeuchi (2022) report on *seeing/evaluating choices* by quoting a teacher saying, “Students that are reading this wouldn’t understand ‘Ooh, you’re different than me because you’re Black’” (p. 1023). Researchers describe their response to the teacher’s feedback saying, “In the second cycle of designing the illustrated story, we started testing different racial representations in the illustrated story” (p. 1023). While we do not claim that every project must include teachers in every type of decision-making to be considered authentic co-design, the limited decision-making by teachers leads us question how well LS researchers are constructing equitable power structures in their collaborations with teachers. We propose two possible explanations for our results and discuss their implications.

Possible Explanation 1: Insufficiently Empowering. One possible explanation for our results is that co-design practices in LS are insufficiently empowering of teachers, that LS researchers who claim to be co-designing are not sharing agency with teachers as much as their framings of their work would suggest. If this is the case, then it is imperative that the community re-evaluate our use of co-design, as both a methodology and a term. There are many legitimate ways researchers involve various stakeholders during a project (i.e., a user study) that are not (and do not claim to be) co-design. When researchers do engage in co-design, it is essential that the ethos of co-design is upheld and power is shared with teachers to make *creating, selecting, concretizing, and seeing/evaluating* choices both about the design of educational innovations and the conduct of research.

Possible Explanation 2: Insufficiently Described. An alternative explanation for our results is that co-design is under-described: researchers are not publishing the specifics of the decision-making. If so, this is a better state of affairs than that offered by our first possible explanation, still one that falls short of co-design’s principles. It is essential for co-design papers to include clear discussions of the specific decisions made by teachers, or by researchers, and for the locus and flow of decision-making to be clearly described. Without such descriptions, readers cannot determine what expertise informed decisions, or the negotiated quiddity (Garfinkel, 1988) of the joint production of an educational innovation. Under description cannot simply be attributed to paper length, as there were short papers that did discuss specifics of decision-making and long papers that did not. A richer description of co-design preserves the meaning of the term “co-design” as a specific form of teacher-researcher collaboration and decision-making, as opposed to a catch-all term for any form of participatory design, user evaluations, or teacher partnerships. In co-design research, the insights gained through the co-design process itself—who made decisions, what, and why those choices were made—is a research result, complementary to studies of an innovation’s implementation, though, established norms regarding paper content may contribute to these details being excluded. We suggest researchers utilize a participatory framework, like Bratteteig and Wagner’s (2016), to report what teachers say and choose to make teacher agency visible. Such efforts would advance co-design in LS, providing a clearly documented history of past approaches to further future work.

Reflection on co-design in the learning sciences

Beyond co-design quality, we must also consider co-design outputs. Most papers we analyzed involved co-design with existing prototypes, meaning a significant portion of the foundational decisions were made without the participating teachers. Even when that was not the case, all but one project was envisioned by researchers, meaning the topics and artifacts created represent researchers’ priorities—not teachers. While the teachers likely benefited from these co-designed artifacts, there remains the question of what teachers would *most* want if given the agency to initiate these research projects themselves with researchers’ support. Nearly all projects we examined were STEM-focused, a finding we conjecture is a function of American funding agencies prioritizing STEM education, as most of the studies we analyzed were conducted by North American researchers. There was a relative lack of projects where teachers co-designed technologies. This is concerning considering the ubiquity of technology in K-12, which makes it especially important for teachers to influence technology projects from their earliest design phases, an effort we are not yet seeing at a substantial scale in the literature. These limitations might be addressed by researchers co-designing with teachers at more points in the research process, including co-conceptualizing and co-writing research proposals. Seeking out ways to address teachers’ needs may offer opportunities to understand teacher learning, develop useful technologies, and construct cross-cutting school reforms.

Sincere co-design is rooted in equitable collaboration between people who value each other’s diverse perspectives and make decisions together. To understand how co-design is conducted in LS, we reviewed the types of choices teachers made in recent co-design papers. Though the generalizability of our analysis is limited by the inclusion of only works published in the core ISLS proceedings and journals, our findings have important considerations for the LS community, nonetheless. We argue that LS researchers must be descriptive, thorough, and precise in their use of co-design as a methodology and a term, to both preserve the knowledge created through these processes and uphold its commitment to disrupting traditional power dynamics.

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