

# Hello World: Grounding the Design of Generative AI in Learning Communities and Contexts with Sociocultural Theories

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## Abstract

While generative artificial intelligence (genAI) has enabled designers to create tools and learners to seek support in new ways, learners are also noticing how the introduction of these tools into their learning environments has decreased their social learning opportunities. In this position paper, we use sociocultural learning theories, which view learning as inherently social and shaped by the culture of its context, to argue for the importance of social learning, illustrate why genAI tools should not foreclose these opportunities, and suggest that designers must consider the details of the context in their work. Sociocultural learning theories also highlight the role of HCI methods like co-design as a path forward for designing genAI tools that are effective for supporting learners.

## CCS Concepts

• **Human-centered computing** → **HCI design and evaluation methods**.

## Keywords

Social learning, sociocultural theories of learning, co-design, learning sciences

### ACM Reference Format:

Kristin Fasiang, Melissa Chen, and Eleanor O'Rourke. 2026. Hello World: Grounding the Design of Generative AI in Learning Communities and Contexts with Sociocultural Theories. In *Proceedings of Conference name (Conference acronym 'XX)*. ACM, New York, NY, USA, 4 pages. <https://doi.org/XXXXXXXX.XXXXXXX>

## 1 Introduction

The rise of generative artificial intelligence models (genAI) has led to exciting advances in tools that provide personalized, easily-accessible support for learners and new ways for students to use out-of-the-box genAI tools like ChatGPT in their learning. However, an unsettling trend stands out: as AI tools enter learning environments, students report that social learning opportunities are being foreclosed, lowering motivation and raising concerns about well-being [10, 20].

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Conference acronym 'XX, Woodstock, NY

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ACM ISBN 978-1-4503-XXXX-X/2018/06

<https://doi.org/XXXXXXXX.XXXXXXX>

Decades of research in the Learning Sciences, a subfield of education research, shows that people learn by interacting with the people and environment around them; this means social interaction is a necessary part of, not an accessory to, learning [19, 24]. However, the social foundations of learning are often given less attention in educational technology (edtech) design. Blikstein and Blikstein analyzed edtech developments over time, finding that many modern genAI learning tools adopt “instructionist” approaches that focus on efficiently transmitting knowledge to individual students, separating students from their community and the context in which learning happens [3]. They warn if this trend of “impersonal” technologies continues, students will not be supported to engage with real-world problems [3].

In this position paper, we explore how sociocultural theories of learning can jointly define productive boundaries for genAI in education and motivate methods for working within those boundaries. First, we review sociocultural learning theories that consider the discipline, social interactions, and tools that shape how learning happens. We argue that even in technology-heavy disciplines like computing education, social learning has important practical impacts. Then, we discuss how sociocultural learning theories motivate adopting a co-design approach and present case studies that illustrate how co-design attunes designers to communities' needs and to social and cultural aspects of learning.

## 2 A Sociocultural Theory Lens on the Design of GenAI for Learning

### 2.1 Sociocultural Theories: The Zone of Proximal Development and Communities of Practice

Learning scientists increasingly use sociocultural theories to understand learning [19], starting from an “observation that all intelligent behavior [is] realized in a complex environment – a human-created environment filled with tools and machines, but also a deeply social environment with collaborators and partners” [18]. One theory that is key to understanding the importance of social interactions in learning is Vygotsky's “Zone of Proximal Development” (ZPD). The ZPD is where learners can do things with the assistance of others that go beyond what they could do alone [24]. Thus, Vygotsky argues that learning (i.e., developing new capabilities) happens in the ZPD and is inherently social.

A cultural perspective further sees learning as *situated*, meaning that it is emergent from and shaped by community practices and norms. In this way, as learning happens through social interaction, a particular *community of practice* [26] shapes the content and form of these social interactions, whether implicitly or explicitly [17]. In this view, as students spend time in a particular community of

practice (CoP), their “learning is about *becoming* as well as *knowing*” [16] (emphasis added), as they come to identify themselves with the people and practices in a particular community.

## 2.2 Differing Views on Technology’s Role in Learning

Researchers have debated the degree to which computers can perform the same functions as human tutors. Some designs reflect the belief that AI can take on a guiding role and lessen the need for human involvement by creating personalized, genAI tutors (e.g., Khanmigo [12]) and genAI avatars for practicing language skills (e.g., Duolingo<sup>1</sup>). However, a sociocultural view argues that direct interactions with people are as valuable for helping students learn through their ZPDs as the tools (e.g., AI tutors) students use [7]. Furthermore, foundational theory on CoPs argues that while technologies can be important parts of functioning systems, learners need human partners who are able to “negotiate meaning and to recognize an experience of meaning in each other” [26]. This is because, through the lens of CoPs, learning is a process through which learners engage with people in a knowledge community, simultaneously developing their own competencies and shaping how the community functions. Because of the importance of engaging in communities, we argue that some educational roles cannot be replaced by genAI, even as technology advances.

## 2.3 Practical Importance of Social Learning

To illustrate what might be lost if genAI tools take on social roles, we draw on examples from our field of computing education research that show human interaction’s impacts on learning. Technology is integral to learning computing, yet studies show that social learning remains crucial. In computing, peer-to-peer interactions were found to be the most powerful predictor of student persistence [2]. Social learning more generally supports computing self-efficacy [27], or a student’s belief that they can achieve a goal [1]. This may be because social interactions help students understand disciplinary practices [5] and recognize their growing expertise [15]. Furthermore, teaching assistants provide both content-specific instruction and emotional support in ways that encourage computing students to persist on tasks [14].

However, social learning with genAI may not be as successful as it is with humans. For example, introductory computing students were skeptical of receiving emotional support when interacting with an AI [6]. Students also reported that using genAI reduced the quality of their social interactions, lowering their self-reported engagement, interest, and motivation [10, 20]. This is important because students’ interactions with peers build on a shared class context, allowing them to get grounded support and develop community in ways they cannot with genAI alone [8]. Lastly, genAI may foreclose peer mentorship opportunities, lessening students’ exposure to the “hidden curriculum” in ways that can harm equitable participation in computing [10]. So, we believe a productive boundary for the design of genAI tools is that they should not replace social learning, but should respect and grow from existing social relationships.

<sup>1</sup><https://blog.duolingo.com/duolingo-max/>

## 2.4 Co-design as a Method for Working within Boundaries

Sociocultural theories emphasize how learning is social and situated, highlighting how each context is different, even when it may appear similar to other contexts. Thus, sociocultural theorists like Lee have called for designers to consider the unique conditions of each context and what principles transfer between them [13]. This call can help chart a middle path between the Learning Sciences, which attends to contextual details, and edtech, which can sometimes abstract away details to focus on generalizability and scale. We argue that a method like *participatory design*, a common method in HCI that fosters collaborations between designers and community members to identify needs and create solutions, can help designers pay attention to sociocultural specificities and integrate designs with existing social relationships, while also contributing generalizable design principles. Co-designing AI technologies with communities is an effective way to surface needs, ideas, and constraints that ground designs and might otherwise not be considered (e.g., [21, 22]).

## 3 Case Studies

We present four case studies of co-design to (1) show how established design methods can center social relationships in genAI design, (2) propose ways of designing that do not take genAI and existing structures as a given, (3) illustrate how co-design can be implemented in classrooms, and (4) challenge designers to involve communities in the training of genAI models, not just in designing products that use those models.

### 3.1 Using Established Co-Design Methods to Surface Sociocultural Understandings

Co-designing with students using common design methods, like personas and storyboards, can help researchers critically examine a learning context and understand how it shapes design. Wang et al. used these techniques when co-designing an AI tool to support social interactions in an online course [25]. Students used a persona activity to present their and their classmates’ needs. Learning what was challenging about getting to know their peers (the social conditions) and why (the cultural conditions) helped the designers understand the course context. This co-design approach also allowed students to shape the design process by expressing preferences for the tool’s dialogue style so it would align with their existing ways of communicating. In later design activities, students presented challenges and opportunities for a proposed tool, where their cultural understandings and resistance to certain uses of AI (particularly concerning ethical impacts) became useful constraints. From this co-design process, the authors outlined design principles, including that AI for supporting online students’ social interactions should mediate introductions, then step back to let human interaction drive social learning. This represents a successful case of using co-design to understand and tailor solutions for a specific community’s social and cultural needs. However, as the authors acknowledged, they assumed that AI was the solution to the problem, potentially constraining the design space the student co-designers considered.

### 3.2 Engaging Context to Co-Design Expansive Futures

Taking a broader approach to design can help illuminate unexpected applications of genAI, challenge underlying institutions, respect students' social and cultural resources, and respond to community needs. Chang et al. engaged in this type of expansive work through a participatory and speculative design workshop with youth focused on designing for more supportive interpersonal relationships [4]. Researchers first introduced students to a "perceptual bridge": visiting cooperative housing near their community to see how people can be in relation with each other in potentially unfamiliar ways [4]. Then, students were invited to design around the question, "what kinds of collaborative / learning spaces do you want in the future world?" [4]. Though not grounded in existing technologies, students' designs were analyzed by technologists who linked these designs to existing technical capabilities. Finally, the researchers and students translated their designs to classrooms, considering what form designs must take to fit that environment.

Beyond using social and cultural understandings as resources for design, Chang et al. show how existing social, cultural, and institutional contexts shape design in ways that are difficult to disentangle. Namely, when students brought their designs into the classroom context, they adapted their designs to align with their schools' institutional norms [4]. This highlights how context is an essential factor in any design, as it constrains or expands design possibilities, and returns us to Lee's question of what can and cannot be transferred between contexts [13].

### 3.3 Co-designing in Classrooms with Students

While the previous studies included workshops implemented in informal and formal learning environments, the co-designed artifacts were not implemented in the environments they arose from. To understand how co-designed artifacts can be adopted and evaluated within classrooms, we take inspiration from Gelderblom's work co-creating the curriculum for a senior-level HCI course with the students in the class [9]. The author, who is also the course professor, sought to teach participatory design (PD) by involving students in a PD process. In the first class, the professor briefly presented on a set of HCI topics, then students rated their preferences for which of these topics to include in the course. For homework, students created data visualizations of the ratings, showing how the PD process can create authentic learning opportunities for students to develop proficiency in PD and course content (in this case, visualization). The professor then organized the course to fit students' interests. Throughout the course, the professor paid attention to "implicit feedback" of course attendance, participation, and grades. Toward the end of the semester, the professor also solicited summative feedback to inform their teaching for the following semester.

Gelderblom's work shows it is possible to conduct PD within the structures of a classroom in ways that tightly interweave with course learning goals [9]. While Gelderblom invited students to co-design course topics [9], we believe that such approaches could also be applied to designing class norms and practices around genAI and genAI tools themselves with students. A teacher could borrow from Gelderblom's approach and briefly introduce genAI to inform students' initial ideas to inform students' design ideas. However,

it may be beneficial to continue to revisit and revise these designs throughout an academic term by leveraging natural mechanisms for formative feedback that already occur in classrooms (e.g., midterm exams, exit tickets, etc.), in addition to summative evaluations at the end of a term. Finally, Gelderblom reported that the PD process in their classroom led to more "collegial relationships" between teachers and students [9]. This might be particularly beneficial in the context of genAI in learning, which can be contentious. Using co-design can help teachers and students see one another's perspectives, support students in developing a perspective on a complex issue, and grow their agency to use their voice.

### 3.4 Centering Community Understandings in the Foundations of GenAI Tools

Given the costs of curating data, training a model, and evaluating its performance, it can be challenging to design genAI tools that take the social and cultural context of the community into account in every aspect of its design. However, we illustrate the value of looking further down the genAI development pipeline by highlighting Jones et al.'s approach to involving community partners and centering their sociocultural understandings while creating a large language model (LLM) that could help teach and revitalize the Maori language (Te Reo Māori) in Aotearoa New Zealand [11]. The team collected data by interviewing people in Te Reo Māori, which specialists carefully transcribed. The authors then hand-selected a benchmarking dataset that exemplified a representative variety of native speakers (e.g., by gender, formality, etc.). After creating the model, language and data specialists collaborated to understand and correct the model's outputs. Here, social understandings of how their community used language demystified errors and cultural understandings guided corrections of mistranslations that would prevent the community from accepting the model. By centering Māori expertise and voices throughout the work, Jones et al. took an approach that "grows from the land and the people" [11], resulting in a design that is interwoven with their social and cultural ways of being and is reflective of their practices.

Jones et al.'s work lets us wonder: what would it look like for genAI tools to grow from a particular learning community's needs and cultures in every stage of design, and to give communities agency in their design and implementation? We have seen that out-of-the-box genAI tools do not accurately and respectfully represent diverse peoples and cultures, as seen when Black Muslim girls struggled to use these tools to enact their creative visions in a critical AI literacy workshop [23]. Could genAI tools built by and with these girls result in models that better enable their creative visions?

## 4 Conclusion

Sociocultural learning theories highlight how genAI tools should not replace human roles in social learning, helping set a productive boundary for design. They also support arguments for attending to sociocultural details when designing educational technologies. We call for designers to do this through methods like co-design, which enable us to design in ways that respect the critical role of humans in learning and meaningfully serve our communities.

## Acknowledgments

We thank the Delta Lab for their feedback. The second author is supported by a National Science Foundation grant (DGE-2234667).

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