

Engaging Youth in Envisioning Artificial Intelligence in Classrooms: Lessons Learned

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November 2022



Rapid Community Reports

Workshop Outcomes

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When young people deliberate the role of artificial intelligence in supporting classroom collaboration, what possibilities, design considerations, and ethical concerns emerge? What are the implications of students' insights and apprehensions for (1) the design of artificial intelligence (AI) collaborative partners and (2) the development of spaces to generate ideas and elicit feedback from students?

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Abstract

As an essential activity toward responsible innovation (Stilgoe et. al, 2013), the NSF National Institute for Student-AI Teaming (iSAT) conducted a 5-day interactive summer workshop with high-school-age youth. Youth named and explored their hopes and concerns about the use of artificial intelligence to support collaboration in classroom environments. We share the findings from this workshop and describe their implications for the design of AI classroom technologies.

Keywords

Collaboration, pedagogical agents, artificial intelligence, responsible innovation, co-design, participatory design research

Suggested Citation: Chang, M. A., Philip, T. M., Cortez, A., McKoy, A., Sumner, T., & Penuel, W. R. (2022). Engaging youth in envisioning artificial intelligence in classrooms: Lessons learned. *Rapid Community Report Series*. Digital Promise and the International Society of the Learning Sciences.
<https://repository.isls.org/handle/1/7670>

Overview

The NSF National Institute for Student AI-Teaming (iSAT) was founded in 2020 to develop and study artificial intelligence (AI) technologies for the next generation of collaborative learning technologies. Central to the Institute is a commitment to “responsible innovation” (Stilgoe et al., 2013), where innovators take responsibility for the impact of the technologies they design by being in genuine dialogue with relevant communities throughout the entire process from conceptualization to product release and beyond. Stilgoe and colleagues present four pillars of responsible innovation: anticipation, reflexivity, inclusiveness, and responsiveness. Towards fulfilling the dimensions of anticipation and inclusiveness, one of the institute-wide performance goals was to develop methods for co-designing technologies, tools, and processes based on ongoing formative feedback from students, teachers, families, community partners, and others.

To start, we decided to closely engage students—a group that will be most affected by new AI technologies but often have limited or negligible input about their purpose and design. In particular, we focused on youth’s dreams, hopes, and concerns about the use of AI to support collaborative learning in classrooms. Aspiring to think imaginatively and expansively about possibilities that might extend beyond the existing constraints of schooling, we termed these sessions *Learning Futures Workshops* (LFW).

We report on the structure and findings from the LFW and discuss their implications for the design of (1) new AI technologies for the classroom and (2) spaces in which youth consider and envision such technologies.

Workshop Attendees



The LFW was planned and facilitated by iSAT researchers from UC Berkeley, CU Boulder, and Project VOYCE, a youth advocacy organization based in Denver, Colorado.

Through an application process that asked youth to describe their interest in the virtual workshop, we selected thirty high school youth from three states (Colorado, California, Oklahoma). Our original intention was to focus on youth from areas in the vicinity of our universities. However, since four students unexpectedly applied from a school in Oklahoma, we decided to include this group to increase geographical diversity. There were no prerequisites for the workshop. Many youth joined the workshop with the express intent of meeting other youth who were interested in the topic of AI. Through intentional recruitment and outreach, nearly all the participants were youth of color. Out of the participants, twelve self-identified as Asian-American or Pacific Islander, seven self-identified as Latinx, six self-identified as African American, two self-identified as Native American, and two self-identified as white. Fifteen youth identified as male,

thirteen youth identified as female, and two students identified as non-binary. Participants were compensated \$300 for their participation over the five days of the workshop.

We held the workshop in late July of 2021 when COVID-19 remained a significant concern amongst facilitators and participants. We, therefore, decided to hold the workshop remotely. While this allowed us to recruit participants from multiple states, participants were required to have access to a networked computer, Zoom video conferencing software, and a working microphone and video camera. While no youth selected for the workshop declined because of this requirement, we are cognizant that constraints of remote access might have prevented some from applying.

Workshop Structure



Our workshop was grounded in commitments to co-designing technology with impacted communities. Our approach to co-design was grounded in the framework of participatory design research (Bang & Vossoughi, 2016), which attends to issues of power in partnering relationships. Bang and Vossoughi argue that reorganizing these powered relationships to become more equitable—or remediation as Gutiérrez et al. (2009) describe—can open a broader range of social or educational possibilities. Through the deliberate design and facilitation of the workshop, we hoped that the participants would actively lead us in considering what role technology (and artificial intelligence in particular) has to play in enabling those expansive futures.

[We] elected to design a workshop where youth were positioned as experts in both school and AI technology.

Through this lens, we elected to design a workshop where youth were positioned as experts in both school and AI technology. In doing so, we sought to disrupt a common pattern in technological co-design where technologists, by virtue of being the only ones with technical expertise, dictate many critical steps of the design process. This pattern of powered relationship

limits the scope of possibilities that may emerge. For instance, a common participation model invites participants to describe their needs or ideas, which are then pruned by researchers, who are versed in the capabilities of the technology. The researchers then propose potential scenarios or technical interventions (Davidoff et al., 2007; Holstein et al., 2019) that the participants test out.

Our Learning Futures Workshop sought to create a space where youth are encouraged to not only identify problems they see as being important in classrooms, but also propose, develop, and experience the technical proposals, consistent with the highest level of participation in co-design spaces (Hart, 1992). The highly interactive workshop introduced students to AI concepts and perspectives from science & technology studies (STS), while also facilitating opportunities for students to build on their expertise and everyday experiences with AI and technology. Throughout the workshop, the facilitators emphasized that they did not have clear answers for how AI might be used in classrooms; they shared both optimism and apprehension about the prospects.

Additionally, rather than drawing an artificial line between researchers and youth (Kirshner, 2010), the facilitators stressed that they would jointly define the problems and possibilities for the workshop with the youth. They encouraged participants to explore expansive AI possibilities, regardless of their immediate technological feasibility.

Below, we describe the driving question for each of the five days of the workshop and provide a brief summary of the discussion on each of those days.

Day 1 and Day 2: Introduction to Artificial Intelligence, Machine Learning, and Socio-Technical Perspectives

Facilitators shared iSAT's research goals and provided an overview of AI that highlighted its affordances (as defined by iSAT's researchers in AI and Natural Language Processing), the importance of data in how AI models are trained, and the existence and risks of societal biases in AI models. As shown in Figure 1, the youth shared how they experienced AI through their personal experiences with social media recommendations and personalized advertisements.

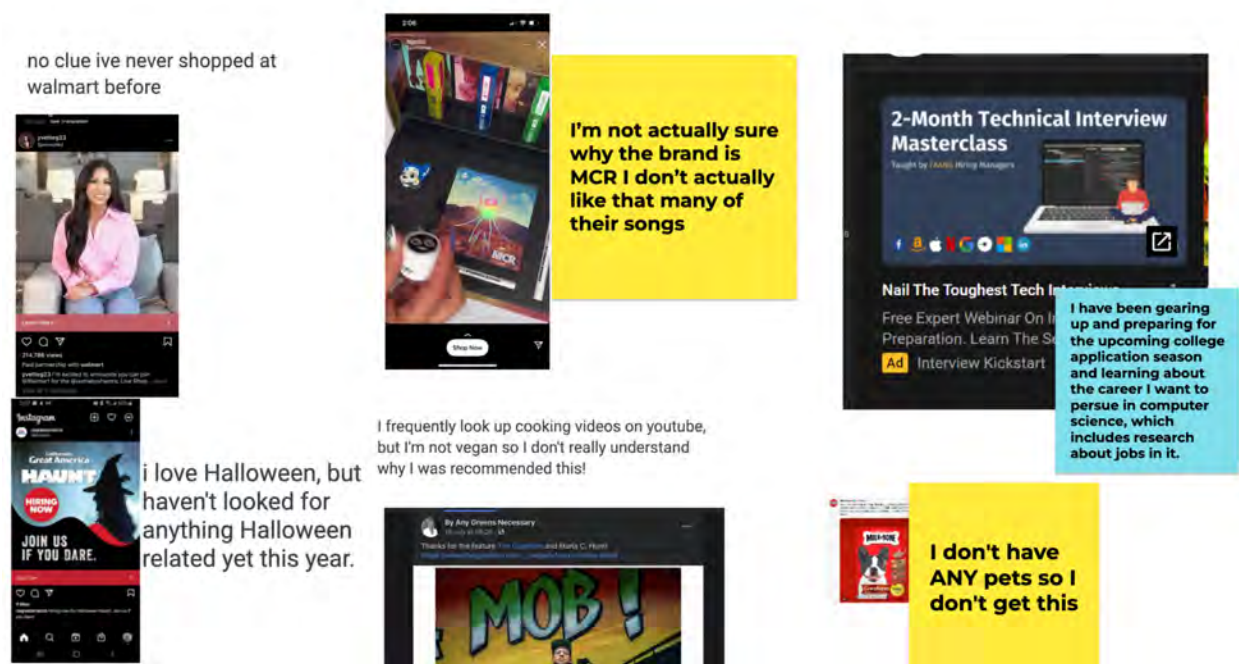


Figure 1: Participants listed out where they encountered AI in their cell phone apps and described their intuition for why an AI made a particular inference.

Day 3: Bridging Real Collaboration with the Ideal

In small groups, each with a facilitator, workshop participants were asked three critical questions consistent with our approach of surfacing deep structural issues in schooling and taking steps towards making those changes a reality through transformations in the “here and now” (Bang & Vossoughi, 2016): What does ideal collaboration look like? What does collaboration look like in

your classrooms today? How might you use AI to help transform the collaboration you experience in schools into a form of ideal collaboration? Finally, the youth were given an opportunity to independently consider how both AI and non-AI possibilities could be used to bring about their ideal forms of collaboration.

In their individual and collective imagining of ideal collaborations, many of the participants emphasized the importance of positive relationships in collaboration. As Ethan¹ synthesized from his group's discussions, ideal collaboration should be "friendly and encouraging," coming from a place of "understanding each other," "accepting students for who they are," "dropping ego," and explicitly promoting "equity" in the group. Ethan's group noted that these human-relational characteristics were often not a reality in their actual classrooms. Another participant, Elysia, described classroom collaboration in the following way: "I feel like collaboration shouldn't be dreadful. In my classroom, it's dreadful many times. Maybe some teachers should not force it upon others, because some people are just really uncomfortable with it." While the youth were able to propose many possibilities for AI in their classrooms, it was often a challenge to see how those proposals would make their ideal collaborations possible. For instance, one common proposal was for an AI agent that matched collaborators together based on shared learning "styles," interests, or by grade (e.g., grouping together students with high grades with students who have low grades). Youth-generated proposals such as this sought to automate practices they already encountered in classrooms, but did not create new possibilities for collaboration that went beyond the good/bad student binary.

Day 4: Developing AI Possibilities

Using the ideal AI possibilities proposed during the previous day's activity, the youth were given a worksheet (see Figure 2 for worksheet completed by one group) that concretized the practical implications of the AI agent. On the worksheet, youth were encouraged to consider how the AI would be embodied in a physical classroom, what actions or interventions the AI agent should take, what the AI agent would need to infer about a collaboration, and what data would be necessary in order to make that inference possible. Drawing from co-design approaches that pose ethical issues as a first-class design principle (Luria & Candy, 2022), youth were also asked to explicitly describe what they would *not* want as they formulated responses to each of the prompts (e.g., what actions or interventions should the AI agent *not* take). Cognizant of the complex and context-dependent tensions between data privacy and the perceived benefit of sharing that data (Slade et al., 2019), our worksheet explicitly made connections between data, data inferences, and the embodied agent. In small groups, the youth decided on a few AI features they desired and completed the worksheet.

¹ All names used in this Report are pseudonyms.

In thinking through the data to which the AI agent should and should not have access, the youth demonstrated awareness of the difficult tradeoffs between privacy (e.g., how much data to share) and the efficacy of an AI agent's interventions.

In thinking through the data to which the AI agent should and should not have access, the youth demonstrated awareness of the difficult tradeoffs between privacy (e.g., how much data to share) and the efficacy of an AI agent's interventions. For instance, in a discussion about an AI agent that would pair people off based on learning styles, one student, Melinda, expressed skepticism about whether a "survey about how people learn" would be sufficient to effectively train an AI agent, given that people may have different learning styles "depending on the time of the

day" and who they were working with. In particular, the youth felt that the aspects of their personal relationships (e.g., romantic interests) should be off-limits for an AI agent collecting data in a classroom. At the same time, they acknowledged the importance of personal relationship data for effective training and inference of the AI model.



Figure 2: Development Worksheet for AI Possibilities, completed by one group of six participants

Day 5: Theater of the Oppressed (Boal, 1985)

Inspired by past work that demonstrated the value of human experience and performance during the co-design process (Giaccardi et al., 2012; Klemmer et al., 2006; Forlizzi & Battarbee, 2004), we chose to evaluate the ideas from the previous days through a dramatic improvisation-based activity. Youth first created and scripted two collaborative scenarios involving an AI agent. These

scripts were then used as part of an adapted *Theater of the Oppressed* activity (Boal 1985), where the youth had an opportunity to interrupt the script and improvise different versions of an idealized AI partner to support collaboration. Participants and facilitators alike stepped in with a variety of proposals, including a “hypeperson” that encouraged people to acknowledge other’s expertise, a shepherd that kept youth on task while collaborating, a social justice bot that called out microaggressions, and a “friend” who helped youth who struggled with school to find a time to do homework. Throughout the process, the youth took the opportunity to explore how they would customize the AI, including how the AI would talk to them. The following exchange about the hypeperson AI illustrates such an interaction:

Amanda (facilitator): What if the AI is a hypeperson, what does that look like, what can that look like? That was a role I was toeing, trying to be myself. My AI would say y’all, my AI would say “go off,” my AI would probably say bro, I feel like I would have it do movements, I would need it to do a snatch and a grab, I need my AI to do all them

Kelly: I would love that, imagine if the AI was like “hold on child”

Amanda (facilitator): My AI would be in conversation, my AI would not be stiff. That’s what the AI would do ... for me.

Kelly: When I think about data, I wouldn’t mind if the AI knew stuff about me and personalized what my needs and what my culture and what my mannerisms, the diction to where I would talk. It would be more fun and more effective and it could talk back to me in the way that my friends talk back to me or the way I would interact with my friends. It would be like a friend rather than a computer, if that makes sense.

Juan: I am not cool with that. It is very scary. Having a computer that is accessible... and everyone knows that is specially a random AI that maybe doesn’t have the best security in the world, that’s a scary thought.

Key Issues



Relationality is critical to ideal collaboration

As we have started to show previously, the participants consistently expressed their desire for affirming interactions where their contributions to the classroom and small group discussions are heard, attributed, and have meaning. Inspired by collaborative experiences out of the classroom (e.g., participation in team sports, making music, creating art, cooking dinner, etc.), the youth highlighted that such experiences are often limited in their classrooms. In thinking about how to achieve such forms of collaboration, youth proposed that an AI partner could connect them with others “like them” or with others who have shared interests—a proposal that a participant, Myron, proclaimed was just “like *Tinder!*” As we demonstrated before, some participants problematized groupings that would only reproduce or

reinforce existing classroom dynamics and envisioned the possibilities of AI to put unlikely collaborators in dialogue as a means to promote learning and mitigate social tensions. Many participants emphasized that widening the reach of communication, for instance through social media, does not amount to genuine collaboration.

Learning is inextricably about *human* relations. Emerging out of a global pandemic that necessitated remote learning for the participants, the youth expressed concerns that overreliance on AI-human interactions could further limit their opportunities for human-human interactions and the accompanying potential to become better people. Cognizant that AI technologies need data generated by humans and that their use in schools might be more in the interest of technology development than student learning, one participant, Riley, remarked that the proliferation of AI in classrooms would lead to students “just ending up helping the agent become a better robot.”

Because research on AI for education has largely focused on the relationship between a single learner and a pedagogical agent, relatively little attention has been directed toward building AI agents that help human actors in a classroom develop better relationships with one another. While this finding has proven to be generative in our discussions with technologists, we observe that the youth are also naming fundamental, systemic issues in the institution of education. A *Tinder* for making friends may be thematically consistent with the goal of relationality, yet falls significantly short of the institutional change necessary to bring about classrooms where youth can feel heard, respected, and valued by their peers, teachers, and other adults on campus.

Tendencies to design for “other” students and implications for Participatory Design Research

The participants spoke extensively about the shortcomings of group work in schools, where students who perform well on the official measures in schools and are motivated by grades—implicitly and explicitly referring to themselves—need to put in a disproportionate amount of time and effort to ensure their own success. To mitigate this imbalance, they saw opportunities where AI could support “other” students to perform better in class. One such idea, which was raised by participants in multiple groups, was for an AI agent that would put youth with good grades alongside youth with poor grades. These participants argued that such an AI agent would eventually reduce the likelihood of being held back in class by peers who did not grasp the material. In a similar vein, several participants proposed AI possibilities that would keep those youth from “goofing off and slowing down the class.”

When prompted to reflect on their own classroom experiences, however, many participants recognized that seemingly off-task conversations were crucial to nurturing relationships and expanding the possibilities of learning. Further, when asked whether an AI partner that would keep *them* (as opposed to “other” students) on task would be helpful, they stated that they would find such technology intrusive. Eddy, a student who had proposed the idea, maintained its usefulness but expressed more hesitance: “It’s good to have, but the AI needs to be more of a person to know we’re getting annoyed... to a certain extent.” Nearly each of the breakout groups across Day

3 and Day 4 of the workshop contained instances where participants held contradictory purposes for technology with respect to themselves and other students, highlighting often overlooked nuances when design feedback is elicited from students.

The tendency to design for the “other” illustrates a key challenge in our approach to Participatory Design Research (PDR). While our efforts to “re-mediate” the powered relationship between the researchers and the participants proved to be generative, we found that PDR should be extended to also re-mediate powered relationships and hierarchies that exist within the focal institutional context (e.g., schools). In the context of schools and our workshop, participants who designed for the “other” adopted deficit-oriented framings towards those who did not perform as well in school, leading to inequitable proposals designed for youth lower in the perceived academic hierarchy.

Agency over an AI partner

As we saw through our five days, the youth envisioned a wide variety of possibilities in which an AI could support them in collaboration. Initially, many youth conceptualized an AI assistant, like Amazon’s Alexa or Apple’s Siri. Activities such as *Theater of the Oppressed* allowed the participants to embody potential AI partner archetypes, which opened the door to an even larger spectrum of possibilities, many of which were new and surprising to the facilitators. In thinking through the AI partner, participants raised many considerations that include not only the AI partner’s dialect and linguistic styles, but also its embodiment, actions, level of affectation, and use of dialect and linguistic styles. As we showed previously in the interaction between Kelly and Juan, Kelly expressed enthusiasm about an AI agent that spoke to her like a friend, one who reflected her own “mannerism,” “culture,” and “diction.” In contrast, Juan viewed this as being a violation of privacy and preferred for the AI agent to speak uniformly to all. We witnessed similar interactions in both breakout groups during the *Theater of the Oppressed* Activity. Across these differences, we observed how the youth advocated for agency over the AI partner. Rather than a universal agent for all, the youth wanted to be able to customize the agent to their needs and preferences.

The importance of youth agency extended far beyond the details of embodiment for the AI agent. In all instances of the *Theater of the Oppressed* activity, youth described how an AI agent that intervened during collaboration in simplistic or undesirable ways would simply be ignored or destroyed. In response to an AI agent that gave him orders (e.g., to stay on task), Sasha declared, “If the AI was being bossy, someone would mess it up. Someone would just smack the thing... I think it would be really easy to ignore. What authority does it really have?” Ultimately, if the AI agent is designed such that youth are deprived of the opportunity to customize the agent to their context or expectations, technology designers run the risk of underwhelming adoption or even complete rejection of a potentially important learning tool.

Data and Functionality Transparency

Beyond customizing the embodied agent, the youth discussed the importance of data privacy. The design worksheet introduced on Day 4 of the workshop proved to be generative for youth to consider what data and inferences from that data would be off-limits. In particular, as we illustrated

in the excerpt about an AI that matches collaborators based on learning styles, youth often drew a boundary between their personal lives (e.g., relationships, where they spent time outside of school) and their school lives. We note that these boundaries often varied by youth. Kelly considered her comfort with data sharing: “Would I want the teacher to know what I do in my free time? I love shopping all the time, buying stuff, retail therapy, I wouldn’t mind if my teacher knew that. I would like it if my teacher knew I had a life, that I wasn’t doing my homework all the time.” In this case, Kelly was willing to give up personal data to a teacher if it meant that teachers would be more likely to view her as a full human and improve her relationship with the teacher. We view these discussions as a call for transparency and clarity about what data is being collected, such that youth are able to make their own data privacy decisions based on what an AI partner might do for them.

Not only did participants weigh what information they were giving up, but some also voiced concerns about the entities with whom their data would be shared. Some youth expressed concerns about an AI agent that “snitched” on their private discussions. One participant, Stephen, declared that should an AI agent snitch, “someone would mess it up. Someone would just smack that thing.” At the same time, youth argued that some possibilities for the AI agent were not possible *without* snitching. In one discussion following one iteration of the *Theater of the Oppressed* activity, Eddy, Ailene, and Janelle considered the implications of an AI partner that would snitch on them when they were going off-task during classroom collaboration. Eddy and Ailene emphasized that they would ignore this AI partner’s directives unless it could report them to a teacher and Janelle stated that she didn’t see the point of an AI agent unless it had “power” and “respect” in the classroom. Extrapolating from these remarks, researchers should carefully consider how students’ reactions to snitching may subvert AI possibilities that inherently require snitching to be effective.

Recommendations for Future Work



Findings from the Learning Futures Workshop have implications for the design of (1) new AI technologies for the classroom and (2) spaces in which youth consider and envision such technologies.

The following are three principles that should be considered in the design of new AI technologies for classrooms. *First*, AI technology should not detract from opportunities for youth to seed, nurture, and extend human relations. In the best case, AI should support these interactions. *Second*, Students desire agency over AI partners that might be present in collaborative spaces, including the ability to turn the partner off/on and the ability to toggle between different modes/personas that a partner might support. *Third*, there should be transparency and clarity about (1) what data students are asked to provide to an AI partner and (2) what the AI partner is inferring from that data, which may seem unrelated to the data students provide. Students should have sufficient information to explicitly weigh data privacy against the value added by the AI partner.

The tendencies to design for “other” students highlight profound challenges to creating spaces in which designers of new technologies can envision new possibilities with students. While the participants were clear about what they valued in authentic collaboration, the prevalent forms of group work in their schools prompted them to produce ideas where technology would provide remedial instruction to their “less able” peers or regulate their “less motivated” classmates. Given their limited ability to effect change, they proposed technological solutions to the deep structural and relational problems in schools that were out of their direct control. Yet, their enthusiasm for nearly each of these proposals was diminished when they envisioned themselves as the object of the AI’s functionality—a process that required careful facilitation and the juxtaposition of students’ statements from across multiple days. A product focus group or research engagement without these features could easily lead to erroneous conclusions about what students want in an AI partner—designs that students admitted they would ignore or sabotage if they were a reality.

In retrospect, we did not co-create sufficient opportunities for the participants to name and analyze systemic inequalities in schooling and the institutional impediments to the types of collaboration they desired. The participants were often constrained by trying to solve complex systemic problems through simple technological solutions that were insufficient. We had limited success in envisioning AI partners that enhanced human capability within or beyond the current conditions. If new AI technologies are to go beyond superficial fixes that often exacerbate the underlying problem (Eubanks, 2018), our efforts toward responsible innovation need to support participants in weighing the affordances and constraints of technology in relation to the multitude of systemic factors that limit the possibilities of learning and collaboration in schools.

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Resources

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Acknowledgments

We are grateful to Azarias Jones, Vanessa Roberts, and Tiera Tanksley, who were instrumental in the planning and facilitation of the Learning Futures Workshop. This research was made possible by NSF grant DRL-2019806 and NSF grant #2021159. Rapid Community Reports are supported by the National Science Foundation under grant #2021159. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.