Make-a-Thon for Middle School AI Educators

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ABSTRACT

AI curricula are being developed and tested in classrooms, but wider adoption is premised by teacher professional development and buy-in. When engaging in professional development, curricula are treated as set in stone, static and educators are prepared to offer the curriculum as written instead of empowered to be leaders in efforts to spread and sustain AI education. This limits the degree to which teachers tailor new curricula to student needs and interests, ultimately distancing students from new and potentially relevant content. This paper describes an *AI Educator Make-a-Thon*, a two-day gathering of 34 educators from across the United States that centered co-design of AI literacy materials as the culminating experience of a year-long professional development program called Everyday AI (EdAI) in which educators studied and practiced implementing an innovative curriculum for Developing AI Literacy (DAILy) in their classrooms. Inspired by the energizing and empowering experiences of Hack-a-Thons, the Make-a-Thon was designed to increase the depth and longevity of the educators' investment in AI education by positively impacting their sense of belonging to the AI community, AI content knowledge, and their self confidence as AI curriculum designers. In this paper we describe the Make-a-Thon design, findings, and recommendations for future educator-centered Make-a-Thons.

CCS CONCEPTS

• **Computing methodologies** → *Artificial intelligence*; • **Social and professional topics** → **Computer science education**.

KEYWORDS

hackathons, AI literacy, teacher professional development, K-12 education

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1 INTRODUCTION

In the past few years, artificial intelligence (AI) education has expanded into a field of its own. As AI tools surge in classroom use [27], AI literacy - the competency to critically evaluate, communicate with, and use AI technologies [26] - has been deemed important knowledge for today's students. There are now recommended guidelines for elementary and secondary school students [12] as well as curricula and interactive tools [4, 7–9, 31, 47]. Though there is growing consensus as to the importance and relevance of AI education in today's society, it is still inaccessible to a majority of students [10]. This problem is due, in part, to a need for teacher professional development (PD) that not only helps teachers develop their own AI literacy, but also prepares them to make AI curricula accessible and inclusive for their students in a variety of content areas.

We sought to address this need by examining how to create a teacher PD experience that empowered teachers as AI curriculum designers: educators who can understand, use modify, and create AI curricula. The need for teachers as AI curricula designers stems from a disconnect between those developing AI curricula and those implementing these curricula. Many elementary and secondary school educators do not have formal training in AI [6, 25], and many of the teaching resources available are created by academic researchers and industry professionals. This process for developing and implementing AI curricula can create an imbalanced relationship wherein AI curricula are treated as complete and unalterable and teachers are trained to implement curricula as written. Yet, to make AI curricula more inclusive and accessible for a diverse body of students, teachers need to play a more central role in the design process.

To address this need, we developed a novel teacher professional development (PD) experience to empower teachers as curriculum designers and as leaders in AI education. This work sits on the shoulders of a number of models for teacher PD in AI, many of them inspired by computer science (CS) pedagogies [2, 11, 14, 29, 33, 48]. One PD method that centers teachers as designers is co-design. Co-design bridges the divide between researchers and practitioners, bringing them together to collaboratively design curricula [16, 43]. However, PD methods using co-design need to be carefully designed to center teachers as design partners (not just learners) [46].

How to design AI co-design PD to empower teachers to modify and make new AI curricula for their students? This question drove us towards literature on hands-on, creative events in which participants take the lead in applying their technical knowledge to create something new in a community of learners, experts, and enthusiasts. Ultimately, this search led to to literature on Hack-a-Thons. Hack-a-Thons are typically intended to speed up the process of innovation [21], but they have also been opportunities for participants to strengthen connections, learn something new, and dedicate time to making [40].

Inspired by this literature on co-design and hack-a-thons, the *Make*-a-Thon (MAT) was designed as a two-day PD workshop for AI teachers. It was *culminating* experience of a year-long PD, called Everyday AI (EdAI), in which participating teachers studied and practiced implementing an innovative AI curriculum, called the Developing AI Literacy (DAILy) curriculum [22]. The intent behind the design of the MAT was to empower teachers as designers by (a) reinvesting in the teachers' sense of belonging to a community of practice that valued their contributions (and to which they valued contributing) and (b) connecting them to a larger community of AI experts and practitioners using AI in the real-world.

2 THEORETICAL FOUNDATIONS

2.1 Co-design methods

The field of learning science has been enriched with the ongoing involvement of teachers in the design of teaching tools, curriculum design and assessment development, a design process commonly referred as co-design [36]. Co-design with teachers is described as 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" [36]. Co-design processes prioritize the teachers' values and needs in the classroom [13], the contextual usability of the design product, and provide agency to the teachers to make important curriculum and tool design decisions, which is critical to the success and adoption of the designs [36]. Teachers' participation in the design process also promotes their investment in and understanding of new innovations [32].

To achieve this type of co-design, teachers need time to become comfortable with the necessary technical knowledge [1, 24, 37], to form learning communities [11], and to discuss and receive feedback on their work [2]. If these needs are met, teachers can achieve a level of technical knowledge that enables a sense of ownership over the curriculum [6, 15] as well as the confidence to apply the curriculum in the real-world to real-life problems [48]. Without this technical knowledge, teachers need a great deal of support and PD experiences feel rushed, ultimately limiting opportunities for learning and leadership. [20]

The MAT design took this potential issue into account, placing the co-design experience at the *end* of a year-long PD, called Everyday AI (EdAI), in which teachers had time to study AI technologies and practice AI pedagogies. Thus, teachers arrived at the MAT co-design experience with several of the typical barriers to effective co-design removed.

2.2 Hack-a-thons as co-design settings

Emerging from the the field of computing, 'hack-a-thons', or time-intensive co-situated software building sessions, have emerged as a productive setting for co-design [5]. While hack-a-thons are more prevalent in the field of computing involving intense programming, recent work has repurposed hack-a-thons to include several modalities, social contexts, and participatory design activities [3, 41]. Hack-a-thons have focused on designing for social and civic impact and designing socio-technical solutions [34, 38].

Classic models of computing hack-a-thons have several limitations when viewed in the context of inclusive co-design processes since they exclude those that are commonly alienated in the White cis-male technology culture [19]. Given their rigid structure and time intensiveness, hack-a-thons are not inclusive for populations that have work, travel or family-related constraints to participate [41]. Hack-a-thons have also been criticized for their techno-centricism, where given the lack of time, creators prioritize building novel technological solutions and de-prioritize critically reflecting on whether a technological solution is warranted [39]. This is incompatible with principles of inclusive co-design with teachers, where the design prioritizes diverse participants' needs and values [36].

However, there are instances in which the hack-a-thon model has been hacked to overcome some of these barriers. A breastfeeding hack-a-thon demonstrated a modified hack-a-thon to incorporate an inclusive co-design method by designing structures that prioritize participants' needs [18]. This modified hack-a-thon was a successful and equitable participatory design process that generated solutions that prioritize the users' need.

Drawing inspiration from this work and best practices, we structured our hack-a-thon in ways that prioritized teachers' needs and deliberately made space for debate, discussion and reflection in addition to making. Given the power structures associated with 'hacking' that benefit those within computing cultures and motivate building without reflecting on the purpose, we renamed our event to Make-a-Thon (MAT), where we prioritize responsible 'making' of new artifacts, ideas and materials while reflecting on their social impact. The MAT does not prioritize the solutions being technically driven, and makes space for diverse expertise and modalities, debate and advocacy.

3 DEVELOPING THE MAKE-A-THON

3.1 Make-a-Thon as part of Everyday AI

Given the challenges teachers may face when participating in co-design of AI education, we purposefully designed the MAT as a culminating experience after a year-long PD program called, Everyday AI (EdAI), which connected new AI teachers with experienced

AI teachers, referred to here as "Facilitators". Facilitators were instructional coaches or computer science (CS) content specialists in partnering school districts, lead instructors and program coordinators from youth-serving organizations, or representatives of regional CS education organizations.

Before the MAT experience, participating teachers and Facilitators engaged in three waves of PD through EdAI: an AI Book Club (ABC), a Summer Practicum, and monthly webinars. Here we briefly describe this PD model and how it scaffolded teachers' AI literacy and implementation of the DAILy curriculum. During EdAI, teachers study and implement lessons and activities from the DAILy curriculum, which includes lessons on AI concepts, ethics in AI, and AI careers. Prior research has established DAILy as an effective AI literacy curriculum for youth ages 10-14 [22] from which teachers can learn about AI with the support of the ABC [23].

The first wave was ABC, designed to introduce teacher participants to AI: its history, mechanics, processes, and the socio-political implications of its use in today's diverse society. This introductory PD experience was modeled after a book club [23]. Teachers and Facilitators met weekly for 1.5 hours for 10-weeks (20 hours total) to read and discuss shared literature about the history and development of AI [30]. During these meetings, participants were introduced to the content from the DAILy curriculum [9]. ABC meetings also served as opportunities for teachers to connect with other teachers, ask questions, experience the learning activities as students, and reflect on how they might implement the curriculum in their classrooms. Facilitators participated in the AI Book Club by facilitating teacher discussion of the book and DAILy activities.

The second wave of the EdAI PD was the Summer Practicum, a 2-week, 4 hour-day (40 hours total) training in which participants implemented DAILy lessons and activities during a virtual summer camp for youth ages 10-14. Teacher participants engaged in the practicum as co-teachers - observing each other teach, co-teaching, debriefing with each other after teaching the DAILy lessons. Facilitators supported the practicum in a wide variety of ways including conducting student recruitment, facilitating the day-to-day logistics of the summer camp, and joining teacher debriefs at the end of each day to support teacher reflection on lesson implementation.

The third wave consisted of monthly webinars that occurred throughout the subsequent academic year. Webinars were flexibly designed to a) allow teachers to share and discuss their classroom experiences from implementing the DAILy curriculum, and to b) reinforce teacher knowledge of the curriculum content through mini-lecture style presentations and discussions. In this way, the webinars were designed to sustain a community of practice among AI teachers and reinforce teacher learning from the previous two waves. Facilitators were invited to join the monthly webinars. The MAT was implemented at the end of these three waves of the EdAI teacher PD.

3.2 Overview of MAT

The MAT was an in-person event held over two days on MIT's campus in March 2022. The event took place on a Saturday and Sunday, given that it was held during the school year and was the most convenient time for many educators to travel to Massachusetts. Most of the program was held in a conference room, and there were opportunities through meals and campus tours for participants to socialize and explore the area. Travel, lodging, and food were covered for all educator participants.

3.3 Brainstorming Problems

In preparation for the MAT weekend, teacher participants joined a one-hour webinar that guided them through an ideation process to identify problems that they had encountered while teaching with the DAILy curriculum. We included language that guided them towards problems with the curriculum when we conducted the clustering and ideation activity, but did not constrain them to only identifying problems in that area. Design of this preparatory element of the MAT was informed by prior research in co-design [46], which suggests that empowering teachers as leaders in curricula design may require (a) identification of authentic problems [45, 46] and (b) teachers expertise [44, 46]. Due to the fact that we wanted to empower teachers to identify problems important to them, we did not constrain them to specific problem areas.

The brainstorming process involved creating and thematically clustering post-its using Miro, an online platform designed for collaborative interaction. Teachers created post-its in response to guiding questions, i.e., "I was struck by..." and "I see an opportunity to..." and "How might we...." Each question was followed by time for teachers to cluster similar post-its, which resulted in 14 clusters describing authentic problems and hinting at possible solutions. Teachers then signed up for clusters that they were most interested in. It was on these decisions that the MAT interest-based groups were formed for each project.

3.4 Expert Panels

To engage teachers with a diverse, contemporary, and refreshing perspectives about AI technologies, we invited eight AI practitioners to share their experience and expertise in different AI-related areas. The topics of the speaker sessions include (1) the intersection of privacy law and AI; (2) using zines to creatively reflect the effects of AI; (3) identifying ways to prevent the proliferation and use of technologies that harm our communities; (4) investigating on whether the development of machine learning technologies supports holistic education principles and goals; (5) empowering voices and values in the design and policy-making of robots; (6) data activism curriculum challenging power inequalities. Each speaker session is followed by Question & Answer session when teachers can have more in-depth discussion with AI experts.

3.5 Making Sessions

During the MAT weekend, three, 2-hour making sessions (total: 6 hours) were designed for teachers to work in interests based teams on a collaborative co-design project with AI experts. Each team was formed based on the project ideas the community proposed during a prior brainstorming session (described above). All ideas and project artifacts originated from the educator team members. AI experts rotated between different teams as "mentors" to provide any support and facilitation needed, leaving the leadership of the design project to the teachers. Each of the 3 sessions had a goal. The first making session aimed to build on ideas generated during the brainstorming session (described above) to finalize a problem statement that the team would address during the MAT. The second session guided teachers to develop prototypes of solutions or processes that would address the problem statement. During the third session, teachers finalized, documented, and presented their projects to all MAT attendees (see 5.2 for Project Summaries).

3.6 Virtual Participation

Seven of our participants were not able to attend the event in person. For these participants, the *Expert Sessions* were live streamed through a microphone enhanced Zoom session. Virtual participants worked together during the *Making Sessions*. A facilitator virtual group moderated to make sure everyone present had an opportunity to speak and participate. The group used Google Slides and other collaborative tools to make their project online.

4 METHODS

4.1 Participants

Participants in the MAT were teachers who took part in the EdAI PD program. The teachers represented three school districts in the Midwestern, Southeastern and Mid-Atlantic regions of the US. Recruitment for the EdAI program involved solicitation from district partners in each region (e.g., school district coordinators, and principals), who facilitated the distribution of invitations (i.e., letters and flyers) describing the EdAI project and inviting teachers to participate.

Twenty-five teachers and facilitators from the EdAI project participated in the MAT. There were 14 teachers (11 participated in person, 3 virtually). Teachers represented a variety of disciplines: 29% (4) CS and 29% Science, 21% (3) math and 21% English Language Arts, 14% (2) Social Studies, 6% (1) Art and 6% all subjects. Many teachers taught multiple disciplines. Their school districts served student populations that are largely from underrepresented groups in STEM and Computing (59%, 90% and 85% respectively). Seventy-nine percent of the teachers were from underrepresented groups in STEM and CS; 64% (9) were female: 50% (7) Black, 6% (1) Hispanic/Latinx, and 6% (1) Asian/Pacific Islanders.

There were 11 Facilitators (9 participated in person, 4 virtually). Facilitators' disciplines represented less variety than teachers: 45% (9) CS, 18% (3) Social Studies, with some overlap. Twenty-seven percent (3) indicated that they taught all subjects. Ninety-percent of the Facilitators were from underrepresented groups in STEM and CS: 82% (9) were female; 27% (3) Black, 18% (2) Hispanic/Latinx.

4.2 Data Collection

MAT participant data was collected in the form of surveys, interviews and observations from both teachers and facilitators. All participants signed a consent form allowing the collection of video and audio data during the MAT. Participants were told that they could request that their information not be recorded during any part of the session, and that would not affect their participation in the MAT.

- **Pre-survey:** All participants were administered a pre-survey before participating in the MAT. Questions asked about participant expectations for the MAT overall and for potential collaborations with peers. Participants were also administered a five item survey aimed to assess their sense of belonging within the EdAI community, where they rated statements on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree).
  Items on the MAT pre-survey were modified versions of items from the General Belongingness Scale (GBS) [28], i.e., "Q5_1 - I feel connected to other teachers in the EdAI community," and the Sense of Belonging Scale (SoBS) [17, 42], i.e., "Q5_2 - If I needed help, I would feel comfortable reaching out to other teachers in the EdAI community," and, "Q5_5 - I feel comfortable reaching out to other teachers in the EdAI community to learn from them." The former was used to get a measure of the teacher's general sense of belonging, while the latter two were validated in an academic context which was better tuned to a learning community. Since our teachers were part of a PD experience, contextualizing their SoB within a learning community made sense.
  Two other items about feeling cared for "Q5_3 - Other teachers in the EdAI community care about my work" and feeling that teachers can contribute to the community "Q5_4 - I feel that I can contribute to the EdAI community" were inspired by Price & Applebaum [35], who validated their instrument in a context very different from ours, a community of museum guests. We were inspired by two of their items because they address the construct of agency, or how much individuals felt they could give and receive from the community. As designers of a co-design experience, these measures were important to us as measures of how participants felt about how the community valued their creations.
- **Post-survey:** All participants were administered a post-survey immediately after the conclusion of the MAT. The post-survey consisted of the same set of sense of belonging items as the pre-survey, as well as open-ended reflection questions asking them to reflect on their experience of designing, their perception of their design product, and their learnings during the MAT.
- **Survey Analysis:** Participant responses to the pre- and post-survey were paired (N=20). Of the 20 respondents, 12 were teachers and 8 were facilitators. Responses were analyzed both as aggregated data and as individual items. Cronbach's alpha was calculated and the survey was found to have a good internal consistency, $\alpha = 0.85$.
  Effect size was calculated using data from the pre and post groups. A Shapiro-Wilk test was used to test normality and was found significant for all items. Thus, due non-normality of the data, a Wilcoxon Signed-Rank test was used to test significance pre and post.
- **Observation notes and Video recordings:** All MAT sessions including speaker sessions, participants' design sessions and presenter sessions were recorded using a GoPro camera and a external USB microphone. In addition, every MAT team was allotted one observer from the research team who took observation notes that were relevant to the participants' design activities, collaboration, challenges encountered, and problem-solving approaches.

- **Design Journals:** Google Slides (with pre-made templates) were used to facilitate group work during the making sessions. In each session, teams were encouraged to complete goals (i.e. create a list of materials for your project, write a list of goals) and summarize what they worked on using Google slides.
- **Interviews:** Three months after the workshop, participants could sign up for post-interviews. In these semi-structured interviews, participants were asked questions about the MAT experience and the MAT design process. Six of the educators volunteered to participate in these interviews, 3 of whom were facilitators and 3 educators.

5 IMPLEMENTATION EXPERIENCES AND CHALLENGES

5.1 Selection of Problems

Nineteen EdAI participants (9 educators, 10 facilitators) were present in the webinar. They came up with 17 distinct problem clusters, 14 of which were directly related to the curriculum, and the remaining three were focused on expanding AI literacy more broadly. After clustering the problems, teachers and facilitators ranked which problems they would like to work on during the MAT. Five groups were chosen based on this ranking, and included three topics directly related to the curriculum and two broader topics.

5.2 Project Summaries

Five teams, each made up of 4-7 educators, defined and created their own projects over the course of 3 working sessions. In this section, we detail each of their problem addressed, stakeholders and design.

5.2.1 Online Workspace for AI Discussing Integration Ideas and Sharing Modified Activities. Team A solved for teacher's need to integrate DAILy into their required curriculum *"due to the strict district requirements that make it difficult to have AI-specific lesson time."* They set up the *AI Plug and Play* Slack workspace for teachers to discuss possible integrations by subject and share materials, which would be stored in Google Drive folders.

5.2.2 Zines for Administrative Support. Team B *"address[ed] institutional barriers"* to teacher implementation of EdAI, focusing on school administrators as stakeholders. They sped through the design journal's problem statement, project summary, and project goals prompts, and began designing a flyer as their prototype during *Making Session 1*. Later, one of the speakers introduced the concept of a zine—a letter-sized paper folded into a small magazine of 8 pages—, which inspired a team members to design a zine for school administrators in addition to the flyer with support from the zine instructor during *Making Session 2*. In a follow up interview, that member remembers thinking the zines *"seem[ed] fun. . . "* and was interested in *"something more hands on"* from the *Expert Sessions*.

5.2.3 Adding Project-Based Learning (PBL) to DAILy. Team C worked on adding a project-based activity or capstone to enrich the curriculum and *"allow students to apply their AI knowledge to solve a problem in their community."* The end result would be PBL examples for other teachers to draw inspiration from, one of which was integrating Scratch and an EdAI lesson that uses Google's Teachable Machine to detect image classes. They chose this because two team members who had worked together on the curriculum before weren't very much interested in the DAILy curriculum's PBL activity of YouTube Redesign. In the interview, one member said:

> *"We have to get [the students] using the goal of Teachable Machine right now, even if they just export it onto to squander the Scratch version you guys [create]."*

Teachers also talked about PBL ideas around Generative Adversarial Networks (GANs) and students using GANs to create posters to share with the community.

5.2.4 Social Media Campaign for Public Awareness. Team D designed a social media campaign to reach policymakers and the general public. *"Our society needs a way to become aware of AI's impacts, both positive and negative, because AI has impacts on our agency and lives."* The campaign, aimed to raise awareness of the impact of AI in everyday life and celebrate AI's achievements, would have three pillars or themes: Learning More, Advocating for Equity, and Changing Policy. Team D recognized *"There is a need and desire for agency over technology and knowledge of AI."*

5.2.5 Integrating a DAILy Lesson Across Content Areas. Team E worked together to adapt a DAILy lesson *"to benefit educators from various content areas and all of their diverse students, especially those who currently are not being exposed to AI."* Initially, the team wanted to structurally align the DAILy curriculum with NGSS standards but it didn't think there was enough time to accomplish that. *"The slide deck was helpful [...] just keeping us on task as far as what we needed to [...] making sure we had a product."* Instead, they decided to work on one DAILy lesson that each group member would adapt by *"modifying the input [data] and the directions for each content area."* This collaboration widened the possibility of integrating AI education for members of the team.

> *"[Adapting a lesson to different content areas] helped [the team] see that it's not as difficult to start thinking in that direction; like, 'I can use this for something else [and] I can also pull it out at any time during the year.'"*

5.3 Community of Practice/Sense of Belonging

Participants answered five questions regarding their sense of belonging to the EdAI community. There was a statistically significant increase in the aggregated questions from pre- to post ($Z(20)=236.50$, $p < .001$, Cohen's $d=0.71$). There were statistically significant increases in Q5_1 "I feel connected to other teachers in the EdAI community" ($Z(20)=11.0$, $p=0.01$, Cohen's $d=0.90$), Q5_3 "Other teachers in the EdAI community care about my work." ($Z(20)=13.5$, $p=0.04$, Cohen's $d=0.79$), and Q5_4 " I feel that I can contribute to the EdAI community" ($Z(20)=5.0$, $p=0.02$, Cohen's $d=0.74$).

6 DISCUSSION

This paper explores a co-design hack-a-thon model as a way to empower teachers as AI curriculum designers and leaders. The Make-a-Thon was intentionally designed to increase participating educators' sense of belonging, AI content knowledge, and confidence in AI curriculum design. Data from the event has illuminated successes and areas for improvement in future educator MATs.

The *Expert Sessions* were designed to have educators hear directly from AI developers and researchers who are doing timely research at the intersection of AI and society. In designing these speaker sessions, the hope was that educators could hear directly from researchers and translate this knowledge into new materials. While the speakers were engaging to educators, some found it difficult to connect the sessions to their work with students. Only one of the five groups (Team B) incorporated what they learned from the expert sessions directly into their work by incorporating zines into their prototype.

Additionally, the *Expert Sessions* focused on new AI research in AI and Society. It did not introduce technical concepts nor reinforced existing ones. In interviews with educators, some expressed their desire to strengthen their technical knowledge and confidence. Additionally, none of the MAT projects focused on the technical understanding of AI. Teachers shared that they chose to focus on other, non-technical projects because the DAILy curriculum is already very technically robust.

As evident by teams A, B, D, and E, it was surprising to see that the majority of groups decided to create a project for other stakeholders in the community. We anticipated that educators would design curricula or lessons for their students, but many chose to create artifacts that would make other educator's lives easier or obtain buy-in from key educational stakeholders, such as administrators or parents.

The *Making Sessions* provided important opportunities for community building, especially in sharing and learning from others' experiences. For example, in Team C, two of the educators wanted to come up with project examples of real-world AI applications for their students. During conversation about AI in their communities, another group member shared their students' experiences with gunshot recognition technology. The group ultimately decided to focus their MAT project on this example. The dedicated time to share experiences proved meaningful, as the discussion ultimately led them to the type of project they were looking for.

It is clear that the educators attending the MAT came into the weekend with an existing sense of community, which they had been cultivating virtually for the past year. Their sense of belonging survey responses were high to begin with, though there was additional growth over the weekend. In final interviews, participants spoke about how the MAT was dedicated time to share their experiences with other educators in informal ways. The shared experience of teaching DAILy laid a foundation that educators could build on in the short, two-day event, which further strengthened the sense of community among EdAI educators. One educator shared,

> It was wonderful to go in and see impressions of what teachers thought of lessons and teachers ideas... It was just refreshing to see that there were other people who were shoulder to shoulder with me, but they weren't in the same city... It was very, very restorative, to see people having the same kind of struggles or trying to implement... I'd bring up certain things about the curriculum [and they would offer ideas].

Survey questions in 5_3 and 5_4 were centered around the participants' sense that they could help and influence the EdAI community [35]. There were significant increases and large effect sizes with both of these questions, pre- to post. Providing help to the community was demonstrated in Team B. After one educator discussed difficulties obtaining buy-in from their administrators, group members supported them in making an informational zine for the administrators. While the flyer didn't necessarily help everyone in the group, all members provided support in the project.

In designing the making portion of the event, we chose to focus more on the design process than a final product. This meant that most teams ended up creating an idea and proof of concept, but not something that was ready for their classroom. In the interviews, educators shared that they did not implement anything from the MAT because it would require more work. While a tangible artifact might help educators feel like they "accomplished" something for their practice, there was a clear benefit to the other skills that educators developed over the weekend: sharing teaching experiences and dedicated time to talk through implementation problems.

7 RECOMMENDATIONS

We have identified design recommendations for others interested in facilitating MATs as a part of a teacher PD program:

Design Recommendation #1: Cultivate a community of practice prior to the event Our MAT was at the end of a one-year teacher learning progression in which the same community of educators learned, taught, and discussed artificial intelligence. This community laid a foundation for building more meaningful connections over the weekend.

Design Recommendation #2: Communicate connections between speaker content and existing AI knowledge We suggest providing time at the end of each session for educators to discuss how this content relates to the existing curriculum, and what other information they learned that they might want to incorporate into their teaching.

Design Recommendation #3: Provide opportunities for Growth in Technical Understanding Future MATs should create space for technical discussion, and reinforcing technical ideas with one another.

Design Recommendation #4: Create opportunities for educators to share, shared experiences, as these conversations helped them connect with other educators and gave them new ideas for their own practice.

Design Recommendation #5: Develop a design journal Virtual participants used the journal as prompts for discussion and staying on track of the task. The design journal was also useful for teams that would not be present for all the working sessions, and wanted to work at a faster pace.

Design Recommendation #6: Have participants leave with a tangible artifact We suggest that future iterations of the MAT prioritize something, even if small, that educators can take back to their classroom.

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