Running an Online Synchronous Culturally Responsive Computing Camp for Middle School Girls

Jaemarie Solyst
jsolyst@andrew.cmu.edu
Carnegie Mellon University
Pittsburgh, PA, USA

Tara Nkrumah
tnkrumah@asu.edu
Arizona State University
Tempe, AZ, USA

Angela Stewart
angelast@andrew.cmu.edu
Carnegie Mellon University
Pittsburgh, PA, USA

Amanda Buddemeyer
amb467@pitt.edu
University of Pittsburgh
Pittsburgh, PA, USA

Erin Walker
eawalker@pitt.edu
University of Pittsburgh
Pittsburgh, PA, USA

Amy Ogan
aeo@andrew.cmu.edu
Carnegie Mellon University
Pittsburgh, PA, USA

ABSTRACT

Computing education is important for K-12 learners, but not all learners resonate with common educational practices. Culturally responsive computing initiatives center and empower learners from diverse and historically excluded backgrounds. Recently, a number of educational programs have been developed and curated for an online experience. In this paper, we describe an online synchronous culturally responsive computing (CRC) camp for middle school girls (ages 11-14 years old) and report on challenges and successes from running the camp curriculum four times over the course of a year. We also describe core iterative changes we made between our runs. We then discuss lessons learned related to building rapport and connection among learners, centering learners of different backgrounds in an online synchronous environment, and facilitating reflection on power and identity aimed at positioning learners as techno-social change agents. Lastly, we offer recommendations for running online CRC experiences.

CCS CONCEPTS

• **Social and professional topics → Computer science education**; **K-12 education**; **Computing literacy**.

KEYWORDS

culturally responsive computing, online learning, out-of-school time learning, computer science camp, middle school

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1 INTRODUCTION

There is a lack of diversity in computing, with fewer women, people of color, and women of color [16]. Research shows that learners develop life aspirations early in the K-12 pipeline [10], an ideal time to build excitement and comfort with computing. Culturally responsive computing (CRC) aims to engage and embolden a range of learners, center learners' identities and experiences, connect learners to each other and their communities, and position learners as techno-social change agents [19]. With the abrupt shift to virtual learning at the beginning of 2020, we explored the creation of an online synchronous CRC curriculum for girls in middle school (ages 11-14 years old). Our work incorporates frameworks of culturally responsive teaching and computing pedagogies [12, 19, 20], as well as critical arts-based methods. We rely on critical arts-based methods, gaming activities, and image theatre, e.g., from Augusto Boal's revolutionary methods through the arts known as the Theatre of the Oppressed (TOTO). Boal's objective is to emancipate the oppressed from unequal power-sharing by exploring and reflecting on the social barriers to equity [3]. Some social barriers discussed include issues of racism, sexism, and classism in TOTO sessions. However, germane to this study is the impact of power relations and identity development on student engagement (i.e., girls and girls of color) in the field of computer science. We identify 'power' as systemic structures that influence the way individuals experience life in a state of marginalization or privilege. We consider the term 'identity' as relating to the categorization of socially constructed traits to determine treatment based on ones' status.

The three main principles of culturally responsive teaching, critical to our program's goals, are asset-building (valuing learner voices and building on what they know), reflection (critically analyzing and decomposing existing power structures), and connectedness (feeling a sense of connection among learners and outside communities) [12]. With additional focus on encouraging techno-social change [19], the goals of our CRC program are to:

(1) Engage learners with computing and provide basic knowledge of CS concepts
(2) Integrate educational CS content with a focus on power and identity
(3) Position learners as techno-social change agents, encouraging critical analysis of tech and computing
(4) Be inclusive of and center a range of learners

We ran our CRC camp four times, updating our curriculum and activities to better reach these goals. We report on our experiences in developing and iterating the camp and describe challenges we faced and recommendations in three multi-part lessons learned: (1) striking a balance between CS concepts and power & identity content, (2) flexible logistics for different learners and times of the school year, and (3) understanding "engagement" is multifaceted and looks different online. This work aims to provide insights helpful for developing CRC educational experiences.

2 CULTURALLY RESPONSIVE TEACHING AND COMPUTING

The style of pedagogy matters in STEM education when engaging disenfranchised groups and people who lack a STEM identity. CRC is informed by culturally relevant pedagogy [12] and culturally responsive teaching [9] research to formulate best practices that engage diverse learners in computing and technology [19]. Guided by three core components: asset-building, reflection, and connectedness, the CRC objective is to produce outcomes for students as techno-social change agents, activists poised to challenge barriers and advocate for change in technology [18]. We further describe the three components to contextualize the goal of CRC.

Valuing student knowledge (asset-building) counters most experiences for girls of color and individuals with identities that are marginalized in traditional school environments [17]. The process of building up the individual begins with setting expectations that diverse ways of thinking are welcomed. Therefore, the teacher creates a learning environment that does not devalue non-traditional/dominant norms. Next, emphasis on critical thinking and problem-posing education (reflection) garners the belief that for societies to thrive and progress towards equity, students have to be trained to critique and actively engage in society [19]. Civic engagement is an important attribute for youth and people of all ages to be aware of self and other individual behaviors that interrupt the flow of social equity. Furthermore, concern for humanity is key and develops from one's ability to form a sense of responsibility to self and to the community (connectedness) [17]. In general, education is designed to prepare individuals as thinkers with the capacity to care for self and take part in the building up of the community. The level of responsibility varies from each individual, yet the expectation remains for everyone to share in the cultivation of societies. Collectively, these three components help to transform groups, especially those of historically excluded populations, shifting unequal power dynamics that hinder social equity.

CRC camps are an ideal way to support youth from historically excluded backgrounds in learning CS. Out-of-school time (OST) programs can contribute to learners developing personal, academic, and social skills [7] and can be especially helpful for at-risk youth in learning STEM [13]. STEM camps have been found to have a positive impact on students' attitudes towards and interest in STEM [14, 15], with potentially positive and long-lasting effects [4, 11]. Due to the switch to online learning, some CRC programs have moved to be virtual. Most recently, Braswell et al. (2021) investigated the effectiveness of an online synchronous CRC camp for Black and Latina middle school girls, with an emphasis on the camp eliciting confidence in learning computing [5]. Woordward et al. (2020) describe how a CRC curriculum can leverage creativity to support heightened interest in computing education [24]. However, to our knowledge, little prior work has explored experiences of online synchronous virtual CRC OST programs from a lessons-learned standpoint. We strive to contribute to filling this gap by offering unique lessons learned from multiple iterations of our camp with actionable recommendations.

3 CRC CAMP PROGRAM

We ran a virtual synchronous CRC camp four times in a year. Camps A, B, C, and D took place in between October 2020 through early August 2021. All of our camps were run on Zoom (https://zoom.us), where we recorded sessions and saved chat logs. Some survey data was collected to understand learner demographics and backgrounds. Learners could type in their racial identities or select one or multiple from a list, as well as report their gender identity. Other measures not germane to the experience report were also collected. In all camps, participants were middle school girls in 6-8th grade (ages 11-14 years old) and were compensated for their participation and contributions to this research at the rate of $10 per hour. Some of the authors facilitated the camps, playing a role in the data collection as research-actors [21] or interacting educator-researchers [6], rotating between leading sections of the curriculum as instructors, observers, or notetakers. Due to our focus on culture and identity, we also include demographics of instructors. In the following subsections, we describe the general flow of the curriculum and types of activities we had in all four camps. We then detail individual camps and participants, as well as noteworthy differences between runs in more depth.

3.1 General Curriculum

In each CRC camp, we covered foundational topics in computer science and programming, including variables, conditionals, and loops. Learners coded on an online platform we developed, featuring a virtual programmable robot character named Symmi. The coding interface builds on Google's Blockly visual programming tool (https://developers.google.com/blockly) by adding custom blocks to allow Symmi to move and speak via a speech bubble (Figure 1).

Interactions with Symmi were designed to center the user's assets in the form of their culture, background, and preferences, prompting reflection on how the user's power and identity could inform their programming of Symmi's behavior. We aimed to encourage connectedness by making coding tasks interactive and social [22]. For example, users first familiarized themselves with the interface by programming Symmi to 'greet someone from their culture' and later applied knowledge about variables by programming Symmi to consider different career options. Each coding lesson (one or two per session) included a 10-25 minute lesson with interactive discussion components or activities, which was then followed by a 20-30 minute coding task where learners practiced computing concepts. Learners were encouraged to socialize with one another during programming and were given the option to share out their code to the camp after each task. To activate student engagement for critical consciousness development around issues of power and identity, the open-ended coding task prompts were contextualized using TOTO exercises (i.e., gaming activities, image theatre).

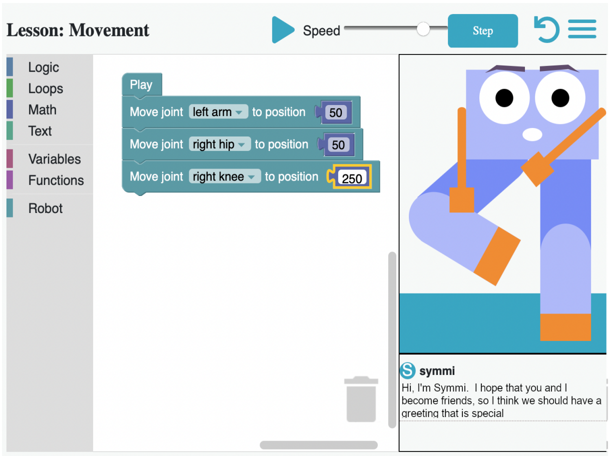

Figure 1: Screenshot of online block-based programming platform with social robot Symmi.

Additionally, in three of the four camps (B, C, D), we included a module on artificial intelligence (AI) and fairness where learners were presented with a lightweight curriculum on how AI works on a high level and algorithmic bias. Learners completed two group activities where they discussed and brainstormed on Jamboards how AI technology could be both helpful and harmful. Two of the four camps (C, D) also included a final project related to AI and fairness, in which they brainstormed their own futuristic AI technologies in a presentation, considered how it could impact different people, thought about training data for their technology, and had the opportunity to share with the rest of the camp participants.

Three of the four camps (A, C, D) included activities purely on power & identity. To build community and de-mechanize the body, we designed activities using Augusto Boal's (2005) Theater of the Oppressed (TOTO) approach [2]. The intent of TOTO is to generate both solidarity and empowerment among participants using acting and physical expression to explore different ways of representing stories while reflecting on the influence of power relations [8]. While sharing out how they experienced the exercise, the facilitator connected it to power and identity. These activities also served as in-depth icebreakers in the first session of each of these camps, allowing learners to share their names and more information about themselves. Camp B only had lightweight starter-question icebreakers at the beginning of each of the three sessions (e.g., asking learners to share their names in the first session and answer questions like 'who is the most interesting person you have met and talked to?'). Pure power, identity, and TOTO activities (i.e., activities without a heavy focus on CS and programming), for example, included learners analyzing the meaning of power in a group discussion, finding objects in their home environment that represent facets of their identity and sharing, or turning their cameras on and off if they identified with a statement (e.g., 'I am a person of color.'). Power, identity, and TOTO activities were dispersed throughout the camps A, C, and D, with at least one in each 2-3 hour session. Camp sessions had one or two 10-15 minute breaks. Across activities, we designed with a learner-centered framework. Weaving together social issues (e.g., racism, sexism, ableism), learners' lived experiences, and critical arts-based methods, the facilitator used this process to contextualize lessons beyond skill development to advance social change through technology. Central to participants engagement is a shared understanding that the learning space is inclusive. To foster inclusivity, an ethic of care was prioritized when establishing the expectations that participants express themselves in the way(s) that were comfortable and natural.

Where applicable, we utilized breakout rooms for a number of activities for smaller group work and coding tasks if there were six or more participants in the session. We had two types of breakout rooms: group work activities (e.g., learners all collaborating together on a Jamboard) and programming task breakout rooms (learners working on their own code for the programming task grouped in breakout rooms together). Across breakout rooms, we generally did not mix learners, keeping the breakout room participants consistent in an effort for them to get to know each other better throughout the camp. During all breakout room activities, we actively encouraged learners to talk to one another.

3.2 Camp Descriptions

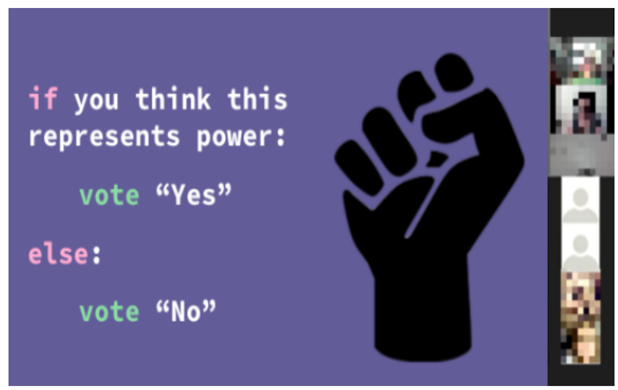

Figure 2: Recreated de-identified screenshot of a session over Zoom and example slide for a group-wide activity on power integrated with the conditionals lesson.

3.2.1 Camp A. In the first iteration of our CRC camp, which we ran in October 2020, learners (N = 10, aged 12-14 years old) were recruited from AmazingGirls (de-identified name), a youth-centered K-12 girls empowerment organization. The girls reported their racial backgrounds as White (4), Hispanic/Latina (2), Hispanic/Latina and White (1), Asian and White (1), American Indian/Alaskan Native (1), and one chose not to say. Nine of the ten learners indicated that they had engaged with some kind of programming before. The three female facilitators identified as Black (2, second and third authors) and Asian (1, first author). The camp took place over three days over three weekends and lasted 2-3 hours in duration per session. Since this was our first run through the camp in general and in a online synchronous setting, we reflected most on challenges related to the virtual experience (e.g., how to gauge and encourage engagement in the program as instructors, overcoming barriers related to technology access), scheduling and pacing the camp, facilitating a social environment where learners may feel comfortable being vulnerable (e.g., asking questions about CS or power/identity content and sharing more about their identity), and better integrating the CS curriculum content with the power, identity, and TOTO activities for a coherent camp experience. We also noted that 3-hour-long sessions, even with short breaks between some activities, seemed to be fatiguing for the learners.

3.2.2 Camp B. In the second iteration, taking place in April 2021, learners (N = 8, aged 12-14 years old) were recruited through BoltGirls (de-identified name), an organization providing OST robotics education to middle and high school girls. The participants reported their racial backgrounds as White (2), Asian (3), White and Asian (1), Black (1), and one chose not to say. The five facilitators (F = 4, M = 1) identified as Asian (4, including first author) and Hispanic and White (1). Seven of eight learners had some kind of experience with programming or CS before. Since BoltGirls is a tech-focused education organization, these learners generally had more in depth experience with programming than those in camp A. Similar to camp A, camp B took place over three days over three weekends but lasted only 2 hours in duration per session.

With a focus on positioning learners as techno-social change agents [19], we added a module on AI and fairness, to encourage learners to practice engaging in critical conversation about AI technology and bias, as well as consider themselves as technology designers in group activities. Between camp A and camp B, we overhauled CS activities to more heavily incorporate power & identity and a content focus and allow opportunities for discussion. For example, we combined one of the pure power & identity activities (without any CS content) where learners voted Yes or No to an image or word symbolizing power with the conditionals lesson, such that learners would vote Yes *if* they thought so, *else* they would vote No (see Figure 2). Due to this close coupling and integration of power and identity, we decided not to include any pure power & identity activities but included lighter icebreaker questions at the beginning of each session. However, while the CS curriculum changes and new materials we developed were more integrated, the overall program did not as effectively support a reflective climate or sense of community among learners, and we opted to reimplement power & identity activities along with our newly developed power & identity-infused CS curriculum for the following camp. We also noted challenges with timing and scheduling, since many activities took much longer to complete than we had planned for, which led to skipping or ending some activities prematurely.

3.2.3 Camp C. In the third camp, which took place in July 2021, learners (N = 4) were aged 11-13 years old and recruited from AmazingGirls. The girls identified as White (2), White and Latina/Hispanic (1), and one preferred not to say. Two of the four had some kind of experience with programming prior to the camp. The four female facilitators identified as Asian (1, first author), Black (2, including second author), and Hispanic/Latina (1). The camp ran for 5 two-hour-long sessions over four consecutive days, with two sessions on the last day.

This camp had some curricular changes to the coding lessons for clarity and included power & identity activities, some of which also acted as more involved icebreakers. We also revised the schedule, accounting for extra time needed for programming, transitions, breaks, and discussions that required more unpacking. We additionally included a final project, which synthesized knowledge related to technology, power, and AI and fairness, and learners had the opportunity to present during the final session and had an artifact to show at the end of the camp.

3.2.4 Camp D. In an effort to test the CRC camp with more learners and interest in investigating scalability of our program, Camp D, which took place in August 2021, had minimal changes made compared to the program from camp C and had the same facilitators. Learners (N = 13), aged 12-14 years old, were recruited from BoltGirls, and all had some kind of experience with programming. The girls identified as White (2), Asian (7), Black (1), Indian American (1), and 2 preferred not to say. 10 of 12 had prior experience in programming. The camp ran for five consecutive days (one 2-hour session per day) during the week.

4 LESSONS LEARNED

After each camp, the research team reflected together and engaged in affinity diagramming [1], coming up with different takeaways, aspects we wanted to improve upon for the next camp, and themes across sessions. The authors and research team has a diverse range of expertise, including learning sciences, culturally responsive teaching, computer science, and design. We considered engagement with the curriculum as learners answering and asking questions, discussing with others about the content, partaking in the Jamboard and slide activities, coding on the platform (which we could see via log data), and participating in physical activities with cameras on or typing in the chat. Comparisons were made to past camp runs for camps B, C, and D. We synthesized research notes and affinity diagrams across camps, validated themes amongst authors, and present three multi-part lessons we learned from designing, iterating, and running a virtual synchronous CRC camp four times.

4.1 Striking a Balance Between Computing Concepts and Power & Identity Content

4.1.1 Integration of Power, Identity, and CS Concepts. In the first camp, we were challenged with providing a cohesive experience for learners, noting that our switching between power/identity and CS concept activities were disconnected and lacked synergy. We found that it took considerable time and creativity to develop the right opportunities, metaphors, and prompts to integrate critical thought about power and identity into learning about core CS topics, and it is still an ongoing process.

From camp A to B, we believed that if we integrated enough activities and discussion prompts about power and identity within the CS curriculum, we could more efficiently meet the goals of the camp, prompting learners to be thinking about and unpacking power as they learned about CS. Although the camp experience was more cohesive as intended, we found that excluding in-depth power & identity (e.g., TOTO) activities that were not directly tied to CS concepts stunted building a sense of community and trust among learners, since there was overall less self-disclosure. In other words, the icebreaker, discussion, and self-disclosure activities were vital to learners connecting to one another. It is possible that some girls may have been hesitant to join conversations because the context of CS may have felt riskier, since there could be more 'wrong' answers compared to activities solely based on discussing identity, where there are very few wrong answers, as they are the experts of themselves. When we reincorporated activities purely focused on power & identity, it not only proved to be necessary to more effectively provide scaffolding for learners to engage in conversations about power structures more confidently throughout the camp but also supported learner-learner rapport and building community (i.e., connectedness [12]), since more sharing and self-disclosure occurred, behaviors that are known to encourage connection and friendship [23]. Furthermore, we found that some of these activities could be used to encourage learners to share more about themselves and surroundings by prompting that they turn on their cameras, even if only for a brief duration. For example, one of our TOTO activities encouraged learners to share objects from their home environment that represent different values.

We recommend that CRC camps incorporate activities that may not be directly tied into a CS concept but rather focus on identity and self-disclosure to build a stronger sense of community, which will set better community norms and benefit the rest of the program.

4.1.2 Participation in Discussions & Speaking 'the Language of STEM'. In camp D, we saw conversations were most fast-paced and energetic compared to the other camps, A, B, and C. Camp D included the most learners with high prior knowledge, and they were eager to engage in activities and discussions related to computing. However, when prompted to connect a social issue like bias to CS, they seldom mentioned inequities related to gender, race, socioeconomic status, or religion. This may suggests that STEM education for individuals who learn how to navigate the culture view the culture from an insider perspective. We believe it important that learners can make these connections, such that they are able to recognize and address inequities in technology. Most of the learners in camp D 'spoke the language of STEM and CS', i.e., had generally positive past experiences and a wealth of STEM and CS knowledge to build off of. They did not need much guidance for the activities nor express or show boredom during the camp, showing high motivation and comfort in the culture of programming.

Unique to camp D in comparison to camp A was the sharp difference between the level of engagement with coding versus the games and activities around power & identity. These learners had a sense of belonging in CS and represented the minority of girls with access to educational resources that nurture interest in CS. The more connected the girls were to CS in knowing and understanding the content, the less saturated conversations were with examples of being excluded or not seeing themselves in a STEM career. When exercises to get them to consider the social issues blocking the growth of more girls as coders, little conversation came from a place of understanding or needing to take action. Generally, attempts to bring in power & identity exercises addressing the barriers blocking them from the field did not have the same impact as for the girls in the earlier camps with less prior knowledge. We observed that the girls in camp D had opinions about the influence of power and identity but rarely in connection to the content, and efforts to position them as techno-social change agents to incite activism did not take place as much as we had hoped.

While we still consider the implications of this, these observations across groups would suggest that the curriculum should take into account different aspects of identity given the learners' backgrounds. For groups of learners who have higher prior knowledge in STEM, the facilitators may have to more heavily scaffold bridging connections to power, identity, and oppression in computing in an effort to elicit more critical thinking. However, for learners without a strong background or identification with STEM, the facilitator may instead first need to encourage learners to feel that they are able to engage in conversations about technology. In promoting social equity, it can not be assumed that CRC focus on critical consciousness development solely benefits the marginalized learners with lower prior in computing. Hence, the role of unequal power dynamics and STEM identity on who (dis)engages in STEM education and the workforce matters for both the privileged and marginalized groups in order to obtain equity.

4.2 Flexible Logistics for Different Learners and Times of the School Year

4.2.1 Adjusting schedule based on prior knowledge. One of the biggest challenges we faced was scheduling accurately (i.e., estimating how much time activities would take and accounting for technical difficulty). Compared to in-person scheduling we found that in an online program, similar to recent prior work [5], some CS activities took up to twice as long as we had originally planned. However, building on this observation, we noted a pattern between learners with higher and lower prior knowledge. Most learners who joined our camp had some encounter with programming, CS, or robotics, but the variety of prior knowledge varied greatly. Learners who were recruited from AmazingGirls generally had less in-depth experience with programming and CS than learners who were recruited from BoltGirls, who more readily dived into tech and CS-related activities and conversations. We saw that in camps with learners with higher prior knowledge in CS (camps B and D), discussions took place and open-ended questions posed by the instructor were answered at a faster pace. Learners with lower prior knowledge in CS were less confident and may have hesitated to answer questions or engage in discussions, leading to slower-paced conversations and sometimes long silences. Therefore, one schedule breakdown does not fit all groups. We recommend planning for more time in camps with learners who have not had as much exposure to computing.

4.2.2 Adding flex time and planning/activities for the unexpected but inevitable tech challenges. In earlier camps, we also did not account for extra time related to technical challenges that would arise, and we were unable to support learners effectively who did not have technical devices compatible with the programming platform we developed. We found that some learners only had access to tablets, which did not work with our coding environment, so we were challenged with finding other ways to include these learners, as well as further develop and test our programming environment to be compatible with more devices. In camps C and D, we added more transition time for inevitable technical difficulties in an online environment. We recommend adding flex time to assist in any technical challenges and to test any tools being used on multiple devices. We further recommend that facilitators make plans for engagement when technology may not work during the program.

4.2.3 During the school year vs. summer break. We also note that scheduling camps during the school year versus the summer can affect the camp experience. In camps A and B (during the school year), we opted to run them during the weekends. We gained two insights about these camps' schedules compared to camps C and D. First, more than 2 hours per session may be difficult for our learners, since many seemed fatigued near the end even with breaks and physical activities (e.g., striking a powerful pose). This may be because of the age group or due to other schooling and activities also taking place online, resulting in an overload of screen time.

Second, we saw that when we had a week-long gap between camp sessions, we had to spend more time reviewing at the beginning of each session. Community-building momentum was lost compared to the other camps C and D, where we felt that learners got to know each other more and felt more comfortable engaging in vulnerable conversations around identity. To reduce time spent reviewing and to prioritize community-building between sessions, we recommend that camps have more frequent sessions, even if they are shorter in duration.

4.3 Understanding "Engagement" is Multifaceted and Looks Different Online

4.3.1 Adjusting expectations as instructors. As we ran more camps, we often discussed "learner engagement" and saw that some learners engage differently in an online curriculum, have different access to technology and stable connections, and are (un)comfortable with sharing their backgrounds and home environments on camera. We as curriculum developers and instructors have had to readjust and be open to how a learner chooses to engage in our online synchronous program. This adjustment took some time. We recommend that instructors and facilitators let go of expectations for what engagement looks like based on in-person settings and be open to engagement being more broad and less obvious in an online setting.

In earlier camps, we were unsure if some learners were engaged due to long silences and having their cameras off most of the time. However, other evidence suggested that learners engaged deeply. We were notified by some parents (whose children were more quiet in the camps) via follow-up emails about the positive impacts of the camp on their children. We also saw via log data that a number of participants (quiet, camera-off learners included) looked at or kept working on the camp activities between and beyond the camp sessions. Some further showed the artifacts they created during the camp to other people. This suggests that learners may be engaging deeply behind what is immediately visible, but it could be hard for facilitators to recognize engagement in an online environment due to different expectations or reduced situational awareness [25].

4.3.2 Being creative in designing the curriculum to have different engagement opportunities. This being said, we also believe in creating opportunities for learners to engage via different modalities, making it easier for instructors to be aware of learners' activities. While requiring that learners have their cameras and microphones on is not feasible, more work on online education has documented the benefits of chat (e.g., [25]). We, too, saw that learners having the ability to engage in the chat has been helpful to being able to express their opinions and helped with timekeeping and scalability, since more than one learner could respond and chat at one time. However, we recommend that curriculum designers and facilitators take this further and work with more modalities beyond just utilizing the chat. We found in our camps that utilizing collaborative Jamboards, a common space for learners to either collaborate with one another or work separately but with the ability to be aware of what other learners were doing in real time, helped to support learner visibility, as well as scalability. For example, in the AI and fairness module, one activity leveraged a Jamboard, and all learners worked on writing out recipe algorithms for their favorite food. The facilitators could both moderate real time and then share their screen to efficiently highlight each learners' work quickly at the end. We recommend that instructors and curriculum designers work with a number of different modalities, specifically going beyond just utilizing the chat to help with scheduling, learners being seen, and enabling different ways for learners to engage with the material.

5 CONCLUSION

Through our camp runs and iterations, we share three lessons learned addressing the program's balance of CS concepts and power & identity content, flexible logistics for different learners and times of the school year, and understanding that "engagement" is multifaceted and looks different online than in person. Online learning poses new barriers, particularly related to cultivating a trusting environment and learners feeling connected to each other. We believe that our recommendations are aligned with the three main principles of culturally responsive teaching (asset-building, reflection, and connectedness) and subsequently our main camp goals, specifically related to inclusion and facilitation of critical discussions.

While there is a growing body of work on CRC OST programs, this experience report contributes new insights and recommendations to developing and running a CRC camp in an online synchronous format. With a rise of virtual learning experiences, our lessons learned and actionable recommendations can support the development of future online CRC programs.

5.1 Limitations

We aim to recruit more learners of different backgrounds to participate, including those from Latinx, First Nation, and Black racial backgrounds, as well as those without prior experience in programming. We recognize that while we intended for payment to lower access barriers and compensate for contributions to research, this may have impacted aspects of the camps related to e.g., learner motivations. Lastly, we acknowledge that although our team was diverse, our reflections and memos may contain our own biases.

5.2 Future Directions

We aim to better understand to what extent we have provided learners with basic knowledge of CS concepts via assessments that do not intimidate or discourage middle school girl learners, as well as understand if the camps had any impact on identity through following up with the learners. In the future, we hope to make our curriculum publicly available after further iteration.

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