

# A Remote Participatory Workshop on Digital Wellbeing and Artificial Intelligence with Middle School Girls

Catherine Grevet Delcourt, Linda Charmaraman, Quan Gu, Caitlin Mbuakoto, Paige Whalen, Gillian Hodgden, Sofia Kobayashi, Aliea Nallbani, Zhamilya Bilyalova, ZhiXin Jin, and Sidrah Durrani

<sup>1</sup> Computer Science Department, Wellesley College, USA

<sup>2</sup> Youth, Media, and Wellbeing Lab, Wellesley Centers for Women, USA

<sup>3</sup> Wellesley College, Wellesley, MA, USA,  
{cdelcour@wellesley.edu}

**Abstract.** The recent rapid rise of AI raises pressing questions about its impact on Digital Wellbeing, especially among teenagers who already grapple with challenges related to tech-life balance. Teenagers are confronting a complex sociotechnical landscape; therefore, anticipating the potential influence of AI, especially on social media, is imperative. In this paper, we describe the outcome of a remote participatory design workshop with 33 adolescent girls from across the United States. They redesigned prevalent social media algorithms with a focus on enhancing wellbeing. Through near-peer mentoring in age-based small groups, participants followed an ethical design framework to evaluate stakeholders, and re-imagine novel algorithms. Our findings highlight the importance of values such as relaxation, personalization, safety, and education for novel algorithms. Furthermore, we observed that participants not only critically examined the impact of invisible algorithms as social media users but also transitioned into empowered creators of novel algorithms through this virtual synchronous workshop.

**Keywords:** digital wellbeing, AI, algorithms, youth, virtual workshop, participatory design, informal learning

## 1 Introduction

Digital wellbeing is a growing concern for youth today, particularly girls [33]. Teen's social lives are hyperconnected and online spaces play an important role in this critical phase of personal development, when peer groups become more important [27, 33]. Acknowledging the profound impact of online spaces on their process of socialization is a firmly established perspective within scholarly discourse. While being connected online can have many benefits, there are also downsides that tend to be particularly negative for girls compared to boys [33]. Engaging youth with the

concept of digital wellbeing can have a positive effect on changing their behaviors towards positive habits and minimizing risks.

Social media is at the center of these online social environments and thus a critical element affecting teens' digital wellbeing. Teens use many social media sites, including TikTok, Snapchat, and Instagram, amongst others, and adolescents often spearhead the adoption of emerging platforms [33]. However, tech companies tend to consider the impact of their products on teens as an afterthought rather than as a driver for design decision-making [27]. Through engaging youth in participatory design about social media and digital wellbeing, teens can envision features and novel apps that support positive habits and safety features [1, 9]. The outcome of these design sessions can challenge existing platforms to promote greater wellbeing in youth, resulting in better experiences for everyone.

Algorithms, particularly those considered 'invisible', are central to shaping social media experiences since they mediate the content available to a user through recommender systems, newsfeed algorithms, and moderation algorithms [15]. Social media users develop their own understanding of these algorithms through use, developing folk theories [10, 14, 24]. Little research to date has explored youth experiences and folk theories about interacting with these algorithms, and even fewer explored digital wellbeing in the context of online algorithms with youth. As such, engaging youth with algorithms and Artificial Intelligence (AI) is pressing. A foreseeable impending shift in tech from recent AI advancements, such as the recent democratization of Generative AI [19], will inevitably impact Information Communication Technologies (ICTs) and pose new questions about digital wellbeing. To navigate this changing landscape, youth need to be equipped with an understanding of the technical and ethical underpinnings of artificial intelligence and algorithms [28], in conjunction with an awareness of digital wellbeing. Broadening access to these competencies is essential for a diverse workforce [28, 37] and ultimately leads to reduced bias and ethical issues in the design of new technologies.

In this paper, we present the structure of our week-long participatory workshop for geographically distributed girls in the U.S., and a thematic analysis of themes emergent from a synergistic workshop discussing AI and digital wellbeing with adolescent girls. The contributions of this work are identifying values for teen girls at the intersection of digital wellbeing and AI, and strategies for a remote participatory workshop to engage youth on algorithmic redesign for pressing and sensitive topics.

## 2 Related Work

### 2.1 Impact of Social Media Usage on Youth's Digital Wellbeing

There is not a generally agreed-upon definition of Digital Wellbeing but its aspiration can be captured in the question: "How can people live a good life both thanks to and despite the constant use of digital media?" [3]. This question illustrates a duality of digital wellbeing: technology can have both a positive and a negative impact. Human-Computer Interaction (HCI) researchers tend to study how to focus on minimizing potentially negative consequences of technology use [16, 29], for instance the notion that digital wellbeing is negatively affected by a user's loss of agency when using technology [29]. For adolescents, this closely relates to concepts of social comparison, social pressures impacting self-presentation, and bullying [16]. Psychological researchers in digital wellbeing have conducted research to understand systematic associations between screen time and one's mental health status (e.g., depression, anxiety), but have not established a universal determination of a cause-and-effect relationship [34]. Sociologists, on the other hand, tend to highlight more beneficial uses of digital resources that can enhance one's subjective wellbeing, such as becoming more skilled at social communication processes and having access to valuable information to improve one's life [3]. The idea that there is varying individual differentiation on the impacts of social media use is a relatively new perspective [42].

Due to normative processes of early adolescent cognitive and social development, youth may not yet have the self-regulation skills to use pervasive technologies in healthy ways. This includes habits such as considering their sleep hygiene when making choices about their phone usage or managing stress [1]. In [1], the authors found that personalization can help with stress associated with digital usage. Further, digital wellbeing can be conceptualized broader than its individual impact (e.g. sleep hygiene) to encompass a social perspective [20]. Since changing peer dynamics and interactions is a core developmental experience for adolescents, considering the role that technology plays in these transitions on a social dimension is essential [20]. Responsible digital citizenship can have an immense impact on peers and the digital ecosystem if one incorporates an ecological framework to digital wellbeing [20].

As social media users, adolescents are not a homogeneous group. Within this population, some are early social media users, some are non-users, and others are engaging in novel appropriations (i.e. Finstas). No matter what stage of social media usage, adolescents are potential users, consumers, and creators of online content with unique needs and perspectives for social media User Experience (UX) design. However, as minors, their choices and actions are subject to the rules of trusted adults, such as caregivers and teachers, and under the purview of ever-evolving policy

regulations. We must take these factors into account when engaging youth about their digital wellbeing needs. Research methods that strive to raise the voices of participants can be particularly effective in these scenarios.

## 2.2 Digital Wellbeing Considerations for Girls

A recent nationally representative study, which included girls aged 11-15 from various racial, ethnic, and socioeconomic backgrounds conducted by Common Sense Media [33] demonstrated that the vast majority of early adolescent girls have used social media sites, with the most popular being YouTube (85%), TikTok (73%), messaging apps (60%), Instagram (59%), and Snapchat (57%). Girls reported being on YouTube, TikTok, and Snapchat on average for two hours per day and Instagram and messaging apps for 90 minutes. The effect that each of these apps has on girls' wellbeing was mixed, with the video-sharing app TikTok being associated with higher addictive qualities and sleep interference compared to the other apps. An area of particular concern is adolescent girls' body image which can be both a negative and positive experience while scrolling through social media platforms. While about one-third of girls reported that they felt worse, at least weekly, about their bodies after scrolling on TikTok (31%), Instagram (32%), and Snapchat (28%), they also reported a much higher tendency to feel more positive or accepting about their bodies from using the same sites (TikTok 60%, Instagram 57%, Snapchat 59%).

The proliferation of image-based social media platforms has set the tone for how new media is impacting body image perceptions in young women. Objectification theory, a concept popularized before social media, describes how the consumption of media depicting perfected, idealized women leads to increased awareness of how one's own body is being perceived by others, influencing young girls and women to engage in "body checking" and other forms of self-objectifying behaviors [18]. Objectification theory was formed around the consumption of magazines, movies, and television, but the emergence of new media has only made the theory more salient. As explained by Richard M. Perloff, "social networking sites are available for viewing, content-creating, and editing 24/7, on mobile devices, anywhere, anytime, allowing for exponentially more opportunities for social comparison and dysfunctional surveillance of pictures of disliked body parts than were ever available with the conventional mass media." [35] While in the past young girls would compare themselves to the models they saw in magazines and actresses they watched on TV, social media creates an environment where young girls are also comparing themselves to their peers. Peer comparison is potent, as individuals feel that comparing themselves to someone they perceive to be similar to them is an effective way to understand how they are being perceived [36]. Yet when one's peers are posting idealized and sometimes edited pictures on social media, this comparison negatively affects one's view of themselves [8, 36]. Adolescent and teenage girls on social media

also participate in self-objectifying behaviors, as described by objectification theory in the form of photo investment, which refers to how much an individual cares about how the photo they post looks, how they appear in the photo, and their desire to edit or retake it. Young women who score highly in photo investment tend to have higher scores of dissatisfaction with their bodies and are more likely to engage in behaviors associated with the development of eating disorders [8, 31, 36]. More research is needed to understand how social media literacy and an understanding of how algorithms work may help reduce body objectification behaviors online or spread body positivity [7].

### **2.3 AI Literacy for Adolescents**

As AI technologies increasingly saturate our daily lives, the need for AI literacy becomes more pressing. In recent years, discussions surrounding AI and its impact on teens have been circulating in academia and industry [22]. Scholars have taken an interest in adolescents' awareness and understanding of AI as they use it in online spaces [21]. Current literature highlights three dimensions for defining AI literacy: understanding the basic functions of AI and their applications in daily life [4, 23], applying AI concepts to different contexts [12, 26], and critically evaluating AI technologies while communicating and collaborating in AI-related contexts in everyday lives [28]. Studies indicate that many adolescents are unaware of AI's capabilities and develop misconceptions surrounding its use and fundamental qualities [25, 26].

Today's adolescents cultivate AI literacy primarily by engaging with social media [39], a fundamental component of their technology usage. AI-driven platforms like TikTok, Instagram, and Snapchat offer limitless entertainment and educational potential. While AI significantly contributes to these experiences, they are 'invisible' features. There exists a level of opacity with AI due to the lack of transparency and comprehensibility of many algorithms. This unfamiliarity is exacerbated by consumers' limited technical literacy regarding AI's limitations [40].

The pervasive usage of social media contributes to the detailed information they can capture about an individual and helps them better recognize a person's preferences, interests, and habits to precisely tailor content to individual users [38] and they can also gauge people's emotional states such as mood, stress, and emotions [30]. These predictive algorithms can lead to negative consequences, including the reinforcement of gender and racial biases [17, 26], which in turn affect the wellbeing of young users; amplifying human manipulation [40], and eroding the deliberative autonomy of consumers by capitalizing on their decision-making vulnerabilities. The concerns in this domain have driven scholars and policymakers to implement regulations on AI utilization [40], and there's a pressing need for educational

materials that empower educators to introduce young individuals to AI concepts and navigate the associated ethical considerations.

However, youth voices remain insufficiently represented in discussions about policy-making, even if those policies directly affect their AI usage, and youth understanding of AI remains an open area of research. Prior research has explored the use of computational tools like Scratch to deepen emotional understanding [41] and innovative programs have employed storytelling to enhance teenagers' awareness of AI's societal impacts [17]. Besides developing students' AI literacy, fostering broader AI literacy is essential for ensuring inclusive design and use of AI technologies, particularly in addressing historical marginalization of groups like people of color and women [26, 28], as well as supporting diverse youth in pursuing computer science careers to help ensure equitable future technologies [17].

## **2.4 Supporting Teen Empowerment**

Participatory design approaches are particularly effective at understanding youth perspectives to either critique existing technologies or to inspire new design ideas. HCI research focused on children and youth often employs a participatory design philosophy in which the intent is to empower those most directly affected by a technology to become creators of them. Usually, these design sessions occur in intergenerational contexts, and propose activities that support collaboration, rapid prototyping, and familiar low-tech tools [22, 43]. Intergenerational structures often refer to research experts (adults) as facilitators and youth as participants [43]. In the context of social media, prior research suggests that near-peer mentors are critical for assisting early adolescents in onboarding youth to use social media in ways that empower them [5]. As such, their participation in participatory design of social media could also be effective. The Participatory design with youth can occur in person or in virtual contexts, where asynchronous programs have demonstrated value with older adolescents and synchronous ones can be valuable for younger teenagers.

A challenge to participatory design with youth is the extent to which technical knowledge poses a barrier to full participation or novel innovation. Many strategies have been explored to reduce these barriers through games, physical interactions, analog methods, and others [22]. AI is a particularly challenging topic to tackle in a participatory context due to the fact that algorithms, especially those on social media, are 'invisible' and thus less amenable to common visual design activities; and require some technical explanations to understand. The MIT RAISE (Responsible AI for Social Empowerment and Education) group developed an AI education curriculum for middle school students [32] that employs a value-sensitive design approach to exploring the values and stakeholders impact by AI decision-making [13].

We propose a synchronous virtual workshop with guided large-group discussions about Digital Wellbeing and AI complemented by small-group participatory design

sessions. We aim to equip young girls with a better understanding of complex topics and provide opportunities for them to explore their creativity, and increase their agency as online users and creators. Our youth advisory board, which consists of middle school, high school, and college students, highly recommended near-peer mentors as relatable, approachable, and knowledgeable collaborators within a participatory design program [6]. Our objective was to better understand the values of adolescent girls without assuming the larger research framing of their experiences necessarily applied to their unique circumstances. This approach opens up greater possibilities for reflection, discovery, and innovation.

### **3 Methods**

This paper presents findings from the fifth installment of our ongoing annual digital wellbeing workshop for early social media users. The pilot workshop, which took place in person during the summer of 2019, examined the topic of raising awareness of time spent on social media [anonymous for review]. Each summer thereafter, the workshop has been conducted virtually and tailored to a timely and critical theme most relevant to young social media users [anonymous for review]. Our most recent summer 2023 workshop focused on empowering young girls and examining the relationship between artificial intelligence (AI), digital wellbeing, and body image.

For this participatory design workshop, our research questions were:

RQ1: What are important design values for social media platforms as it relates to body image and early adolescents girls?

RQ2: How do early adolescent girls conceptualize ways that AI can support digital wellbeing for body image on social media?

RQ3: In what ways can educational contexts centered on digital wellbeing also advance AI literacy?

#### **3.1 Workshop Structure**

The workshop took place for a week in July 2023 and was conducted virtually on Zoom for two hours every day. Before the workshop, participants completed a baseline questionnaire asking about demographics and social media usage. They also received directions for connecting to the workshop Zoom link. On the first day of the workshop, we introduced the workshop guidelines and an agenda overview, followed by participants viewing a video about girls' confidence. This video was then discussed in small breakout groups led by near-peer mentors. Participants then created memes about body image in their small groups. Afterward, we were joined by a guest speaker, a social media influencer who specializes in adolescent puberty, and we ended with a brief introduction and discussion on AI. On day two, we gave an in-

depth explanation of AI. The small groups, led by near-peer mentors, then conducted two AI design activities, including a stakeholder analysis and ethical matrix creation. As a large group, we were then joined by a guest speaker who focused on highlighting social/emotional growth. Finally, two workshop organizers presented emerging research about digital wellbeing and body image. On day three, we were joined by a guest speaker who spoke about "size-ism" on Instagram. Participants worked on an algorithm redesign project in small groups, and then near-peer facilitators presented their own experiences on social media and with body image. On day four, we held a panel about careers within different areas of STEM, and small groups continued to finalize their projects. On day five, participants finished their projects and presented them to the workshop group and outside clients. Every day of the workshop started with an icebreaker and ended with a daily survey about their experience.

**AI Literacy components.** Our AI discussion and activities were inspired by the AI curriculum developed by MIT RAISE [32]. Our goal was to emphasize the everyday applications of AI, particularly focusing on functions and features within social media platforms. We incorporated the "What is AI?" class developed by RAISE [32] to delve deeper into AI concepts, which were organized into four key sections: AI in social media, the three components of AI systems, biases and ethical concerns, and values and stakeholders. The section on AI in social media provided insights into AI's everyday applications, including content personalization, image filters, noise filtering (spam detection), and personalized ads. Following this, we explored the three core elements of AI systems: datasets, learning algorithms, and predictions, with a specific focus on explaining how filters are trained. To emphasize the issue of bias and the current limitations of AI technologies, we screened Joy Buolamwini's "Gender Shades" video, offering students a clear understanding of the ethical concerns surrounding AI. Students engaged in the Ethical Design Activity developed by RAISE [11]. Participants came up with app redesign ideas, identified stakeholders, used an ethical matrix to assess ethical considerations and conflicts related to their app, and conducted a data audit for the data to be incorporated into their algorithm, all within their breakout groups. Facilitators adjusted their explanations of AI concepts based on the students' ages and comprehension levels. In our redesign activity, students were prompted to identify the limitations of existing apps concerning mental wellbeing, particularly with regard to teenagers' body image issues, and brainstormed solutions for promoting positive body image within the context of social media and wellbeing discussions during the workshop.

**Digital Wellbeing components.** To discuss Digital Wellbeing, we followed similar a similar structure to our prior workshops: large-group discussions with guest speakers, and small group breakout activities [anonymous for review]. On the topic of body image, we included discussions and activities designed to elicit reflection about a)



confidence during early adolescence, b) social media content around body positivity, c) self-compassion and mindfulness as it relates to body image, and d) “size-ism” on Instagram.

### **3.2 Youth Advisory Board and Workshop Facilitators**

In order to support a safe space for discussing topics relevant to youth, the planning and execution of the workshop incorporated youth input from the onset. In order to prioritize the voices of youth in the planning process, the workshop organizers assembled a Youth Advisory Board (YAB) consisting of former workshop participants who were still in middle school. In bi-weekly YAB meetings through Spring 2023, members of the board deliberated on the 2023 workshop theme and discussed the most pressing topics concerning wellbeing within their peer group. After several discussion-based meetings, the youth determined that body image was a concern amongst themselves and girls their age. Incorporating this subject within our overarching digital wellbeing theme, the young participants expressed a desire to understand how artificial intelligence could shape body image perceptions in online contexts. The collective decision was to focus our workshop theme on the intersection of body image and artificial intelligence, a choice that the youth deemed highly pertinent and impactful for teenage girls in current times. Some participants from the YAB joined the 2023 workshop as guests, but their role in the workshop was focused on the early planning efforts.

In addition to the YAB which occurred prior to the workshop, we also recruited high school and college students as near-peer workshop facilitators to assist small groups during the workshop. These facilitators were recruited based on their relevant coursework and career interests in psychology, education, or computer science, prior experiences in research on digital media or mental health, and/or interest in mentoring youth. To ensure a favorable student/mentor ratio, we hired 12 high school, undergraduate, and post-graduate facilitators. Our research team also included two co-organizers who led large group discussions for the 33 workshop participants. All facilitators participated in a 5-hour training session prior to the workshop that included bonding games, readings and activities related to digital wellbeing, body image, youth development, MIT RAISE curriculum, and AI literacy. Due to the sensitive nature of our workshop content about body image, we ensured that each small group could include two near-peer mentors [6] to facilitate discussion and collaboration among the adolescent participants.

### 3.3 Recruitment

We began recruiting middle school participants in early 2023, leading up to the summer week-long workshop. We recruited adolescent girls (rising 6th-10<sup>th</sup> grade) nationwide. No previous knowledge of STEM or social media was required for participation. Recruitment efforts included e-newsletter announcements by partner school administrators, institutional faculty/staff e-listervs, institutional social media posts, paper-based flyering at public libraries, in-person flyering at local events, and by word of mouth. We also shared enrollment information with over 37 local public middle schools and libraries and over 32 girl-based educational clubs and organizations.

Overall, we received a total of 50 applications from nine states. Priority enrollment was given to prior workshop participants and applicants, students from our partner school districts, and girls from underrepresented backgrounds (e.g., racial/ethnic minorities). All workshop participants were recruited to enroll in our evaluation study.

Following our IRB-approved informed consent procedures, parents/guardians of the minor participants signed consent forms and a media release that provided permission to use participant images, artwork, and de-identified Zoom recordings for future reports. Participants were also asked to sign a minor assent form agreeing to their enrollment.

### 3.4 Workshop Participants

There were 33 female participants in the workshop with representation from all regions of the United States. The participants ranged from 11 to 15 years old. There were five 6th graders (11 years old), nine 7th graders (12-13 years old), eleven 8th graders (13-14 years old), seven 9th graders (14-15 years old), and one 10th grader (15 years old). The participants of this workshop were also racially and ethnically diverse. Twenty-five percent of the participants identified as White, 8 as Asian-American, 7 as Black/African-American/West Indies, 4 as Hispanic/Latine, 3 as Middle Eastern, and 3 as Multiracial. All information and quotes from the participants have been anonymized.

The baseline evaluation surveys indicated that the most popular social media applications among the participants were YouTube, Zoom, Pinterest, TikTok, Snapchat, WhatsApp, and Instagram. A majority of the participants had at least a minimal knowledge of STEM concepts whether it be through school courses and clubs or online spaces outside of school (e.g. creating TikTok videos, learning how to code/Scratch). The participants were most interested in expanding their STEM knowledge and better understanding how to improve their own and other's digital wellbeing. In order to help facilitate conversation and increase comfort among participants, we created small groups based on grade levels and social media adoption

stages. Due to the participant population, some groups were split across two grades. We ultimately organized participants into 6 groups consisting of two groups of 6/7th graders, two groups of 7/8th graders, one group of 8th graders, and one group of 9/10th graders.

### 3.5 Data Collection and Analysis

We captured the audio transcript of the Zoom discussions in large and small groups, the Zoom chat logs, and the student projects on Google Sites (6 total). For our process evaluation, we collected daily survey responses at the end of each workshop day (5 total). The surveys asked participants open-ended questions about the most valuable lesson they learned each day.

We used a qualitative theoretical thematic analysis [2] approach to selectively code the relevant portions of the workshop transcripts, specifically the small groups in which participants actively participated and the final project presentations. We also coded the open-ended responses in the end-of-day surveys about the most important lesson they learned. We started with phase one coding where facilitators, and authors on this paper, coded days three and four of their small groups, and the workshop leads coded the project presentations (which also corresponded closely to the data in the project Google Sites) and survey responses. We cleaned the data and coded statements according to prominent discussion themes. The emerging themes were AI, Wellbeing, Body Image, Social Media, and Teens. Through a later team meeting, we discussed these themes and noted that every discussion was relevant to teens so we removed that code. Instead, we added STEM empowerment for new insights about AI or being a creator of technology and slightly modified wellbeing to be more specifically about digital wellbeing. We then coded the rest of the small group transcripts in phase two coding using those new themes. After finding consensus in our themes and coding the rest of the dataset, we were interested in exploring the context surrounding conversations at the intersections of multiple themes. We present

**Table 1.** End-of-day survey responses categorized by our core themes. The total number of responses varies from day to day, reflecting the practical challenges of collecting feedback during workshops, despite our reminders and incentives.

Day	Digital Wellbeing	Artificial Intelligence	Social media	STEM empowerment	total responses
1	88.46%	3.85%	15.38%	0%	26
2	65.52%	27.59%	31.03%	0%	29
3	62.96%	7.41%	51.85%	0%	27
4	63.64%	0%	9.09%	22.73%	22
5	77.27%	0%	4.55%	9.09%	22

our results chronologically based on the prominent themes appearing in the end-of-day survey reflections as shown in Table 1.

4 Findings

Our analysis themes focus on digital wellbeing values emergent from our workshop, reflections from participants on invisible algorithms as users, and innovative ideas from participants. As participants gained more knowledge and experience during the workshop, they were able to start by gaining an in-depth awareness and understanding of the following intersections: a) values about digital and social media, then b) the impact of AI on social media, and c) finally using those concepts for STEM empowerment and redesigning algorithms. As shown in Table 1, 'digital wellbeing' was the topic that appeared the most throughout the workshop. This was expected as it was the primary theme for the workshop. Additionally, it appears that participants reflected on many different topics throughout the week which highlights their diverse interests in the discussions during the workshop.

4.2 Values about Digital Wellbeing and Social Media

Based on the structure of our workshop, we discussed concepts related to digital wellbeing in large groups, often with the participation of guest speakers, and participants reflected on these discussions in small groups. From our data analysis, we highlight four values that emerged from the discussions and artifacts created during the workshop.



Fig. 1.. On the second day of the workshop, participants created an ethical matrix in their small groups to discuss values they believe are important for social media consumers. This figure is a compiled ethical matrix with stakeholders and values from all the groups design activities.

**Personalization.** Personalization was a value determined by multiple groups, and specified as a value for the viewers/teens stakeholders amongst 3 groups during our workshop. In a group of 7/8th grade students, facilitators and participants heavily discussed personalization as a value as they developed their ethical matrix. Reflecting on why participants value personalization, one of the participants responded that it helps them find the most enjoyable content: *"I like [personalization] because, I know*

*I like the video.*" This was a sentiment echoed by other participants in that group. In this discussion, the facilitator prompted the group about whether any of their other stakeholders also value personalized content to which a participant responded *"I think the parents too [...] Because they also want to have fun with their children."* In this sense, personalization was valued because it supports the notion of content that will be highly valued and enjoyed by viewers.

**Safety.** Safety considerations emerged as another important value. A group of 7/8th grade students discussed safety as an important value by explaining that personalized content includes age-appropriate content which aligns with the concept of safety *"I think the viewers would like our new algorithm because it's personalized and safe, like precise to their interests and the parents would like it because it's safe and it shows appropriate content for their child's age group."* Similarly, a group of 6/7th grade students also discussed values for safety including the fact that safety is an important value for parents because *"So their kids feel 'secure'? (with their bodies)"*, quote copied as typed by the participant in a chat message. While online safety is often discussed in terms of personal privacy, and protecting one's data from reaching harmful hands, these comments highlight a wellbeing dimension of safety related to consuming age-appropriate content. The 9/10th grade students discussed safety protection mechanisms such as adding a warning for triggering content *"Trigger on triggering, hurtful content or something."* including mentioning when content was edited or filtered to notify the audience of alterations.

**Relaxation.** After discussions about the ways current social media models contribute to social comparisons among young girls in both online and offline spaces, many participants highlighted how a change in the types of content presented on these social media platforms could increase digital wellbeing among young girls. Participants recognized the role of algorithms in making positive content more visible to social media users of all ages, not just young girls. For the students, positive content was more than simply presenting counterarguments to harmful body image messages. Instead, there was a consensus that mindfulness should be prioritized and promoted for social media users. When participants were creating their value analyses, one of the participants from a 6/7th grade group suggested relaxation as an important value so *"then maybe [celebrities] like need a break from something or like to relax or something."* This group then went on to evaluate relaxation as an important value for other stakeholders, including teenagers and parents. The young girls believed that the negative effects of harmful videos and messages on social media could be mitigated by videos that serve as a distraction from both online and offline comments and judgments. This emphasis on using nontraditional types of positive content to improve digital wellbeing was echoed by other participants throughout the workshop. When brainstorming ways to improve current social media platforms utilizing AI, one

of the participants from a group of 7/8th grade students said, *"in addition to showing people relatable videos, it [the algorithm] could also show inspirational videos?"* They called this curation page *"Maybe we could call [it] the positive page where you feel positive about yourself?"* A participant from a group of 6/7th grade students one suggests using AI to create a supportive community: *"Adding on to [participant's] idea the AI could show images of people using the app. And maybe those people could say why they think they're perfect the way they are. So it can motivate other people to do the same."* The young girls in this workshop desired a social media platform that presented content that made them feel empowered.

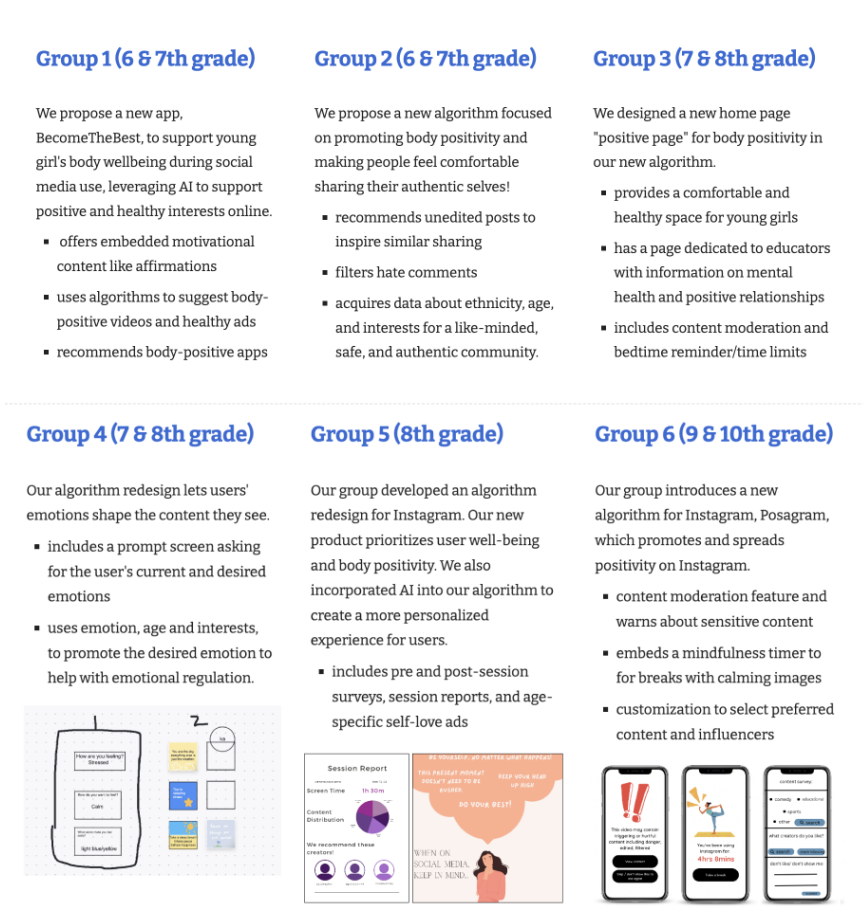
**Education.** One of the groups of 6/7th grade students determined that education was a value for their stakeholder analysis. A participant in this group first suggested that a value for the youth stakeholders might be *"probably learning more things for school"* in the chat. The group facilitator then oriented the group towards 'education' as a value for their teen stakeholder. As they described ways in which education on social media was a value for their design, one participant commented: *"For the 'why' of kids and teens, you could put for when they need to learn something they didn't know"* to which another participant added on: *"Education because kids might get better grades on their assignments"* suggesting that social media, when designed with education as a value, could complement academic content. This discussion further led another participant to add that education could be valuable because social media could be a relaxing break from studying. As they reviewed their values and other stakeholders, this group expanded on others also valuing education such as parents which aligns with the educational value for their children, and celebrities *"so they have a good public image"*.

### 4.3 Impact of AI on social media usage

In addition to values arising about digital wellbeing and social media, our focus on AI and redesigning algorithms revealed features or technical solutions to incorporate these values. The insights they gained about algorithms on social media and their concepts for redesigning them culminated in their final group projects which are summarized in figure 2. In this section, we present the ways that workshop participants envisioned redesigning AI in social media to uphold important values as it emerged through group discussions and the activities they created.

**Age-appropriate content.** When participants in a 7/8th grade group began brainstorming a new algorithm for a proposed social media application, they said, *"Our new algorithm is much safer because it takes into account age. It's also less focused on the advertising than the current one and it might like make, like the social media app more friendly for teens and families and show more appropriate content."*

Another group member continued this sentiment: *"I said it would be safer because the age of the content would be like, picked by, like the creator of the video and the parents wouldn't really have to worry as much because the content would be appropriate and they, like the kids, would be like at the right age, or watch what the people are making and stuff."* This would include advertisements: *"Maybe we should change the ads based on your age."* Viewing age-appropriate content is something that participants learned they can manage for themselves, by interacting with age-appropriate content for training the feed algorithm or selecting a network of peers whose content will be available to them. They also urge social media platforms to consider age in their designs. In the final projects, a 6/7th grader group recommended industry professionals to *"Make social media kid-friendly. Ask the age of the user, and then set up an age-appropriate algorithm and social media design."*



**Fig. 2..** Summary of group projects displayed on a Google Site for viewing during the project presentations. Groups 4, 5, and 6 include visual designs of apps envisioned by those groups.

**Individual network management and content visibility.** Several groups discussed the importance of who you invite into your online network and how peer influence can go both ways. For instance, a participant recommended to *"Curate your feed to encourage positive self-image"*. On day two, one of the groups of 6/7th students discussed staying focused on content that matters to you rather than being distracted by outsider content: *"She can try to monitor her social media and only look at her friends' posts Not like other people"*. On day three, a participant from another group of 6/7th graders revealed that *"If someone I watch doesn't use filters I'm more encouraged to take off the filter"*, emphasizing that if others can be more authentic, it empowers them to do the same. Groups also discussed the topic of maintaining a small network to promote digital wellbeing, which was inspired by the emerging research findings that having a smaller online network is protective for body image issues [anonymous for review].

**Social comparisons among peers.** A group of 6/7th grade students discussed the natural tendency in adolescence to compare what others are doing, using, wearing, buying, etc. For instance, the discussion turned to skincare products on social media: *"adding on to what she said is a lot of people are more concerned about what products they have, because that's kind of what is like trending right now. Those are like expensive too. Some people might be a little bit jealous of their friends who use some products. And everybody has different skin types, so sometimes the skin care doesn't work on them and they get kind of mad because they can't post that kind of videos about like crappy products."* For better or worse, social media was a window into their friends' preferences and lifestyle choices, which may have brought up negative emotions.

**Adapting to user's changing self-concept.** The group of 9/10th grade students discussed how people change and how they should be given a chance to "retrain" existing algorithms. *"Well, I don't really remember because I got Instagram a while ago, so I don't remember what happens when you first log in. But I know for Pinterest and Spotify or something, you give lists of interests that you like and then it curates that. So I guess maybe Instagram should ask that like weekly maybe, or there should be a place where you can change that and figure out because your interests aren't always the same from when you first got it. And I'm a lot different from like a year ago."* There was a realization that algorithms may need to be trained not only in the moment but also over time as their user preferences shift and they go through different developmental stages.



**User agency related to AI systems.** Participants continued to understand how invisible algorithms work and some agency that they have in interacting with the algorithm to achieve more healthy results: *"It's okay to remove yourself from a platform if it's making you feel more bad than good about yourself", "That it is best to keep off social media until you're older, because there can be more of a negative impact. Scrolling all day, feeling pressured to have a perfect login streak and needing to have lots of followers can be stressful and keep you away from spending time with your friends and family offline."*

**Feedback loops for personalization.** Participants described the utility of surveys as feedback loops between users and the AI. In group the group of 8th graders, after a discussion on data input using the data audit activity, a participant suggested incorporating a feature using a survey to get better information about the user *"Maybe a survey when you go into the app of, like, what are your interests today?"* A participant in a 6/7th grade group also suggested the idea of a survey *"But once you log on each day, it asks you a few questions, maybe about your body or about positivity."* Participants commented on the need to provide reinforcement feedback at the end of the session *"And then once they log off, they ask you another question, like, have you changed about how you're feeling now?"* The group of 9/10th grade students then suggested *"then they curate a for you page for that stuff that you like it"*, which would also take as input things the user dislikes and hide that content.

**Empathetic content warnings.** The 9/10th grade group discussed how their idea could help control content quality *"Maybe if you're about to comment on something and it has certain words or phrases - just warning them before they comment it."* This group discussed different aspects of content moderation and suggested these ideas to help guide users toward quality content before they post something that could result in harsh pushback. They also suggested a mechanism for second chances by first warning users before punishing them for misbehavior.

#### **4.4 Digital Wellbeing reflections and STEM empowerment from the workshop**

The discussions from the early days of the workshop culminated into a Google Site presentation on day five. They collaboratively developed many new ideas merging their understanding of digital wellbeing as it relates to body image that were incorporated into their final projects (see Figure 2).

**Digital Wellbeing, Body Image, and Social Comparison.** On day one, we introduced the workshop and were joined by a guest speaker, a social media influencer, who spoke about puberty. Afterward, participants reflected in small groups

on the guest speaker as well as a video about confidence in teenagers and worked on a meme activity. Participants in a 7/8th grade group commented on a discussion from the guest speaker about the trajectory of confidence for kids that peaks at around nine years old: *"I think when you're younger, people have fewer expectations of what you're supposed to wear and what you're supposed to look like and what you're supposed to say. And then when you grow older, those expectations increase, like whether social media, showing how you're supposed to look like or your family or friends showing you how to speak or what to say. And that just changes your confidence levels too."*

In an older group composed of 8th graders, participants reflected on two different experiences related to confidence. One echoed the experience of the younger participants by stating: *"I think that when I was little, I was, like, very whatever I wanted to do, I just did it because I don't really care what other people thought. And now I kind of think about what other people are thinking."* while another participant responded feeling like they lead busier lives as they age and thus don't spend the time engaging in social comparison as much: *"Actually, it's the opposite for me. I used to care a lot more when I was younger. [...] And I'm like, Oh, my God. No time to be picking out a thousand outfits [...]"* This group also discussed fashion trends and how they have changed over time, while one student commented *"Being skinny is like it has always been there. Like no matter what time period."*

In the end-of-day surveys from day 1, students reflected on the value of connecting with other girls sharing the same experiences as them: *"Definitely when the guest speaker came and talked about puberty. She made everything seem so easy to understand and not to be ashamed of going through it."*, *"that many kids confidence levels decrease as they get older from having more access to other people opinions and likes."* Participants also deeply reflected on how these social/emotional changes happening in early adolescents are related to social media usage: *"When I was in the workshop, I learned that so many girls/people are struggling with their body image, people commenting on their bodies online and offline, and their confidence goes downhill from the age of nine, which (I think) is usually when kids get their phones, which means they are getting social media too."* Following this introduction to the workshop and discussing the topics of body image and digital wellbeing, the following day introduced the topic of AI and how it relates to social media platforms.

On day one, we introduced the workshop and were joined by a guest speaker, a social media influencer, who spoke about puberty. Afterward, participants reflected in small groups on the guest speaker as well as a video about confidence in teenagers and worked on a meme activity. Participants in a 7/8th grade group commented on a discussion from the guest speaker about the trajectory of confidence for kids that peaks at around nine years old: *"I think when you're younger, people have fewer expectations of what you're supposed to wear and what you're supposed to look like*

*and what you're supposed to say. And then when you grow older, those expectations increase, like whether social media, showing how you're supposed to look like or your family or friends showing you how to speak or what to say. And that just changes your confidence levels too."*

In an older group composed of 8th graders, participants reflected on two different experiences related to confidence. One echoed the experience of the younger participants by stating: *"I think that when I was little, I was, like, very whatever I wanted to do, I just did it because I don't really care what other people thought. And now I kind of think about what other people are thinking."* while another participant responded feeling like they lead busier lives as they age and thus don't spend the time engaging in social comparison as much: *"Actually, it's the opposite for me. I used to care a lot more when I was younger. [...] And I'm like, Oh, my God. No time to be picking out a thousand outfits [...]"* This group also discussed fashion trends and how they have changed over time, while one student commented *"Being skinny is like it has always been there. Like no matter what time period."*

In the end-of-day surveys from day 1, students reflected on the value of connecting with other girls sharing the same experiences as them: *"Definitely when the guest speaker came and talked about puberty. She made everything seem so easy to understand and not to be ashamed of going through it.", "that many kids confidence levels decrease as they get older from having more access to other people opinions and likes."* Participants also deeply reflected on how these social/emotional changes happening in early adolescents are related to social media usage: *"When I was in the workshop, I learned that so many girls/people are struggling with their body image, people commenting on their bodies online and offline, and their confidence goes downhill from the age of nine, which (I think) is usually when kids get their phones, which means they are getting social media too."* Following this introduction to the workshop and discussing the topics of body image and digital wellbeing, the following day introduced the topic of AI and how it relates to social media platforms.

**New insights about how AI works.** On day one, a participant mentioned learning about filters and AI in the end-of-day survey, with small group discussions providing a forum to gain more insights about the technical underpinnings and limitations of AI through the workshop. In small group discussions with 7/8th grade students, participants reflected on what they learned during the workshop including *"how AI is used in social media"* and stating that *"I agree with the gender shades video, but also how come, like it doesn't always pick up your face, sometimes it matters how the texture in your face and skin tone and stuff like that."* In a group of 6/7th grade students, the facilitator asked participants how AI would determine what content promotes body positivity. A participant first responded that using the search term "body positivity" on YouTube or TikTok would show the corresponding content. The

facilitator asked a follow-up question to encourage participants to think more specifically about the data that would inform the AI of the content: *"So how do you think the AI knows what is a body positive video? Does it look for some clues within the video? Within the captioning maybe?"* and a second participant responded, *"the creators of YouTube or TikTok or any app, maybe they come up with different codes to order the AI to come up with options that other [people might be looking for] especially the most watched videos."* Another participant added the use of user-generated tags *"So maybe AI could use hashtags to figure out if you're being positive about bodies and stuff."* Another participant chimed in by adding *"title of posts"* which was positively received by the facilitator. In their end-of-day survey responses on the second day, many participants commented on their new understanding of AI: *"Before today, I thought that AI was all bad, and that it wasn't helpful. But, now I know that it can help protect people from scary or inappropriate things, give us what we want without having to keep scrolling forever, and that it can help identify bad users."*

## 5 Discussion

### 5.1 RQ1: Important values for teen girls about body image on social media

In addition to values often found from similar value-eliciting workshops with youth related to AI [11, 13], our focus on digital wellbeing allowed us to find other values that may be overlooked when the lens isn't as focused on digital wellbeing. We found important values about digital wellbeing and AI as: personalization, safety, relaxation, and education. Each of these values have tensions. For example, as expressed by participants, personalization can be beneficial, especially for youth, in making sure that the content available to them is age-appropriate. However, this personalization requires data or analytics on users' age which violate personal privacy, another important value [11]. Comments from participants in our workshop also highlight a dimension of safety related to viewing age-appropriate content. This value aligns with "Good Content" found in other studies with youth and AI values [11]. By exploring values on social media in the context of wellbeing, we found that positive content was more than simply presenting counterarguments to harmful body image messages. Instead, there was a consensus that encouragements to take breaks and exercise mindfulness should be promoted for social media users. Participants also noted that social media could complement their education, both by serving extracurricular educational content and providing a useful tool for taking breaks from studying.

### **5.3 RQ2: How can AI support positive body image for adolescent girls?**

Many groups saw a connection between feed personalization and digital wellbeing, with a common consensus among participants that if users can personalize their feeds in great detail, there is a less likely chance of being exposed to content that will lead to negative self-perceptions and body image. Each group had a different perception of what “wellbeing” referred to, in turn giving varying algorithm redesigns that targeted different aspects of this concept from body positivity in the youngest groups to self-expression and mindfulness in the older groups. Both younger and older groups (7th-10th grade) associated personalization with authenticity, designing algorithms encouraging authentic posting in the hopes that it would lead to fewer concerns around body image. Group four (7th/8th graders) associated personalization and emotional regulation, designing an algorithm that showed users content associated with their desired emotions. This echoes other recommendations for better wellbeing tools in social media, such as feedback for Instagram recommending personalized Explore and Feed pages [16]. Similarly, a study of teen anxiety on social media recommended preferential personalization to support teens’ self-concept and as emphasized in this study: “Every teen is different: what may work for some may not work for others” [1]. Personalization is important for teens. However, personalization also comes at the cost of more disclosure. Similarly, safety is a common topic of discussion with teens and social media. These topics align with prior work engaging youth in social media redesign activities.

Novel topics that are not revealed by prior work are the educational value and relaxation. These topics emerged by discussing wellbeing in the context of algorithms. For education, youth in the workshop described the responsibility of social media platforms in creating spaces for “high-value” content. They described pages/spaces where social media platforms could curate the “best” content for supporting the digital wellbeing of content consumers. The youngest workshop participants focused on the content of advertisements, promoting motivational content, and monitoring hateful comments. Relaxation and calming techniques for relieving stress were also identified as a value for teens in [1].

### **5.2 RQ3: Discussing AI Literacy and Digital Wellbeing in a remote context**

Through conducting this workshop in a remote context, we were able engage participants in discussions on difficult and complex topics. The input from our Youth Advisory Board was invaluable for creating this. Workshop participants were able to reflect on how AI impacts their current social media experience so they could create an algorithm redesign that confronted issues around body image online, with the support of near-peer facilitators. In their final project websites, workshop participants emphasized breaking down unrealistic beauty ideals, authenticity, body positivity, and

emotional regulation to confront the issues surrounding body image online. The different workshop groups addressed the issue from varying angles, with some groups preventing the negative self-image from occurring and others managing the outcomes. Groups attempting to prevent negative self-image designed algorithms targeting smaller, relevant audiences so users felt more comfortable posting authentically. Many groups designed algorithms that provided body positivity resources, and older groups tended to incorporate feedback forms to help users manage their body image and help designers understand how their apps are impacting users.

The responses of workshop participants in the end-of-day surveys revealed the substantial impact that our AI curriculum had on girls' empowerment as AI creators. In teaching workshop participants the inner workings of AI and its role in everyday life, students gained a greater understanding of how to approach such technologies. A notable skill the girls gained was the ability to understand how machine learning works. This newfound knowledge allowed them to critically assess the role of AI in various aspects of their lives, particularly in the realm of social media. Students were then prompted to take their understanding of AI and apply it to a tangible product that utilized AI in its operations. Students demonstrated a strong understanding of AI and algorithms in their prototypes, developing products ranging from qualitative surveys to AI-generated positive content. The skills that students gained throughout the week will be applicable beyond the workshop. Girls left as empowered AI creators, approaching social media with a more knowledgeable perspective and armed with strategies for effecting change.

## **6 Limitations**

Due to the nature of virtual learning contexts, there was a greater opportunity to participate without geographic restrictions, however, our participants may be a self-selected sample of families who desired a free STEM activity over the summer. The outcomes of this particular workshop may not be transferable in other learning environments that did not have near-peer facilitators who had received prior training on digital wellbeing and teaching AI to adolescents. Also, the virtual nature of the workshop may yield different results compared to an in-person workshop. The specific timeframe of this study occurred six months after the release of ChatGPT and pervasive media coverage of AI, which may have affected perceptions and attitudes of participants and facilitators.

## 7 Conclusion

In this paper, we describe the outcome of a remote participatory design workshop with 33 adolescent girls from across the United States. Through this workshop, assisted by near-peer small group facilitators, participants redesigned prevalent social media algorithms with a focus on enhancing wellbeing. Small groups followed an ethical design framework to evaluate stakeholders and values in their designs. Our findings expand on values identified by youth for algorithm redesigns with a focus on wellbeing values, highlighting the importance of relaxation, personalization, safety, and education. Furthermore, we observed that participants not only critically examined the impact of invisible algorithms as social media users but also transitioned into empowered creators of novel algorithms. Overall, discussing body image with young girls was a valuable theme for tackling a wide range of topics related to digital wellbeing and AI, helping them both gain insights as more informed users of these platforms as well as starting to view themselves as possible creators of future technologies.

**Acknowledgments.** We thank our project coordinator Alyssa Gramajo. We are grateful to our past and current digital wellbeing workshop programming funders: Metrowest Women's Fund, Metrowest Health Foundation, I Am Strong Foundation, Morningstar Family Foundation, Wellesley College Social Sciences Summer Research Program, Wellesley Centers for Women Class of '67 Internship Fund. We thank the youth workshop participants who provided their valuable feedback, the workshop facilitators who helped build our programming each year, and our Youth Advisory Board who gave us inspiration.

### **CRedit author statement.**

**Catherine Delcourt:** Co-PI, data collection, analysis and writing. **Linda Charmaraman:** Co-PI, data collection, analysis and writing. **Quan Gu:** Data collection, analysis and writing. **Caitlin Mbuakoto:** Data collection, analysis and writing. **Paige Whalen:** Data collection, analysis and writing. **Gillian Hodgden:** Data collection, analysis and writing. **Sofia Kobayashi:** Data collection, analysis and writing. **Aliea Nallbani:** Data collection, analysis and writing. **Zhamilya Bilyalova:** Data collection, analysis and writing. **ZhiXin Jin:** Data collection, analysis and writing. **Sidrah Durrani:** writing.

## References

1. Arpita Bhattacharya, Calvin Liang, Emily Y Zeng, Kanishk Shukla, Miguel ER Wong, Sean A Munson, and Julie A Kientz. 2019. Engaging teenagers in asynchronous online groups to design for stress management. In *Proceedings of the 18th ACM International Conference on Interaction Design and Children*. 26–37. <https://doi.org/10.1145/3311927.3323140>
2. Virginia Braun and Victoria Clarke. 2006. Using thematic analysis in psychology. *Qualitative research in psychology* 3, 2 (2006), 77–101. <https://doi.org/10.1191/1478088706qp063oa>
3. Moritz Büchi. 2021. Digital well-being theory and research. *New Media & Society* (2021), 14614448211056851. <https://doi.org/10.31219/osf.io/k3e2j>
4. Harald Burgsteiner, Martin Kandlhofer, and Gerald Steinbauer. 2016. IRobot: Teaching the Basics of Artificial Intelligence in High Schools. In *Proceedings of the Thirtieth AAAI Conference on Artificial Intelligence (Phoenix, Arizona) (AAAI'16)*. AAAI Press, 4126–4127. <https://doi.org/10.1609/aaai.v30i1.9864>
5. Linda Charmaraman, Catherine Grevet Delcourt, Sidrah Durrani, Jyontika Kapoor, Amanda M Richer, and Le Fan Xiao. 2022. The role of parents, other adults, peers and informal learning communities in shaping positive social media use in adolescent girls. *Information and Learning Sciences* 123, 7/8 (2022), 399–420. <https://doi.org/10.1108/ILS-03-2022-0034>
6. Jody Clarke-Midura, Frederick Poole, Katarina Pantic, Megan Hamilton, Chongning Sun, and Vicki Allan. 2018. How near peer mentoring affects middle school mentees. In *Proceedings of the 49th ACM Technical Symposium on Computer Science Education*. 664–669. <https://doi.org/10.1145/3159450.3159525>
7. Rachel Cohen, Lauren Irwin, Toby Newton-John, and Amy Slater. 2019. #bodypositivity: A content analysis of body positive accounts on Instagram. *Body image* 29 (2019), 47–57. <https://doi.org/10.1016/j.bodyim.2019.02.007>
8. Rachel Cohen, Toby Newton-John, and Amy Slater. 2018. ‘Selfie’-objectification: The role of selfies in self-objectification and disordered eating in young women. *Computers in Human Behavior* 79 (2018), 68–74. <https://doi.org/10.1016/j.chb.2017.10.027>
9. Catherine Grevet Delcourt, Linda Charmaraman, Sidrah Durrani, Quan Gu, and Le Fan Xiao. 2022. Innovating Novel Online Social Spaces with Diverse Middle School Girls: Ideation and Collaboration in a Synchronous Virtual Design Workshop. In *Proceedings of the 2022 CHI Conference on Human Factors in Computing Systems (New Orleans, LA, USA) (CHI '22)*. Association for Computing Machinery, New York, NY, USA, Article 248, 16 pages. <https://doi.org/10.1145/3491102.3517576>
10. Michael A DeVito, Darren Gergle, and Jeremy Birnholtz. 2017. " Algorithms ruin everything" # RIPTwitter, Folk Theories, and Resistance to Algorithmic Change in Social Media. In *Proceedings of the 2017 CHI conference on human factors in computing systems*. 3163–3174. <https://doi.org/10.1145/3025453.3025659>
11. Daniella DiPaola, Blakeley H. Payne, and Cynthia Breazeal. 2020. Decoding Design Agendas: An Ethical Design Activity for Middle School Students. In *Proceedings of the Interaction Design and Children Conference (London, United*



- Kingdom) (IDC '20). Association for Computing Machinery, New York, NY, USA, 1–10. <https://doi.org/10.1145/3392063.3394396>
12. Stefania Druga, Sarah T. Vu, Eesh Likhith, and Tammy Qiu. 2019. Inclusive AI Literacy for Kids around the World. In *Proceedings of FabLearn 2019* (New York, NY, USA) (FL2019). Association for Computing Machinery, New York, NY, USA, 104–111. <https://doi.org/10.1145/3311890.3311904>
13. Salma Elsayed-Ali, Elizabeth Bonsignore, Hernisa Kacorri, and Mega Subramaniam. 2020. Designing for children's values: conceptualizing value- sensitive technologies with children. In *Proceedings of the 2020 ACM Interaction Design and Children Conference: Extended Abstracts*. 296–301. <https://doi.org/doi/pdf/10.1145/3397617.3397826>
14. Motahhare Eslami, Karrie Karahalios, Christian Sandvig, Kristen Vaccaro, Aimee Rickman, Kevin Hamilton, and Alex Kirlik. 2016. First I "like" it, then I hide it: Folk Theories of Social Feeds. In *Proceedings of the 2016 CHI conference on human factors in computing systems*. 2371–2382. <https://doi.org/10.1145/2858036.2858494>
15. Motahhare Eslami, Aimee Rickman, Kristen Vaccaro, Amirhossein Aleyasen, Andy Vuong, Karrie Karahalios, Kevin Hamilton, and Christian Sandvig. 2015. " I always assumed that I wasn't really that close to [her]" Reasoning about Invisible Algorithms in News Feeds. In *Proceedings of the 33rd annual ACM conference on human factors in computing systems*. 153–162. <https://doi.org/10.1145/2702123.2702556>
16. Dan Fitton, Janet C Read, and Sheral Thompson. 2022. Understanding Instagram's Deep Dive into Teen Mental Health. In *35th International BCS Human-Computer Interaction Conference 35*. 1–10. <https://doi.org/10.14236/ewic/HCI2022.26>
17. Stacey Forsyth, Bridget Dalton, Ellie Haberl Foster, Benjamin Walsh, Jacqueline Smilack, and Tom Yeh. 2021. Imagine a More Ethical AI: Using Stories to Develop Teens' Awareness and Understanding of Artificial Intelligence and its Societal Impacts. In *2021 Conference on Research in Equitable and Sustained Participation in Engineering, Computing, and Technology (RESPECT)*. IEEE, 1–2. <https://doi.org/10.1109/RESPECT51740.2021.9620549>
18. Barbara L. Fredrickson and Tomi-Ann Roberts. 1997. Objectification Theory: Toward Understanding Women's Lived Experiences and Mental Health Risks. *Psychology of Women Quarterly* 21, 2 (1997), 173–206. <https://doi.org/10.1111/j.1471-6402.1997.tb00108.x>
19. Fiona Fui-Hoon Nah, Ruilin Zheng, Jingyuan Cai, Keng Siau, and Langtao Chen. 2023. Generative AI and ChatGPT: Applications, challenges, and AI-human collaboration. , 277–304 pages. <https://doi.org/10.1080/15228053.2023.2233814>
20. Rosella Gennari, Maristella Matera, Diego Morra, Alessandra Melonio, and Mehdi Rizvi. 2023. Design for social digital well-being with young generations: Engage them and make them reflect. *International Journal of Human-Computer Studies* 173 (2023), 103006. <https://doi.org/10.1016/j.ijhcs.2023.103006>
21. Eric Greenwald, Maxyn Leitner, and Ning Wang. 2021. Learning artificial intelligence: insights into how youth encounter and build understanding of AI concepts. In *Proceedings of the AAAI Conference on Artificial Intelligence*, Vol. 35. 15526–15533. <https://doi.org/10.1609/aaai.v35i17.17828>
22. Alexa Hasse, Sandra Cortesi, Andres Lombana-Bermudez, and Urs Gasser. 2019. Youth and artificial intelligence: Where we stand. *Berkman Klein Center Research Publication 2019-3* (2019). <https://doi.org/10.2139/ssrn.3385718>

23. Martin Kandlhofer, Gerald Steinbauer, Sabine Hirschmugl-Gaisch, and Petra Huber. 2016. Artificial Intelligence and Computer Science in Education: From Kindergarten to University. In 2016 IEEE Frontiers in Education Conference (FIE) (Eire, PA, USA). IEEE Press, 1–9. <https://doi.org/10.1109/FIE.2016.7757570>
24. Nadia Karizat, Dan Delmonaco, Motahhare Eslami, and Nazanin Andalibi. 2021. Algorithmic folk theories and identity: How TikTok users co-produce Knowledge of identity and engage in algorithmic resistance. *Proceedings of the ACM on Human-Computer Interaction* 5, CSCW2 (2021), 1–44. <https://doi.org/10.1145/3476046>
25. Keunjae Kim, Kyungbin Kwon, Anne Ottenbreit-Leftwich, Haesol Bae, and Krista Glazewski. 2023. Exploring middle school students' common naive conceptions of Artificial Intelligence concepts, and the evolution of these ideas. *Education and Information Technologies* (2023), 1–28. <https://doi.org/10.1007/s10639-023-11600-3>
26. Irene Lee, Safinah Ali, Helen Zhang, Daniella DiPaola, and Cynthia Breazeal. 2021. Developing Middle School Students' AI Literacy. In *Proceedings of the 52nd ACM Technical Symposium on Computer Science Education (Virtual Event, USA) (SIGCSE '21)*. Association for Computing Machinery, New York, NY, USA, 191–197. <https://doi.org/10.1145/3408877.3432513>
27. Amanda Lenhart and Kellie Owens. 2021. The unseen teen: The challenges of building healthy tech for young people. *Data & Society* (2021).
28. Duri Long and Brian Magerko. 2020. What is AI literacy? Competencies and design considerations. In *Proceedings of the 2020 CHI conference on human factors in computing systems*. 1–16. <https://doi.org/10.1145/3313831.3376727>
29. Kai Lukoff, Ulrik Lyngs, Himanshu Zade, J Vera Liao, James Choi, Kaiyue Fan, Sean A Munson, and Alexis Hiniker. 2021. How the design of youtube influences user sense of agency. In *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems*. 1–17. <https://doi.org/10.1145/3411764.3445467>
30. Sandra C Matz, Ruth E Appel, and Michal Kosinski. 2020. Privacy in the age of psychological targeting. *Current opinion in psychology* 31 (2020), 116–121. <https://doi.org/10.1016/j.copsyc.2019.08.010>
31. Siân A. McLean, Susan J. Paxton, Eleanor H. Wertheim, and Jennifer Masters. 2015. Photoshopping the selfie: Self photo editing and photo investment are associated with body dissatisfaction in adolescent girls. *International Journal of Eating Disorders* 48, 8 (2015), 1132–1140. <https://doi.org/10.1002/eat.22449>
32. MIT Media Lab - Responsive Environments Group. 2023. Responsive Environments Group. <https://www.media.mit.edu/groups/raise/overview/>
33. Jacqueline Nesi, Supreet Mann, and Michael B. Robb. 2023. Teens and mental health: How girls really feel about social media. San Francisco, CA: Common Sense (2023).
34. Candice L Odgers and Michaeline R Jensen. 2020. Annual research review: Adolescent mental health in the digital age: Facts, fears, and future directions. *Journal of Child Psychology and Psychiatry* 61, 3 (2020), 336–348. <https://doi.org/10.1111/jcpp.13190>
35. Richard M. Perloff. 2014. Social media effects on young women's Body Image Concerns: Theoretical Perspectives and an agenda for research. *Sex Roles* 71, 11–12 (2014), 363–377. <https://doi.org/10.1007/s11199-014-0384-6>
36. Alyssa N. Saiphoo and Zahra Vahedi. 2019. A meta-analytic review of the relationship between social media use and body image disturbance. *Computers in Human Behavior* 101 (2019), 259–275. <https://doi.org/10.1016/j.chb.2019.07.028>

37. Jaemarie Solyst, Shixian Xie, Ellia Yang, Angela EB Stewart, Motahhare Eslami, Jessica Hammer, and Amy Ogan. 2023. "I Would Like to Design": Black Girls Analyzing and Ideating Fair and Accountable AI. In *Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems*. 1–14. <https://doi.org/10.1145/3544548.3581378>
38. Daniel Susser, Beate Roessler, and Helen Nissenbaum. 2019. Technology, autonomy, and manipulation. *Internet Policy Review* 8, 2 (2019). <https://doi.org/10.14763/2019.2.1410>
39. Milena Tsvetkova, Irina Ushatikova, Nataliya Antonova, Svetlana Salimova, and Tatyana Degtyarevskaya. 2021. The use of social media for the development of digital literacy of students: From adequate use to cognition tools. *International Journal of Emerging Technologies in Learning (iJET)* 16, 2 (2021), 65–78. <https://doi.org/10.3991/ijet.v16i02.18751>
40. Risto Uuk. 2022. Manipulation and the AI Act. The Future of Life Institute (2022).
41. Ralph Vacca. 2019. Exploring the intersection of emotional literacy and computational modeling using scratch. In *Proceedings of the 2019 on Designing Interactive Systems Conference*. 849–858. <https://doi.org/10.1145/3322276.3322358>
42. Patti Valkenburg, Ine Beyens, J Loes Pouwels, Irene I van Driel, and Loes Keijsers. 2021. Social media use and adolescents' self-esteem: Heading for a person-specific media effects paradigm. *Journal of Communication* 71, 1 (2021), 56–78. <https://doi.org/10.1093/joc/jqaa039>
43. Jason C Yip, Kiley Sobel, Caroline Pitt, Kung Jin Lee, Sijin Chen, Kari Nasu, and Laura R Pina. 2017. Examining adult-child interactions in intergenerational participatory design. In *Proceedings of the 2017 CHI conference on human factors in computing systems*. 5742–5754. <https://doi.org/10.1145/3025453.3025787>