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Materializing Social Media Youth Practices for Algorithmic Learning

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Abstract: Social media is a prevalent space for youth to create, share, and curate personally relevant content online. Social media has been considered for content-based learning (e.g., sharing educational videos), but remains under-explored as a practice-based learning environment (i.e., learning by interacting on social media). Taking a constructionist approach to learning, this qualitative study analyzed video data of a connected algorithmic learning workshop that asked youths to translate their social media practices into tangible flowcharts. Findings show that the tangible tools made it possible for youth to identify flow-control structures in their practice, validating to youth the complexity of their own practices and decision-making online as relevant for algorithmic learning. The study highlights how using tangible tools to represent digital practices can foster educational practices that leverage youth's home practices with social media for algorithmic learning with possibilities for expanding computing cultures.

Social media as an algorithmic learning environment

Algorithmic practices and understanding how algorithms function, such as formulating problems that transform an input into the desired output, are vital for societal success (Anger et al., 2022). Equally relevant to fostering a prosperous technical society is the diversity of its participants. One way to diversify participation in technical fields is by expanding the cultural practices that are valued as core to a field and fostering approaches to learning that are deeply embedded in youth cultural practices (Ito et al., 2020). One such learning environment–and perhaps an unlikely one–is social media, a prevalent space for youth to create, share, and curate content online (Aichner et al., 2021). Youth social media practices involve digital content creation through linking hashtags and tagging people as well as tangible practices like holding a camera and pressing a button to capture a real world moment. For educational purposes, social media has been presented as a space for content sharing, including science-related content, through focused channels, hashtags, and other features (Romero-Hall, 2021; Lundgren et al., 2020). Youth cultural practices on social media, such as sharing and curating of content, are promising sources for technical learning as they involve complex algorithmic practices (Keune & Hurtado, 2023). One way to understand the algorithmic interactions is through youth algorithmic imaginings, which explore different approaches youth develop to live with the algorithms they encounter (Low et al., 2023). Building on this work, leveraging youth social media practices for algorithmic learning within educational contexts seems promising because it can integrate resilient youth cultural practices toward algorithmic learning. However, thus far, limited work exists on making algorithmic practices of everyday social media practices explicit. Therefore, we asked: *How can middle school youth investigate and articulate the algorithmic practices involved in sharing content on social media?*

A tangible context to investigate algorithmic practices on social media

To address this question, we built on constructionist approaches to learning (Papert, 1993; Holbert et al., 2020) to investigate the use of a tangible activity for youth to probe into their own algorithmic practices involved while sharing and consuming content on social media. Constructionist approaches to learning focus on learners creating personally meaningful projects to foster rich learning opportunities (Papert, 1993). Constructionism argues that knowledge not only happens through the individual learner while constructing their project, but that the creation process, the materials involved, and the final product can happen in social environments with peer feedback and through collaboration. Moreover, engagement with engineering and computing ideas can be supported when bringing together personal interests, personal histories, and homelives (Hurtado et al., 2023). In fact, social media seems to align with such constructionist ideas, providing opportunities for merging computational learning (e.g., algorithmic practices) with youths' at-home practices.

Methods

This qualitative study was set in the context of a workshop that consisted of three sessions (55 minutes each; 2,75 hours in total) carried out over the course of one month with three 8th grade groups of youth at an international school in Germany. A total of 30 young people participated in the study. The workshop focused on social media

youth practices, their algorithmic learning opportunities, the resistance strategies from youth, and the design possibilities. For this paper, the analysis focused on the first session, which happened three times with three groups. The session asked youth to create tangible flowcharts to explore the algorithmic decision-making of their own social media content creation practices based on hypothetical scenarios. The hypothetical scenarios were designed based on prior analysis of ethnographically inspired social-media walkthroughs and youth social media practices (Keune & Hurtado, 2023). During the workshop, youth created, for instance, a hypothetical post on a social media platform of their choosing where they would share pictures of a vacation, visualizing their process of posting in detail in the form of tangible flowcharts. To do this, each working table had an instant camera, a pinboard, pins, yarn, post-its, and other crafting materials to develop a physical flowchart of their posting process. The activity design built on a methodological approach of translating youths' everyday practices into their underlying algorithmic learning to understand conceptual and digital learning as relationally bound to material practice (Keune, 2022). We selected flowcharts because they provide visual representations of algorithms and have been used to teach programming to novice learners (Charntaweekhun & Wangsiripitak, 2006). For this workshop, we asked the youth to perform the translation themselves, which meant shifting from translating material practices into digital code to translating digital practices into material code. All three workshop sessions were video recorded, with a GoPro camera recording each small group of 3-5 students (5.4 hours of video data). Shorter videos (49 minutes in total) and 43 pictures taken with a mobile phone camera captured the progress of the flowcharts up close. We analyzed whether and how the activity made it possible for youth to illustrate (1) personal flow control structures of everyday social media practices and (2) how their content production decision-making was intertwined with the imagined working of the platforms they typically shared content on. We conducted an iterative and thematic analysis (Morgan & Nica, 2020) of the conversations, creation process, and reflections during the workshop and artifact analysis (Trăușan-Matu & Slotta, 2021) of the flowcharts.

Findings

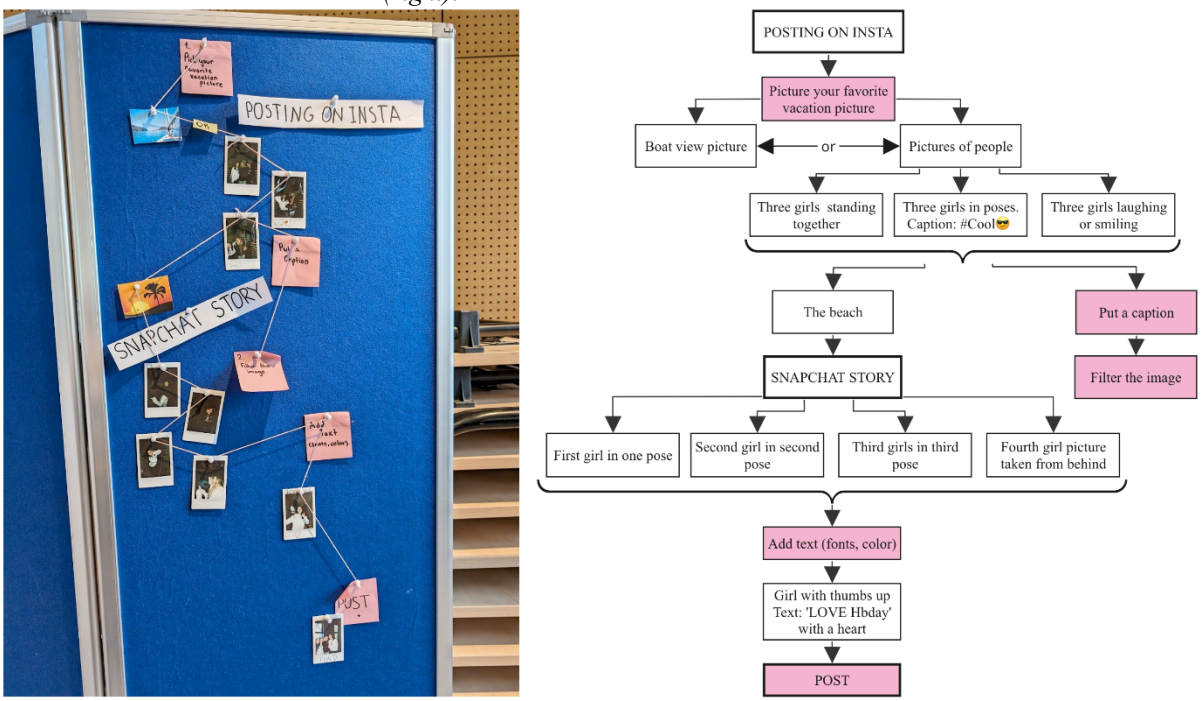
Through the analysis we identified that the activity made it possible for youth to articulate personal flow-control structures of their social media practices. Figure 1 shows a photograph of the flow control structure created by one group we will focus on for this paper and a diagram translation included for clarity. For example, the youth in the group described starting their algorithm through an event that prompts a picture or video to be taken. In this case, they started with the hypothetical example of a vacation event that prompted them to create a number of pictures. The youth paused, captured, and printed photographs of themselves posing as if on vacation using the Instant cameras available through the workshop. Then, they elaborated their algorithmic practice in the flowchart. One of the youths explained:

> *"We have three options because that's usually the way you post. You not only post one thing on Instagram. For a story, you post only one story, for a post, you post multiple of like your best ones. [...] Then we have a different section that's a Snapchat story, which is an individual story, and then we have individual pictures."*

They explained that they would decide on the platform (i.e., Instagram, Snapchat) and kind of post and, therefore, the number and type of pictures to include. For an Instagram post, more than one individual should be shown in the picture, while Snapchat was for photos that showed only one individual. What stands out in this practice is how digital and tangible practices converged within the youths' personal flow control structures, which is atypical in flowcharts that describe algorithmic software practices. For example, one essential practice for creating flowchart was staging the documentation of the hypothetical events (e.g., taking selfies and other pictures), showcasing the picture selection process with several instagram-pictures on the pinboard, as well as mapping how the picture-taking evolved from an event to a multiplatform posting opportunity by connecting pins with threads. The activity of creating tangible flowcharts realized nested relationships of digital and tangible aspects of the participants' algorithmic practices on social media.

Further, youths' tangible flow charts showed the image used for the vacation post as possible content for a birthday story, which the original poster of the vacation story could share to honor one of the people shown in the photo later on. This illustrates a complexity of decision-making across timescales that the activity made available to the youth as they noticed that their postings were based on aesthetic choices, platform features (timeline organization), youth culture (birthday stories), and considerations about possible future actions (how the content could be used in the future). The participants mentioned they wanted to expand their design more, but due to time constraints, they could not include additional decisions such as when to post (e.g., if they post when nobody is online, it will get no attention), what audience they aim for (i.e., everyone or specific people), who to tag, sharing location or not, and adding the time of posting.

Figure 1
Tangible flowchart showing youths' flow control structure of posting about a vacation on several social media platforms (left) and diagram translation (right).



When asked about how they could relate this content creation process to algorithms, one of them responded that the process is similar to algorithms as they are processes with specific steps. The participants seem to quickly grasp similarities between a broad definition of an algorithm and their own practices. Sandra (pseudonym) said "*These trends, they come and they go, but as you get used to posting more and more, you just know what to post better and what would look better.*" This suggests that the activity led to reflections about personal learning experiences and practices developed over time with social media use.

Furthermore, by making personal flow control structures explicit through tangible flowchart creations, youth demonstrated how their own decision-making intersected with the real and the imagined working of an ecology of social media platforms. Youth decisions on whether to post or not related to the features of a platform and how it matched their intention for content creation, such as the possibility of creating captions and whether a post could be timed. Their decisions were driven by how they imagined the algorithms of the platforms would present content to others and how others would perceive the content. Some content could be intended for a wider audience, and therefore the content in this post should be curated with more scrutiny, paying attention to considerations, such as appropriateness or whether everyone in a picture had permission to post by their parents.

Discussion

Youths' translation of their own practices can illustrate the complexity of youths' practices and decision-making online. Further, the findings show that the tangible tools for making social media algorithmic practices visible can highlight intersections of digital and tangible aspects of everyday practices and enable articulations of ecologies of platforms that can drive personal algorithmic practices. At a time when computational learning is dominantly orienting toward digitalization, the present study highlights the usefulness of integrating tangible tools into algorithmic learning as a way to generate awareness that everyday practices are connected to and shaped by algorithms, and how youth practices can make a difference in how algorithms behave. Additionally, recognizing their personal and at-home social media practices as possible contexts for algorithmic learning (e.g., optimizing practices over the course of several years), validates their practices as relevant sources of domain-specific learning. Therefore, the work could present opportunities for diversifying entry points into computer science education, where tangible approaches, youth-cultural practices, and home-based approaches to algorithmic learning can serve as meaningful learning contexts. Combining personal practices, social media and tangible tools

to learn within computer science can be meaningful to further investigate in the learning sciences as a way to highlight youth practices for learning.

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