Social Media TestDrive: Real-World Social Media Education for the Next Generation

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ABSTRACT

Social media sites are where life happens for many of today's young people, so it is important to teach them to use these sites safely and effectively. Many youth receive classroom education on digital literacy topics, but have few chances to build actual skills. Social Media TestDrive, an interactive social media simulation, fills a gap in digital literacy education by combining experiential learning in a realistic and safe social media environment with educator-facilitated classroom lessons. The tool was piloted with 12 educators and over 200 students, and formative evaluation data suggest that TestDrive achieved high levels of engagement with both groups. Students reported the modules enhanced their understanding of digital citizenship issues, and educators noted that students were engaging in meaningful classroom conversations. Finally, we discuss the importance of involving multiple stakeholder groups (e.g., researchers, youth, educators, curriculum developers) in designing educational technology.

CCS CONCEPTS

• **Human-centered computing** → **Social media**; • **Applied computing** → *Interactive learning environments*;

KEYWORDS

Digital Citizen; Education; Youth Development; Social Media

1 INTRODUCTION

Adolescents' digital citizenship education is more important now than ever. Eighty nine percent of teenagers in the U.S. characterize themselves as being online several times a day or "almost constantly" [1]. With online activity comes an array of opportunities and risks [4, 28]. For example, once active online, children are likely to face a variety of confusing or outright negative experiences, such as cyberbullying [17], over-disclosure of private information [30], and fake news [29]. Few young users of social media, however, are prepared to deal with complicated choices related to privacy, sharing, responding to cyberbullies, or discerning between accurate and distorted news [4]. Indeed, in a recent survey of primary and secondary school students in the U. K., only 2% of participants were able to distinguish fake news from truth [27].

To categorically focus on risks, however, is to misrepresent the diversity of online experiences. Like many realms of life, social media may present both negative and positive experiences for young people. Online spaces can provide teens with places to learn, be creative, "hang out" with friends, and try on new identities [5]. Moreover, while research shows teenagers with more online skills are exposed to more online risks as well as opportunities [19], facing these risks online can be an effective way for teenagers to learn the boundaries of appropriate online behavior [14]. As Karen Pittman, founder of the national youth development initiative Ready by 21 wrote, "Problem-free is not fully prepared"[23]. Positive youth development approaches suggest that effective education for young people about social media must include

information not just about ways to avoid potential dangers or negative experiences, but must also focus on the potential benefits of social media participation [12].

Fully restricting teens' access to social media is neither feasible nor desirable, since contemporary youth must be equipped to engage in increasingly abundant and complex social media experiences. Indeed, it is likely that every child will have to engage in online social platforms to navigate future work and social environments [1]. A growing number of educational institutions require youth to navigate online environments (e.g., Google Classroom) to engage with educational material, some of which includes social exchange [15]. It is incumbent on parents, educators, HCI designers, and other adults who care about young people to invest in creative and effective strategies for preparing them to engage in the online world in ways that minimize risks and maximize opportunities for positive development. Ideally, such education should begin early, as participation in social media often occurs even before youth reach the the legal age required to open an official account [20] because it is easy for youth to circumvent age requirements by entering a fake birthday to create an account.

Responsible social media use means effectively identifying and mitigating risks while simultaneously recognizing and capitalizing on potential benefits. This requires three primary skills: understanding key issues surrounding technology, using technology responsibly, and developing lifelong skills to use technology in a positive way [24].

Current efforts to prepare youth and families to deal with the challenges that accompany social media use are referred to as "digital literacy" [9]. Historically, digital literacy referred to responsible consumption and interpretation of traditional mass media such as TV, film, and news. More recently, it has been joined by the related term "Internet literacy", defined as "the abilities to access, analyze, evaluate, and create online content" [19]. Some have even argued for "social media literacy" as a separate term, dealing specifically with issues associated with social media use [18].

However, integrating each of the three aforementioned skills requires more than simply "literacy": education efforts must prepare youth to manage a wide range of digital media, and to act as responsible citizens of the digital platforms they occupy (for a review, see [3, 6]). The primary measure of "citizenship" goes beyond demonstration of knowledge about specific content, features, or functions of the Internet, and includes demonstration of critical thinking about digital media use and the complex challenges that accompany it [6]. Thus, while "literacy" and "citizenship" are often used interchangeably, we use the latter to emphasize that it requires understanding not just of the content presented, but of responsible conduct in and around these media.

Educational programs under these and other names have proliferated in recent years. While some of these have effectively prepared youth and their families to recognize and mitigate risks, others have had little impact or have even produced harmful effects [7].

Current Digital Citizenship Tools

Current digital citizenship education tools fall under three broad categories: non-interactive curricula, interactive edutainment games, and unguided platforms. Basic curricula typically contain scripted lessons or activities designed to be mostly delivered in offline classroom settings or through "do it yourself" online resources such as videos. A notable example of a non-interactive curriculum is the stand-alone Common Sense Education K-12 Digital Citizenship Curriculum, which consists of classroom lesson plans, educational material, and videos for grades K-12 on many digital citizenship topics. Though these lessons and their contents are rich, they do not allow for interaction between the student and a social media platform, and do not provide hands-on learning experiences. Google has also released a number of educational tools and curricula for different age ranges. The company's "Online Safety Roadshow" consists of teacher lesson plans for high school audiences. Their "Applied Digital Skills" site is broader in scope, using videos and tutorials to teach basic digital skills like searching for information or applying for a job to both teens and adults. Other efforts in this area include programs such as Facebook's "Bullying Prevention Hub" and "Digital Literacy Library," and the Digital Literacy Resource Platform from the Berkman Klein Center for Internet and Society.

Interactive edutainment games are designed on the premise that high engagement through interactive gaming assists in learning and retention. In the context of digital citizenship and social media education, these games often include narrative vignettes of people encountering technology-based issues, with the user navigating the situation in the role of a main character. Common Sense Media's Digital Compass is an example of this model, using cartoon videos where students can decide how the story continues for the main character. For example, in the lesson "Kung Fu Fibber," students help an ox named Hutch decide whether to post truth or exaggerations online, reviewing what he should post and what he should think twice about. While these situations may reflect those found in the real world, the available interactions are limited to a few pre-defined options and do not provide experience with the actual interfaces or interactions found on real social media platforms. Edutainment games with similar models include Digizen's Cyberbullying Game and the Federal Trade Commission's OnGuardOnline program.

Edutainment media also mimic popular game genres (e.g., 2D platformers, puzzles) with added educational material or text. Often the game and the educational material are neither thematically nor mechanically connected. For example, Google's "Be Internet Awesome" game allows a player to control a Google Android mascot around a series of platforms, giving "likes" and heart emojis to sad robots while blocking bully robots. The game is meant to teach players to uplift others and stand up to cyberbullies. While the lesson is well-intentioned, the connection between robots giving each other heart emojis in a 2D world is far removed from a real situation or social media environment. Other games that use this model include CyberWise by PBS kids, Carnegie Cyber Academy, and Netsmartz Teens.

The third category of digital citizenship education tools are unguided platforms or sandboxes. These tools are less educational resources than specially made social media platforms designed for youth audiences. A recent and popular example is Facebook's "Messenger Kids," a version of Facebook Messenger that allows parents an oversight of their children's messaging. Parents can control their child's address book and monitor messages sent or received through the app. While there is no educational material explicitly included, it does give children protected, hands-on experience using chat applications such as Facebook Messenger. Google provides a similar product called "Family Link" that allows parents to monitor their children's Android phones. Other examples of social sites made for young people include TOCO mail and Yoursphere.

Addressing the Current Gap in Tools

Most of the interactive tools reviewed above are one-time educational games that are fun but do not necessarily build lasting skills. Preparation for social media involvement needs to be both instructive and tailored to the kinds of social media youth actually use. However, most of the currently available tools do not combine an interactive social media component with an educational component. Since the consequences of social media mistakes can be immediate and lasting, educational tools should combine the realism of social media use with guided educational material. Such a tool needs to be thoughtfully designed and needs to incorporate core elements of experiential learning.

The social media platforms favored by young people vary widely in interface and purpose: 85% of teens 13-17 use YouTube, 72% use Instagram, and 69% use SnapChat [1]. New forms of social media appear regularly, drawing crowds of young users with new and engaging features. Some existing supervised social media experiences, such as Facebook Messenger, can be helpful in acclimating young users to these sites while allowing for a parental control. However, these site-specific experiences do not help users transfer their skills to other sites and while providing for a parental monitoring, do not specifically teach digital citizenship skills. Educational tools must not only prepare young people to responsibly use existing social media platforms, but teach the citizenship and critical thinking skills required to safely navigate platforms that may not yet exist. The theoretical framework of experiential learning can also help in this regard.

Theoretical Perspectives

Compared to passive, didactic learning based on non-interactive curricula, experiential learning provides students with hands-on experiences and opportunities to reflect on what they are learning. According to Kolb's experiential learning model, learners develop abstract conceptualizations through the process of reflective observation about concrete experiences. These conceptualizations are then tested again through active experimentation, and this cyclical process of experience, thought, and reflection helps students develop understanding of the real world [16]. Though learners alone may drive experiential learning, the process can be facilitated by another who guides the process of reflection. Questions that prompt learners to consider what happened during their experimentation and why, and if this happens in the real world and why. Facilitators can use this information to encourage learners to critically reflect on their experiences and apply this learning to their own lives [11].

Digital citizenship is an area of education ripe for experiential learning. The current didactic digital citizenship curricula lack hands-on experiences, while interactive edutainment games are more engaging but unrealistic. Unguided forays into social media may provide hands-on experience in "real-world" online communication, but lack the guided reflection critical for learning. To fill in this gap in digital citizenship training, we have developed a social media simulation, and accompanying materials for educators, to introduce key concepts of digital citizenship and to facilitate reflection. This tool provides a unique blend of realistic hands-on experience and guided instruction.

2 SOCIAL MEDIA TESTDRIVE

Social Media TestDrive simulates the look and feel of a social media site, but without connection to the general Internet. Developed through conversations with youth development educators participating in a University-organized research and practice workshop in summer 2017, TestDrive arose as an educational adaptation of a simulation platform originally designed for experimental social media research studies. In a series of semi-structured focus-group-like conversations, educators and youth development experts were prompted to reflect on topics relating to youth and social media. They described working with youth who use social media, and discussed helping youth deal with issues related to mental

health, cyberbullying, and sexting. The research team then informally presented their work on exploring the mechanisms of bystander intervention in cyberbullying via a simulated social networking site. The subsequent exchange between educators and researchers led the group to realize the opportunity to adapt the existing research simulation for experiential learning in digital citizenship.

Following these initial conversations, the research team engaged local youth educators to further understand their needs for an educational social media simulation. A group of youth development professionals from local groups provided feedback on early iterations of TestDrive. Their input assisted the research team in choosing lesson topics, identifying existing digital citizenship curricula, and creating engaging and age-appropriate content.

The TestDrive Platform

Social Media TestDrive is an educational tool meant to be used by educators in classrooms, after-school groups, camps, or in other educational or youth development settings. The goals of Social Media TestDrive are to teach and practice of social media skills in a safe, realistic environment. It is designed for middle school students aged 10-13, who are aware of social media and technology but do not yet have social media accounts of their own. The platform gets its name from virtual driving simulators used in driver education courses, where students practice in a safe, simulated environment to get hands-on experience using concepts they have learned in the classroom. At its heart, Social Media TestDrive simulates a social media experience by presenting a realistic social media interface (e.g., profile pages and a timeline) and interactions (e.g., creating posts and making comments). Unlike a real social media site with thousands or millions of other users, all other users of Social Media TestDrive are pre-programmed bots following a simple script. Interactions that take place on the site are only viewable to the individual user, and never published to the public Web. This allows students to practice still-developing skills without fear of public failure or lasting consequences, as any missteps are private and are wiped away when they finish the lesson.

Student experiences in the social media simulation are bookended by educator-led discussion of key concepts and reflection questions about the lesson topic. This structure - introduction of key concepts, experience within the social media simulation, and reflection through discussion - is founded on experiential learning theory [16], which, as discussed above, suggests that individuals learn most robustly when they actively do something (e.g., participate in the simulation) and when they reflect on the experience. Social Media TestDrive provides a âĂIJsimulationâĂİ environment for this experiential learning, with concepts and prosocial examples administered through the educator-led

reflection process. This helps learners to consciously connect abstract concepts with concrete actions, and to consider the application of their new skills to future social media use. As such, learning outcomes include 1) increase in knowledge about relevant concepts, 2) development and demonstration of social media skills and 3) intention to apply those skills in future real world social media use.

The technology behind the Social Media TestDrive project comes from a research platform called Truman, named after the 1998 film *The Truman Show*. The Truman Platform was built to create complete social media simulations for research studies [8]. Research participants are led to believe that the social media site is a genuine social media platform. In actuality, every user, post, like, reply, notification, and interaction a participant sees is carefully curated and controlled by the research team. This allows a research team to control not only the technical interface of the site, but also the social context in which they use it. The simulation is also dynamic, reacting in real time to the participant's actions. When a participant posts a new picture to the site, the "bot" users will read, like, and reply back. Bot actions also create notifications for the participant, further extending the realness of the site.

Social Media TestDrive is a web application, and thus can work on any device that has a web browser and an Internet connection. Its interface is reactive to device type and will re-size itself to work on desktops, tablets and mobile devices. The application was built with security in mind, and uses best practices in web security such as SSL encryption (HTTPS), Content Security Policy headers and Cross-Site Request Forgery protection. TestDrive has been tested on all major modern browsers at the time of writing (Google Chrome 68, Mozilla Firefox 61, Microsoft Edge 42, and Apple Safari 11).

Lessons and Materials

Social Media TestDrive leverages the Truman platform for educational rather than research purposes. The functionality is the same: Participants engage only with "bots" in the social media timeline, and their interactions are entirely contained in a single session in the TestDrive simulation. However, TestDrive expands upon Truman by combining it with educational materials. Each TestDrive lesson and interactive activity are accompanied by an educator guide, parents' guide, and pre- and post-activity quizzes. The educator guide provides an overview of a digital citizenship topic, details about the interactive activity, and questions to facilitate student reflection and discussion before and after the activity is completed. Educator guides and material were drawn from Common Sense Education's Digital Citizenship Curriculum, the Berkman Klein Center for Internet and
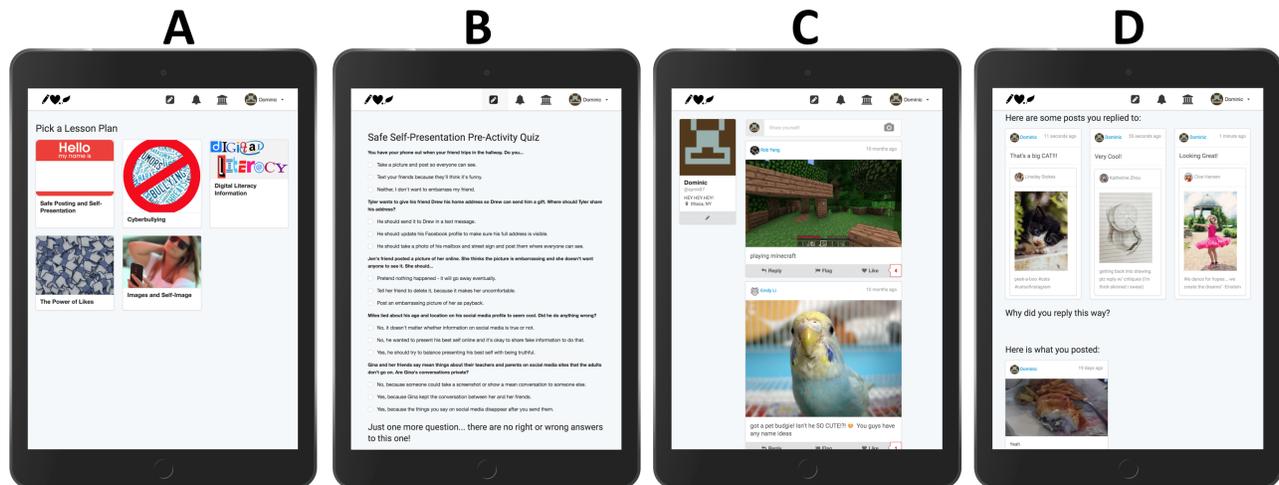
Figure 1: A: The lesson module selection screen. B: A Pre-Activity Quiz. C: An activity's interactive timeline. D: The activity reflection page.

Society's Digital Literacy Resource Platform, and Fordham University's Privacy Educators Program.

Social Media TestDrive also includes an Instructor portal. Instructors are given account privileges that allow them to create class groups, assign students to classes, and monitor student progress through the lessons.

Current Modules. Social Media TestDrive currently has 6 modules, each focused on a different digital citizenship theme or issue.

- **Usernames, Passwords, and Bios.** This module acts as both an introduction to Social Media TestDrive and a lesson on creating an online account. It guides a new student user through the process of account creation, presenting them with material to help them think through the process of creating a strong password, choosing an appropriate username, and other considerations.
- **Stopping Cyberbullying.** This module helps students learn to understand what cyberbullying is, how to spot it, and what to do when faced with a cyberbully. This module encourages students to not just be bystanders to cyberbullying situations they may see, but to stand up and intervene in appropriate ways.
- **Information Literacy[1].** This module teaches users how to check the facts on information they find online. It includes material on how to spot fake news or untrustworthy facts, and helps students practice reacting constructively when they see others sharing misinformation.

- **Safe Posting and Self-Presentation.** This module focuses on best practices for online self-disclosure and audience management. It helps learners understand who else might see what they post, how to carefully choose what to share, and how to react when they see others sharing too much.
- **The Power of Likes.** This module helps users critically examine what "likes" and other forms of approval mean in a social media context, and how they might rethink their reactions to the number of likes received by their or another person's post.
- **Self Esteem and Self-Image.** This module assists learners in critically interpreting the ways others might present themselves online, and the effects these curated online personas might have on their own self-esteem. It also provides practice in interpreting images that might be altered or manipulated.

Module Workflow. A typical TestDrive lesson proceeds as follows. Young people in a classroom or group first log into the TestDrive platform, select a module (in this example, the "Safe Posting and Self-Presentation" module) from the Lesson Selection screen (see Figure 1A) and take a pre-lesson quiz to establish a baseline of topic-related knowledge and social media familiarity (see Figure 1B). The quiz might include questions (e.g., "Tyler wants to give his friend Drew his home address so Drew can send him a gift. Where should Tyler share his address?") with multiple choice responses (e.g. "He should send it to Drew in a text message" or "He should update his Facebook profile to make sure his full address is visible"). After students complete the quiz, an educator

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[1]We use "literacy" rather than "citizenship" here to align with nomenclature used by the curricula from which the module activities were drawn.

delivers a short lesson on audience, self-presentation, self-disclosure, and privacy on social media, using material from the educator guide. A group discussion follows, prompted by questions such as "How do you want people on social media to see you?" and "Who do you think sees the things you post online?".

After the preliminary discussion, students are instructed to access the lesson's interactive activity. In the Safe Posting and Self-Presentation lesson, students are asked to scroll through a simulated social media timeline and decide if the information being shared by other "users" is appropriate or not (see Figure 1C). If students see someone engaging in smart self-presentation, they are asked to "like" the post. If students see what they perceive as inappropriate, they are encouraged to give constructive feedback in a "comment" on the post. Finally, students are asked to create a post themselves, keeping in mind the smart self-presentation tactics they discussed.

After the interactive activity, students are directed to a reflection page, which lets them review the posts they have created, commented on, and liked (see Figure 1D). The reflection page is the springboard for further classroom reflection and discussion, using questions listed in the educator guide such as "What kind of things did you click the 'like' button for?" and "If you created a post of your own, what did it say and why?". This discussion helps students consciously consider and articulate why they took the actions they did, what they could have done differently, and how these experiences relate to their own interactions on social media sites. This reflection process couples the users' experience with cognitive processing and enhances learning.

Finally, students are directed to post-activity quiz questions (e.g., "Carla and her friends make fun of their teachers and parents on social media sites that the adults don't go on. Are Carla's conversations private?"). The post-activity quiz also includes basic evaluation questions (e.g., "How much did you like this activity?"). Students then see a final summary page with their quiz results, allowing them to note their knowledge improvement on the lesson's topic.

3 EVALUATION METHODS

Formative Evaluation

Ongoing connections with local youth development experts enabled members of the research team to work directly with local youth, parents, and educators to collect feedback on Social Media TestDrive. Through a systematic formative evaluation process, the research team collected data for the purpose of iteratively improving and refining the content, curriculum materials, and operation of the TestDrive platform and educator guides [25]. Formative evaluation data (often qualitative) draws input from experts and users to assess

the content, design, technical quality, appeal, effectiveness, implementability, and user acceptance of the educational materials [26]. This process assists in the development of educational materials by identifying potential deficiencies in learning effectiveness, ease of use problems, efficiency of instruction, and instructional strengths of the materials [26]. The phase of evaluation described here focused on 1) assessment of learner knowledge change, engagement, and satisfaction, and 2) educator observations about the overall ease of use, degree and nature of youth engagement, and effectiveness of the reflection process. This information was used to make improvements to the program, all of which were again evaluated. Capturing both learner and educator experience with early design iterations has allowed the research team to triangulate findings, identifying improvements for learning and interaction design and a developing a better understanding of what project elements promote learning. This collaborative and iterative process has resulted in a refined product with strong educational promise. This process has also allowed the research team to be sensitive to the needs of multiple stakeholders and to incorporate suggestions in such a way that they can be well-tested before deployment.

Data Collection Procedures

To conduct a formative evaluation of the TestDrive tool, educators in the Northeast U.S. were recruited to administer TestDrive modules in classrooms and after-school programs. Evaluation data was collected from educators (N=12) and their students (N=203) in six primarily rural counties in the Northeast U.S. Educators provided feedback about TestDrive and the educator guides in open-ended questions on an online survey (N=10) or through phone interviews (N=2) using the same open-ended questions. Questions fell broadly into three categories: aspects of the modules the students and educators liked or disliked, feedback on the content and length of activities, and general suggestions for future TestDrive development. Students answered survey questions at the end of each module about whether they liked the module, whether they felt they had a better understanding of the topic, whether they liked the length of the module, and whether they would recommend the module to a friend. In addition, scores (i.e., number of correct responses) from the pre- and post-activity quizzes were recorded. The three modules completed assessed using this approach were self-presentation, cyberbullying, and information literacy.

4 EVALUATION RESULTS

Qualitative Feedback from Educators

The qualitative feedback data from educators were in the form of detailed notes from phone interviews, and written
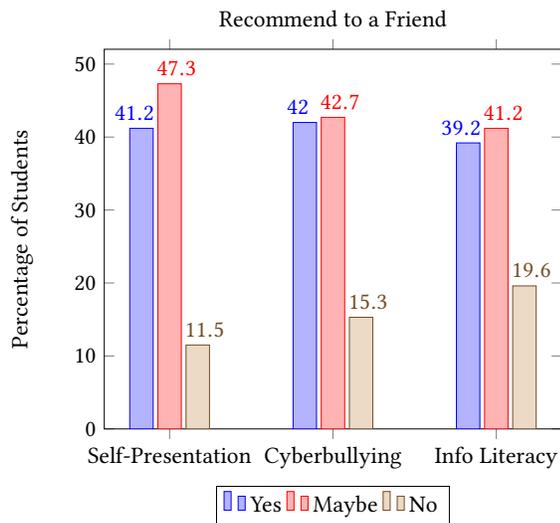
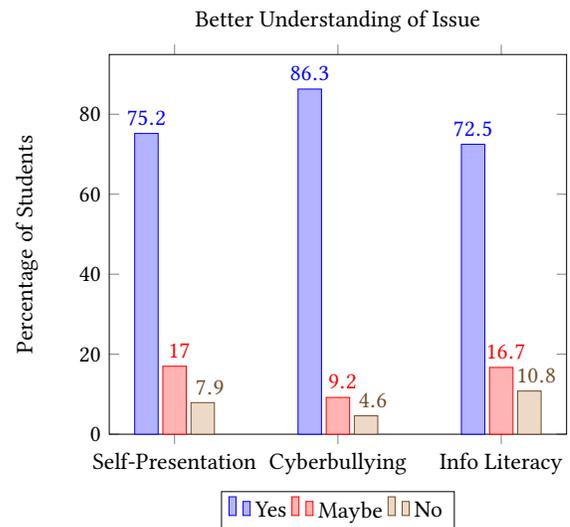Figure 2: Whether students would recommend the module to a friend.

Figure 4: Students' understanding of the topic after module completion.
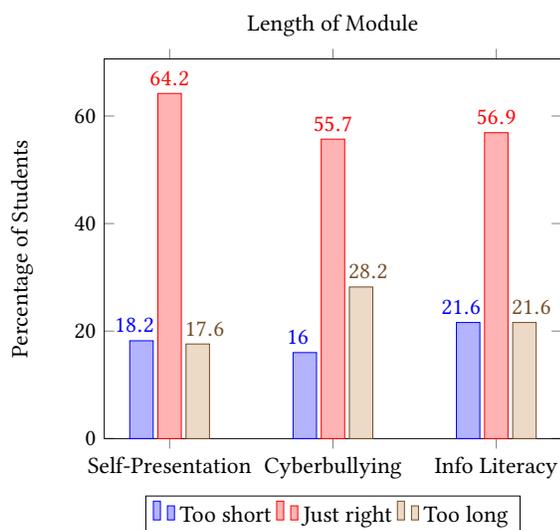

Figure 3: Students' perceptions of the length of the module.

responses from open-ended questions of an online survey. The data were analyzed using a thematic analysis method where responses were summarized and synthesized into main themes. Results showed that educators administered the TestDrive modules to students in grades 4 through 8 (corresponding roughly to ages 9 through 14). Educators reported that to their knowledge, most of the student participants did not have much, if any, experience with social media. Although some students had received prior training

in school about topics such as internet safety and cyberbullying, most of them did not have an account on social media and were not familiar with how to use a social media site.

Most educator feedback about TestDrive fell into three areas: educator engagement, student engagement, and suggestions for improvement. Overall, educators had positive impressions of TestDrive. Most thought that the content of the modules and activities were appropriate for the age and skill level of their students. One of the most-liked aspects was the meaningful classroom discussion generated around each module since completing a TestDrive activity prompted students to actively participate in class discussion. One teacher reported that the students "really engaged in the conversations and enjoyed talking about their real life situations," and another remarked that the group discussions "really allows the kids to understand the topics and give examples of things like cyberbullying to other students." Educators especially appreciated discussion questions and prompts provided by the educator guides, since it made it easy for them to facilitate the discussion. Some educators also reported they liked watching their students completing the TestDrive simulations, since this was the part that students enjoyed the most.

As for student engagement, educators reported that TestDrive was most liked by older students, those in grades 6-8, the target group for TestDrive. Some of the younger students were insufficiently experienced with social media to understand even the basic concepts involved in the use of a social media site, such as liking and commenting on posts. According to educators, the most engaging element for students

was interacting with the timeline simulation. As one instructor remarked, "The students loved getting onto the site, and couldn't wait to get there while we were teaching the lesson." The content of the timeline was one of the major elements that fostered this engagement. One educator stated that students would "get giddy" at some of the images, and many others also noted that students enjoyed looking through the simulated social media posts. Educators also reported that students enjoyed answering discussion questions and participating in the discussion by sharing their own experiences with social media and the internet.

In addition to the positive feedback, educators suggested improvements and changes that could be implemented in future development of TestDrive. Most frequently identified as needing improvement were the pre- and post-activity quizzes, since students thought they were boring and text-heavy. The quizzes were not interesting for students, especially for those who struggled with reading comprehension. Other major suggestions included fixing glitches in the system that would disrupt the workflow of modules. Many educators also wanted to see the TestDrive curriculum expanded to cover more digital citizenship topics and newer technologies, such as SnapChat and Twitter.

Quantitative Feedback from Students

For the most part, students responded that they liked the TestDrive module activities. Mean liking scores for each module were as follows (1="not at all", 5="a lot"): self-presentation (N=165), M=3.85, SD=1.20, cyberbullying (N=131), M=3.73, SD=1.29, and information literacy (N=102), M=3.49, SD=1.36. A majority of students also responded they thought the length of the module was appropriate and that they had a better understanding of issues after completing the activity, and many said that they would recommend the lessons to a friend (see Figures 2-4).

Paired sample T-tests were conducted on pre- and post-activity quiz scores to see if there were significant changes in how many quiz questions students answered correctly. The only significant changes were in the self-presentation module (out of 5 total questions), $t(174)$=4.62, p<.001, M_{pre}=3.92, M_{post}=4.29. Students did not have significantly different pre- and post-activity quiz scores for the cyberbullying (out of 5 total questions), $t(140)$=1.12, p=.26, M_{pre}=4.06, M_{post}=4.16, and information literacy (out of 4 total questions), $t(132)$=1.80, p=.07, M_{pre}=3.05, M_{post}=3.20, modules.

5 DISCUSSION

In this paper, we introduce a novel digital citizenship education tool designed to prepare youth for prosocial participation in social media platforms. We situate Social Media TestDrive within the landscape of existing digital citizenship educational interventions and describe the collaborative and

multi-stakeholder design process, as well as processes for future improvement. Our design process integrates behavioral science theories with ongoing feedback from educators. Thus, our work contributes to what Zimmerman and colleagues /citezimmerman2007research call the creation of an artifact that "provides concrete embodiments of theory and technical opportunities" (p. 498).

This paper contributes to the HCI field by engaging in a "research through design" process /citezimmerman2007research to solve a concrete problem (i.e., gap in digital literacy tools). This work also follows the process of iterative design, which has been used in designing and upgrading platforms (e.g., CivilServant [21]). We also present the results of a formative evaluation conducted as an ongoing part of the design process. Measures of engagement with TestDrive were how much educators and students liked the tool, and for students, increases in knowledge of the subject after participating in the modules.

Overall, we found that both educators and students were highly engaged with TestDrive. Qualitative feedback from educators showed satisfaction with the content and format of TestDrive modules. In addition, a majority of students indicated liking the content of the modules and willingness to recommend the tool to others. While students self-reported a greater understanding of the issues presented in the modules, analysis of pre- and post-activity quiz scores present more mixed results. There was a significant increase in correctly answered post-activity quiz questions for the self-presentation module, but the pre- and post-activity difference was not significant for the cyberbullying and information literacy modules, although there was a positive trend. One explanation for the lack of significance is that students had a relatively good topical knowledge before completing the module, as evidenced by high pre-activity quiz scores, leaving little room to observe an increase in knowledge. Educators also reported that many students had received some prior information literacy and cyberbullying response training before participating in TestDrive.

Theoretical and Methodological Implications

The formative evaluation results suggest that TestDrive, despite being a social media *simulation*, may be similar enough to "real world" social media platforms for experiential learning to take place. Both students and educators found the photos and posts from the timeline engaging; one educator even reported that students "couldn't wait to get there" during lessons. The positive reactions to reflective discussions before and after TestDrive lessons also suggest that the activities and lessons may promote experiential learning, of which reflection about concrete experiences is an essential part [16]. However, social media education should not be limited to

technical skills or even development of critical thinking. Further evaluation is needed to determine whether TestDrive also promotes ethical thinking about digital citizenship, and whether the simulated social media experience is sufficiently authentic to contribute to experiential learning.

TestDrive may also have implications for research on how young people implicitly and explicitly balance the risks of social media with the opportunities it presents (e.g. [19]. Rather than solely providing information about preventing harm, the platform's lessons are designed to both promote pro social norms and to highlight both the positive and negative aspects of social media use [23]. Future research should focus on whether young people using TestDrive's approach to education show different digital citizenship abilities compared to those using curricula that are solely focused on harm reduction.

Design Implications

Social Media TestDrive's design improves considerably on existing digital citizenship education tools. Most of these tools broadly fall under three categories: non-interactive curricula, interactive edutainment games, and unguided platforms. Non-interactive curricula impart educational lessons on digital citizenship, but cannot on their own provide experience in using these skills. Interactive edutainment games increase retention and engagement with educational lessons through interactivity, but activities are often removed from the social media context and do not provide realistic experience. Unguided platforms create spaces to practice these skills, but often lack educational material. They are also often public, permanent, and searchable, meaning that mistakes can have far-reaching consequences.

Social Media TestDrive fills the gaps left by these tools by integrating the best features of all three. Like non-interactive curricula, TestDrive has educational content, designed to be delivered by an instructor in a classroom setting, that integrates material well-tested through existing digital citizenship curricula. TestDrive is also highly interactive, with a fully functional social media simulation, pre- and post-activity quizzes, and reflection activities that engage learners while providing experiences that can be translated to real social media platforms. Finally, unlike the unguided platforms, each TestDrive instance is accessible only to the learner, making it a safe and consequence-free environment for practicing digital skills.

TestDrive also has implications for designers and researchers. The research team worked with multiple stakeholders in designing and co-creating this educational technology, including youth, educators, curriculum developers, and school administrators. An iterative design process was used for development, in which users identify problems or undesirable features in design, the designers fix the problem, and then re-iterate the process with the new design [22]. For example, in the design process for TestDrive, iterative design resulted in the implementation of a "STOP" sign page between the lesson content and the timeline simulation. Educators reported being frustrated when students would skip ahead to browse the timeline before the lesson was finished. The research team added the "STOP" page to help students pause and wait for the instructor before continuing. This design choice was the direct result of receiving input from the educators who were administering the modules. Since different groups bring different perspectives that are unique based on their experiences, an iterative design process with key stakeholder groups only serves to improve the final product.

Finally, TestDrive's origins as a research platform demonstrate the potential of adapting tools designed for research to other contexts. TestDrive's adaptation to education arose through dialogue with educators, as part of concerted outreach efforts by the researchers. These connections both communicate the state of research to practitioners and give the researchers a better understanding of the needs of educators and youth. This successful collaboration suggests that other research tools could be adapted for educational or other public-facing projects, and that the involvement of users and practitioners is vital to such adaptation.

Future Directions and Challenges

Future development of Social Media TestDrive will be focused on a) continuous improvemnt of the curriculum and interactive components, b) diversifying the range of social media experiences available for "test driving", c) assessing impact on key experiential and behavioral outcomes, and d) reaching a broader cross section of users. In service to assuring that TestDrive meets high standards for positive educational impact on its target populations, the research team has formed a partnership with a leading digital citizenship education organization. By working closely with educational design experts, we aim to ensure that curricula and educational activities included in TestDrive are vetted and conform to educational best practices. The same collaboration will drive development of additional modules and guide improvements to the tool's interaction design. For example, one of the current major additions to TestDrive is the ability for self-guided learning. This will allow independent learners to complete TestDrive modules without the guidance of an adult facilitator. The current lessons are being revised so that all of the instruction is contained within the platform instead of being delivered by an educator. This revised format necessitates the delivery of key concepts and examples of desired prosocial orienation and behaviors within the platform itself. Drawing from social learning theory [2], which suggests observational learning occurs when learners are exposed to situations where they can observe and imitate

others, the revised lessons include a tutorial and guided activities designed to model prosocial norms and strategies for overcoming common challenges to positive behaviors (e.g. how to be an upstander rather than bystander). By placing this section before the free play section, participants are encourage to demonstrate competence in both the technical skills needed to interact on the platform as well as in engaging in a positive manner. The freeplay and timeline simulation is followed by open-ended questions at the end of each module, which facilitate a self-reflection process for learners. This sequence of a tutorial, guided activities, and free play, combined with the use of the timeline followed by reflection, allows for interactive but scaffolded knowledge and skill development, thereby integrating tenets of both experiential and social learning theories [2, 10].

Second, TestDrive will need to be updated to adapt to the continually changing social media landscape. At present, TestDrive simulates a social media site based around a photo-centric timeline, with profiles for individual users. However, not all social media sites follow this format, especially those heavily used by TestDrive's target audience. Future TestDrive lessons will need to account for the popularity of video sites (e.g., YouTube), real time chat applications (e.g., WhatsApp), live-streaming services (e.g., Twitch), micro-blogging services (e.g., Twitter), and photo messaging applications (e.g., SnapChat). TestDrive's lessons will also need to be adaptable to future social media platforms not yet created.

The research team will continue formative evaluation throughout the development of TestDrive, ensuring that the platform is appealing and easy to use for both learners and educators. In the medium term, quiz question and survey analyses will continue to provide baseline satisfaction and knowledge change outcome data. Combined with ad-hoc feedback from users and stakeholders, this data will be used for ongoing iterative improvements. Social Media TestDrive modules are still in development, and as such, specific outcome evaluation measures have yet to be defined. Longer term assessment of impact will require outcome evaluation strategies designed to assess core competency areas in media literacy (demonstrated competence in accessing, analyzing and evaluating, creating, reflecting, and productively acting digital content) [10] as well as media-relevant and behavior-relevant measures [13]. Aligning with Social Media TestDriveâĂŹs overarching goals, measures will include assessments of knowledge change (specifically regarding learning objectives for each module), applications of critical analysis skills, demonstrations of prosocial behaviors, and changes in perceived social norms and expectancies in social media.

Finally, although TestDrive was designed for middle school students in a classroom environment, it can be expanded to serve the needs of other types of learners. Growing use of social media by elementary school-aged children means that digital citizenship education for these learners is increasingly necessary. Youth older than middle school age can also benefit from learning social media skills. TestDrive's lessons can easily expand to include age-appropriate activities for all youth.

TestDrive can also address the needs of adults in understanding social media use among young people. Parents, grandparents parenting for the second time, and other adults who care for young people could use TestDrive to better understand the platforms their children use, and the issues they may encounter while using them. Last, while TestDrive was designed to be used in a classroom setting, it could be adapted for self-guided education, allowing young people to learn at their own pace and without the need for a facilitator.

6 CONCLUSION

Social media is a rewarding but risky environment for young people. Teaching them to safely navigate online spaces in ways that minimize risk and encourage exploration of opportunities requires novel solutions. Social Media TestDrive is an innovative combination of educational content and interactive social media simulation that allows young people to explore, learn, and test digital citizenship skills in a safe, protected environment before transferring them to real-world social media sites.

A formative evaluation of the tool among educators and students in the Northeastern U.S. suggests high levels of engagement: educators liked that students were engaged in classroom conversations on digital citizenship topics, and students felt that their understanding of digital citizenship issues increased after using TestDrive.

Future development and evaluation of TestDrive will ensure better educational outcomes for students using the tool, establish stronger links to best in class digital citizenship curricula, and expand the tool to wider audiences.

7 ACKNOWLEDGMENTS

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