HUMAN-COMPUTER
INTERACTION LAB ›

41st
ANNUAL
SYMPOSIUM
THURSDAY, MAY 23, 2024

**PRESENTATION SUMMARIES
AND OTHER INFORMATION**

The Human-Computer Interaction Lab (HCIL), launched in 1983 at the University of Maryland, has a rich history of transforming the experience people have with new technologies. From understanding user needs to developing and evaluating these technologies, the lab's faculty, staff, and students have been leading HCI research for more than 40 years.

The HCIL was established as an interdisciplinary effort within the University of Maryland's Institute for Advanced Computer Studies (UMIACS). Today, HCIL participants include faculty, staff, and students from the following units on campus: Information Studies (iSchool), Computer Science, Psychology, Education, English, Engineering, Journalism, and American Studies. In addition, HCIL faculty are members in a number of centers and institutes on campus, including UMIACS, the Maryland Institute for Technology in the Humanities (MITH), the Applied Research Laboratory for Intelligence and Security (ARLIS), the Maryland Cybersecurity Center (MC2), the Social Data Science Center (SoDa), the Institute for Trustworthy AI in Law & Society (TRAILS), and the Dingman Center for Entrepreneurship.

This booklet contains Symposium presentation summaries and selected highlights of our faculty and students' news and accomplishments over the past year.

Please visit our website (https://hcil.umd.edu) for more information about the research happening in the HCIL.

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HCIL Director's Letter
HCIL's 41st Annual Symposium | May 2024

And just like that, another year has passed. This is my third director's letter, but in many ways, the first one—which I wrote in May 2022 while attending my first in-person conference since the start of the pandemic—feels like it was written yesterday. While many things have changed in the last two years, one remains constant: HCI research is alive and well at the University of Maryland.

Probably the biggest change in the last year has been the explosion of AI—particularly large language models like ChatGPT—and UMD has been quick to take a leading role in AI research. TRAILS (the Institute for Trustworthy AI in Law & Society) launched last May with HCIL faculty member Hal Daumé III directing and several HCIL faculty as members. TRAILS has spent this last year ramping up its research, education, and outreach, including multiple seed funding opportunities for researchers working on AI problems. More recently, the university launched the AI Interdisciplinary Institute at Maryland (AIM), also with Hal at the helm (he's a very busy man!), but also with HCIL faculty Sheena Erete as the Associate Director of Research. I am excited and heartened to see faculty I deeply respect being tapped for such important roles.

At the same time, these appointments should be a surprise to no one, as many of our HCIL faculty have been long thinking about AI in their work. In fact, HCIL founder Ben Shneiderman published his book "Human-Centered AI" in 2022, highlighting the deep connections between HCI and AI. And as a privacy and data ethics scholar, I think it is more critical now than ever before for us to remember the humans that shape technological advances and those affected by it. HCI researchers at UMD and around the world should play a central role in developing AI technology that is usable, accessible, and ethical. I am excited to look back at this time next year to see what progress we have made in this space.

Beyond AI, HCIL researchers have been taking on a wide range of topics this year, ranging from core design work to exploring collaboration and creativity, usable privacy, accessibility, and more. In total, today's symposium features 29 lightning talks, three plenary talks, and two panels, as well as demos, trivia, and a poster session. These talks involve students and faculty from across campus, representing numerous undergraduate and graduate programs. Our students and faculty work hard throughout the year on these research projects; in fact, many are in Hawaii as I write this to participate in the ACM Conference on Human Factors in Computing Systems (CHI). HCIL members are authors on 15 CHI papers, two workshops, and one SIG (Special Interest Group), and three papers have won prestigious awards. Special congrats to Utkarsh Dwivedi, Salma Elsayed-Ali, Beth

Bonsignore, Hernisa Kacorri, and Michelle Mazurek for being awarded honorable mentions, and to Zeyu Yan, Jiasheng Li, Zining Zhang, and Huaishu Peng for receiving a special recognition for sustainable practice.

There is much to celebrate this year, and I encourage you to check out the back of the program, which includes a detailed list of awards earned by HCIL faculty and students. I'd also like to call out a few extra-noteworthy items. First, congrats to Amanda Lazar, who earned tenure and promotion to associate professor this spring and to me (yes, that feels weird to write) for being promoted to full professor. Promotion in academia is a very long and involved process, so these promotions are a testament to research impact. Congrats to our seven graduating PhD students and four graduating HCI Master's students involved in research in the lab – we look forward to hearing about the next steps you take in your career journey! And congrats to the four HCIL faculty who were among the inaugural winners of the UMD Do Good Innovator Awards: Beth Bonsignore, Carol Boston, Bill Kules, and Galina Reitz. Each of you plays a critical role in us achieving our educational goals and in enhancing our community.

Today's symposium would not be possible without support from campus units, funding agencies, and industry sponsors. I want to offer my sincere gratitude to our industry sponsor (VEX Robotics) and our campus sponsors (College of Information Studies; Philip Merrill College of Journalism; Computer Science Department; College of Computer, Mathematical, and Natural Sciences; Applied Research Laboratory for Intelligence and Security; and the Institute for Advanced Computer Studies). I am deeply grateful for the support of Paris Lane, who joined the HCIL last summer to support me in the day-to-day operations of the lab. I'd also like to thank the various staff members, including Rachael Bennett, Sarah Grun, Craig Allan Taylor, Mia Hinckle, and the INFO Comms team for helping organize the symposium, as well as all the students, faculty, and staff who volunteered this week.

Every year, our annual symposium amazes me anew at the creative and innovative research HCIL students and faculty are undertaking, and each year I feel inspired by the future of the field. I hope you are similarly inspired by today's talks, panels, posters and demos.

Welcome to the 41st annual HCIL symposium!

Jessica Vitak
Director, Human-Computer Interaction Lab (HCIL)
Associate Professor, College of Information Studies
University of Maryland, College Park

41st Annual Human-Computer Interaction Lab (HCIL) Symposium

May 23, 2024

Brendan Iribe Center, Room 0324, University of Maryland

All times listed in Eastern Time (ET)

Detailed Program

Time	Details
9:00am	**Registration Opens (atrium)**
	• Check in and grab your name tag and some swag. Check out lunch options (themed tables, trivia), and get caffeinated.
9:30am	**Welcome Address**
	• Jessica Vitak, Director, HCIL
10:00am	**Plenary Talks**
	• **Amanda Lazar**: *How stereotypes of aging affect the user-centered design process* • **Jonathan Lazar**: *Born-Accessible Design* • **Sheena Erete**: *Applying an Intersectional Analysis of Structural Oppression and Power in HCI and Design*
11:00am	**Lightning Talks: Session 1**
	• 11 short talks on topics spanning design and usable privacy/security
12:30pm	**Lunch**
	We have multiple lunch options for you (signup required for some): • Grab your lunch and play HCI trivia • Join HCIL faculty at one of our themed lunch tables • Take lunch inside or outside with other attendees
1:30pm	**Panel**
	• **Topic:** Handling Imposter Participants in Qualitative Research • **Participants:** Jessica Vitak (moderator), Sunyup Park, Wentao Guo, Jian Zheng, Sam Martocci

41ˢᵗ Annual Human-Computer Interaction Lab (HCIL) Symposium

May 23, 2024
Brendan Iribe Center, Room 0324, University of Maryland
All times listed in Eastern Time (ET)

Detailed Program (continued)

Time	Details
2:10pm	**Lighting Talks: Session 2**
	• 9 short talks on topics addressing communication, collaboration, sensemaking, and creativity
3:25pm	**Coffee Break**
	• Coffee, tea, and light snacks
3:55pm	**Panel**
	• **Topic:** AI and Humans in Teams • **Panelists:** Joel Chan (moderator), Susan Campbell, Marine Carpuat, Susannah Paletz, Stephanie Valencia
4:40pm	**Lightning Talks: Session 3**
	• 10 short talks on topics addressing how we can make platforms Better and create data and computation opportunities for everyone
6:00pm	**Reception (atrium)**
	• Stay for cake, hors d'oeuvres, and conversation! • Check out demos and student posters • Vote for your favorite poster!

Sponsorships

The research that happens in the lab—and the lab itself—cannot happen without financial support, and we are grateful to our corporate, campus, and research sponsors, especially those who have contributed to HCIL and its members in the last year.

Industry Sponsor (Champion Level):
VEX Robotics

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National Science Foundation (NSF)
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Sloan Foundation
Teaching and Learning Transformation Center (TLTC)
University of Maryland
University of Regina

PLENARY SPEAKERS
&
PANEL DESCRIPTIONS

Plenary Speaker: Amanda Lazar, Assistant Professor, College of Information Studies, University of Maryland

Talk Title: *How stereotypes of aging affect the user-centered design process*

Abstract: Ageism in technology manifests at different levels, from individual self-stereotyping to organizational biases in design and policy. Additionally, many commercially available technologies frequently fail to accommodate the needs of older adults, potentially stemming from ageist attitudes within the technology industry and a lack of representation in the research and design processes. Stereotypes of aging significantly hinder the acceptance and usability of technology for older adults, affecting this group's participation in the digital world and the inclusivity of technological design. In this talk, I describe the ways that ageism appears in user-centered design and technology adoption despite researchers' best intentions. I draw out existing research and ways forward to mitigate these issues.

Bio: Amanda Lazar is an assistant professor in the College of Information Studies, with an affiliate appointment in the Department of Computer Science, at the University of Maryland, College Park. Her research is in the area of Human Computer Interaction, informed by Health Informatics and Gerontology. She received her PhD from the University of Washington in Biomedical and Health Informatics. Her research examines the design of technology for older adults – and in particular, older adults with dementia – to support social interaction and engagement in activities. Her work is supported by the National Science Foundation (NSF) and the National Institute on Disability, Independent Living, and Rehabilitation Research (NIDILRR).

Human-Computer Interaction Lab
41st Annual Symposium

Plenary Speaker: Jonathan Lazar, Professor, College of Information Studies, University of Maryland
Talk Title: _Born-accessible design_

Abstract: Digital technologies (such as software) and content are often created without considering accessibility for people with disabilities. Often, a technology is built inaccessibly, and then either remediated for accessibility, remediated for accessibility only when there is a complaint from a person with a disability, or is never remediated for accessibility. Building inaccessible technologies or content and then remediating them after-the-fact is not an effective approach. The time delay between when digital technologies and content are built and released and when they are made accessible can itself be a form of societal discrimination, as some people have access to the technologies and content while others do not. Furthermore, remediating a technology after-the-fact tends to cost more than accessibility built from the start, which unfortunately leads to the misperception that accessibility is expensive. While disability rights advocates often call for digital technologies and content to be built using a born-accessible approach, the research literature in HCI and UX does not define the details for a born-accessible model. The goal of this plenary talk is to present some of the core concepts of the born-accessible model and discuss ongoing work at the University of Maryland related to defining the born-accessible model.

Bio: Jonathan Lazar, PhD, LLM is a professor in the College of Information Studies at the University of Maryland, where he is the executive director of the Maryland Initiative for Digital Accessibility (MIDA). Dr. Lazar has authored or edited 17 books on HCI, accessibility, and law, including _Research Methods in Human-Computer Interaction_, and has published over 200 refereed articles. He served as the general chair of the 2021 ACM ASSETS conference, is a member of the SIGCHI Academy, and is the recipient of the _2020 ACM SIGACCESS Award for Outstanding Contributions to Computing and Accessibility_ and the _2016 ACM SIGCHI Social Impact Award_.

Plenary Speaker: Sheena Erete, Associate Professor, College of Information Studies, University of Maryland

Talk Title: A Method to the Madness: Applying an Intersectional Analysis of Structural Oppression and Power in HCI and Design

Abstract: With increased focus on historically excluded populations, there have been recent calls for HCI research methods to more adequately acknowledge and address the historical context of racism, sexism, gendered racism, epistemic violence, classism, and so on. In this talk, I'll share results from a paper recently published in *ACM Transactions on Computer-Human Interaction*. The paper makes the following contributions: (1) identify the saturated site of violence; (2) identify the intersecting systems of power and who holds power (past and present); (3) describe the "conceptual glue" that binds these intersecting systems together and the assumption(s) that those who hold power are employing to guide their interactions; (4) examine the ways in which Black people are subjugated, surveilled, and/or expected to assimilate to "normative" ways of being and behaving; and (5) identify acts of resistance. This work contributes an alternative to traditional HCI and design methods that falsely perpetuate a lens of neutrality and colorblindness that centers on whiteness, innovation, and capitalism and ignores the history of State-sanctioned violence and structural oppression.

Bio: Sheena Erete is an associate professor in the College of Information at the University of Maryland, College Park and the founder and director of the Community Research and Design Collective. Her research explores and designs technologies used by geographically-bound communities to address social issues by considering social, cultural, and economic contexts as well as socio-technical infrastructures. She works to co-design sustainable technologies, practices, and policies with community organizations that aim to counter structural oppression using equity-centered, justice-oriented, assets-based approaches to research and design. Currently, she is focusing on issues such as equity in AI/ML tools, community safety, education, political efficacy, and economic development in communities that have been historically oppressed and resourced-constrained due to unfair policies and State violence.

PANEL: Handling Imposter Participants in Qualitative Research

DESCRIPTION

Especially since the COVID-19 pandemic, conducting qualitative research (e.g., interviews and focus groups) online has helped researchers recruit diverse research participants. Conducting qualitative research online has many benefits: it reduces time and effort in recruitment, reaches more diverse participants (e.g., location and accommodating different schedules), and provides safety for both researchers and participants in situations such as a global pandemic. However, conducting qualitative research online also gives participants new ways to deceive researchers about their identity, eligibility, and experience. It can be very challenging for researchers to determine whether participants are telling the truth about their eligibility and experiences, or whether they simply want any incentive associated with participating.

Based on panelists' experiences with fraudulent participants, this panel discussion aims to share researchers' experiences facing fake participants, reflect on root causes, and propose guidelines to prevent and respond to imposter participants. By reflecting together honestly and critically on the challenges and limitations of our research, we hope to explore, share, and connect with fellow researchers as well as create guidelines on how to deal with this emerging challenge of imposter participants in qualitative research.

MODERATOR

Jessica Vitak is an Associate Professor in UMD's College of Information Studies and Director of the HCIL. She is also a affiliate member of UMD's Institutional Review Board. She has done conducted dozens of human-subjects studies over the last 15 years and has had her share of sketchy participants over the years.

PANELISTS

Sunyup Park is a PhD candidate in the College of Information at the University of Maryland, College Park. Her research focuses on understanding users' perspectives of privacy in smart environments. During her PhD, she has studied marginalized communities' perspective of data privacy in a smart city; smart home power users' perspective of privacy in a smart home; and short-term rental hosts' perspectives of guests' privacy in a smart rental.

Wentao Guo is a PhD student in Computer Science at the University of Maryland studying human-centered security and privacy. His research focuses on unlocking the power of professionals to protect users' security and privacy. During his PhD, he has studied how tech product reviewers evaluate the security and privacy of the devices they write about; how researchers approach the challenging task of de-identifying sensitive data; and how experts tailor security and privacy advice for individuals who face elevated risks.

Jian Zheng is a PhD candidate in the College of Information Studies at the University of Maryland, College Park. His research focuses on Human-Computer Interaction and Digital Well-being. He has published in CHI, CSCW, IJHCS, etc. Before joining the program, he obtained his bachelor and master degrees in psychology at Beijing Normal University and worked at the Department of Industrial Engineering in Tsinghua University.

Sam Martocci is an IRB Specialist focused on Education and Improvement in the Human Research Protection Office at the University of Maryland, College Park. In this role, she is responsible for reviewing initial applications, spearheading education initiatives, and improving processes for researchers and within the IRB Office.

Interested in this topic? You may also want to check out this workshop just held during CHI 2024:
Forms of Fraudulence in Human-Centered Design: Collective Strategies and Future Agenda for Qualitative HCI Research
https://fraud-in-hci.github.io/

PANEL: AI and Humans in Teams: An OTTRS-HCIL Panel

Description

Can, should, and might AI support human teams? Would an AI (or several) be considered teammates, tools, or both? Scholars from the Organizational Teams and Technology Research Society (OTTRS) and the Human Computer Interaction Lab (HCIL) will discuss AI and humans in teams: state-of-the-art, challenges, opportunities, limits, and possibilities. Collectively, we come from the fields of cognitive, organizational and social psychology, HCI, computer science, and accessibility and design. Each of these fields has different research foci, perspectives, definitions, and requirements regarding research on teams and on AI.

Moderator

Joel Chan (Assistant Professor, UMD INFO College) investigates systems that support creative knowledge work, such as scientific discovery and innovative design. His long-term goal is to help create a future where innovation systems are characterized by openness and sustainability. Previously, he was a Postdoctoral Research Fellow and Project Scientist in the Human-Computer Interaction Institute (HCII) at Carnegie Mellon University, and received his PhD in Cognitive Psychology at the University of Pittsburgh.

Panelists

Susan Campbell (Associate Research Scientist, UMD ARLIS; Senior Lecturer, UMD INFO College) earned her PhD in Psychology from the University of Maryland. She is a cognitive psychologist by training and has worked on a variety of applied problems. Her research interests include measuring the human abilities required to interact with complex technologies such as cybersecurity and artificial intelligence.

Marine Carpuat (Associate Professor, Computer Science, UMD) conducts research in natural language processing to design technology that helps people communicate no matter what language they speak. She is the recipient of an NSF CAREER award, research awards from Google and Amazon, best paper awards at *SEM, TALN, EMNLP. Before joining the faculty at Maryland, she was a Research Scientist at the National Research Council Canada. She received a PhD in Computer Science and a MPhil in Electrical Engineering from the Hong Kong University of Science & Technology, and a Diplome d'Ingenieur from the French Grande Ecole Supelec.

Susannah B. F. Paletz (Associate Professor, UMD INFO College) earned her Ph.D. in Social/Personality Psychology from the University of California, Berkeley (2003). Her research focuses on teams, creativity, and culture, as well as applying psychology methods and theory to a variety of problems. She is on the editorial boards of Small Group Research and Group Dynamics: Theory, Research, and Practice, is an elected board member of the Interdisciplinary Network for Group Research (INGRoup), and is the founding Director of the OTTRS, a cross-UMD/DC-area research group.

Stephanie Valencia Valencia (Assistant Professor, UMD INFO College) earned her Ph.D. in Human-Computer Interaction from Carnegie Mellon University. Her research interests include accessible computing, social and personal agency, and communication interfaces for people with speech and motor disabilities. Stephanie uses participatory design to explore how different design materials such as Artificial intelligence and physical computing devices can be used to create agency-increasing augmentative and alternative communication systems.

LIGHTNING TALKS: ABSTRACTS
[talks listed in order of presentation]

Clusters:

- The Many Shades of Design

- Unpacking Privacy & Security Perceptions

- Communication and Collaboration Across Boundaries

- Sensemaking & Creativity

- Making Platforms Better

- Data and Computation for All

AI-enhanced Communication Support System for People with Aphasia

**Lei Mao, Yasmeen Faroqi Shah, Stephanie Valencia**
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Aphasia, an acquired disability that impacts communication, including comprehension and production of language, impacts a significant number of individuals globally, with an estimated 2 million people in the USA living with aphasia (https://aphasia.org/). Aphasia is most often caused by brain injury from stroke, which not only challenges individuals' ability to express themselves but also significantly affects their daily lives and social interactions. In response, multidisciplinary research, spanning computer science, psychology, and speech-language pathology, investigates how technology can be designed to support people with aphasia (PWA) in their daily lives.

The goal of our research is to explore AI-enhanced communication technologies that can benefit PWA. Large language models (LLMs) can facilitate communication by suggesting words or completing sentences based on the context; and engage PWA in interactive language-based tasks for rehabilitation to offer them personalized support that improves over time with machine learning. Our research is exploratory as it aims to uncover design requirements for future technologies through interviews, design activities, and user testability with adults with aphasia. We hope this research informs us on how to develop communication tools that can support people with aphasia in their everyday lives and their speech and language rehabilitation. We will investigate three research questions: (RQ1) **What are communication, rehabilitation, and design requirements for PWA?** (RQ2) **How can AI support PWA's communication and rehabilitation goals?** and (RQ3) **What are PWA's experiences when using AI-enhanced communication systems?**

We are currently working on the first phase of this project which focuses on gathering design requirements through semi-structured interviews. To do this, our interviews will be divided into three parts. First, we will ask general and routine questions to prompt our participants to share their
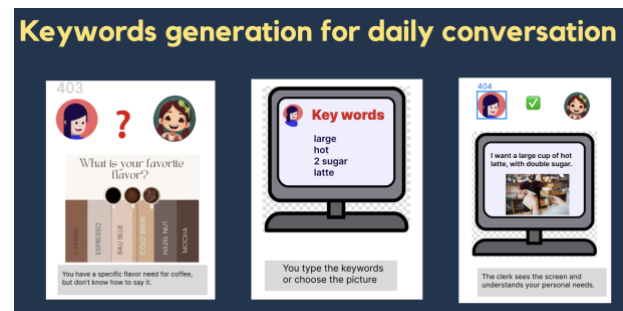
Figure 1 – Using storyboards we aim to explain specific AI model functionality, like keyword generation.

experiences. We aim to analyze PWA's speaking patterns and current expression problems as they share their answers. For the second part of the interview, we will ask about language support to gain insight into PWA's more concrete needs like word retrieval and grammar support. For instance, we will ask about strategies participants use to support their communication and barrier they might experience when saying full sentences. The last part of interview focuses on ideation to inform what a potential future LLM-supported communication device might be. We will present our participants with slides and storyboards (see Figure 1) to explain what AI and LLMs are, and then ask them to imagine future uses of these technologies. We will also ask participant questions related to features they would like to see in the AI communication tools including AI assistants.

Our research's second phase will focus on validating the design requirements via storyboarding, a design method that allows us to communicate and visualize design ideas to gather participant's feedback. The third phase will involve developing and evaluating a system to understand the impact of the proposed design ideas.

Talisman: An Approach for Inclusive Co-Design with Personal Objects as Design Materials

Salma Elsayed-Ali, Elizabeth Bonsignore, Joel Chan
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OVERVIEW

Materials, both tangible and intangible, are an important way that users can enact their identities and lived experiences; yet materials are often overlooked and imposed on users in Participatory Design (PD). This can be problematic as the materials selected may not be relevant or useful to users' situated contexts or goals, or could lead to exclusion. This project therefore seeks to understand how we might support users to enact core aspects of their identities and lived experiences in PD.

To do this, we propose an approach that **shifts control of design materials to users by inviting them to bring in personal objects from their lives.** Using Research through Design, we developed a sociotechnical system called **Talisman** consisting of a flexible set of techniques to scaffold users' selection and interaction with their personal objects in the design process. This includes a customizable prompt to support participants' material selection; set of discussion-based design activities called the "4 C's"; template in Padlet to support Distributed PD; and an open-source toolkit for communities to use on their own.

Over the course of a year, we collaborated with three distinct communities to embed Talisman in co-design workshops alongside young adults who are underrepresented in STEM education. These communities included: 1) A STEM education nonprofit based in Chicago focused on creating youth-led "Safe Spaces;" 2) A high school summer internship program based in Baltimore focused on Environmental Justice; and 3) a faculty-led research project at the College of Information Studies focused on redesigning undergraduate programming education to support diverse learners in light of Generative AI.

Through direct observations and accounts from young adults into their experiences bringing in and engaging with their personal objects in the design of solutions for their communities, we found that users brought in "*pieces of themselves*" that served as sources of inspiration, motivation, and shared understanding. Then, through a cross-case analysis of the three case studies in which Talisman was deployed, we found that Talisman helped cede decision-making power over material selection from facilitators to
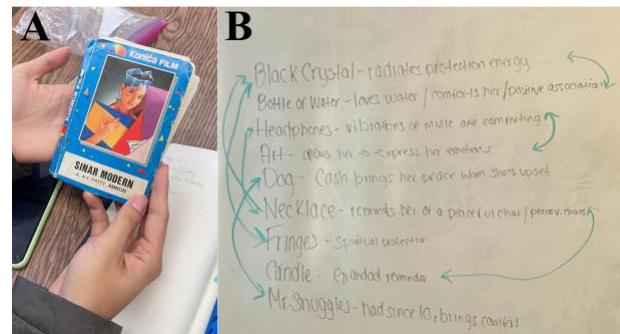
Figure 1 – (A) Family album a participant brought in (left); (B) Personal objects listed on a whiteboard with arrows drawing connections between them (right).

users; support users to share what they wanted in the format they wanted; and, led to productive outcomes across a breadth of design topics, modalities, and ways of deploying.

Overall, this research suggests that Talisman may be an adaptable approach to scaffolding selection and use of personal objects in co-design, expanding the ways that users may enact aspects of their identities and lived experiences in broader Participatory and Assets-based design practice.

TALISMAN TOOLKIT

If you are interested in using Talisman, visit our open-source toolkit here: https://www.TalismanToolkit.com/

PAPERS

1. Elsayed-Ali, Bonsignore, and Chan. *Personal Objects as Design Materials: A Case Study of Co-Designing Safe Spaces With Young Adults*. (CSCW '23). https://doi.org/10.1145/3584931.3606991

2. Elsayed-Ali, Bonsignore, and Chan. *Exploring Challenges to Inclusion in Participatory Design From the Perspectives of Global North Practitioners*. (CSCW '23). https://doi.org/10.1145/3579606

3. Elsayed-Ali. *Solidarity and the Self: The Role of Personal Objects and Materials*. HCIxBorders (CHI '23). https://doi.org/10.13140/RG.2.2.15255.85924

Journey's End - Leveraging Journey Maps for PreK Teacher PD Learning Experience Design

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OVERVIEW

This paper presents a transformative approach to PreK teacher professional development (PD) by integrating podcasts within a hybrid learning framework, emphasizing both synchronous and asynchronous interactions. Drawing on insights from learning experience design and the learning engineering (LE) framework, we have reenvisioned PD as a journey that accommodates individual learning styles, professional contexts, and cultural responsiveness. The overarching research question guiding this study is: How can an integrated, podcast-driven PD model be designed and implemented to enhance PreK teachers' efficacy, motivation, and cultural competence while addressing their unique learning needs, professional contexts, and cultural backgrounds?

Our methodology began with comprehensive cognitive interviews with 14 PreK teachers from diverse backgrounds, aimed at identifying key pain points in current PD practices. These interviews revealed critical areas such as the need for flexible learning formats, engaging practice-related content, and culturally relevant instructional strategies. Utilizing the Kano Model and participatory design principles, these narratives were transformed into storymaps that highlight teachers' behaviors, affective states, attitudes, and mindsets throughout their prior PD experiences.

Further refinement of these storymaps through the learning experience design principles led to the development of journey maps. These maps serve as visual guides that represent the teachers' progression through various stages of learning, integrating the ethos of the PreK Computational Literacy Experience Initiative PCLX-I, a Research Practice Partnership, which focuses on shared beliefs, understanding, and cultural responsiveness, underpinning all instructional strategies and content delivery.

LE framework was instrumental in designing the overall learning experience, ensuring alignment between the identified needs, learning objectives, and culturally responsive instructional strategies. The journey maps served as blueprints for engineering the learning experience, allowing us to map out specific phases, activities, and resources required for effective knowledge acquisition, skill development, and influencing mindset shifts while accounting for cultural nuances.

Two key big ideas underpin this study: 1) PD is a continuous journey that should be personalized, contextualized, and culturally responsive to effectively support teachers' growth and impact student learning. 2) Podcasts, when thoughtfully integrated into a hybrid learning framework, can serve as powerful vehicles for delivering engaging, practice-oriented content and fostering collaborative, socially immersive learning experiences.

Podcasts were introduced to solve multiple constraints of PreK teachers. Participants indicated that podcasts could deliver engaging, practice-oriented content or Principled Practice Knowledge when integrated with elements of peer interaction, reflection, application, and feedback (IRAF model), and fostering a collaborative and socially immersive learning environment.

Iterative, participatory, design-based approaches were used to design and scaffold activities and discussions, supported by knowledge graphs that track and quantify teacher engagement and learning outcomes. This data-driven approach achieved learning-needs fit: the alignment between the designed learning experience and the unique needs, contexts, and backgrounds of the learners (in this case, PreK teachers).

Using podcasts as part of an integrated learning experience, promises to enhance teacher efficacy, motivation, and cultural competence through supported professional engagement and tailored learning experiences that address the unique needs, contexts, and cultural backgrounds. Effective PD for PreK teachers requires a deep understanding of their diverse backgrounds, experiences, and perspectives, as well as a commitment to creating culturally affirming and inclusive learning environments that resonate with their lived realities. LE principles and methods can transform a one-size-fits-all approach to a dynamic, responsive system that aligns with teachers' evolving needs, contexts, and growth trajectories, ultimately enhancing their efficacy, motivation, and cultural competence.

SolderlessPCB: Reusing Electronic Components in PCB Prototyping through Detachable 3D Printed Housings

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OVERVIEW

The iterative prototyping process for printed circuit boards (PCBs) frequently employs surface-mounted device (SMD) components, which are often discarded rather than reused due to the challenges associated with desoldering, leading to unnecessary electronic waste. This paper introduces SolderlessPCB, a collection of techniques for solder-free PCB prototyping, specifically designed to promote the recycling and reuse of electronic components. Central to this approach are custom 3D-printable housings that allow SMD components to be mounted onto PCBs without soldering. We detail the design of SolderlessPCB, and the experiments conducted to evaluate its design parameters, electrical performance, and durability.

While recent research has been conducted on developing new materials and processes for sustainable prototyping, transitioning from research concepts to practical use may take time. New materials often do not perform as well as traditional ones and require significant research and development to mature. Additionally, these materials can present challenges for integration into existing design and prototyping workflows due to the need for specialized fabrication processes.

Rather than focusing solely on new materials, we ask: Can sustainable design and prototyping practices be achieved by optimizing conventional design and fabrication workflows? We argue that making minimal adjustments to the existing prototyping pipeline can be beneficial as it preserves current design practices and enables designers to sidestep the need to adapt to new materials or workflows.

SolderlessPCB focuses on the prototyping process for creating small, intricate PCBs, which often involves the soldering of surface-mounted device (SMD) components. These PCB prototypes typically have a short lifespan. They are designed to demonstrate a design concept or validate certain functionalities but are not utilized afterwards. Despite many SMD components on these PCBs being perfectly functional, they are not salvaged and recycled, but instead contribute to e-waste.
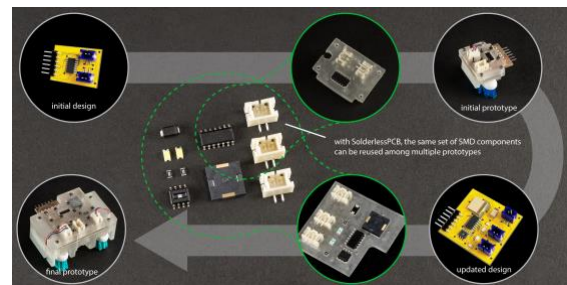

Figure 1 – SolderlessPCB assembly.

SolderlessPCB aims to facilitate the reuse of SMD components by proposing a slightly modified PCB assembly and disassembly process. Recognizing that the desoldering process is the most time-consuming and challenging task in recycling SMD components, we propose assembling PCBs in a solderless manner. Through custom 3D-printed cases, SMD components can be mechanically bonded to the PCB baseboard. This method achieves comparable electronic performance and significantly simplifies the process for designers to remove SMD components from circuits, as desoldering is no longer required. Consequently, PCBs that are not in use can be disassembled more easily. Since the design and prototyping workflow with SolderlessPCB is similar to conventional methods of making PCB prototypes, we argue it would require minimal effort for electronic designers to integrate SolderlessPCB into their existing workflows, presumably resulting in a higher yield of recycling and reuse of SMD components.

PROJECT WEBSITE

https://www.zeyuyan.com/solderlesspcb

PAPERS

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3D Printing Magnetophoretic Displays

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OVERVIEW

We present a pipeline for printing interactive and always-on magnetophoretic displays using affordable Fused Deposition Modeling (FDM) 3D printers. Using our pipeline, an end-user can convert the surface of a 3D shape into a matrix of voxels. The generated model can be sent to an FDM 3D printer equipped with an additional syringe-based injector. During the printing process, an oil and iron powder-based liquid mixture is injected into each voxel cell, allowing the appearance of the once-printed object to be editable with external magnetic sources. To achieve this, we made modifications to the 3D printer hardware and the firmware. We also developed a 3D editor to prepare printable models. We demonstrate our pipeline with a variety of examples, including a printed Stanford bunny with customizable appearances, a small espresso mug that can be used as a post-it note surface, a board game figurine with a computationally updated display, and a collection of flexible wearable accessories with editable visuals.

A magnetophoretic display consists of a matrix of cells distributed across the display surface, with each cell containing a mixture of opaque liquid and magnetic powder; these two components typically exhibit contrasting colors.

Our pipeline focuses on facilitating the manufacturing of custom magnetorphoretic displays. The automated manufacturing of the displays is made possible with a modified low-cost FDM desktop 3D printer (Creality Ender 3 Pro). We integrated a stepper-driven, syringe-based liquid injector next to the original FDM extruder to enable liquid injection. The liquid mixture comprises 1) iron powder, our choice of magnetic powder due to its high permeability, superior magnetic susceptibility and wide accessibility, and 2) mineral oil, which serves as the liquid substrate to prevent the iron powder from rusting. The mixture is further thickened with talcum powder. Additional oil-based white dye is also added for better contrast.

The printing of magnetophoretic displays is similar to the conventional FDM process, where the printing materials are deposited layer by layer. When the print proceeds, certain cell(s) would have the majority of their volume printed, leaving an opening that fits the liquid injector nozzle.

We develop a 3D editor, a Grasshopper plugin for Rhino 3D programmed in C\# with Rhinocommon API and Human UI,
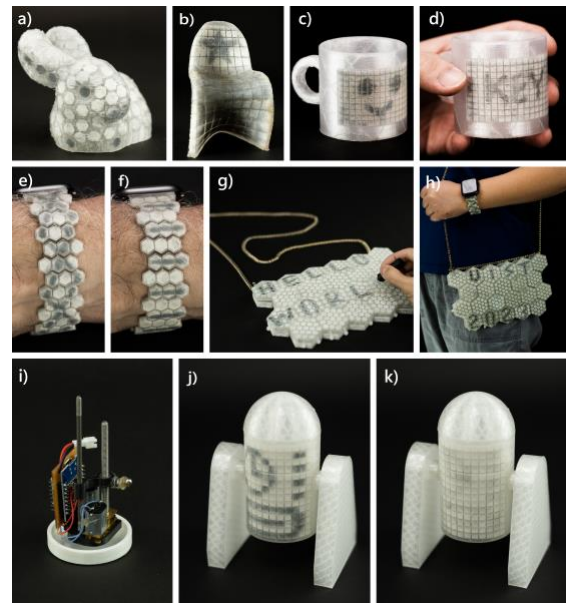

Figure 1 – Examples.

enabling end-users to convert a 3D model into a magnetophoretic display. The plugin assists the user in generating distributed cells across the surface of a CAD model through a simple user interface. The user can modify cell parameters such as cell size and distribution gap, and the tool generates the updated model for G-code slicing. To ensure successful prints, any necessary manipulations to the G-code automatically proceed with a Python script when fed with the generated geometries from our tool. The custom G-code post-processor is developed with Trimesh.

PROJECT WEBSITE

https://www.zeyuyan.com/printdisplay

PAPERS

1. Zeyu Yan, Hsuanling Lee, Liang He, Huaishu Peng. 3D Printing Magnetophoretic Display. In *Proceedings of the 36th Annual ACM Symposium on User Interface Software and Technology (UIST '23)*. Association for Computing Machinery, New York, NY, USA, Article 54, 1–12. https://doi.org/10.1145/3586183.3606804

Understanding Harms Relating to Email Verification During Website Signup

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Websites use *email verification* during account signup to confirm the account creator owns the email address they enter. Typically, an email is sent to the address entered during signup containing a code the user must enter or a verification link. This prevents unauthorized use of someone's email address and ensures the account creator does not accidentally input the wrong email address. However, not all websites implement email verification. This allows anyone to sign up with an email that is not theirs, either intentionally or unintentionally. Lack of verification – or failed verification, if the account creator enters the wrong email address – can result in the email owner receiving spam, being unable to create an account later, and being unable to claim free trials or other benefits. On the other hand, an account creator who mistakenly enters the wrong email address might not receive important information via email, might have website functionality limited until they verify, and is at risk of the email owner potentially stealing their account. Further, misdirected verification emails can leak personal data entered by the account creator to the email owner.

To date, no large study focuses specifically on harms related to email verification (or lack thereof) during online account signup. To fill this gap, we are conducting a measurement study to characterize, and measure the prevalence of, these harms. We hope our results can provide insight on how to better design email verification mechanisms.

Methods

We are sampling both popular and less frequented sites from the Tranco Top 1 Million list. We suspect popular sites will be more likely to implement email verification, so we are also sampling less trafficked sites for more variation. We discard sites that do not load, do not have an obvious way to sign up, or use shared accounts with sites we have signed up on already.

We mimic the signup process from the perspectives of both the email owner and the account creator during verification. If a site requires verification, we attempt to finish the verification from the email owner's computer to see if a malicious email owner could steal the account.
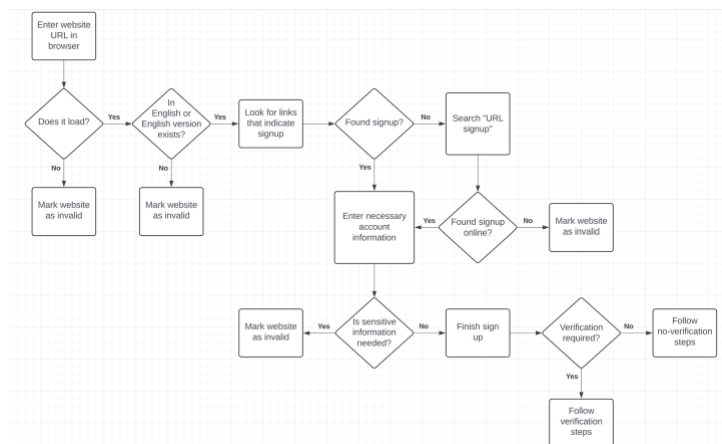
Figure 1 - The flowchart guiding our signup process for each site. Different websites will have distinct signup procedures, each requiring unique information or steps to create an account. We use this flowchart to maintain consistency and reproducibility.

Simultaneously, acting as the account creator, we document how much and what functionality is available before verification. We also document information leakage via emails (about verification or otherwise) sent by the platform, as well as whether the account creator is able to take any public actions "impersonating" the email owner.

Preliminary Results

So far, we have signed up for 33 unique sites (representing the Tranco top 136); 16 require email verification, while 17 do not. Of those that require verification, we successfully "stole" the account 8 times. We have seen cases names and IP addresses leaked via emails. In one case, items the account creator adds in an online shopping cart are disclosed to the email owner via email.

ACKNOWLEDGEMENTS

We are grateful to Joe Calandrino for his help and feedback so far.

Understanding How People Share Passwords

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OVERVIEW

Many systems are built around the assumption that one account corresponds to one user. Likewise, password creation and management is often studied in the context of single-user accounts. However, account and credential sharing is commonplace, and password generation has not been thoroughly investigated in accounts shared among multiple users. We examine account sharing behaviors, as well as strategies and motivations for creating shared passwords, through a census-representative survey of U.S. users (n = 300). We found that password creation for shared accounts tends to be an individual, rather than collaborative, process. While people tend to have broadly similar password creation strategies and goals for both their personal and shared accounts, users sometimes make security concessions in order to improve password usability and account accessibility in shared accounts. Password reuse is common among accounts collectively shared within a group, and almost a third of our participants either directly reuse or reuse a variant of a personal account password on a shared account. Based on our findings, we make recommendations for developers to facilitate safe sharing practices.

METHODS

In our survey we asked participants to describe what kinds of accounts they shared and self-report their strategies for creating passwords (including if they used a password generator, had the help of another person, the importance of factors such as length and memorability to them, and why they chose the password strategy that they did) both on these accounts they shared with others and on accounts they kept private.

TYPES OF ACCOUNTS SHARED

Participants reported sharing a median of 3 accounts with others. Within our sample, streaming accounts are the most common type of accounts shared by our participants (with 273 participants sharing at least one such account). Participants tended to share accounts with only a few people close to them (median: 2 additional users), typically partners and family members.

MAKERS OF SHARED PASSWORDS

Users rarely collaborate to make passwords for shared accounts, even for accounts where users described themselves as co-owning with another user. Generally, password creation is left to the sole discretion of a single account owner, who is often the user who either pays for or originally created the account.

PASSWORD CREATION STRATEGIES

For the most part, users employ similar strategies to create passwords for both accounts they share and those they keep personal, such as by incorporating meaningful information into their passwords, focusing on making passwords memorable, and putting more effort into securing accounts they deem most valuable or sensitive. However, one key difference is that password-makers often take into account the capabilities of other users on the account when creating these passwords for sharing, especially in the case of young or elderly users. In these situations, usability may be prioritized over (or even at the expense of) security, notably in the form of password reuse.

PASSWORD REUSE

Almost a third of our participants report that they reuse passwords of their shared accounts. This reuse happens in two contexts: in other shared accounts and in personal accounts not shared with others. In the former case, users may elect to use a single password for all accounts shared among a group or family for ease of account access and memorability's sake. In the latter case, password reuse across the shared/personal contexts can occur when participants begin to share a formerly-personal account but fail to update the password, which itself was already reused in other personal accounts they do not share with others. Participants reported reusing shared passwords in both the shared and personal contexts with roughly equal frequency.

PAPER

User Attitudes Towards Mutually-Dependent Privacy Controls in Messaging, Social Media, and IoT Devices

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When user interfaces provide people with privacy options, these decisions are typically unilateral; for example, who gets to see a post you publish? Should third parties be able to set cookies? Sometimes, these choices involve trade-offs, such as when sites demand that users disable their ad blockers in order to see content, or when acquiescing to data collection is required to enable a feature.

A special case of privacy options with mandatory trade-offs is when, to obtain some information, users are required to reveal corresponding information about themselves. For example, in many messaging apps, including WhatsApp, Signal, and others, users can enable read receipts to find out when their messages have been read. However, if a user has read receipts enabled, their messaging partners also get to find out if their messages were read. Read receipts also illustrate the mutually-dependent property of such controls: both sides need to enable them for the information to be shared.

The popularity of messaging apps with read receipts means that, in aggregate, hundreds of millions of people are making privacy choices through these controls. Yet, they have not seen much study, which means their role is not well understood. If they are not aligned with how people want to handle their privacy, users are being forced to share information that they would otherwise not want to give up. Conversely, if they work well and match how people want to manage their privacy, they could be used across more products and types of settings to implement privacy controls in a natural and intuitive manner.

To better understand how these privacy controls are used today, as well as their future potential, we formulated the following research questions:

- What is the current usage of mutually-dependent privacy controls? Are people making deliberate choices about their settings? What current norms are in play?
- How do such controls change people's choices? Are users more likely to share personal information with others with mutually-dependent privacy controls than without them?
- Which factors drive people to choose their privacy settings in mutually-dependent contexts?
- How do people feel about these controls? Do they see them as enhancing privacy or promoting fairness?
- Will similar privacy control schemes work in settings where they are currently not deployed?
- Are these privacy controls enforcing existing reciprocity norms?

We surveyed 802 participants, investigating people's present and hypothetical privacy settings in three domains: messaging apps, social media, and data visibility in Internet-of-things (IoT) devices. In each domain, we performed within- and between-subjects comparisons of three variants of mutually-dependent settings: traditionally mutually-dependent, a variation where the user's choice is unlinked into two separate options, and a further condition that allowed participants to express an explicit preference for privacy settings that are mutually dependent.

We found that people already frequently engage with mutually-dependent privacy controls by changing their settings, and there are substantive disagreements in the population about whether or not they should be enabled. Our results support our hypothesis that such privacy controls force people to make privacy choices they otherwise would not. Despite this, most people perceived these kinds of privacy controls as fair, and many preferred them to settings where they had more flexibility. Overall, we conclude that considerations of mutual dependence play a large role in people's current privacy choices and can potentially be harnessed in novel privacy controls as well.

Well-Intended But Half-Hearted: Hosts' Consideration of Guests' Privacy Using Smart Devices on Rental Properties

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Smart home devices (SHDs) have grown in popularity in short-term rentals (STRs) that allow individuals to rent out part or all of their homes (e.g., Airbnb). To illustrate this point, numerous articles exist to help hosts select which types of SHDs are necessary for successfully managing their properties, ranging from various types of sensors to interior/exterior cameras. The increased usage of SHDs in STRs raises privacy concerns. These concerns can range from interpersonal entities' (e.g., next guest, hosts, property managers) monitoring and surveillance, to data being collected, stored, and shared with institutional entities (e.g., manufacturers, law enforcement, third parties).

Researchers have found that Airbnb guests are uncomfortable with devices that could potentially monitor them and want to negotiate their privacy needs with hosts. At the same time, Airbnb hosts express little or no concern about guests' privacy when using SHDs on their property; rather, their concerns about privacy pertained to guests' accessing hosts' data. Despite hosts' lack of concern of guests' privacy, we argue that STR hosts are incentivized to accommodate guests' privacy concerns due to maintain their business. Therefore, facilitating privacy negotiation between hosts and guests is crucial in addressing the tension between hosts' goals of using SHDs and guests' values of privacy.

Privacy negotiation involves multiple stakeholders trying to reach a consensus regarding data collection practices. To facilitate the negotiation process, we need to learn the needs and practices of all stakeholders involved. Most prior work focuses on guests' privacy needs, and lack knowledge about hosts' current practices around SHD usage, especially in terms of managing and disclosing SHDs. Therefore, we ask the following research questions:

RQ1: How do short-term rental hosts use smart devices in their rental properties?

RQ2: How do hosts manage smart devices on their rental properties?

RQ3: How do hosts disclose their smart devices to guests?

We conducted semi-structured interviews with 15 Airbnb/Vrbo hosts about their usage of SHDs in their STRs, focusing on how they manage and communicate with guests about their devices, as well as how, if at all, they consider guests' privacy when making decisions related to SHDs.

Contrary to prior research, we found evidence that hosts take guests' privacy into consideration, albeit in limited ways. For example, hosts consider guests' privacy when deciding which devices to use and where to locate them, logging out of guests' accounts, limiting monitoring and control during guests' visits, and partially disclosing their devices to guests. That said, we found that hosts rarely, if ever, review or delete data; provide limited control options to guests; and do not disclose all SHDs.

We discuss the potential harms of hosts' usage of SHDs, reasons why hosts' intentions to protect guests' privacy is not enough, and identify platforms' insufficient instructions as the fundamental problem. We suggest ways to improve platforms' policies and guidelines regarding the usage of SHDs in STRs, as well as design features to support communication between hosts and guests.

How Data Consequences Affect Privacy Perceptions

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Background. Online tracking relates to the process of identifying users—their habits, interests, and other monetizable information—on the web. A simple way to conceptualize online tracking is with cookies. Cookies are pieces of memory (i.e., state) that users store on their computers and pass back to websites when requested. Cookies allow websites to offer services like shopping carts, providing a way for a browsing session to maintain consistency after you open a new browser tab or window, but also allow companies to track a user's identity and behavior. If a company can keep track of the products you buy on a website, it might also be able to infer certain unique characteristics about you, like your pregnancy status or your propensity for travel. This information, in turn, may be useful to advertisers, a practice known as Online Behavioral Advertising (OBA).

Researchers have studied the privacy implications of OBA for many years. Starting in the early 2000s, researchers measured the web and identified an increase in tracking frequency over time. Foundationally, these measurement studies highlighted the types of tools users needed to increase their privacy (i.e., self-management). In 2009, 2010, and 2012, for example, researchers noted that stateless tracking forms (i.e., tracking techniques that do not require a user to store or transmit any information, placing user identification outside of a user-controlled process) were particularly problematic. Following this, in work that is ongoing today, researchers developed tools to block these types of stateless tracking techniques.

Missing pieces. Included in all of this work, however, is an implicit assumption: users themselves find tracking problematic. Pushing on this assumption, researchers began to draw in the lines on where users were most or least uncomfortable with tracking. What researchers found, however, was a large amount of nuance.

Tracking is, on the one hand, creepy, causing participants to say things like ``Incognito mode, my best friend [1]." At the same time, tracking can also be useful, and a growing body of work shows how participants want the results of targeted ads via tracking. The nuance deepens further when attempting to identify certain types of tracking that users find problematic. When showing participants a series of tracking-themed visualizations, using participants' own data, Reitinger et al. found that no more than 66% of participants could agree on a visualization's creepiness (five-point Likert scale) [1]. In short, privacy invasions in terms of detailed, real-world, and even potentially sensitive inferences drawn, may not be as related to privacy attitudes as one might assume.

Our preliminary work looks not to privacy, but to what has been called the "holy grail" of privacy-attitude motivation: the consequences of data sharing [2]. Data is not shared into a void, it is used in risk assessments for recidivism, likelihood assessments for loan default, and a host of other life-event decisions. If we turn our focus away from "what information can be inferred about a person" and toward "how can that information be used," will this affect privacy attitudes or behavior? What can we learn about creepiness within the environment of consequence, and how is that different from the prior work done on the environment of inference?

Conclusion. We answer these research questions by building a mobile application that provides transparency about data consequences. Our application will focus on the consequences of mobile data—e.g., vehicle and health insurance rates, loan eligibility—and use a two-part survey to: (1) show participants the consequences of their data; and (2) observe whether attitudes or behavioral changes occur.

ACKNOWLEDGEMENTS

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Media Portrayals of Student Privacy in Higher Education: A 2013-2023 Review

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OVERVIEW

The rapid advancement of technology has profoundly transformed higher education, turning classrooms into highly advanced digital learning environments. While technology can promote personalized and efficient learning, it also raises concerns about student privacy. As technology becomes an essential part of the higher education setting, it is crucial to understand its impact.

This research examines how U.S. mainstream media has covered the intersection of technology and student privacy in higher education from 2013 to 2023. Employing a media analysis approach, I explore how the coverage of privacy concerns has evolved in response to technological advancements. By contextualizing the media discussion of student privacy, this research underscores the need for technology adoption that can maximize benefits while protecting privacy. The findings are intended to guide policymakers and educational stakeholders in making informed decisions regarding EdTech implementation.

BACKGROUND

While previous studies have addressed privacy in a broader context, there is a lack of focused research on how media narratives specifically address student privacy issues in higher education. This gap is particularly significant in understanding the perspectives and concerns of a demographic that is heavily reliant on digital technologies for their education. The majority of existing media analyses do not cover the period of the pandemic. The pandemic has likely shifted the media's focus and framing of privacy issues, particularly in relation to online learning, virtual classrooms, and digital surveillance tools used in higher education.

METHODS

To investigate the evolution of media narratives on student privacy in educational technology over the past decade, a content analysis approach will be employed. The analysis will focus on news articles sourced from a comprehensive database: ProQuest. The chosen timeframe for the analysis spans a decade, from 2013 to 2023, capturing significant developments and legislative changes in the field. The search queries used in the databases will be tailored to identify relevant news articles related to student privacy, educational technology, and associated legislative developments.

To further refine the analysis and provide a contemporary perspective, an in-depth examination of media narratives during the pandemic will be conducted. This timeframe is chosen to capture the unique challenges and changes in discourse that have emerged as a result of the global pandemic, which has significantly impacted the utilization of educational technology.

PRELIMINARY FINDINGS

Preliminary findings reveal a broad spectrum of student privacy concerns extending beyond the classroom. There was a significant increase in article count around pandemic years as remote technology gained more attention. Several key themes, including security, safety, health (including mental health, abortion, suicide, COVID-19), and freedom of speech, frequently intersect with privacy discussions. These topics highlight the challenge of balancing priorities and illustrate which issues receive national attention. Further analysis aims to clarify the primary privacy concerns, explore effective strategies for addressing these issues, and suggest actionable steps for the future.

COMPA: COntext Marking and Phrase Assistance to achieve common ground in AAC*

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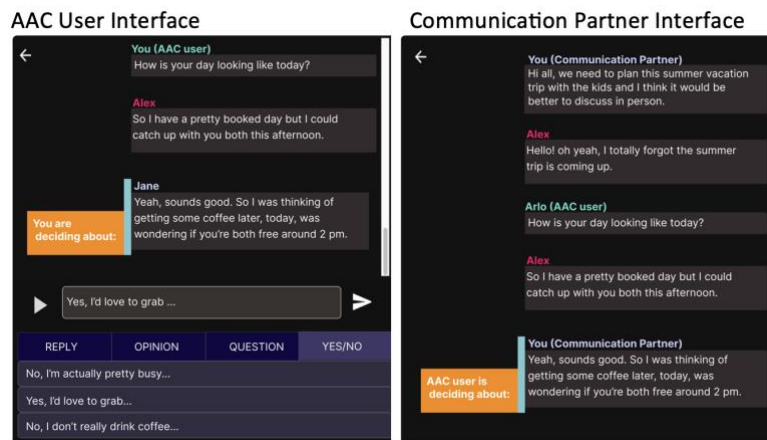
Figure 1 – COMPA supports creating a shared understanding of conversational context and awareness of AAC user intent. To support a shared conversational context, COMPA displays a *real-time transcript* of the conversation, which automatically *pauses* when the AAC user starts to type their response. COMPA *notifies* both the AAC user and the conversation partner when the transcript has been paused by *Context Marking* a relevant conversation portion. To support awareness of AAC user's intent, AAC users can select an *intent* (e.g., reply, opinion, question, yes/no answer), which is added to the pause notification. The transcript and intent are additionally leveraged to create *starter phrases* that enable AAC users to easily add context to their comments.

Motivation

Speech-generating Augmentative and Alternative Communication (AAC) devices are used by individuals to enhance or substitute their speech. AAC users' comments in conversation can often be over a minute delayed as AAC users need to input text into their device before it is synthesized into speech. Therefore, speaking rates for AAC users are slower than people that use speech to talk. Asymmetrical speeds of communication between AAC and their conversation partners (CPs) can make conversations challenging as being able to reply to a topic while it is still relevant requires the correct timing. Additionally, when AAC users are typing, co-occurring discussion by other CPs may change the topic of the conversation faster than what AAC users can respond to. As a result, AAC users may be discouraged from participating or their responses may be out-of-context and thus misunderstood.

Approach

We present COMPA, an add-on tool for online group conversations, realized as a Chrome Extension, that seeks to support conversation partners with different speaking rates in achieving common ground. We studied COMPA in 5 different triadic group conversations, each composed by a researcher, an AAC user and a CP, to study how it's specific features support participants in achieving common ground.

Participants shared that the live transcript and the pause feature "leveled the playing field". Intent-specific notifications and context marking, made it easier for CPs to know what the AAC user wanted to respond to. Additionally, starter phrases were selected by AAC users when they contained contextually relevant words but were always slightly edited. COMPA can support both AAC and non-AAC users in having a better flow in their conversation.

Studying The Effects of Color Within Virtual Reality (VR)

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OVERVIEW

Color theory is an important aspect of today's world, especially when considering user design, technology, and art. The primary objective of this thesis was to examine how the color groups, warm and cool, affect individuals psychologically and physiologically. While combining technological advancements, physiological methods, and psychological analyses, I investigated the emotional associations with specific color groups and tested the psychological and physiological impact of color groups on individuals. I hypothesized that warm colors would increase heart rate, which would directly correlate to emotions of stress and excitement, and cool colors would decrease heart rate, which is associated with the emotions of calmness and positivity.

METHODS

Twenty participants were recruited through the University of Maryland College Park campus and the surrounding areas of DC, Maryland, and Virginia. Participants were between the ages of 18 and 34 and had no history of Colorblindness and/or any history of epilepsy due to the nature of the research. The reason for the age range of 18 and 34.

This study was conducted with an Oculus Quest 2, which showed different colors for 10 minutes. There were two groups; a warm group and a cool group. The colors that were used for warm colors were red, red-orange, orange, yellow-orange, and yellow. For cool colors the colors used were violet, blue-violet, blue, blue-green, and green. The colors were shown based on the assigned group of the participant. During the color simulation, participants wore sound-canceling Peltor headphones in order to limit any noise distractions. Participants were asked to focus on what they were seeing while in the VR headset. Each participant had their heart rate taken before, during, and after testing to measure physiological changes. Participants were also asked to fill out a Positive and Negative Affect Schedule (PANAS) before and after viewing the colors within Virtual Reality (VR) headset to observe changes in emotion.

RESULTS

This study demonstrated how the two-color groups exhibited different influences on heart rate. This study found that when the heart rate increased and/or decreased there was a correlation between corresponding changes in participants' self-reported emotions. It was found that 80% of participants experienced an increase in heart rate either during or immediately after the showcasing of warm colors. In contrast, all 10 of the participants experienced a decrease in heart rate either during or immediately after viewing the cool colors. It was also found that warm colors were associated with emotions associated with higher arousal, such as attention and alertness. For cool colors, it was found that participants rated emotions with high arousal and negative valence lower on the PANAS scale.

DISCUSSION

Through the participant pool, it was found that cool colors have a less stimulating effect compared to warm colors. It was also found that warm colors were more likely to be associated with emotions considered to have high arousal and negative valence than cool colors. This research can be applied to user experience and how users interact with applications with specific color palettes. Also, knowing how colors affect users can allow designers to build applications that will create the desired emotional reaction based on the color palette applied. These findings can also be applied to immersive technology, and understanding how colors affect users allows developers to build impactful scenes in VR. Knowing how colors affect users will allow designers and developers to build impactful and long-lasting applications, especially when impacting the user experience.

Exploring Interactive User Manuals with 3D Instructions to Support Older Adults in Operating Makerspace Tools

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ABSTRACT

Collaborative environments like makerspaces present opportunities for supporting and shaping technology use by providing access to various hands-on technology tools and resources. Instruction and support are key for older adults, who do not always have access to the technology support that younger people do. In this project, we examined the potential of providing assistance for complex makerspace tools through interactive 3D manuals with embodied instructions. We developed a prototype and evaluated it through our ongoing collaboration with a resident-led makerspace in an independent living community. Initial findings suggest that older adults respond positively to 3D manuals, finding them sufficiently useful and usable to prefer them over other instruction methods.

PROTOTYPE

We created an interactive prototype for the study using Bezi (Available at https://bezi.com/prototype). This prototype has three main flows 1) Introduction - Basic use cases of the machine to motivate users 2) Learn - Explanation of each part of the printer and a task flow for printing a box 3) Troubleshoot - Instruction for a troubleshooting scenario. All of these instructions and explanations were displayed with the 3D simulation of the printer and embodied instructions to help in grasping the printer's component locations and orientations more accurately.

STUDY

We conducted four prototype testing sessions followed by semi-structured interviews to understand older adults' perceptions, usability, and experience of using these 3D manuals to support their makerspace tools use. Our preliminary findings indicate that 3D manuals may be able to enhance user motivation, comprehension, and self-confidence for operating complex tools like 3D printers.

Figure 1 - Prototype screen showing a 3D simulation of a 3D printer with embodied instructions.

Factors contributing to such a positive impact were the simplicity and clarity with which 3D manuals present information according to participants. They also highlighted that displaying every part of the printer in 3D provides accurate location and orientation, which makes it easier to grasp compared to text-heavy instruction booklets, or getting remote troubleshooting support.

ACKNOWLEDGEMENTS

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Team Meeting Modes and Disability

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OVERVIEW

Workplace meetings have recently changed from face-to-face to virtual due to COVID-19 mitigations and then back again. The effects of these modes of working on productivity, organizational culture, collaboration, and innovation have been debated in organizational psychology (Gibson et al., 2023), but less so the needs of workers with disabilities when faced with different meeting modes. HCI researchers have studied the effects of technology on workers with disabilities (e.g., Tang, 2021), including the barriers and opportunities of hybrid meetings on disabled workers (Alharbi et al., 2023).

The goal of this study is to better understand the challenges, opportunities, and effects on disabled workers of team meeting mode, be it face-to-face, virtual/remote, or hybrid. Hybrid meetings can involve workers as either the remote or the in-person team members. We have begun a semi-structured interview study, which is ongoing.

METHODS

We conducted interviews with 15 participants: 67% identify as women, 20% as nonbinary, and 13% as men, with an average age of 35 (23-59). They identified as having a wide variety of disabilities including chronic illness, physical disabilities, cognitive impairment, and learning disabilities.

Participants were recruited via disability listservs and via gatekeepers at U.S organizations that listed disability affinity groups. The interviews consisted of three sections of questions centering lived experiences with team meetings and then requested recall of two critical incidents. Questions covered aspects of technology usage, benefits, drawbacks, and frustrations with team meeting modality, and characteristics of ideal meetings. We are conducting thematic analysis of the transcribed interviews and intend to conduct iterative and reliability coding.

PRELIMINARY RESULTS

Preliminary findings indicate that participants are most concerned about communication barriers, regardless of the meeting format. Poor audiovisual quality was the most common barrier to participation, negatively affecting participants with all types of disabilities. Participants with both physical and non-physical disabilities cited hybrid and virtual options as an accessible accommodation, even if their preference was for in-person meetings.

Commentary emerged on the issue of conflicting accommodations, such as the use of captioning that is necessary for one participant causing significant nausea in another. While some participants cited a need for visual connection with meeting attendees, others cited camera-off meetings as an accessibility option that allowed them to work through pain or discomfort when they otherwise would not have been able to attend meetings. Though this point was asserted as a benefit, it raises concerns about expectations of presenteeism instead of using sick time.

Participant feedback on ideal meeting features centered around facilitation, planning, and logistical considerations, regardless of meeting format. Agendas, post-meeting notes, and detailed information about the digital and physical accessibility accommodations of an upcoming meeting were the main participant requests.

We will continue data collection and analysis through 2024.

POSITIONALITY

AT LEAST TWO OF US HAVE DOCUMENTED DISABILITIES AND SEVERAL OF US HAVE FRIENDS AND FAMILY MEMBERS WITH DISABILITIES.

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Exploring Videoconferencing for Older Adults with Cognitive Concerns Using a Dramaturgical Lens

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ABSTRACT

This paper presents a deconstructed view of videoconferencing by older adults with cognitive concerns. To do so, we use a sociological theatrical framework developed by Erving Goffman [2]. Our study recruited 18 older adults with varying levels of cognitive concerns, employing focus groups, interviews, and observations to gather data. Through a reflexive thematic analysis, we focus on three major areas: the "roles and performances" where users adapt to new identities, the "backstage," which involves the physical and logistical setup, and the "frontstage," where people communicate through audio and visual channels to present a desired impression. Our discussion generates insights into how deconstructing these elements can inform more accessible HCI design.

METHODS

To qualify for participating in this study, participants had to 1) be 65 years of age or older, 2) have subjective cognitive concern, decline, or be within the span of dementia and 3) use or be interested in some form of videoconferencing. We collected data through two discussion groups, thirteen semi-structured interviews, and five observation sessions. The analysis was conducted through reflexive thematic analysis [1].

FINDINGS

We adopted Goffman's perspective to deconstruct our data into three sets of theatrical metaphors:

Performances and Roles

Videoconferencing served as a tool for sustaining, adapting, and embracing new roles amidst cognitive changes. The types of performances that were most frequently mentioned by participants were familial and religious.

Working in Backstage

Backstage is where people engage in more private behaviors. We learned more about the back region through interviews and observing participants' videoconferencing setups. Critical backstage work included selecting devices that would support a videoconferencing performance appropriately, with relevant characteristics including size, portability, and obsolescence. "Cues" participants described using in the back region to manage the logistical aspects of preparing for a videoconference including emails and handwritten notes.

Performing in Frontstage

In the frontstage, participants manage how they appear to others, or self-presentation: the audio and video channels afforded by videoconferences as important for giving desired performances and communicating with audiences. To make these communication channels work for their intended performances, they needed to engage in two kinds of work. First, they ensured that the communication channels were working through sound and visual checks. Second, they set backgrounds to convey certain impressions.

DISCUSSION

Viewing the data through Goffman's theatrical metaphors lets us view these interactions with people with memory concerns as the "main character". This allows us to see the active role they are taking in selecting videoconferencing opportunities that are relevant to them and the roles they wish to continue playing, the ways that they manage devices and materials to get "on stage" in a videoconferencing engagement at the right time and in the right way, and present themselves as they wish to others.

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Formulating or Fixating: Effects of Examples on Problem Solving Vary as a Function of Example Presentation Interface Design

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Interactive systems that facilitate exposure to examples can augment problem solving performance. However, designers of such systems are often faced with many practical design decisions about how users will interact with examples, with little clear theoretical guidance. For example, how should we support interaction with examples over different screen sizes? Should examples be delivered via recommendation (in small sets), a feed, or some other interaction paradigm? This project seeks to develop a **theory of human-example interaction** that can help map these design decisions to creativity-relevant behaviors and outcomes, ideally with a nuanced specification of the precise benefits and costs of each design decision for these behaviors and outcomes.

As a step towards developing such a theory, we conducted an experiment where 182 participants worked on a controlled analog to an exploratory creativity task. We systematically varied both the diversity of examples and the types of presentations: overlaid on the search environment (the "In-Context" condition), presented in a list (the "List" condition), or in a dropdown selectable menu (the "Dropdown" condition). The "In-Context" design was inspired by an emerging pattern of contextualizing examples in the creator's workspace or problem in HCI systems for example-based creativity on the one hand, and theoretical descriptions of the use of examples to (re)formulate problems the latter "List" and "Dropdown" conditions were designed to be representative of common interfaces for interacting with examples (in search results lists and pages of recommendations).

Our primary results were threefold: 1) "List" presentation harmed solution quality compared with "In-Context" or "Dropdown" presentation; 2) each interface condition was associated with distinct self-reported example usage strategies (notably, more usage of examples to "model" the problem space to guide exploration in the In-Context vs. List or Dropdown conditions, and more usage of examples to "stimulate" a specific direction of exploration in the List condition); and 3) the List condition's propensity for stimulation-based strategies was corroborated by an increased usage of "hillclimbing" strategies early on, as evidenced by analyses of sequential distance between participants' moves in the solution space.
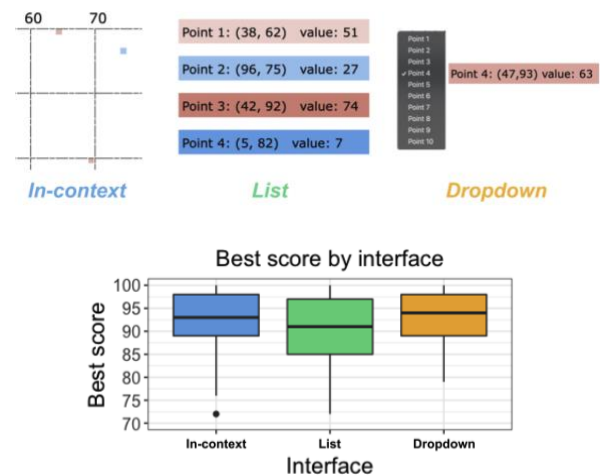
Figure 1 – Example interfaces tested in this study (top), and experimental results for task performance (bottom)

Overall, our results suggest that interaction design considerations for human-example interaction go beyond usability: there is indeed a space of mappings to explore between design affordances and fundamental psychological mechanisms of creative inspiration from examples. From a practical standpoint, our empirical results suggest the limitations of only showing examples without the problem space as context, especially if the problem space is large (a common feature of real-world problems) and there exist some potential solutions far away from the initial examples.

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Towards Intent-based User Interfaces: Charting the Design Space of Intent-AI Interactions Across Task Types

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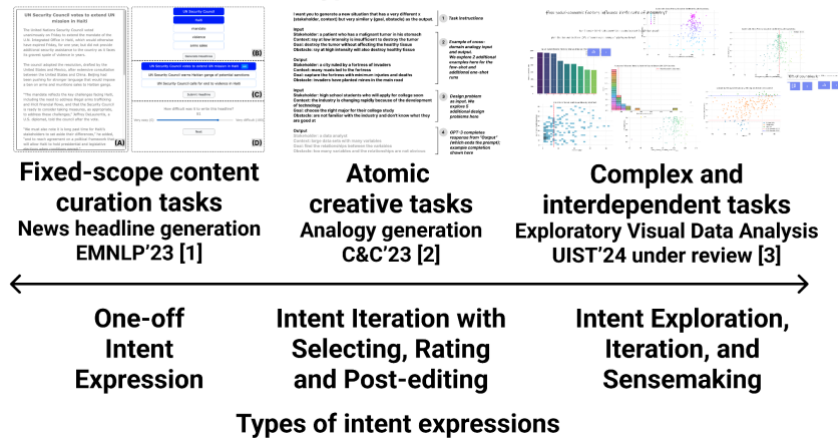
Figure 1 - The spectrum of human intent expression ranges from low for fixed-scope content curation tasks [1], to post-editing for atomic creative tasks [2], and exploration / iteration / organization for complex and interdependent tasks [3].

Human-computer interaction (HCI) involves humans expressing intent for a task, which the machine then interprets, executes, and communicates the results back to the user. Historically, the capabilities of machines to interpret human intents and execute tasks were limited, resulting in complex and burdensome processes for expressing these intents. This complexity often necessitated the mastery of intricate programming languages for command-line interfaces or the manipulation of buttons, dropdown menus, and other elements within graphical user interfaces (GUIs). The advent of generative AI, particularly the emergence of large language models, enables humans — at least for simple tasks like text summarization — to convey their intents to machines using natural language, which are then translated into actions. Building on these shifts in machine capabilities and interaction paradigms, we are inspired to explore the concept of **Intent-based User Interfaces (IUIs)**. Here, "intent" refers to the overarching purpose or objective at a higher level in the causal chain of a task, rather than the specific steps such as direct manipulations on complex GUIs. For instance, in a data analysis programming environment, the primary intent is to understand trends in the data, as opposed to manually inputting column names in plotting functions.

To explore the design space of IUI, which bridges user intents with task execution, we have investigated the types of intent-based interactions required for various types of tasks.. Figure 1 illustrates a spectrum of these intent-based interactions that extend from *one-off expressions* of intent for fixed-scope content curation tasks like news headline generation [1], through intent *iterations* with selecting, rating and post-editing for atomic creative tasks such as analogy-driven problem reformulation [2]. Current work is exploring what intent-based interactions are needed for complex and interdependent tasks,, such as exploratory visual data analysis: here, we have some evidence that intent *sensemaking* with affordances like exploration iteration, and curation are needed to support intent-based interactions [3].

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Exploring AI Problem Formulation with Children via Teachable Machines

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OVERVIEW

Emphasizing problem formulation in AI literacy activities with children is vital, yet we lack empirical studies on their structure and affordances. We propose that participatory design involving teachable machines facilitates problem formulation activities. In this work, we integrated problem reduction heuristics into storyboarding and invited a university-based intergenerational design team of 10 children (ages 8-13) and 9 adults to co-design a teachable machine. This storyboarding activity (Figure 1) is situated within a larger effort to involve children in participatory machine learning activities that enable them to practice and build upon AI literacies. Our partnership with children involves first focusing their attention on specific aspects of the machine teaching process, then gradually removing such scaffolding so that they are equipped to tackle AI problem formulation.

We find that children's formulated AI problems draw from their life experiences, addressing needs at home like security, automation, and familial support, as well as challenges at school such as math, safety, and social interactions. They envision AI with voice capabilities and often expect constant video monitoring. While some stick to supervised classification, others explore various machine learning approaches including learning by demonstration or unsupervised learning. Most anticipate errors and plan to address them through by adding more training data, retraining or, imagining self-debugging capabilities.

We also find that most of the children's ideas encompass a recent call on human-centered AI for a shift in the design metaphors around AI development to move away from "autonomous AI systems" towards systems that "center human capabilities and involvement." Yet, the concept of intelligent agents and social robots who operate as teammates or with assured autonomy remained enticing for a few of the children; this was especially the case for those who described their AI-infused technologies as something that they would not have to train.

Last, we used the Rokeach Value Survey as an analytical framework to examine the values reflected in children's designs. The framework includes terminal values, which
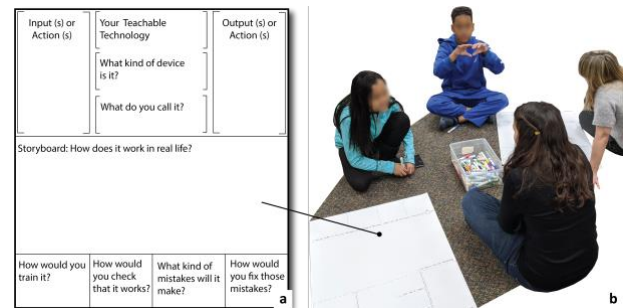
Figure 1 – Our co-design study comprises: a) modified *Big Paper* with a structured storyboard that b) child-adult pairs use to frame and discuss their ideas.

represent the ultimate end goals people strive for, while instrumental values reflect the desirable modes of conduct that people exercise to reach those end goals. We found that instrumental values such as "capability," "logic," "helpfulness," and "responsibility," were shared among all children as preferred modes of behavior for their machines. Terminal values were also less present with "a comfortable life" being most prevalent followed by "family security," "inner harmony," and "an exciting life."

Our exploratory insights contribute to the design of learning activities that use teachable machines. Particularly, they could benefit from allowing children to formulate their machine learning problems, using children's values to be usable and enjoyable, and showcasing their utility to support children's goals.

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Hypertext-Augmented Workflows for Scholarly Sensemaking

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The early days of HCI were marked by bold visions of hypertext as a transformative medium for augmented sensemaking, exemplified in systems like Memex, Xanadu, and NoteCards. Today, however, hypertext is often disconnected from discussions of the future of sensemaking. Here, we investigate how the recent resurgence in hypertext "tools for thought" (e.g., tools like RoamResearch, Obsidian, and Tana) might point to new directions for hypertext-augmented sensemaking.

To do this, we conducted in-depth interviews with 23 scholars who gave us "guided tours" of how they use tools – including new hypertext notebooks --- to support their scholarly sensemaking work.

Figure 1 – Example hub note (B) with backlinks to that hub (A).

A significant portion of our guided tours was spent discussing "meta-work" required to get into a position to do active sensemaking. This core problem was expressed in terms of **temporo-spatial fragmentation of sensemaking work**: sensemaking is naturally temporally fragmented due to the limited amount of information and energy a person has at the moment when they try to understand something; and participants described a tension between the required centralization of information artifacts for synthesis and the reality of spatial fragmentation of these information artifacts across a range of "information scraps" [1] and tools.

Participants often constructed specialized information artifacts that extended their ability to retrieve information that was fragmented across time and across their hypertext notebooks. Of particular note were a cluster of use patterns that drew on classic hypertext affordances, such as backlinks (surfacing notes that link back *to* a given note, not just outgoing links), and new hypertext features such as structure searches (searches defined not just in terms of content or metadata, but patterns of connections to other notes), which were proposed in the first wave of hypertext research in the 90's [2], but are now implemented in many of the consumer hypertext notebooks used by our participants.
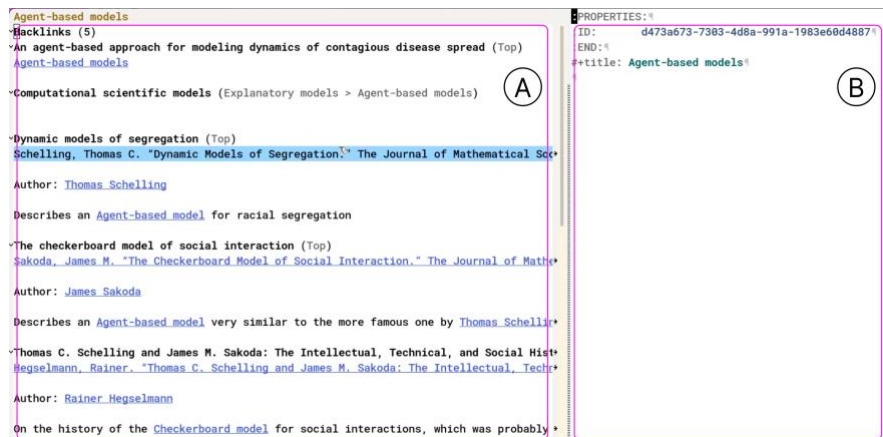
Examples of these use patterns included **Hubs** (empty note pages with backlinks or queries that provided swift access to distributed information artifacts; **Indices** (manually constructed or structure search-powered note pages that contain links to a set of related notes, as well as descriptions of the nature of the information being linked to); and **Incubators** (note pages where participants add and describe links to other notes and also added a temporal or developmental dimension.

These usage patterns --- in part leveraging novel features of the new wave of hypertext notebooks, such as structure searches, and formal note schemas --- expand the design space of approaches for hypertext-augmented sensemaking, and open up new research directions for the future of sensemaking.

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Self-organized Critical Appraisal of Research in Digital Communities: What Can Reviewers Learn?

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OVERVIEW

*"We thank the readers for their scrutiny of our articles: when we get it wrong, the **crowdsourcing dynamic of open science** means that community feedback helps us to quickly correct the record."* – @FrontiersIn, X.com

Across diverse scholarly communities, manuscripts face similar peer review rituals. A learned society or publisher, led by an editor, *privately invites* reviewers within their specialty to assess the manuscript's merits. This tradition is often centered on a loosely structured *critical appraisal* of credibility, clarity, creativity, and connectivity to other research and practice. We call this *formal critical appraisal or formal per review* and characterize it as editor-led (top-down), closed, intradisciplinary, and concentrated in formal digital communities like journals and proceedings.

Although formal critical appraisal is common, we are not married to it. Scholars in many disciplines and geographies are increasingly self-organizing on social media platforms, PubPeer, and personal websites to make sense of the exponentially growing corpus. To a lesser degree, they post on journal websites, preprint servers, and wikis. These modern and understudied patterns of scholarly *peer production* are often self-organized (bottom-up), open, and highly distributed over informal digital communities.

Self-organized appraisers often act as detectives, finding issues that formal appraisers missed: plagiarism, fraud, analytic errors, conflicts of interest, methodological flaws, shaky conceptual foundations, undisclosed deviations from preregistrations, questionable interpretation of results, and more. Beyond publicizing limitations, self-organized appraisers also improve the clarity of research decisions and contributions with explanations, advice for enhancing clarity, reconsiderations of studies' value, and connections to related literature.

To understand self-organized appraisers deeply, we trace critical discourse about scholarly research from publishers to digital communities and back to publishers (Fig. 1). We consider the intersection between self-organized peer review and the STS research on knowledge infrastructures, data journeys, and infrastructural inversion that are fruitful for theory-building, conceptualizing the network of publishers, digital communities, tools, and peer review practices to be a *knowledge infrastructure* made visible by focused study.
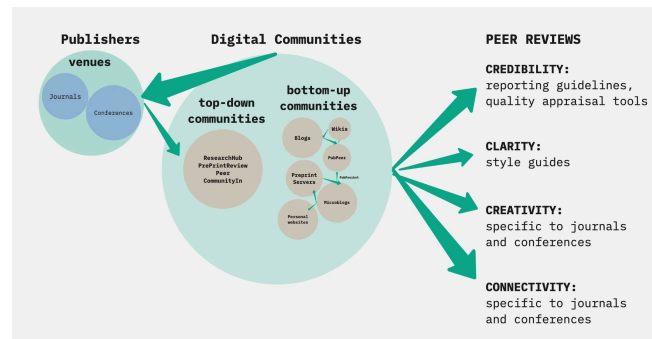

Fig 1. Data journey of scholarly information from Publishers (left) to Digital Communities (center) and back. We extract criteria for appraising research (right).

STUDY: DESIGN & ANALYSES

In this study, we collected and coded quotes and associated multimedia from appraisers posting on X/Twitter, BlueSky, PubPeer, blogs, and Reddit. We used inductive and deductive content analysis in our dataset of 60 appraisal cases, gleaning unique criteria and lessons for critical appraisal that are absent in common reporting guidelines and quality appraisal tools.

Our immersive investigations have revealed a spectrum of problems in peer-reviewed publications that could be prevented with stricter pre-submission quality checks, the difficulty of eradicating zombie publications from the record, and the crucial role of scholarly influencers who actively teach and preach the underappreciated art of error detection to their reform-minded followers.

PROJECT WEBSITE

Our open dataset is available on GitHub.

Interaction Techniques for Supporting Content Creators in Marking up Text for Accessibility

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OVERVIEW

We have had authoring tools such as word processors for several decades, however, the developers of these tools gave little attention towards enabling authors to create documents that were accessible by people with disabilities. Since then, this gap has persisted: there has remained a shortage of ways to author content while simultaneously adding accessibility markup.

An overwhelming majority of internet content remains difficult to access for people with disabilities [4]. An underlying cause for this problem is that authoring tools lack affordances to help authors easily add the requisite markup in order to make digital content accessible.

Creating accessible content as HTML web pages makes it possible for creators to design fully accessible content from the beginning of development. However, most document formats – such as PDF – do not support such an approach, since they usually require authors to remediate it for accessibility only after the content has been created [1]. Remediation approaches are perhaps the only option for dealing with the trillions of PDFs that already exist and are inaccessible. While we have studied and developed tools to improve PDF remediation for accessibility, the process could be made much more efficient if the markup was added simultaneously at the time of authoring. In this work-in-progress, we present ways to make a document "born accessible", meaning that a document is marked up for accessibility during authoring as opposed to afterward.

Prior work has involved remediation of PDF documents to meet requirements for accessibility. Pradhan et. al. developed a tool to apply tags to a document for multiple content types including headings, alt text, reading order and tables [3], while Paliwal et. al. demonstrated a tool for improved PDF form remediation [2]. Both tools utilized best design practices from HCI literature, and demonstrated significant improvement in user accuracy and speed compared to Adobe Acrobat Pro, the industry standard tool. At the same time, these authors also acknowledge that such
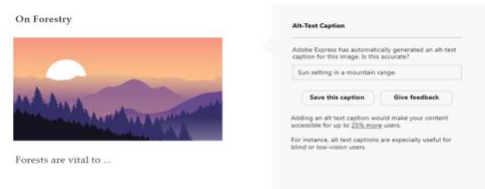
Figure 1 – UI intervention to add image alt text

an approach can be expensive as compared to one that simultaneously tags a document for markup.

We have conducted initial listening sessions with members from disability rights groups, developed early fidelity designs, and are currently formalizing our user study. We hypothesize that this approach will be easier and more user friendly for content authoring, and as part of our ongoing research, we are involving people with disabilities early in our design process.

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Gender Gap in Wikipedia: Where Are The Notable Women?

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OVERVIEW

Wikipedia, a vast repository of knowledge, hosts 1.9 million biographies of notable individuals worldwide. Yet, it faces a significant gender gap, with only 19% featuring women. This imbalance risks reinforcing societal gender inequalities and perpetuating biases. Many notable women are not only absent from Wikipedia but also at risk of deletion through the Article for Deletion (AfD) process. AfD facilitates collective deliberation on whether articles should be removed from Wikipedia. Central to this process is the concept of "notability," whereby a subject's significance is gauged based on reliable, independent, and published external coverage.

Despite the noteworthy accomplishments of many women, prior studies (Tripodi, 2021; Lemieux et. al, 2023; Martini, 2023) have revealed a troubling trend: biographies of women are disproportionately nominated for deletion compared to those of men, despite ample coverage of their contributions in reputable news media and other prominent sources. However, it is unknown how quickly those biographies become nominated for deletion during the editing process.

Estimating the likelihood of deletion over an article's lifespan is important for several reasons. Firstly, articles mature over time due to collaborative editing with rich content and reference base. However, since notability assessments are an integral part of the editorial process, articles may face nomination for deletion at any stage of development. As articles are continually developed, early nominations for deletion shorten the window for further improvement. Secondly, efforts by various notable editorial communities in Wikipedia such as "Women in Red" and feminist movements (Langrock et. al, 2022) have increased women's biographies in recent years, but articles typically receive higher scrutiny, and thus greater risk of deletion, when they are new.

In this study, our objective is to investigate the question: How promptly are biographies evaluated for deletion in the AfD process? Specifically, we aim to determine if there is any gender-based discrepancy in the timing of deletion consideration. We make two significant contributions: First, we employ a computational method to explore potential gender disparities in the timing of nomination for deletion, covering the entire history of the AfD process from January 1, 2001, to November 3, 2023. This study is the most comprehensive study about the editorial deliberation in AfD process to date. This involves the use of statistical models in Survival Analysis, allowing us to standardize biographies based on their ages and estimate the likelihood of survival from nomination for deletion over time. Second, We examine factors influencing creation-to-nomination for deletion time, including the evolution of Wikipedia from its inception.

Since Wikipedia is the repository of both historical and contemporary knowledge, we also considered two more factors. One such factor is the biographical status of individuals: debates about the notability of living individuals are more challenging due to concerns about the reliability of their pages and the need to prevent harms to the reputation of living persons. Another factor is whether the person nominated is an historical figure since Wikipedia is affected by a well-known contemporaneity bias.

Our research uncovers a tendency to prematurely question the merit of women and promptly nominate for deletion in the AfD process at a higher rate than men. This suggests that women's contributions are quickly undermined by editors, offering them fewer opportunities to enhance their Wikipedia presence. This highlights the challenges of preserving knowledge about women throughout history on Wikipedia, where traditional narratives have often overlooked their contributions. The under-representation of women in historical and contemporary records contributes to perceptions of lower notability, leading to premature deletion consideration in the AfD process. In conclusion, our study offers valuable insights into gender disparities on Wikipedia, shedding light on the challenges and opportunities for creating a more inclusive encyclopedia.

ACKNOWLEDGMENT

Does Crowdsourced Transcription Data Increase Accessibility for Print-disabled Users?

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OVERVIEW

Crowdsourced Data: Accuracy, Accessibility, and Authority (CDAAA) is a 3-year Institute of Museum and Library Services (IMLS) grant project to identify barriers that Libraries, Archives, and Museums (LAMs) face in making crowdsourced transcriptions accessible to sighted users, and print-disabled people who use assistive technology to access digital text. LAMs run crowdsourced transcription projects to make non-machine-readable images of documents discoverable and accessible, but how successful are these projects? We work with 12 US-based partners including private, public, university, and federal LAM institutions, and community-led groups using platforms like Zooniverse.org, FromThePage, and bespoke software, to run transcription projects.

Our findings derive from a mixed-methods approach including survey, interview and user-testing methods. All data were gathered 3/2023-3/2024. Our research questions are: **RQ1 (Authority)**: Are LAMs able to integrate crowdsourced transcriptions into their CMSs (the authoritative record)? If yes, how? If not, what technical barriers do they face? **RQ2 (Accuracy and Authority)**: What are LAM practitioners' attitudes towards crowdsourced transcription data quality? Do these attitudes impact whether or not crowdsourced data are incorporated into CMSs? How do LAM practitioners assess the quality of crowdsourced data? **RQ3 (Accessibility)**: When transcription data is successfully integrated with CMSs, is it accessible to print-disabled people? What are print-disabled users' experiences of searching for and reading transcription data?

LAM PARTNER FINDINGS (RQ1 and RQ2)

LAM Partners report common challenges with crowdsourced data integration, including infrequent and complex manual ingests and vendor or bespoke CMSs that were not designed to host large amounts of textual. LAM practitioners approach data ingestion or sharing in different ways, i.e. placing transcriptions in notes or description fields, publishing a separate .txt or .pdf file attached to the authorial record, or in a separate repository like Dataverse.

8/10 LAM Partners who have ingested data rate volunteer transcriptions as high enough quality to ingest, with varied degrees of text editing and post-processing required. 2 LAM Partners collected crowdsourcing data that is too low quality or difficult to use and have not ingested it.

ACCESSIBILITY TESTER FINDINGS (RQ3)

All 4 accessibility user testers were unaware of the availability of crowdsourced transcription resources, and were unfamiliar with searching for this content in LAM CMSs or databases. Users often found existing pathways through CMSs frustrating and difficult to navigate. Collectively, the 4 blind user testers (as of March 2024) found transcriptions in 7/12 systems. All users benchmarked their expectations for crowdsourced transcriptions against low-quality OCR text. When presented with relatively clean crowdsourced transcriptions held in some LAM CMSs, or more accessible versions of transcriptions refined by the CDAAA team, 3 users were pleasantly surprised by the readability and quality of these texts. All users were unfamiliar with transcription conventions and scholarly editing practices, such as representing original spelling and deletions in encoded text and likened these to "tracked changes.

PROJECT WEBSITE

To view our project process visit: https://github.com/VVH/CDAAA

ACKNOWLEDGEMENTS

VisTorch: Interacting with Situated Visualizations using Handheld Projectors

Biswaksen Patnaik[1], Huaishu Peng[1], Niklas Elmqvist[2]
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OVERVIEW

A fundamental premise of ubiquitous, situated, and immersive analytics is the presentation of data in situ, i.e., integrating visual representations of data in the real world. There are many benefits to this approach: (1) it increases the display space from a small set of monitors to potentially the entire area surrounding a user; (2) it supports situated action as well as distributed and embodied cognition central to human reasoning; and (3) it facilitates multiple people working together in the same physical space. Furthermore, in situations when the data has a connection to the user's physical location, it also enables embedding the data in a location relevant to the data, such as temperature near a weather station, a time schedule at a bus stop, or electricity consumption on a refrigerator. However, there are a few drawbacks - fixed displays are static and mobile devices are typically limited in size, thus limiting the display area and the potential for data embedding. Augmented Reality (AR) using head-mounted displays is nearly ideal for the purpose, but such devices are costly and not yet widely available. Even handheld AR, which is trivial using current mobile devices, is troublesome because the imagery is shown on a personal screen, making establishing deixis and common ground between collaborators awkward.

We present VisTorch [1], a custom-built handheld device combining a laser pico-projector with a camera and trackpad input (Fig. 1). VisTorch enables a user to shine the projector at any surface in a room to reveal any physical visualization dashboard component located on that surface. The onboard camera tracks fiducial markers placed on the surface and calculates the projector's orientation, allowing the projected content to be corrected to avoid distortion due to skewed perspective. VisTorch does not require wearing a bulky (and costly) HMD, and the physical action of pointing the projector to reveal data is akin to shining a flashlight to light up a darkened room, a peephole interaction that is familiar to many. Furthermore, the projected image is visible by all participants co-located in space, facilitating synchronous collaboration. We evaluated the approach using both a user study and an expert review. In the former, I asked 20
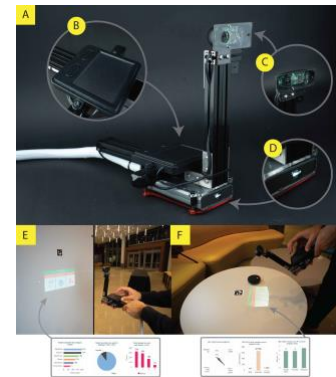
Figure 1 – (A) Close up view of VisTorch. (B) Trackpad for interaction. (C) Camera for reading ArUCo markers. (D) Projector to display contents. (E) Using VisTorch to uncover data in the physical space. (F) VisTorch showing situated data.

participants to first organize charts in space and then refer to these charts to answer questions. We observed three spatial and one temporal pattern in participant analyses. In the latter, four experts—a museum designer, a statistical software developer, a theater stage designer, and an environmental educator—utilized VisTorch to derive practical usage scenarios in their respective domains. Results from the study showcase the utility of situated visualizations for memory and recall.

ACKNOWLEDGEMENTS

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1. Biswaksen Patnaik, Huaishu Peng, Niklas Elmqvist. VisTorch: Interacting with Situated Visualizations using Handheld Projectors. *In Proceedings of the ACM Conference on Human Factors in Computing Systems, to appear, 2024.*

Health Data Visualization Literacy Skills of Young Adults with Down Syndrome & the Barriers to Inference-making

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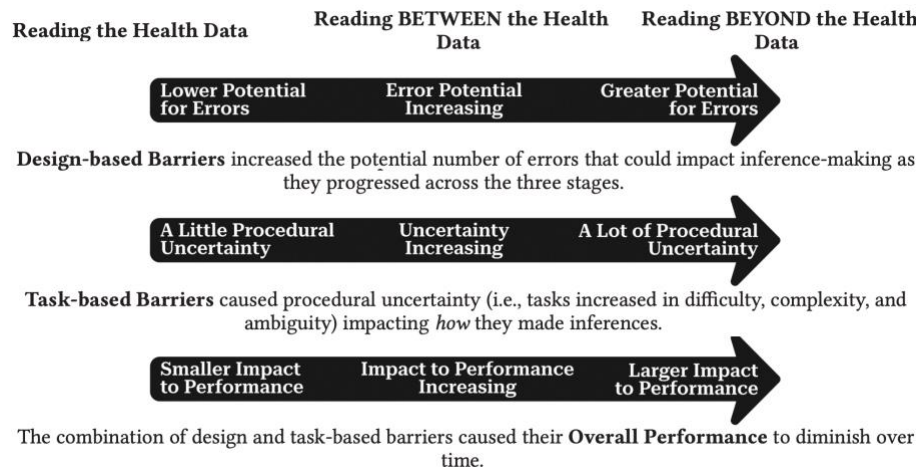
Figure 1 – Types & Impacts of Health Data Visualization Barriers to Inference-Making by People with Down Syndrome

OVERVIEW

Introduction: As health management becomes more intertwined with data, an individual's ability to read, interpret, & engage with personal health information in data visualizations is increasingly critical to one's quality of care. People with Down Syndrome (PwDS) experience greater health disparities than typically developing individuals. Inaccessible health information & technologies may magnify these inequities further by negatively impacting PwDS' ability to adopt & use health systems or devices, make informed decisions about their bodies, & advocate for themselves in health contexts. The first of its kind, this study investigated the underlying health data visualization (HDV) literacy skills of PwDS as they progressed through the three stages of *Reading an HDV* (i.e., locating & identifying graph elements); *Reading BETWEEN the HDV* (i.e., observing & comparing relationships to map information); & *Reading BEYOND the HDV* (i.e., constructing meaning & synthesizing outside of the HDV). **Methods:** Study design & methods were co-developed with a self-advocate to ensure accessibility & to collect richer data across a series of semi-structured interviews involving ten young adults with Down Syndrome (ages 16 & 29 years old; 22.3 mean). **Results & Discussion**: Participants completed more than half (~56.9%) of the HDV reading activities. Overall performance (i.e., successful completion of stage-specific activities)

diminished over time (1st stage: 79.3%. 2nd stage: 53.6%. 3rd stage: 37.9%). Design & task barriers adversely impacted participants' inference-making abilities. Findings resulted in 12 design considerations & potential strategies to improve HDV accessibility for PwDS: 1) Integrate training 2) personalization, 3) definitions, & background knowledge into HDV design, 4) describe abstract content using specific, concrete language, 5) avoid omitting information 6) & intervals requiring mental calculation, 7) support early HDV element identification, 8) be wary of transposing content, 9) layer encoding to reinforce visual metaphors, 10) visually connect elements during information mapping, 11) support inference-making & 12) question generation abilities.

PAPER

1. Rachel Wood, Jinjuan Heidi Feng, & Jonathan Lazar. 2024. Health Data Visualization Literacy Skills of Young Adults with Down Syndrome & the Barriers to Inference-making. *ACM Trans. Access. Comput. 17, 1, Article 4* (March 2024). https://doi.org/10.1145/3648621

API Can Code: Situating Data Science in the Lives of High School Students

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OVERVIEW

Students today are increasingly immersed in a data-driven world where information and technology are central to their daily lives. Equipping students with the necessary knowledge and skills to understand and interpret data is essential for their future success [1]. In response to these needs, the field of data science education has gained momentum, and there is a growing demand to teach data literacy and foundational data science concepts in K-12 contexts [2].

The API Can Code is a project aimed to situate data science in the lived experiences of today's students. As part of this project, we developed an interest-driven curriculum that introduces high school students to the computational foundations of data science through authentic, meaningful data exploration. The central idea of this curriculum is anchored in the data science cycle. Students are encouraged to formulate questions based on their interests, identify relevant datasets, programmatically manipulate and analyze the data, and communicate their findings.

The curriculum is divided into three units (Figure 1), each containing six lessons. The first unit aims to enhance students' understanding of the data around them and its impact on their lives. Students explore the entities that collect their data, are introduced to the Data-Information-Knowledge-Wisdom (DIKW) model, and learn about transforming data into valuable insights. Additionally, they learn about different data sources, ways to evaluate datasets, and how data can influence equity and algorithmic bias. The second unit is focused on the computational foundations of data science. Students first learn about data science and its importance and then practice ways to programmatically retrieve and manipulate publicly available data from various Application Programming Interfaces (APIs). This is done using EduBlocks, a block-based programming tool designed to introduce text-based programming languages, such as Python, in a user-friendly and engaging manner. Students write programs to request and access data from APIs that intrigue them. The third unit centers on data science practices, including analyzing and visualizing data to extract valuable insights. Students learn to use CODAP, a free
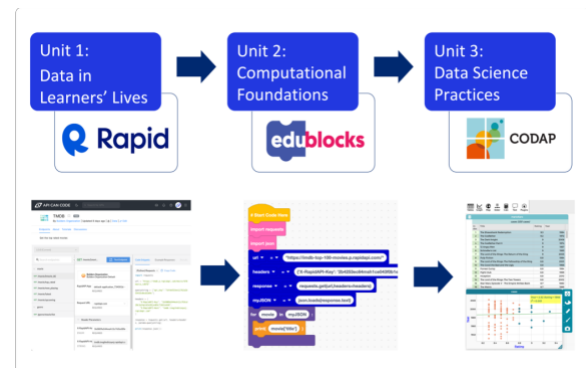

Figure 1 – The API Can Code instructional units.

Online data analysis platform, to analyze the data, create and interpret a variety of summary plots, and perform statistical tests. After the third unit, the students work on a summative project where they find and evaluate APIs that contain data relevant to their interests. Students formulate questions that can be answered with the data, write programs to manipulate the data, and create visualizations to illustrate the answers to their questions. By the end of the curriculum, students are equipped with the knowledge and practical skills necessary to tackle real-world data science challenges.

PROJECT WEBSITE

To read more about the project, visit the API Can Code Website: https://apicancode.umd.edu/

ACKNOWLEDGMENTS

PAPERS

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2. LaMar, T., & Boaler, J. (2021). The importance and emergence of K-12 data science. Phi Delta Kappan, 103(1).

TactualPlot: Spatializing Data as Sound using Sensory Substitution for Touchscreen Accessibility

Pramod Chundury[1], Yasmin Reyazuddin[2], J. Bern Jordan[1], Jonathan Lazar[1], and Niklas Elmqvist[3]
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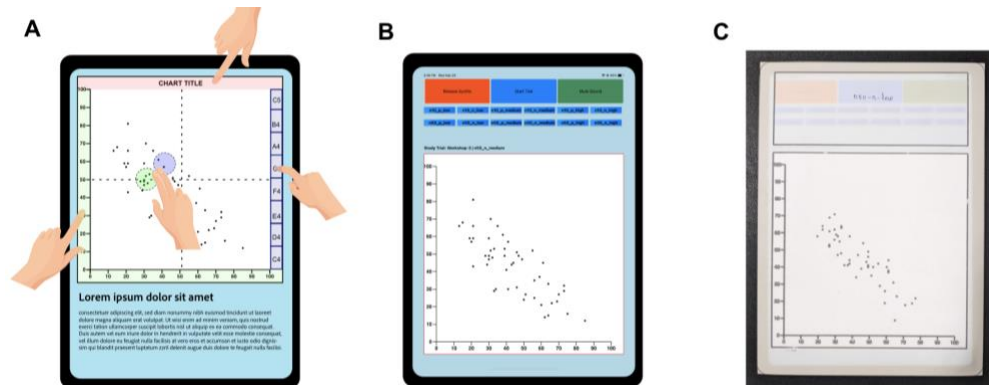
Figure 1 – Designing the TactualPlot technique. (A) Illustration of the TactualPlot technique with its continuous and discrete touch actions and regions. (B) Our implementation of the technique that was evaluated in formative design session 3 and design review sessions. (C) Tactile scatterplot implemented using American Thermoform swell touch paper and aligned to dimensions of the TactualPlot system. Tactile scatterplots were overlaid on an Apple iPad.

OVERVIEW

We explore the potential of sensory substitution technologies to enhance data accessibility for blind individuals. Traditionally, blind people rely heavily on the sense of touch, using their hands and tools like white canes to perceive their environment. In academic and professional contexts, this tactile approach is extended through data physicalization methods that convert data into tangible formats, such as thermoform paper and 3D-printed models. These methods, while affordable, are static and time-consuming to produce. Conversely, more sophisticated technologies that offer interactive feedback, such as shape-changing displays and refreshable Braille displays, are prohibitively expensive for a demographic that often faces significant financial constraints.

Given these limitations, our work proposes a novel method utilizing ubiquitous touchscreen devices, which have become integral to the lives of blind people through widespread smartphone adoption. We introduce TactualPlot, a crossmodal sensory substitution technique that converts touch interactions on a smartphone into auditory feedback, enabling blind users to "touch" and interpret complex datasets as spatialized audio. This approach, which does not require specialized haptic technology, draws on principles of crossmodal substitution where inputs from one sensory modality are transformed into outputs in another. This mimics synesthetic experiences, such as perceiving colors through sound.

TactualPlot specifically targets the exploration of scatterplots, allowing users to perceive data points through changes in audio tones that represent varying densities under their fingertips. The design of TactualPlot was refined through participatory sessions with blind collaborators, leading to significant enhancements including multi-touch interactions and improved axis manipulation. We also conducted expert reviews with blind professionals to validate the utility of this technique. Our findings suggest that TactualPlot holds promise not only as a scalable solution for accessing large data sets but also as a generalizable method for non-visual graphical perception.

RELATED PAPER

1. Pramod Chundury, Yasmin Reyazuddin, J. Bern Jordan, Jonathan Lazar, and Niklas Elmqvist. TactualPlot: Spatializing Data as Sound using Sensory Substitution for Touchscreen Accessibility. *Transactions on Visualization and Computer Graphics*. (2023).

Switch Mode: Transitioning Students from Block to Text

Yuhan Lin[1], **David Weintrop**[1], **Jason McKenna**[2]

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Figure 1 (left): The Switch Mode interface and the drag and drop to add Switch mode blocks to a program.
Figure 2 (right): Converting conventional blocks to Switch mode blocks.

Block-based programming (BBP) is an effective way to introduce young learners to programming and the field of computer science more broadly [2,4,5]. With BBP environments designed for learners of all ages, youth as young as kindergarten are learning to program [1,2]. BBP reduces syntax errors by using visual cues to denote how commands fit together and not allowing incompatible commands to connect [4].

However, BBP is only a steppingstone to text-based programming for learners who are interested in pursuing future computer science coursework or interested in a career that will rely on programming. As learners progress to high school and beyond, they will have to shift from BBP to conventional text-based programming (TBP) languages such as Python or Java. This transition is not always smooth as learners face additional steps and conceptual challenges when they leave BBP [3].

Although the transition from block-based to text-based programming can be challenging [6], relatively few resources currently exist to help learners navigate the transition. To help learners move from BBP to TBP, we have designed Switch mode, a programming approach that blends block-based and text-based programming features within a virtual robotics platform. Switch mode blocks can be added by either directly drag-and-dropping them into a program (Figure 1) or by right clicking a block and converting it into a Switch mode block (Figure 2).

This scaffolded approach can support learners in transitioning from BBP to text-based programming. This lighting talk presents an analysis of the eight distinct strategies that learners developed to compose programs using Switch mode blocks. This work contributes to our understanding of how we can design environments that support students of varying levels of prior experience and confidence in transitioning from introductory (block-based) to more powerful (text-based) programming modalities.

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Posters Only (no lightning talk)

This year we invited our HCI master's students to participate in our poster session. Below are descriptions of these posters – make sure to check them out during the reception.

Exploring the Role of Generative AI in Native Language Learning among Children

Dinesh Kumar Nanduri, Diana E. Marsh, Elizabeth M. Bonsignore, Jason Aston, Joel Chan

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In an era marked by the rapid disappearance of languages, UNESCO warns that nearly half of the world's languages are in danger of disappearing before the end of the century. Despite its relatively robust health, the Telugu language has witnessed a decline in usage, reduced focus in India's educational systems, and overshadowing by dominant global languages.

This thesis explores Generative Artificial Intelligence (GenAI) to counter this trend, focusing on its application in native language learning for children, key carriers of their ancestral tongues. We address two research questions: first, the integration of AI into language learning pedagogy through ethically driven and culturally respectful ways in non-western indigenous languages, and second, children's design preferences in AI storytelling interactions, alongside the role of elders in authenticating these narratives. The research is driven by a personal motivation to preserving the native language Telugu with aspirations to extend these protective measures to other languages at risk.

Enhancing Youth Education for Sustainable Development through Data Physicalization

Yi Hsieh Lin, Jason Aston, Elizabeth Bonsignore
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This paper explores the integration of data physicalization in Education for Sustainable Development (ESD), focusing on its potential to enhance the learning experience for young audiences, particularly those aged 7-12. By examining the current gaps in sustainability education and analyzing the impact of tangible data interactions on children's understanding of and engagement with sustainability issues, the study underscores the importance of innovative educational methods. Preliminary findings indicate that data physicalization significantly boosts comprehension, engagement, and active learning among young learners. The research contributes to the discourse on effective ESD practices, advocating for the inclusion of data physicalization techniques in educational curriculums to better prepare youth for addressing global environmental challenges.

HCIL Honors and Awards

On the following pages, we celebrate some of the awards and honors that HCIL faculty and students have received in the last year.

Promotion & Tenure	
Amanda Lazar	Received tenure in 2024 (iSchool)
Jessica Vitak	Promoted to full professor in 2024 (iSchool)

Awards for research papers	
Team of authors, led by Omer Akgul, co-author Michelle Mazurek	Distinguished Paper Award, USENIX Security Paper: Bug hunters' perspectives on the challenges and benefits of the bug bounty ecosystem
Team of authors (led by Cody Buntain)	Best Evaluation Paper, International Conference on the Web and Social Media (ICWSM) Paper: Measuring the Ideology of Audiences for Web Links and Domains Using Differentially Private Engagement Data.
Team of authors, led by Zijian (Jason) Ding with coauthors Arvind Srinivasan and Joel Chan	Best Paper Honorable Mention, Conference on Creativity and Cognition Paper: Fluid Transformers and Creative Analogies: Exploring Large Language Models' Capacity for Augmenting Cross-Domain Analogical Creativity
Utkarsh Dwivedi, Salma Elsayed-Ali, Elizabeth Bonsignore, Hernisa Kacorri	Best Paper Honorable Mention, ACM CHI Paper: Exploring AI Problem Formulation with Children via Teachable Machines
Yuhan (Jimmy) Lin, David Weintrop, Jason McKenna (VEX Robotics)	Best Short Paper, Visual Languages and Human-Centric Computing (VL/HCC) Paper: Coder and Coder Cards: A Novel Tangible Programming Approach to Support Young Programmers
Team of authors, including Michelle Mazurek	Best Paper Honorable Mention, ACM CHI Paper: Designing a data-driven survey system: Leveraging participants' online data to personalize surveys
Team of authors, including Jessica Vitak	Outstanding Article Award, International Communication Association (ICA)

	Paper: Open Science, Closed Doors? Countering Marginalization through an Agenda for Ethical, Inclusive Research in Communication
Zeyu Yan, Jiasheng Li, Zining Zhang, and Huaishu Peng	Special Recognition for Sustainable Practice, for Research with Potential for Sustainable Impact, ACM CHI Paper: SolderlessPCB: Reusing Electronic Components in PCB Prototyping through Detachable 3D Printed Housings

Major Funding Received

Cody Buntain	NSF Award: Research Collaboration Network: Democracy in a Networked Era
Joel Chan & David Weintrop	Google Award for Inclusion Research: "Computer, Help Me With My Code!": Understanding the Impact of Conversational Large Language Models in Introductory Programming Courses for Students from Historically Excluded Populations in Computing
Leo Zhicheng Liu	NSF Career Award: Manipulable Semantic Components in Data Visualization Design
Michelle Mazurek	NSF Award: Beyond App-centric Privacy: Investigating Privacy Ecosystems among Vulnerable Populations
Michelle Mazurek	Laboratory for Telecommunication Sciences Award: Enabling Vulnerability Analysis With More Usable Fuzzing
Stephanie Valencia & Vaishnav Kamesvaran	Google Research Scholar Award: Designing AI-powered DIY Communication Tools with AAC users
Jessica Vitak	NSF Award: Supporting Privacy Negotiation Among Multiple Stakeholders in Smart Environments

Other Awards & Achievements

Beth Bonsignore	Inaugural Do Good Innovator Awardee, University of Maryland
Carol Boston	Inaugural Do Good Innovator Awardee, University of Maryland
Sheena Erete	Named inaugural research director of Artificial Intelligence Interdisciplinary Institute at Maryland (AIM)
Kelsey Fulton	John Karat Usable Privacy and Security Student Research Award, Symposium on Usable Privacy and Security (SOUPS)
Bill Kules	Inaugural Do Good Innovator Awardee, University of Maryland
Galina Reitz	Inaugural Do Good Innovator Awardee, University of Maryland

HCIL Student Graduation

Finally, we celebrate the many HCIL students who have graduated over the last year. Students are an integral part of the lab's success, and these students have worked with faculty on a range of important research projects in recent years. Congratulations and good luck to each of these students!

Student Name	Advisor	Grad Date	Degree
Omer Akgul	Michelle Mazurek	December 2023	PhD (Computer Science)
Janet Bih	David Weintrop	May 2024	PhD (Education)
Salma Elsayed-Ali	Joel Chan	May 2024	PhD (INFO)
Kelsey Fulton	Michelle Mazurek	August 2023	PhD (Computer Science)
Jimmy Lin	David Weintrop	May 2024	PhD (Education)
Daniel Pauw	Tammy Clegg	May 2024	PhD (INFO)
Noel Warford	Michelle Mazurek	May 2024	PhD (Computer Science)

Student Name	Advisor	Grad Date	Degree
Ciara Fabian	Jason Aston	May 2024	HCIM
Mengying Li	Eun Kyoung Choe	May 2024	HCIM
Dinesh Nanduri	Diana Marsh	May 2024	HCIM
Jialun Yang	Heera Lee	July 2023	HCIM

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