EduVis: 2nd IEEE VIS Workshop on Visualization Education, Literacy, and Activities

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ABSTRACT

This is the 2nd workshop on visualization education, literacy, and activities, a succession of a successful workshop in 2023 that attracted a high number of attendees (∼50-70). As its predecessor, this workshop aims to become a forum to share and discuss advances, challenges, and methods at the intersection of visualization and education. This includes education for visualization (literacy) as well as visualization for education. The workshop intends to bring together junior and senior scholars to share research and experience and to discuss educational activities, methods, materials, goals, (digital) tools, empirical evidence, applications, and research challenges. The workshop addresses an interdisciplinary audience from and beyond visualization, education, learning analytics, science communication, psychology, or people from adjacent fields such as data science, AI, and HCI. It will include presentations of research papers and working group discussions. Beyond these, the workshop will discuss challenges in data visualization education and sketch a research agenda for visualization education, literacy, and activities. New this year, we will also feature 'educators reports', which solicit written advice on visualization to educators.

1 MOTIVATION

Visualization pedagogy plays an important role in improving data visualization literacy, which encapsulates abilities such as reading and creating visualizations [2]. Recently, we have seen a surge of research endeavors on visualization education, literacy, and activities in the visualization community. In 2023, we organized a highly successful and well-attended 1st EduVis workshop at IEEE VIS [14], published a paper on the challenges and opportunities in visualization education [3] as one output from a Dagstuhl seminar on the same topic [1], and have seen the introduction of an Education full paper track at the IEEE/CGF EuroVis conference.[1] We also observed activities in related venues such as an IEEE VIS tutorial on "Design Sprints for Visualization" and an ACM CHI 2024 workshop "Toward a More Comprehensive Understanding of Visualization Literacy" at CHI'24 [6]. These activities show a growing awareness of the importance of education in visualization and the responsibility that comes with the goal of advancing a highly dynamic field with strong ties between academia and practice.

As we create novel visualization techniques, interactions, and algorithms, as well as surfacing empirical evidence about visualization, we need to think about training our intended users. This process includes traditional formats of formal (classroom) teaching to children, young adults, and students, but many of the less understood challenges arise with informal education through online classes, self-paced learning, professional upskilling, and learning on demand as people want to know only the little visualization knowledge that helps them get their job done. Some of the associated challenges have recently been described in our IEEE VIS 2023 full paper "Challenges and Opportunities in Data Visualization Education: A Call to Action" [3] and include issues such as multi-disciplinarity, the lack of tools and common learning goals, as well as questions around the potential and pitfalls of using AI in education. Despite the recent increase in research in education and visualization, we still too often only rely on vague personal experiences to communicate our contributions and engage our collaborators in co-design. We want more students, junior faculties, and researchers to grow our community. Continuing and strengthening this momentum in both academia and practice is essential to address challenges and opportunities that arise in a broad range of topics (learning tools, assessments, tools, visualization techniques, etc.), audiences (children, students, working professionals, designers, data scientists, journalists, educators, decision-makers, etc.), and scenarios (classroom learning, informal learning, collaboration, museums, science fairs, workshops, hybrid and online teaching, scientific collaborations, consulting, etc.). The interplay between research and practice calls for a more structured and informed approach to visualization knowledge, education, and application in practice.

To drive the creation of a broader community, three workshop groups interested in visualization and education joined forces. As a result, we propose three independent tracks under the umbrella of one workshop, *EduVis*. Those tracks are:

Track A: Visualization for Education. This track focuses on questions around using visualization in educational and pedagogical settings of any discipline or topic—from school subjects to professional training. We hope this will generate synergy between the two topics and draw in more knowledge on education.

Track B: AI for Visualization Education. this track spotlights and promotes the ongoing and necessary discussions regarding how to best integrate or limit tools like ChatGPT and generative AI into visualization education [3, 24]. More broadly, we aim to raise questions like *what are the implications of introducing any new practices into what and how we teach visualization (e.g., how can AI support education for visualization?) How efficient are these techniques for supporting visualization education practice?*

Track C: Generic Topics in Visualization and Education. This track covers any other relevant topics, questions, and experiences about visualization and education.

New this year, we introduce **'educator reports'**, a short template-agnostic report aimed at communicating 'advances, evidence, and best practices' to visualization educators. Educator reports will be published on the online blog Nightingale,[2] run by the Data Visualization Society. These reports are meant to translate our research findings into wider practice as well as engage in discussion with practitioners through the blog medium. At the same time, these reports will help us reflect on what knowledge and practices we as a community agree on.

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[1] https://event.sdu.dk/eurovis/education-papers

[2] https://nightingaledvs.com

2 Previous related scientific initiatives

The visualization community has some track record in discussing education with high-quality outputs, initiated by a wide range of people and often independent from each other. Initiatives include:

- ACM CHI (2024) Toward a More Comprehensive Understanding of Visualization Literacy [6]
- IEEE VIS workshops: two workshops (2020, 2021) on Data Vis Activities to facilitate learning, reflecting, discussing [9, 10] and two workshops (2016, 2017) on Pedagogy of Data Visualization [11, 12]
- Dagstuhl seminar (2022) on "Visualization Empowerment: How to Teach and Learn Data Visualization" [1]
- Special issue on Visualization Education at IEEE Computer Graphics and Application (2021) [2]
- IEEE VIS 2015 Panel: Vis, the next generation: Teaching across the researcher-practitioner gap [8]

These events have demonstrated that education is a topic of long-lasting interest to the visualization community. Last year, we, 8 organizers (5 are among this year's organizers), conducted the first EduVIS workshop at IEEE VIS 2023. The workshop was well attended (50-70 attendees). We started the workshop with a keynote from Dr. Roberto Martinez-Maldonado (Monash University). We received 13 paper submissions and accepted 9 papers for presentation and publication. The paper presentations were focused on teaching visualization design, teaching visualization development and analysis, and evaluation techniques. The papers were published at the Conference Proceedings.[3] We had a lively discussion about activities attendees ran in their visualization classes and shared stories of successes and failures with the activities. This interest is also reflected in the list of visualization researchers and educators on our program committee who supported this workshop at IEEE VIS. [4]

It is thus timely to streamline these efforts and provide a platform for education and engagement practices in visualization, and we hope to eventually be able to establish a permanent forum at IEEE VIS, akin to other communities such as EduCHI (ACM SIGCHI) [7], the education track at Eurographics [20], or the public resources and activities created by the Data-Viz Society. This forum would benefit students, junior faculty members new to teaching, senior researchers in planning outreach and education, as well as researchers and practitioners outside the (academic) visualization community.

3 Workshop Goals

A workshop on Visualization Education, Literacy, and Activities can bring new people to IEEE VIS who are outside the traditional visualization network. This includes people from education, learning analytics, science communication, psychology, or people from adjacent fields such as data science, AI, and HCI. Another goal of this workshop is to bring together newly appointed and experienced faculty to share experiences and discuss novel datavis activities, teaching methods, and challenges. Furthermore, this format is intended to serve as a platform for researchers to foster interdisciplinary exchange and share research results and best practices. With this workshop, we want to achieve the following goals:

- build a permanent forum and interdisciplinary community around teaching data visualization, open to researchers, students, and practitioners outside the traditional VIS community.
- publish the results of our discussions on visualization literacy, education and teaching, activities, and practices.
- discuss best practices to teach data visualization to diverse audiences (e.g., children/adult learning, data journalists/data scientists/computer scientists/designers) and in different scenarios (onsite, online, hybrid).
- share visualization educational tools, materials, and processes.
- collect, and systematize learning activities.
- discuss higher-level issues concerning human-centered approaches to visualization, visualization design, and education.
- promote the critical discussions around the implications of AI for visualization education.

[3] https://www.computer.org/csdl/proceedings/eduvis/2023/1SOLI22NGak

[4] https://ieee-eduvis.github.io/#program-committee

4 Scope of Topics

The workshop topics include, but are not limited to:

- Generative AI and visualization (in learning and assessment)
- Visualization literacy and pedagogy in visualization
- Learning goals and learning methods
- Evaluation methods and learning analytics
- Educational tools
- Visualization activities
- Hybrid and online teaching
- Reflective and research practices
- Understanding audiences
- Guidelines, strategies, and guidance for education
- Debate and discussions on visualization guidelines and well-established knowledge
- Knowledge dissemination
- Challenges and personal experiences
- Informal learning
- Experiential learning (hands-on learning and physicalization)
- Visualizations for public education (e.g., health education, science communication)
- Engagement with visualizations
- Teaching to encourage creativity and design critique
- Accessibility of visualization learning resources

5 Submission Formats

The workshop will accept two types of submissions, peer-reviewed by at least two PC members and one workshop organizer.

- **Paper submissions:** full papers (4-8 pages excluding references); submissions will be published at the IEEE Xplore
- **Educator reports:** short template-agnostic reports (1-2 pages) to discuss opinions or reflections on teaching experiences, or description of the results of a datavis activity conducted and how it could be reused by others and in other contexts; they will be published in the Nightingale magazine (pre-arranged with the Data Visualization Society). This is not intended to be assessed as scientific writing; we recommend framing these reports similar to blog posts. The goal of these reports is to disseminate knowledge to non-academic audiences.

6 Workshop Activities

We plan a full day on-site half-day workshop that will include paper and report presentations, working group sessions, and a general discussion on community building and sustainability of this workshop.
Submission presentation: Each accepted submission will be given 5-10 min to present, followed by a Q&A session. The timing will depend on the submission type. After all accepted submissions have been presented, we will leave space for an open discussion on challenges and directions related to the workshop topic.
Working groups: Driven by the special topics of focus proposed for this workshop and based on the discussions throughout the first part of the workshop, we will form working groups for further discussion. Workshop organizers will moderate these groups and strongly encourage participants to work toward a research outcome, including but not limited to co-authoring a position paper, proposing a new activity, and co-authoring a book chapter on a special topic. We will encourage the participants in the working groups to continue their discussions in the afternoon. Subsequently, in the afternoon, we will

collect groups' reports on their discussion and plan for disseminating their outcomes using a shared repository, such as Google Drive.
Networking: After the workshop session, a voluntary workshop dinner will be planned to encourage community building and networking among working groups.
Steps forward: Each organizer will take the lead on one working group and the group collectively defines their next steps. The workshop organizers will welcome any interested scholars to join us to submit a proposal for a permanent event to the steering committee by the end of the conference.
Back-up policy: We anticipate that the workshop will receive between 10-20 submissions, similar to last year. However, if we receive few submissions, we plan to add additional working groups and increase the discussion time, allowing more time for participants to work towards their intended outcomes.

7 Tentative Schedule

We are applying for a full-day workshop to be held on-site. The workshop will require a standard conference session room that can fit 50-100 people, with sound, visual equipment, internet access and preferably with large tables and chairs that can be moved around.

- 09:00 —09:15 **Opening and outline**
- 09:15 —10:15 **Submission presentations and Q/A**
- *10:15 —10:45* ***Coffee Break***
- 10:45 —12:00 **Special topic working group discussions**
- *12:00 —14:00* ***Lunch break***
- 14:00 —15:15 **Special topic group discussions**
- *15:15 —15:45* ***Coffee Break***
- 15:45 —16:30 **Special topic working group discussions**
- 16:30 —17:00 **Presentation and sharing the special topic working group discussions and next steps**
- 19:00 **Voluntary Workshop Dinner**

8 Workshop Organization Timeline

The timeline for the workshop organization is as follows:

- April 20, 2024: **Call for Participation**
- July 1, 2024: **Paper and Educator Report Submission**
- July 26, 2024: **Reviews Collected**
- July 30, 2024: **Author Notification**
- August 15, 2024: **Camera-ready Submission**

We plan to advertise on the respective mailing lists for ACM CHI, IEEE VIS, DRS, ACM DIS, Digital Humanities, Art+Design, Tableau, and social media (Twitter, LinkedIn, etc.).

9 Intended Outcomes

This workshop will allow participants to discuss the challenges they face in data visualization education and exchange ideas and approaches with other visualization researchers and educators. Participants in the working groups will be encouraged to work towards publishing the outcomes of their discussions in the forms of full paper, position paper, and workshop paper. Upon collecting the outcomes of the working group discussions, we will sketch a research agenda and highlight the opportunities for visualization education, literacy, and activities for the community. This will contribute to the broader visualization community, literacy, and education agenda.

10 Program Committee

We had a diverse list of program committee members for last year's EduVis workshop, which we will re-invite this year.[5] In addition, we will reach out to new potential members, for example, inviting members from the CHI'24 workshop "Toward a More Comprehensive Understanding of Visualization Literacy" [6] organizers.

[5] https://ieee-eduvis.github.io/#program-committee

11 Organizing Committee

Fateme Rajabiyazdi, fateme.rajabiyazdi@carleton.ca (`http://healthvisfutures.sce.carleton.ca/`)
Fateme Rajabiyazdi is an Assistant Professor in the Department of Systems and Computer Engineering at Carleton University. She received her Ph.D. in Computer Science in the area of information visualization from the University of Calgary. She actively studies and teaches data visualizations to engineers. She was a co-organizer for the 1st IEEE EduVis Workshop [14] and co-authored [3].
Mandy Keck, mandy.keck@fh-hagenberg.at (`https://pure.fh-ooe.at/en/persons/mandy-keck`)
Mandy Keck is a professor in UX and Interaction Design at the University of Applied Sciences Upper Austria. She co-authored papers on visualization education [3, 16] and design workshops [13,15], and was co-organizer of several workshops, including the 1st IEEE EduVis Workshop [14], and the IEEE VIS Datavis Activities workshops in 2020 and 2021 [9, 10].
Christina Stoiber, cstoiber@fhstp.ac.at `https://icmt.fhstp.ac.at/en/team/christina-stoiber`
Christina Stoiber, a researcher at St. Pölten University of Applied Sciences in Austria, specializes in Information Visualization, HCI, and Visualization Literacy and Education. She completed her dissertation on visualization literacy and onboarding in December 2023 [21]. Her work aims to improve the use of visualization tools across various domains [22]. She co-organized the 1st EduVis Workshop [14] and co-authored [3].
Jonathan C. Roberts, j.c.roberts@bangor.ac.uk ([click-for-homepage]) Jonathan is a professor in Visualization at Bangor University. He is the creator of the Five Design-Sheet method [18] and lead author of the book Five Design-Sheets: Creative Design and Sketching for Computing and Visualization, Springer Nature, June 2017. His research spans heritage, archaeology, oceanography, pedagogy, lexicography, and social networking domains, and for many years has encouraged researchers to develop multiple coordinated view systems. He is a keen advocate of sketching and low-fidelity design [18, 19], and promotes more design thinking in teaching.
Hari Subramonyam, *harihars@stanford.edu* is a Research Assistant Professor at Stanford University's Graduate School of Education, Stanford HCI, and the Institute for Human-Centered AI (HAI). His research focuses on AI-augmented equitable education to develop processes and tools for learning and teaching. At Stanford, he also teaches the Data Visualization Course in the Computer Science Department. (`https://haridecoded.com/`)
Lily Ge, *wanqian.ge@northwestern.edu*, `https://lilyge.com/` Lily is a Ph.D. candidate in Computer Science and a member of the Midwest Uncertainty Collective at Northwestern University. Her research is at the intersection of visualization literacy and misinformation. She has previously led the investigation of ways to assess people's susceptibility to visualization misinformation [5]. Additionally, she served as a co-organizer for a visualization literacy workshop at ACM CHI 2024 [6].
Magdalena Boucher, mboucher@fhstp.ac.at `https://icmt.fhstp.ac.at/en/team/magdalena-boucher`
Magdalena is a PhD candidate researching and teaching at St. Pölten University of Applied Sciences, Austria. With a background in illustration and 2D animation for computer games and explanation videos, she researches how to enhance visualization literacy with comics [4]. She teaches game storytelling and several design courses. Magdalena was a member of the program committee of the 1st EduVis Workshop [14] and co-author of the paper on challenges and opportunities in visualization education [3].
Benjamin Bach, *benjamin.bach@.inria.fr*, `http://benjbach.net`. Benjamin is a researcher at Inria, France, and an Associate Professor in Visualization at the University of Edinburgh, UK. Benjamin has been organizing several workshops related to visualization

education (VisActivities, VisGuides, EduVis), the 2022 Dagstuhl seminar, and co-authored papers on visualization challenges [3], visualization cheatsheets [25], visualization tools [17], design workshops [23].

Lonni Besancon is an assistant professor at Linkoping University, Sweden. He was a co-chair of the IEEE VIS Open Practices. He has contributed several workshops and meet-ups at both IEEE VIS and ACM CHI (e.g., Fail Fest, alt.VIS 2021, alt.VIS 2022, alt.VIS 2023, the JoVI meetup,...). He has publications related to using visualization for educational purposes in science centers and is currently co-supervising a large research effort in this direction at the Norrkoping Visualisation Center C.

Mathis Brossier is a PhD student at Linkoping University, Sweden. His PhD work will focus on providing and studying visualization with visioverbal interaction components in public settings.

Anders Ynnerman holds the chair in scientific visualization at Linkoping University and is the director of the Norrkoping Visualization Center C. He is a member of the Swedish Royal Academy of Engineering Sciences and the Royal Swedish Academy of Sciences. In 2007 Ynnerman was awarded the Akzo Nobel Science award and in 2010 he received the Swedish Knowledge Award for dissemination of scientific knowledge to the public. In 2017 he was honored with the King's medal for his contributions to science and in 2018 he received the IEEE VGTC technical achievement award.

Konrad Schonborn is a professor of visual learning and communication at Linkoping University, Sweden. He is currently scientific leader of the Swedish national graduate school in science and technology education (FontD). He is a member of the Royal Society of Biology (MRSB). His research explores the interface between visualization and STEM education, with emphasis on visual literacy, multimodal virtual environments, visualization for public spaces, and the role of AI-technology in education.

Alon Friedman, *alonfriedman@usf.edu*, `https://www.visualpeerreview.org/`. He is an associate professor in Data Visualization Analytics at the University of South Florida, USA. In 2022, Friedman was awarded the NSF Award III-2216227: Using Behavioral Nudges in Peer Review to Improve Critical Analysis in STEM Courses. A key focus of his research is visual peer review within visual education and STEM. His current publication focused on predictive modeling using visual peer review and AI.

Bo Pei, *bpei@usf.edu*, `https://www.usf.edu/education/faculty/faculty-profiles/bo-pei.aspx`. He is an assistant professor in the Instructional Technology program at the University of South Florida. Dr. Pei works on data visualization in education and AI in education aiming to promote an equitable and inclusive learning environment.

Ly Dinh, *lydinh@usf.edu*,
Ly Dinh is an assistant professor at the School of Information, University of South Florida. Her research applies methods from natural language processing and network science to aid natural crisis response. Ly's research has appeared in Quantitative Science Studies, Communication Research, Scientific Reports, and peer-reviewed conferences such as ICWSM, ISCRAM, ACL, and EMNLP.

Md Dilshadur Rahman, *dilshadur@sci.utah.edu*, `https://dilshadur.owlstown.net`. Dilshadur is currently pursuing a PhD in Computer Science in the SCI Institute and the Kahlert School of Computing at the University of Utah. His research focuses on Information Visualization and Human-Computer Interaction.

Yan Chen, *ych@vt.edu*, `https://chensivan.github.io/`.
He is an assistant professor in Computer Science at Virginia Tech, USA. He studies and designs intelligent systems to enhance human collaborative learning with real-time support.

Kevin Hawley, *kevinhawley@usf.edu*.
He is a senior instructor in the Zimmerman School of Advertising & Mass Communications at the University of South Florida, where he teaches Visual Literacy and design courses, and directs the University's undergraduate Certificate in Visualization & Design program. Formerly an advertising agency creative director, his current research interest lies in visual persuasion and the visual aesthetics of AI-generated images.

Julia Woodward, *juliaevewoodward@usf.edu*, `https://juliawoodward.wordpress.com/`.
She is an Assistant Professor in the Department of Computer Science and Engineering at The University of South Florida. Her research is in Human-Computer Interaction (HCI), which aims to comprehend how people, both adults and children, use and conceptualize technology in order to design more effective experiences.

Paul Rosen, *paul.rosen@utah.edu*, `https://cspaul.com/`.
He is an Associate Professor in the Scientific Computing and Imaging Institute and Kahlert School of Computing at the University of Utah. His research interests lie at the intersection of human-centered computing and using geometric and topological methods to address a broad set of visualization problems.

Acknowledgments

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