

Ali Raza

University of Colorado Boulder
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EDUCATION

- 2022** **University of Colorado Boulder**
Dual Ph.D. in Computer Science and Cognitive Science (Fall 2022)
Dissertation: Understanding and Supporting Equity in Science Classrooms with Visual Learning Analytics: A Novel Approach Using Student Electronic Exit Tickets (SEETs)
Advisors: Tamara Sumner, William R. Penuel
- 2021** **University of Colorado Boulder**
M.S. in Computer Science
Major: *Human-Centered Computing*
- 2016** **University of Management and Technology, Lahore**
M.S. in Computer Science
Major: *Software Engineering*
- 2014** **University of Lahore**
B.S. in Computer Science

RESEARCH INTERESTS

My research interest lies in **Human-Computer Interaction (HCI), Education Technology, Learning Sciences, and Information Visualization**. I co-design, develop, and study educational technologies in formal and informal learning settings adopting a Design-Based Research approach to support equitable student experiences for diverse learners. In my dissertation, I co-designed and developed an equity based visual learning analytics tool; the science student electronic exit ticket (SEET) system and studied how it can support equity of participation in middle school science classrooms.

HONORS, AWARDS, CERTIFICATIONS

- [10] Defended and submitted the doctoral dissertation to graduate school without any revision.
- [9] Graduate Certificate in Cognitive Science. Institute of Cognitive Science, University of Colorado Boulder. 2022.
- [8] Diversity, Equity, and Inclusion Award – Honorable Mention University of Colorado Boulder. Spring, 2021.
- [7] Travel Grant Scholarship for \$200 Department of Computer Science, University of Colorado Boulder. Fall, 2020.
- [6] Mentored by Prof. Ken Koedinger during LearnLab initiative. Department of Computer Science, Carnegie Mellon University. Summer, 2019.
- [5] Four papers presented in one conference, *International Conference of Innovative Computing*, 2016. (Lightly reviewed)
- [4] Completed Teachers training program from Beaconhouse School System. February, 2015.
- [3] Got selected as a candidate for innovative idea in Plan9 Launch pad Lahore (Pakistan's Largest Tech Incubator). March, 2013.
- [2] Java (J2SE), android SDK certification from Tekxon IT institute. Summer, 2013.

[1] Received scholarship for being in top 8% of the undergraduate batch in junior and senior years.

PEER REVIEWD CONFERENCE PUBLICATIONS

[3] **A. Raza**, W.R. Penuel, Y.D. Salinas. (2022) Supporting Science Teachers in Using Student Experience Data to Support More Equitable Participation in Science Classrooms. In *National Association for Research in Science Teaching (NARST, 2022) Annual Conference*, Vancouver, CA.

[2] **Raza, A.**, Penuel, W. R., Allen, A.-R., Sumner, T., & Jacobs, J. K. (2021). “Making it culturally relevant”: A visual learning analytics system supporting teachers to reflect on classroom equity. In E. de Vries, Y. Hod, & J. Ahn (Eds.), *Proceedings of the 15th International Conference of the Learning Sciences* (pp. 442-449). International Society of the Learning Sciences. **Acceptance rate:** 30%

[1] A.R. Allen, **A. Raza**, D. Watkins, W.R. Penuel. (2020). Measuring and Supporting Student Experiences in Biology Classrooms: Design Tensions in Assessing Interest and Identity Dimensions of Science Learning. In *Annual Meeting of the American Educational Research Association San Francisco, CA*.

PEER REVIEWED BOOK CHAPTER

[1] **A. Raza**, W.R. Penuel, J. Jacobs, T. Sumner. (2020). Supporting equity in schools with visual learning analytics by documenting student experience in the classroom. (J. Barnes-Johnson and J. M. Johnson, Eds.) In *M. Schmidt, A. Tawfik, Y. Earnshaw, I. Jahnke (Eds.), Learner and user experience research: An introduction for the field of learning design technology*.

PEER REVIEWD JOURNAL PUBLICATION

[3] **A. Raza**, W.R. Penuel, L. Jiawei, K. Frank (2023). Supporting Science Teachers in Using Student Experience Data to Support More Equitable Participation in Science Classrooms (2023). Under-review in *Journal of Research in Science Teaching (JRST)*.

[2] Pavlović, T., Azevedo, F., De, K., Riaño-Moreno,..., J. Gruber, **A. Raza** & Keudel, O. (2022). Predicting attitudinal and behavioral responses to COVID-19 pandemic using machine learning. *PNAS nexus*, 1(3), pgac093.

[1] J.Bavel,... J. Gruber, **A. Raza**, & Jørgensen, F. J. (2021). National identity predicts public health support during a global pandemic: Results from 67 nations. In *Nature Communications*, 2021.

PEER REVIEWD POSTER

[2] **A. Raza**, W.R. Penuel, J. Jacobs, T. Sumner. (2020) Scaffolding Teachers Sense Making for Classroom Equity using Visual Analytics. Poster presented at *Tenth International Learning Analytics Knowledge Conference (LAK'20)*.

[1] **A. Raza**, W.R. Penuel, T. Sumner. (2020). Designing Visual Learning Analytics for Supporting Equity in STEM Classrooms. Poster presented at *IEEE Visualization conference (VIS'20)*.

PEER REVIEWD SYMPOSIUM AND OTHER PAPERS

[5] **A. Raza**, W.R. Penuel, L.Jiawei, K. Frank (2023). Using Student Experience Data in Collaborative Inquiry Cycle to Support Equity in the Science Classrooms. In *Annual Meeting of the American Educational Research Association, Chicago, IL*.

- [4] **A. Raza**, Y.S. Del Val, W.R. Penuel, T. Sumner. (2022). Understanding Teachers' Sensemaking to Equity Analytics in Science Classrooms. *Learning Sciences Graduate Student Conference (LSGSC)*, 2022.
- [3] W.R. Penuel, C.E. Carlson, S. Wachowski, D. Freitas, A. Alvarez, R. Hamilton, A. Schild, **A. Raza**. (2022) Steps to Designing Justice-Focused Assessments in Science. (*In STEM Teaching Tools, UW Institute for Science+ Math Education, 2022*)
- [2] **A. Raza**, S. Mahmood. (2016). From traditional to active data warehousing. In *International Conference of Innovative Computing*. (Lightly reviewed, non-archival).
- [1] **A. Raza**, S.Farooq, A. Abid. (2016). Design of Scaffoldy: A C++ editor for mobile phone. In *International Conference of Innovative Computing*. (Lightly reviewed, non-archival).

PAPERS IN PROGRESS

- [1] **A. Raza**, Y.S. Del Val, T. Sumner, W.R. Penuel, M. Campanella. (2022). The Science SEET system: A longitudinal study examining how different visualization forms support teachers to notice and reflect on inequalities in student classroom experiences (To submit at *International Society of Learning Sciences (ISLS)*, 2023).

DEMO AND PRESENTATION

- [7] **A. Raza (2022)**. Demo the Science SEET system and evidence based instructional strategies for supporting equitable instruction in science classrooms to 8 teachers in San Marcos Middle School, CA, 2022.
- [6] **A. Raza**, W.R. Penuel, T. Sumner. (2021). SEET: A Visual Learning Analytics tool for Supporting Equity in Science Classrooms. Demo *In Eleventh International Learning Analytics Knowledge Conference (LAK'21)*.
- [5] W.R. Penuel, **A. Raza**. (2021). Co-lead two sessions on the use of experience-based formative assessment in middle school science classrooms at the *Science Assessment Task Resource Symposium*.
- [4] **A. Raza**, W.R. Penuel. (2021). Provided an overview in two sessions of the Equitable Professional Learning series and SEET system to State Science Supervisors of public schools from more than 5 different states.
- [3] **A. Raza**, W.R. Penuel, T. Sumner. (2021). Presented on Designing Visual Learning Analytics for Supporting Equity in STEM Classrooms. Department of Computer Science annual research expo, University of Colorado Boulder.
- [2] **A. Raza** (2021). Using AI Tools to Provide Teachers with Real-Time Feedback on their Classroom Discourse Patterns. Department of Mathematics, Science, and Social Studies Education & Institute for Artificial Intelligence. University of Georgia.
- [1] **A. Raza** (2021). Supporting equity in science classrooms with a visual learning analytics approach. Institute of Cognitive Science lightning talks, University of Colorado Boulder.

PROFESSIONAL EXPERIENCE

- Jan 2023- Present **Research Scientist**
 Project: School-Wide Labs
 University of Colorado boulder
 Mentor: Tamara Sumner
- Activities: Supporting the use of the Science Student Electronic Exit Ticket (SEET) system to support computationally rich communication in middle school science students. And contributing to the project in other data collection and analysis related to the students' investigations of scientific phenomena using computational sensors in place-based activities.

- Aug 2022-
Dec 2022
- Graduate Teaching Assistant**
Human-Computer Interaction
University of Colorado boulder
Mentor: David Quigley, Mirela Alistar
- Activities: Conducted HCI recitation for two sections of more than 30 students. Supported them in hands on activities of the recitation homework, managed the course logistics by helping instructors with grading course project milestones and helping with grading queries.
- Sep 2020-
Aug 2022
- Graduate Research Assistant**
Advancing Coherent and Equitable Systems of Science Education (ACESSE) project
Project partnership between University of Colorado boulder and University of Washington, Seattle
Mentor: William R. Penuel
- Activities: Co-developed a four-part Equitable Professional Learning series for supporting equity of participation in middle school science. Organized it twice for more than 50 plus middle school science teachers to collaboratively work in Plan-Do-Study-Act cycle to gather experience based formative assessment data incorporated in Science Student Electronic Exit Ticket (SEET) for supporting equity of participation. I partnered with teachers on the enactment of different instructional strategies and gathering evidence for their practice to support equitable instruction. And also provided support in adoption of using the SEET system as part of the regular classroom practice. I scaled the use of SEET to more than 120 teachers by providing support to multiple STEM education Research-Practice partnerships. Currently, I am also doing data analysis to understand teacher's sense-making to different data visualizations and gathering evidence on which instructional strategies are more supportive to elevating student experiences.
- Sep 2018-
Aug 2020
- Graduate Research Assistant**
Building a scalable infrastructure to use student experience as formative assessment project
University of Colorado boulder
Mentor: Tamara Sumner, William R. Penuel
- Activities: Co-designed visual feedback displays of a visual learning analytics tool Student Electronic Exit Ticket (SEET) with the middle school teachers for supporting of equity in the science classrooms. Developed and tested the SEET system that can support teachers to reflect on student's classroom experience and use it as experience based formative assessment in science classrooms. SEET can support middle school science teachers to notice patterns of inequity/equity in experience across gender and race.
- Sep 2018-
Aug 2020
- Graduate Teaching Assistant**
Senior year capstone project
University of Colorado boulder
Mentor: Rick Parker
- Activities: Supervised and managed eight senior projects capstone teams to successful completion of the industry sponsored projects. Instructed and implemented Agile development methodologies in the student capstone teams for the completion of their projects.
- Jan 2015-
May 2017
- Graduate Research Assistant**
University of Management and Technology, Lahore

Mentor: Shoaib Farooq

- Activities: Worked in the area of Computer Science (CS) Education to design C++ mobile code editor scaffolds for undergraduate novice learners of programming. Conducted in-depth literature review on the CS pedagogy and what types of evidence based instructional scaffolds are being implemented in conjunction with education technology to support novice programmer needs.

Aug 2014-
May 2017

Computer Science teacher

O/A Levels, middle school
Beaconhouse School System

- Activities: Delivered O-Level 2210 lectures to a group of fifteen students for over a year. Conducted ICT lessons with over three hundred kids in middle school to support IT and programming skills for two years

May 2014-
Aug 2014

Al-Khyam Developers

Software development internship

- Activities: Analyzed and Designed the software plan for Land Management System. Structured the software system workflow for the frontend. Implemented relational database for land management software for selling and purchasing modules.

Sep 2009-
Mar 2015

Middle school STEM and O-Levels Computer Science Home Tutor

- Activities: Taught more than 30 students in STEM and provided home tutoring to support rich learning experiences.

SKILLS

User Experience: Interviewing, Focus groups, Think aloud, Survey design & validation, Design-based research, Diary studies, Wireframing, Video-analysis, Ethnography, User studies.

Research Methods: Mixed (Qualitative and quantitative)

Programming: React, NodeJS, Python, JavaScript, amCharts, d3, C/C++, R, HTML5/CSS, OpenGL, Java(J2SE), Tableau, MySQL

Theoretical/Technical: Scientific writing, Visualization design/research, System analysis and design, SRS documentation, Database design, Research and development, AWS cloud services

WORKSHOPS & PROFESSIONAL LEARNING

[4] CHIME workshop as part of the *Computer-Human Interaction (CHI)* conference to understand how socio-cultural aspects should be considered while designing computational systems, 2021.

[3] Diversity, Equity, and Inclusion workshop series at University of Colorado Boulder. 2021.

[2] Rising scholars' workshop at the *Connected Learning Summit*. To hear from senior scholars, got experience from their academic journeys and how to do impactful research in the field, 2021.

[1] HCI across borders at *CHI conference*, attended three days' workshop on how to better understand and support cultural, socio-economic background, gender, race, and accessibility across different populations and communities, 2017.

PROFESSIONAL AFFILIATION & MEMBERSHIP

Spring 2021 Member

Equitable-instruction group lead by Kerri Wingert, part of InquiryHub research-practice partnership.

University of Colorado Boulder

- Every week we discussed evidence based instructional strategies such as placed-based pedagogies, interventions to support diverse learners in STEM for creating equitable learning environments.

2019-Present Reader/member

Positive Emotion and Psychopathology (PEP) Lab

University of Colorado Boulder

Mentor: June Gruber, Ph.D.

- Contributed to lab's weekly reading group and provided feedback to paper submissions of peers. Learned about the Facial Action Coding System (FACS), experience sampling method to quantifying emotions.

2019-Present International Society of Learning Sciences (ISLS)

2017-Present Institute of Cognitive Science, University of Colorado Boulder

2016-Present Association of Computing Machinery (ACM)

TEACHING EXPERIENCE/MENTORSHIP

Fall'22 Teaching Assistant, CS Department, University of Colorado Boulder

Human-Computer Interaction (CSCI 3002)

TA Evaluation Rating (4.62/5.0)

Fall'17 Teaching Assistant, CS Department, University of Colorado Boulder

Software Engineering Project I (CSCI 4308)

TA Evaluation Rating (5.54/6.0)

Spring'18 Teaching Assistant, CS Department, University of Colorado Boulder

Software Engineering Project II (CSCI 4308)

TA Evaluation Rating (5.64/6.0)

Fall'19 Teaching Assistant, CS Department, University of Colorado Boulder

Software Engineering Project I (CSCI 4308)

TA Evaluation Rating (5.65/6.0)

Students mentored: Cornelius Adejoro (PhD student in Computer Science, Fall 2022), Yamileth Salinas Del Val (Undergraduate in Ethnic Studies and Education at CU Boulder, 2021), Zainab Ejaz (High School STEM student at Lahore Grammar School, 2021).

SERVICE

Paper Reviewer: AERA ('20), ICLS ('20-'21), SIGCSE ('19-'21)

Student Volunteer: CHI'17, IEEE Visualization'2020, EURO Vis 2021, Connected Learning Summit (2021), IEEE Visualization'2021, Mentor at Access, Inclusion and Student Programs at College of Engineering and Applied Science, CU Boulder.

Institute of Cognitive Science: Institute's executive committee member (Supported in recruitment of faculty members and managing speakers for colloquium). Member of inclusion, diversity, equity committee (IDEC) to support institution wide initiatives to support equitable experiences for all members and participated in weekly meetings, agenda to support such efforts.

Department of Computer Science: Volunteered in recruitment events and research showcase meetings. Offered department mentorship services to incoming graduate students.

GRADUATE COURSE WORK AT UNIVERSITY OF COLORADO BOULDER

Computer Science: User-Centered Design and Development (CSCI 5839), Input and Accessibility (CSCI 7000), Technology and Young (CSCI 7000), Data Mining (CSCI 5502), Big Data Architecture (ATLS 5214), Computer Graphics (CSCI 5229)

Information Science: Design for Creativity and Learning (INFO 5505), Information Visualization (INFO 5602), Visualization Design Studies (Audited)

Education: Qualitative Methods I (EDUC 8250), Advance Qualitative Methods (EDUC 8730), Issues and methods in Design Based Research (EDUC 8348), Measurement in Survey Research (EDUC 8710)

Psychology: Affective Science (PYSC 5131), Topics in Cognitive Science (CSCI 7772), Issues and Methods in Cognitive Science (CSCI 6402)

INVITED TALK

[1] A. Raza (2021, December). Using advance education technologies to support students' learning experience in school context. Department of Computer Science, University of Management & Technology, Lahore.

ACADEMIC CONFERENCES ATTENDED

- Computer-Human Interaction (CHI), 2017 & 2021
- Interaction Design and Children (IDC), Boise, ID. 2018
- Learning Analytics and Knowledge (LAK) conference, Remote, (2020 & 2021)
- IEEE Visualization'2020, EURO Vis 2021, Remote.
- Connected Learning Summit (CLS), 2018 & 2021
- National Network of Education Research-Practice Partnerships, Remote, (2020 & 2021)