Idris Malik

Ph.D. Student · Graduate Research Assistant
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Summary

I am a Physics Education Researcher interested in student thinking and experiences on the boundary of math and physics. I currently do qualitative research into how undergraduate students talk and think about conceptions of mathematics, physics, and math used in physics. I hope to pursue research that centers the perspective of students and makes physics instruction and curriculum more accessible to all students.

Education

North Dakota State University — *Fargo, North Dakota*

Physics and Discipline-Based Education Research Ph.D. (4.0) — *August 2023 - Present*

- **Advised by Dr. Warren Christensen**: PER on the boundary of Math and Physics

The Ohio State University (College of Arts and Sciences Honors Program) — *Columbus, Ohio*

B.S. in Physics (Minor in Mathematics) (3.84) — *April 2019 - May 2023*

- **Advised by Dr. Andrew Heckler**: Student practice on STEM Fluency assignments

Research Experience

Physics and Discipline-Based Education Research Ph.D. Program, North Dakota State University

(Dr. Warren Christensen) — *Fargo, North Dakota*

Graduate Research Assistant — *August 2023 - Present*

- Exploring Physics Education Research literature, with emphasis on work regarding the boundary of Math and Physics
- Taking field notes during classroom Observations of a Calculus-Based Intro Physics course
- Designing Interview Protocols and conducting student interviews about Math used in a Physics classroom
- Revising and creating new instructional materials for Separation of Variables and Taylor Series for use in Quantum, E&M, and Math Methods courses
- Presentations at the 2024 Winter American Association of Physics Teachers (AAPT), and 2024 and 2025 American Physical Society April Meeting (APS), and 2024 Summer AAPT and PERC conferences

Undergraduate Research, The Ohio State University Physics Education Research Group

(Dr. Andrew Heckler) — *Columbus, Ohio*

Physics Education Researcher — *Feb. 2021 - July 2023*

- Worked with Dr. Andrew Heckler on analyzing topics and proposing hypotheses regarding Student Agency and motivators for student choice of essential skill practice
- Cleaned and analyzed data sets using *Python and Microsoft Excel*, developed methods for specific analyses, and created graphs and tables to communicate results
- Performed and assessed linear regressions, logistic regressions, Multilevel-Models, and Multi-level Structural Equation Models using *R*
- Compiled and developed summaries of research results using *Microsoft Word and Overleaf*
- Prepared *instructional images of 3-D objects*, along with writing corresponding *questions and descriptive text* for screen reader users, using *Wolfram Mathematica*

Discipline Based Education Research REU, North Dakota State University

(Dr. Warren Christensen) — *Fargo, North Dakota*

Physics Education Researcher — *May 2022 - August 2022*

- Designed and conducted a *semi-structured interviews* regarding *Meta-Representational Competence* in the context of *Quantum Mechanics*
- Performed audio transcription of interviews and performed video/audio editing for a presentation video in *Adobe Premiere Pro*
- Attended *professional development seminars* covering scientific communication through informal, formal, visual-focused, and audio-focused media
- Presented a research poster at the REU end-of-program seminar
- Research paper accepted for a 30 min presentation at the *2023 Research in Undergraduate Math Education conference*. This was funded with an REU Travel Grant from North Dakota State University

Teaching Experience

The Ohio State University, Mathematics and Statistics Learning Center — *Columbus, Ohio*

Undergraduate Peer Tutor — *Jan. 2021 - Apr. 2023*

- Virtual tutoring of peers through weekly and one-time appointments in various math courses from Calculus 1 to Linear Algebra.
- In-Person tutoring of Calculus I, II, and III students in a drop-in room (~5 student interactions per hour)
- Tutoring focused on assessing and addressing specific student issues, through the directed conversation of ideas, while setting a productive meeting tone and initiating conversations on both specific and expansive topics
- Created materials to better explain problem setup, relevant equations, and solving techniques to students
- Participated in 18 interactive, small group-oriented, self-reflective *Professional Development sessions*

The Ohio State University, Department of Physics — *Columbus, Ohio*

Student Assistant / Grader — *Aug. 2021 - Apr. 2022*

- Held weekly office hours (on Zoom and in person) for homework help and exam review for *Intermediate Mechanics I & II*
- Graded homework assignments and provided detailed written feedback to students on *Gradescope*
- Helped proctor midterm exams in 3-hour shifts

Honors & Awards

Scholarships and Grants

2023-	**Graduate Research Assistant Fellowship ($22000 a year)**, North Dakota State University	*Fargo, North Dakota*
2019-2023	**Maximus Scholarship ($3000 a year for 4 years)**, The Ohio State University	*Columbus, Ohio*
2022	**REU Research Presentation Travel Grant ($1600)**, For 2023 (RUME) Conference	*Omaha, Nebraska*
2022	**Growing Up STEM REU ($5000)**, North Dakota State University	*Fargo, North Dakota*
2021	**Physics Summer Research Program ($5000)**, Ohio State Department of Physics	*Columbus, Ohio*
2021	**Second-year Transformational Experience Program Grant ($2500)**, Ohio State STEP Program	*Columbus, Ohio*
2019	**College Board National Merit Scholar Finalist**, Lakota East High School	*Liberty Township, Ohio*

Publications

Preliminary Paper submission for RUME conference 2023 — *Peer reviewed*

Main Author — *Fall 2022*

- Malik, Idris I., Christensen, Warren M. "Investigating Student Use of Representation in Quantum Mechanics Change of Basis Problems" *RUME XXV Conference Proceedings*. http://sigmaa.maa.org/rume/Site/Proceedings.html
- Collaborated with Dr. Warren Christensen from North Dakota State University on a 5-page peer-reviewed conference proceedings paper

Presentations

Presenter for NDSU Research Projects

- Malik, Idris I., Meyer, Samantha K. Christensen, Warren M. (2025, March 16-21) *Student Resources across Mathematics and Physics Integration Questions* [Conference Presentation]. APS Global Physics Summit 2025, Anaheim, CA, United States.
- Malik, Idris I., Christensen, Warren M. (2025, March 16-21) *Facets of Meta-Representational Competence in Quantum Mechanics Change of Basis Problems* [Poster Session]. APS Global Physics Summit 2025, Anaheim, CA, United States.
- Malik, Idris I., Christensen, Warren M. (2024, July 10-11) *Epistemic Messages and Reflections In a Calculus-based Intro-Physics Classroom* [Poster Session]. Physics Education Research Conference 2024, Boston, MA, United States.
- Malik, Idris I., Christensen, Warren M. (2024, July 6-10) *Meta-Representational Competence in Quantum Mechanics Change of Basis Problems* [Conference Presentation]. AAPT 2024 Summer Meeting, Boston, MA, United States.
- Malik, Idris I., Christensen, Warren M., Hansen, Matthew. (2024, July 6-10) *Developing a Separation of Variables Tutorial for Upper-division Physics Contexts* [Poster Session]. AAPT 2024 Summer Meeting, Boston, MA, United States.

- Malik, Idris I., Christensen, Warren M. (2024, April 3-6) *Exploring Epistemic Messages in a Calculus-based Intro-Physics Classroom* [Conference Presentation]. APS April Meeting 2024, Sacramento, CA, United States.
- Malik, Idris I., Christensen, Warren M. (2024, April 3-6) *Epistemic Messages Shared in a Calculus-based Intro-Physics Classroom* [Poster Session]. APS April Meeting 2024, Sacramento, CA, United States.
- Malik, Idris I., Christensen, Warren M. (2024, January 6-10) *Investigating "Math" and "Physics" Conceptions in a Calculus-based Intro-Physics Classroom* [Conference Presentation]. AAPT 2024 Winter Meeting, New Orleans, LA, United States.
- Malik, Idris I., Christensen, Warren M. (2024, January 6-10) *Investigating "Math" and "Physics" Conceptions in a Calculus-based Intro-Physics Classroom* [Poster Session]. AAPT 2024 Winter Meeting, New Orleans, LA, United States.
- Introduced Epistemic Messaging as a framework to analyze classroom observations and semi-structured interviews.
- Identified emergent themes from observations and inquired students on their experiences or conceptions of those themes.
- Presented potential changes in messaging to better represent and portray "Math", "Physics", and the "Math done in Physics."

Presenter for Ohio State Research Project (April, July. 2023)

- Malik, Idris I., Heckler, Andrew F. (2023, July 15-19) *When given the choice, which basic STEM skills do students choose to practice?* [Poster Session]. AAPT 2023 Summer Meeting, Sacramento, CA, United States.
- Malik, Idris I., Heckler, Andrew F. (2023, July 15-19) *When given the choice, which basic STEM skills do students choose to practice?* [Conference Presentation]. AAPT 2023 Summer Meeting, Sacramento, CA, United States.
- Malik, Idris I., Heckler, Andrew F. (2023, April 6) *When given the choice, which basic STEM skills do students choose to practice?* [Poster Session]. The Ohio State University 2023 Spring Undergraduate Research Festival, Columbus, OH, United States.
- Introduced the STEM Fluency framework and how student performance data can be analyzed with logistic regressions.
- Characterized student choice behavior trends within a class and across semesters.
- Presented possible explanations for student behavior and proposed future directions to explore deeper research questions.

Presenter for NDSU Summer Research Project

- Malik, Idris I., Christensen, Warren M., (2023, February 23-25) *Investigating Student Use of Representation in Quantum Mechanics Change of Basis Problems* [Conference Presentation]. 25th Research in Undergraduate Mathematics Education Conference, Omaha, NE, United States.
- Malik, Idris I., Christensen, Warren M., (2022, August 5) *Investigating Student Use of Representation in Quantum* [Poster Session] North Dakota State University Summer Research Programs Poster Session, Fargo, ND
- Introduced the Math Education Theoretical Framework of Meta-representational Competence, and its recent introduction into Physics Education
- Related Quantum Mechanics Spin Change-of-Basis questions to Eigentheory and Linear Algebra concepts
- Presented preliminary coding, analysis, and conclusions from 2 hour-long student interviews, with a Q & A regarding future analysis focus

Involvement, Service & Outreach

Physics Education Research Leadership and Organizing Council

Fargo, North Dakota

Graduate Student Representative

Jan. 2025 - Jan. 2027

- Serving a 2-year committee term as Graduate Student Representative, Physics Education Research Consortium of Graduate Students liason
- Participated in meetings to meet the emergent needs of the American Association of Physics Teachers PER Topical Group
- Helped organize and recruit panelists for a PERC Conference Panel about non-academia career options for PER Graduate Students
- Worked to help support PER community members by working on the Mini-grant working group for the annual PERC conference
- Organized and facilitated an online Community Conversation series, by inviting speakers to speak on topics of interest to the PER community

North Dakota State University Discipline Based Education Research Program

Fargo, North Dakota

Graduate Student

Aug. 2023 - Present

- Coordinator of Book Club Series (Feb. 2025).Planned discussion topics for "A Pedagogy of Kindness", facilitated discussions small (5-person) groups, collected community questions for author's zoom seminar.

North Dakota State University Grad Phi

Fargo, North Dakota

Member

Aug. 2023 - Present

- Planned and volunteered in science outreach activities with other NDSU Physics Graduate Students
- Planned and Facilitated three 10-student sessions "Say Watt? The Electrifying Fundamentals of Circuits" for the NDSU Avenues of Scientific Discovery, a weekend science event for middle-high schoolers

Ohio State University Polaris Mentorship Program

Columbus, Ohio

Upperclassman Mentor

Aug. 2022 - Dec 2022

- Mentored a non-traditional physics undergraduate student in a large group and 1 on 1 setting
- Provided guidance on how to best access and use resources for fulfilling academic and career goals
- Participated in discussions about experiences in Physics and Astronomy centered around holistic perspectives

Ohio State University Athletic Band

Columbus, Ohio

Athletic Band Advisory Council: Life Skills Committee

Nov. 2022 - May. 2023

- Performing member in the Clarinet section since January 2020
- Served as Section Leader of the Clarinet section and representing the voices of the band at large with directing staff
- Life Skills Committee member: coordinating presentations on Title IX, Alcohol, and Social Media policies

Ohio State Society of Physics Students (Sigma Pi Sigma)

Columbus, Ohio

Treasurer

Apr. 2022 - Apr. 2023

- Helped plan professor talks, physics demonstrations, mini competitions, and other general meetings
- Treasurer: wrote programming fund requests, organized catering orders, and fulfilled reimbursement forms

The Sundial Humor Magazine (Ohio State University)

Columbus, Ohio

Editor-in-Chief, Social Media Officer, Editor

Apr. 2022 - Apr. 2023

- Editor in Chief (April 2022-April 2023): Planned and ran general body meetings and writing workshops, submitted space request forms, and delegated responsibilities to other officers
- Social Media Officer (April 2020-April 2022): Managed club social media accounts, created promotional images, and updated general membership on club information
- Editor (October 2020-April 2023): Provided positive feedback and optional constructive revisions for submitted articles

Ohio State University Sci-Access Zenith Mentorship Program

Columbus, Ohio

Upperclassman Mentor

Aug. 2020 - Dec. 2020

- Worked as a virtual mentor (over Zoom) for blind and visually impaired (BVI) students (grades 8-12) from across the country
- Worked one-on-one with a student (including helping them prepare a short astronomy presentation), and in a full group setting, on a weekly basis
- Communicated encouragingly and contributed to large group meetings through support and interest in student perspectives

Skills

Programming	Python (Jupyter), R (RStudio), Excel, Mathematica, Ohio Super Computer, LaTeX
Languages	English (fluent), Spanish (5 years of High School / College instruction)
Media Editing	*Print*: Canva, Photoshop, *Audio and Video*: Audacity, Adobe Premiere Pro
Organizational	Student organization meeting planning and leading, *Treasurer responsibilities*: Tax forms, programming fund and reimbursement requests, budgets, bank account management
Additional	B-flat Clarinet (10 years), certified in RCR Social and Behavioral & HSP Social and Behavioral (Stage 1) (6 Feb 2021), strong interpersonal communication skills and project management