

# Joseph E Michaelis

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Assistant Professor of Computer Science & Learning Sciences  
Department of Computer Science & Learning Sciences Research Institute  
University of Illinois Chicago

## ACADEMIC APPOINTMENTS

**Assistant Professor**, Computer Science, University of Illinois Chicago (2019-present)

**Visiting Professor**, Educational Psychology, University of Wisconsin-Madison (2019-2023)

**Science Teacher**, Perspectives Charter Schools, Chicago, IL (2008-2013)

## EDUCATION

### Ph.D. – Learning Sciences (2019)

*University of Wisconsin, Madison, WI*

Computer Sciences Minor

Educational Graduate Research Scholars Fellow

O’Shea Dissertation Writing Fellow

**Committee:** M. Nathan (chair), B. Mutlu, D. Bolt, M. Rau, and J. Harackiewicz

### Master of Science – Learning Sciences (2015)

*University of Wisconsin, Madison, WI*

### Master of Science – Science Education Leadership (2012)

*Illinois Institute of Technology, Chicago, IL*

### Bachelor of Science – Philosophy (2004)

*University of Wisconsin, Madison, WI*

## PUBLICATIONS

### Refereed Journal Articles

Mantovani, M., Wentzel, A., Trelles, J., Michaelis, J. E., Marai, E. G. (2024). Kiviat Defense: An Empirical Evaluation of Visual Encoding Effectiveness in Multivariate Data Similarity Detection, *Journal of Imaging Science and Technology*, Jan 2024.

Hatch, P., Rahman, A. & **Michaelis, J. E.** (2023). PATHWiSE: An Authoring Tool to Support Teachers to Create Robot-Supported Social Learning Experiences During Homework. *Proceedings of the ACM on Human-Computer Interaction*, 7(CSCW1) 1–23. *Impact Factor: 4.57*

**Michaelis, J. E.** & Weintrop (2022). Interest Development Theory in Computing Education: A Framework and Toolkit for Researchers and Designers. *ACM Transactions on Computing Education (TOCE)*. *Impact Factor: 1.72*

Nathan, M. J., Schenck, K., Vinsonhaler, R., **Michaelis, J. E.**, Swart, M., & Walkington, C. (2020). Embodied geometric reasoning: Dynamic gestures during intuition, insight, and proof. *Journal of Educational Psychology*, 113(5), 929–948. *Impact Factor: 5.80*

**Michaelis, J. E.**, & Mutlu, B. (2018). Reading socially: Transforming the in-home reading experience with a learning-companion robot. *Science Robotics*, 3(21). *Impact Factor: 23.75*

Rau, M. A., **Michaelis, J. E.**, & Fay, N. (2015). Connection making between multiple graphical representations: A multi-methods approach for domain-specific grounding of an intelligent tutoring system for chemistry. *Computers & Education*, 82(0), 460-485. *Impact Factor: 8.54*

## Refereed Papers in Conference Proceedings

Grosso, V. & **Michaelis, J. E.** (2023). The Impact of Robot Co-Location on Student Learning Experiences When Reasoning about Geometry. In *2023 32nd IEEE International Conference on Robot and Human Interactive Communication (RO-MAN)*. Busan, Korea.

**Michaelis, J. E.**, Cagiltay, B., Ibtasar, R. & Mutlu, B. (2023). Off Script: Design Opportunities Emerging from Long-Term Social Robot Interactions In-the-Wild. In *ACM International Conference on Human-Robot Interaction (ACM HRI 2023)*. Stockholm, Sweden. Acceptance Rate ~25%

Cagiltay, B., Mutlu, B. & **Michaelis, J. E.** (2023). "My Unconditional Homework Buddy": Designing Augmented Homework Experiences for Children with a Social Learning Companion Robot In *ACM Interaction Design for Children Conference (ACM IDC 2023)*. Chicago, IL. Acceptance Rate 29.8%

Ibtasar, R., Joseph, S., Athar, S. & **Michaelis, J. E.** (2023). Scaffolding Middle School Children's Coding Experiences in an Open-Ended Social Robotics Program. In *International Conference of the Learning Sciences, (ISLS2023)*. Montreal, Canada.

Hatch, P. & **Michaelis, J. E.** (2023). "Wait, Wait, Go Back": Investigating Social Supports for Homework During Co-design Sessions with Teachers. In *International Conference of the Learning Sciences, (ISLS2023)*. Montreal, Canada.

Cagiltay, B., White, N., Ibtasar, R., Mutlu, B. & **Michaelis, J. E.** (2022). Understanding Factors that Shape Children's Long Term Engagement with an In-Home Learning Companion Robot. In *ACM SIGCHI Interaction Design and Children Conference (ACM IDC 2022)*. Portugal. Acceptance Rate 35%

Cagiltay, B., **Michaelis, J. E.**, Sebo, S. & Mutlu, B. (2022) Exploring Children's Preferences for Taking Care of a Social Robot. In *ACM SIGCHI Interaction Design and Children Conference (ACM IDC 2022)*. Portugal. Acceptance Rate 35%

### ★ **Best Paper Award**

Hatch, P. & **Michaelis, J. E.** (2022) Making Home...Work: Codesigning Teacher Tools to Support At-Home Learning. In *International Conference of the Learning Sciences, (ICLS 2022)*.

Ibtasar, R., Heineke, C. & **Michaelis, J. E.** (2022) "With You I'll be Able to Actually Learn Everything": Exploring Learner Experiences With a 'Study With Me' Video. In *International Conference of the Learning Sciences, (ICLS 2022)*.

**Michaelis, J. E.** & Di Canio, D. (2022). Embodied Geometric Reasoning with a Robot: The Impact of Robot Gestures on Student Reasoning about Geometrical Conjectures. In *ACM SIGCHI Conference on Human Factors in Computing Systems (ACM CHI 2022)*. Acceptance Rate ~25%

**Michaelis, J. E.** & Mutlu, B. (2021). "That Was Mindblowing": How Reading with a Social Robot Enhances Science Learning Experiences. In *International Conference of the Learning Sciences (ICLS 2021)*. 267-274. Acceptance Rate 31%

White, N. T., Cagiltay, B., **Michaelis, J. E.**, & Mutlu, B. (2021). Designing Emotionally Expressive Social Commentary to Facilitate Child-Robot Interaction. In *ACM SIGCHI Interaction Design and Children Conference (ACM IDC 2021)*. 314-325. Acceptance Rate 31%

- Zhao, F., White, N., Cagiltay, B., Niedenthal, P., **Michaelis, J. E.**, & Mutlu, B. (2021). Designing Emotional Expressions for a Reading Companion Robot. *Society for Affective Science Conference (SAS 2021)*.
- Siebert-Evenstone, A., **Michaelis, J. E.**, Shaffer, D. W., & Mutlu, B. (2021). Safety First: Developing a Model of Expertise in Collaborative Robotics. *In Conference on Advances in Quantitative Ethnography (ICQE 2021)*. 304–318. Acceptance Rate 50%
- Cagiltay, B., Ho, H., **Michaelis, J. E.**, & Mutlu, B. (2020) Investigating Family Perceptions and Design Preferences for an In-home Robot. *In ACM SIGCHI Interaction Design and Children Conference (ACM IDC 2020)*. 229-242. Acceptance Rate 31%
- Michaelis, J. E.**, Siebert-Evenstone, A., Shaffer, D. W. & Mutlu, B. (2020). Collaborative or Simply Uncaged? Understanding Human-Cobot Interactions in Automation. *In ACM SIGCHI Conference on Human Factors in Computing Systems (ACM CHI 2020)*. 1-12. Acceptance Rate 24%
- Michaelis, J. E.** & Mutlu, B. (2020) Social Aptitude from an Educational Robot Helps Promote Interest in Science Learning. *In Annual Meeting of the American Educational Research Association (AERA 2020)*. Acceptance Rate 41%
- Michaelis, J. E.** & Nathan, M. J. (2020) A Case Study of Enculturation Practices that Support Emerging STEM Interest in an Out-of-School Program. *In Annual Meeting of the American Educational Research Association (AERA 2020)*. Acceptance Rate 41%
- Schenck, K.E., **Michaelis, J.E.**, Swart, M. I., Xia, F., Nathan, M. J., and Walkington, C. (2020). Mathematical Knowledge is Embodied: Synergistic Contributions of Gesture and Speech During Geometry Proof Production. *In Annual Meeting of the American Educational Research Association (AERA 2020)*. Acceptance Rate 41%
- Michaelis, J. E.**, & Mutlu, B. (2019). Supporting interest development in science learning with a social robot. *In ACM SIGCHI Interaction Design and Children Conference (ACM IDC 2019)*. 71-82.  
★ **Best Paper Award Nominee** Acceptance Rate 33%
- Walkington, C. A., Swart, M.I., Kwon, O.H., Vinsonhaler, R., **Michaelis, J.E.**, Biznak, J.V., Schenck, K.E., McGinty, J.D., Sung, Y., Nathan, M.J. (2018). Kinecting geometric proof concepts using gestures. *In Proceedings of North American Chapter of the International Group for the Psychology of Mathematics Education (PME 2018)*.
- Michaelis, J. E.**, Wu, S. P. W., Rau, M. A., Nathan, M. J. (2018, April). Testing the four-phase interest development survey for Chemistry. *In Annual Meeting of the American Educational Research Association (AERA 2018)*. Acceptance Rate 37%
- Nathan, M. J., Walkington, C., Vinsonhaler, R., **Michaelis, J. E.**, McGinty, J., Binzak, J. V., & Kwon, O., H. (2018). *Embodied account of geometry proof, insight, and intuition among novices, experts, and English language learners*. *In Annual Meeting of the American Educational Research Association (AERA 2018)*. Acceptance Rate 37%
- Francis, C. A, **Michaelis, J. E.**, Acuna, S. A. Towles, J. (2017). Impact of biomechanics-based activities on situational and individual interest among K-12 students. *In American Society for Engineering Education Annual Conference & Exposition (ASEE 2017)*.
- Michaelis, J. E.**, & Mutlu, B. (2017). Someone to read with: Design of and experiences with an in-home learning companion robot for reading *In ACM SIGCHI Conference on Human Factors in Computing Systems (ACM CHI 2017)*. 301-312. Acceptance Rate 25%
- Michaelis, J. E.**, & Nathan, M. J. (2016). Observing and measuring interest development among high school students in an out-of-school robotics competition. *In American Society for Engineering Education Annual Conference & Exposition (ASEE 2016)*.

**Michaelis, J. E., & Nathan, M. J. (2015).** The Four-Phase Interest Development in Engineering Survey. *In American Society for Engineering Education Annual Conference & Exposition (ASEE 2015).*

**Michaelis, J. E., & Nathan, M. J. (2015).** The role of feedback in interest development in an out-of-school engineering setting. *In Annual Meeting of the American Educational Research Association (AERA 2015).* Acceptance Rate 38%

## Refereed Posters in Conference Proceedings

Hatch, P. & **Michaelis, J. E. (2022).** Teacher Perspectives on Personalized Guidance for Science Homework. *In Annual Meeting of the American Educational Research Association (AERA 2022).*

**Michaelis, J. E., & Mutlu, B. (2018).** Social reading: Field study with an in-home learning companion robot. *In International Conference of the Learning Sciences (ICLS 2018).* 1675-1676. Acceptance Rate 33%

Acuna, S., **Michaelis, J. E.,** Roth, J, & Towles, J. (2018). Intervention designed to increase interest in engineering for low-interest, K-12 girls did so for boys and girls. *In American Society for Engineering Education Annual Conference & Exposition (ASEE 2018).*

**Michaelis, J. E.,** Clinton, V. E., Cooper, J. L., Nathan, M. J., Alibali, M. W. (2016) Cognitive principles for effective uses of visual information improve mathematics learning by encouraging deeper processing. *In Annual Meeting of the American Educational Research Association (AERA 2016).* Acceptance Rate 37%

**Michaelis, J. E.,** Nathan, M.J. (2014). The role of feedback in interest development in an out-of-school engineering setting. *In International Conference of the Learning Sciences (ICLS 2014).* 1525-1526. Acceptance Rate 52%

## Book Chapter and Commissioned Paper

**Michaelis, J. E. (2017).** *The role of interest and motivation in science investigation and engineering design instruction.* Paper commissioned for the National Academies of Sciences, Engineering, and Medicine committee on Science Investigations and Engineering Design for Grades 6-12.

Clinton, V. E., Cooper, J. L., **Michaelis, J. E.,** Alibali, M. W., Nathan, M. (2016). How revisions to mathematical visuals affect cognition: Evidence from eye tracking. In B. Morris, C. Was & F. Sansosti (Eds.) *Eye-Tracking technology applications in educational research.* New York, NY: IGI

## Conference Workshops and Symposia

### Workshop Organizer

Cagiltay, B., Ibtasar, R., **Michaelis, J. E.,** Sebo, S. & Mutlu, B. (2023). From Child-Centered to Family-Centered Interaction Design. *In ACM Interaction Design for Children Conference (ACM IDC 2023).* Chicago, IL.

### Workshop or Symposia Accepted Papers

Ibtasar, R. & **Michaelis, J. E. (2023)** Fostering Interest in Computing with a Social Robotics Camp for Middle-School Aged Girls. In Symposium on *Perceptions of the Self, Social Identities, and STEM Fields: Influences on STEM Motivation and Participation.* Annual Meeting of the American Educational Research Association (AERA 2023).

**Michaelis, J. E. (2021).** STEMMates: Exploring the use of companion robots with socially situated interest supports for in-home science reading. *In Robots for Learning Workshop at the ACM/IEEE International Conference on Human-Robot Interaction Virtual Conference (HRI 2021).*

**Michaelis, J. E.** (2021). Improving Interest and Learning in STEM with Social Robots. In *Early Career Workshop at the International Conference of the Learning Sciences (ICLS 2021)*

**Michaelis, J. E.** (2020). Interest-based Learning in Computing. In *Expanding the Field: How the Learning Sciences Might Further Computing Education Research. Workshop at the International Conference of the Learning Sciences (ICLS 2020)*.

## RESEARCH GRANTS

### Awarded



*MyTurn: An Afterschool Social Robotics Program to Promote Interest in Computing Among Middle School Students*, NSF ITEST #2342099, PI: **Joseph E Michaelis**, 2024-2027, Total Award (Solo PI): \$500,000.



*Collaborative Research: HCC: Small: PATHWiSE - Supporting Teacher Authoring of Robot-Assisted Homework*, NSF CISE #2202802, PIs: **Joseph E Michaelis** and Bilge Mutlu, 2022-2024, Total Award: \$600,000. Total Awarded to UIC and PI Michaelis: \$345,981



*Collaborative Research: HCC: Medium: Designing Social Companion Robots for Long-term Interaction*, NSF CISE #2312353, PIs: Sarah Sebo, **Joseph E Michaelis** and Bilge Mutlu, 2023-2027, Total Award: \$1,200,000. Total Awarded to UIC and PI Michaelis: \$434,999



*RET Site: Computational Modeling and Simulation for Science, Technology, Engineering, and Mathematics Education*, NSF # 2302171, PIs: Shafiq Mehraeen, Co-PI: **Joseph E Michaelis** 2023-2026, Total Award: \$600,000.



*Comparing Student Experiences During Robot Reading Sessions*, UIC Covid Relief Fund Award, PI: Joseph E Michaelis, 2023, Total Award: \$15,000.

### Subaward



*STEMMates: Designing Companion Robots with Socially Situated Interest Scaffolds for Informal, In-home STEM Learning* NSF AISL Award #1906854, PI: Joseph E Michaelis, 2019-2021, \$96,100

## AWARDS AND HONORS

### **Michael Vincent and Harriet Frisbie Eastabrooks O'Shea Fellowship (2018-19)**

*Competitive \$20,000 fellowship award in honor of Michael Vincent O'Shea*

### **National Academy of Education (NAEd)/Spencer Dissertation Fellowship (2018)**

*Semifinalist*

### **Competitive Conference Travel Awards:**

University of Wisconsin Graduate School Student Research Grant Competition (2018)

Educational Psychology Department Travel Grant (2018)

Busk Family Travel Grant (2016)

## TEACHING EXPERIENCE

### University Level

Social Robots and Human-Robot Interaction (Computer Science 594) Fall 2021, Fall 2023

Design of Learning Technology Environments (LRSC 512) Spring 2021

Foundations of Scientific Inquiry (LRSC 503) Spring 2022, Spring 2024

User Interaction Design and Programming (Computer Science 422) Fall 2019, Fall 2020, Fall 2022

Learning Sciences Journal Club (LRSC 540) Spring 2020  
*University of Illinois Chicago*

Science Teacher Education Master's Capstone (Curriculum & Instruction 747) 2019  
Human Abilities and Learning (Educational Psychology 301) 2016  
Learning Theory and Application (Educational Psychology 711-025) 2015-16  
Teaching Assistant – Introduction to Learning Sciences (Educational Psychology 795/796) 2014-16  
Guest Lecturer – Introduction to Learning Sciences (Educational Psychology 795) Fall 2017  
Guest Lecturer – Human-Computer Interaction (Computer Sciences 770) Fall 2018  
*University of Wisconsin-Madison*

## K-12 Level

Instructional Leader and Teacher – 6<sup>th</sup> Grade and 11<sup>th</sup> Grade Physics and Robotics, 2008-13  
*Perspectives Charter School/IIT – Math and Science Academy, Chicago, IL.*  
Teacher – Physics and Chemistry, 9<sup>th</sup> and 10<sup>th</sup> grade, 2006-07  
*Lancaster High School, Lancaster, TX.*

## INVITED TALKS

Thriving in the Wilds. *Keynote Panel at Learning Sciences Graduate Student Conference.* Iowa City, IA. 2023.  
The Future of Robots in Libraries. *Invited talk for the Tech Talk Stage at the American Librarian's Association Conference.* Chicago, IL. 2023.  
Robot Gestures for Geometric Reasoning. *Invited talk for UW-Madison MAGIC Lab Research Spotlight Seminar.* Madison, WI. 2021.  
Conceptualizing and Measuring Interest Development in Educational Technologies. *Northwestern University Center for Connected Learning and Computer-Based Modeling Research Seminar.* Evanston, IL. 2020.  
Methods in Computer Science Research. *Breakthrough Tech Undergraduate Intern Seminar.* Chicago, IL. 2020.  
AI and the Future of Education. *UW-Madison Teacher Education Seminar.* Madison, WI. 2019 & 2020.  
Long-term child-robot interactions to support interest in STEM. *UIC Cognitive Psychology Dept. Brown Bag Lectures.* Chicago, IL. 2019.  
Social reading: In-home learning companion robots in Wisconsin. *UW-Madison Day at the Capitol.* Madison, WI. 2018.

## SELECTED PRESS COVERAGE

**RISE**, 2023

Putting humans first in computer design.

**Science News**, 2019

Research and opinion sought in “Robots are becoming classroom tutors. But will they make the grade?”

**CNN**, 2018

Research covered and opinion sought in “The 'dunce robots' of Japan will help children learn”

**Discover Magazine**, 2018

Research covered in “Want Your Kids to Read More? Get ‘Em a Robot”

**Popular Science**, 2018

Research covered in “Kids aren't reading enough. One solution? Robots.”

**U.S. News & World Report**, 2018

Research covered in *"Your Kid's New Reading Buddy Could Be a Robot"*

**Education Week**, 2018

Research covered in *"Can Buddy Reading With a Bot Help Struggling Students?"*

**Inverse**, 2018

Research covered in *"With a Robot by Their Side, Kids Understand More of What They're Reading"*

**Sciences et Avenir (France)**, 2018

Research covered in *"Minnie, le robot qui fait lire"*

## SERVICE

### Professional Association Elected Position

**American Educational Research Associate**

*Chair, SIG-Learning Sciences (2022-2023)*

### Journal Editor

**Frontiers in Robotics and AI**

*Guest Editor: Novelty Effects Special Topic (2020-21) and From Child-Centered to Family-Centered Design for New Technology (2023-24)*

### Conference Program Committees

**ACM CHI Conference on Human Factors in Computing Systems**

*Associate Chair, Subcommittee on Learning, Education, and Families (2024)*

**International Symposium on Learning, Design and Technology at ACM IDC**

*Program Committee (2024)*

**Learning Sciences Graduate Student Conference**

*Papers Chair and PC Member (2015-17)*

**ACM Interaction Design for Children**

*Associate Chair (2023)*

**American Educational Research Associate**

*Chair and Program Chair, SIG-Learning Sciences (2023-2024)*

### Student Organizations

**STEMbuds**, Advisor (2015-16)

*Undergraduate student group to broaden participation in K-12 STEM*

### Honors College Fellow

**UIC Honor's College** (2020 – present)

### Conference and Journal Review

ACM CHI Conference on Human Factors in Computing Systems (2021-2023)

ACM HRI Human-Robot Interaction Conference (2018-2023)

ACM IDC Interaction Design and Children Conference (2018-2023)

ACM TOCE Transactions on Computing Education (2021)

International Journal of Human-Computer Studies (2021)

International Journal of Social Robotics (2018 - 2021)

Computers & Education (2018-2021)

Frontiers in Robotics and AI (2021-2023)

Journal of the Learning Sciences (2018-2020)

Journal of Pre-college Engineering Education Research (2018)

American Educational Research Association (2017-2023)

*SIGs: Advanced Technologies for Learning, Learning Sciences, Motivation*  
International Society of the Learning Sciences Annual Meeting (2014-2023)  
Artificial Intelligence in Education Conference (2018)  
American Society for Engineering Education (2015 - 2018)  
Computers in Human Behavior (2015-2017)  
International Conference on Intelligent Tutoring Systems (2016)  
Transactions on Human-Robot Interaction (2022-2023)

### **Community Outreach**

MyTurn Social Robotics to Promote Women in Computer Sciences  
*Class Curriculum – St Josaphat School (2024)*  
*Afterschool Program - Forest Park School District (2023)*  
*Enrichment Program - St John Berchman's School (2022)*  
*Summer Camp - UIC (2022)*

UIC Engineering Experiences Camp  
*Computer Science – Social Robotics (2023)*

Read with a Robot  
*Afterschool Program – Forest Park Public Library (2023)*

## **PROFESSIONAL AFFILIATIONS**

American Educational Research Association (2014 – present)  
Association for Computing Machinery (2017 – present)  
International Society of the Learning Sciences, (2013 – present)  
National Science Teachers Association, (2010 – present)

## **SOFTWARE & PROGRAMMING**

Expertise/Proficiency in: R, LaTeX, C++, Java, Python, Linux, ROS, HTML/CSS/JavaScript, Adobe Illustrator.

Robotics Research Platforms: Misty Robotics Misty II, TEMI, Softbank's Robotics NAO, Cozmo, Arduino/Raspberry Pi