Curriculum Vitae

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1. Education Background

Ph.D., Psychology-Human Factors, 1996, Dept. of Psychology, North Carolina State University, Raleigh, NC. *Recognition of Local Metric Changes in 3-D Computer Models*. Major Advisor: Don Mershon

MA, Industrial Design, 1987, North Carolina State University, School of Design, Raleigh, NC. *The Development of Human-Computer Interface Criteria for the Designer.* Major Advisor: Vince Foote

BA, Chemistry, 1982, Duke University, Durham, NC.

2. Professional Experience

Senior Research Fellow, July 2006 – Present, Friday Institute for Educational Innovation. College of Education, North Carolina State University

Professor, May 2012 – Present, Dept. of STEM Education. College of Education, North Carolina State University

Interim Associate Dean for Research and Administration, August 2015 – December 2016, College of Education, North Carolina State University

Associate Professor, May 2003 – April 2012, Dept. of STEM Education. College of Education, North Carolina State University

Assistant Professor, August 1997 – April 2003, Dept. of Mathematics, Science, and Technology Education. College of Education, North Carolina State University

Interim Director of Planning and Operations, January 1996 - July 1997, College of Education and Psychology, NC State University

Lecturer, August 1989 - July 1997, Graphic Communications Program, College of Education and Psychology, NC State University

3. Scholarly Activities

Journal Article, Refereed

Min, W., Frankosky, M. H., Mott, B., Rowe, J., Smith, A., Wiebe, E., Boyer, K. E., Lester, J., (in preparation). DeepStealth: Game-Based Learning Stealth Assessment with Deep Neural Networks. *IEEE Transactions on Learning Technology Journal.* (2016 Impact Factor 2.267; Google Scholar top-10 journal in educational technology)

Boulden, D. C., Wiebe, E. Akram, B., Buffum, P., Aksit, O., Mott, B., Boyer, K. E., & Lester, J. (under review). Computational Thinking Integration into Middle Grades Science Classrooms: Strategies for Meeting the Challenges. *Middle Grades Review*.

Wiebe, E., Thompson, I., Creager, J., & Behrend, T. (under review). Engagement Trajectories in Massive Open Online Courses Suggest Distinct Learner Motivations. *Journal of Computer Assisted Learning*.

Wiebe, E., Unfried, A., & Faber, M. (March, 2018; in press). Relationship of STEM attitudes and career interest. *Eurasia Journal of Mathematics, Science and Technology Education*. (2016 Impact Factor .903)

Milbourne, J. & Wiebe, E. (2018). The Role of Content Knowledge in Ill-Structured Problem Solving for High School Physics Students. *Research in Science Education*. *48*(1) 165-179 doi: 10.1007/s11165-016-9564-4 (2016 Impact Factor 1.329)

Smith, A., Leeman-Munk, S., Shelton, A., Mott, B., Wiebe, E., Lester, J., (2018). A Multimodal Assessment Framework for Integrating Student Writing and Drawing in Elementary Science Learning. *IEEE Transactions on Learning Technology Journal.* doi: 10.1109/TLT.2018.2799871 (2016 Impact Factor 2.267; Google Scholar top-10 journal in educational technology)

Wiggins, J.,B., Grafsgaard, J. F., Boyer, K. E., Wiebe, E. N., Lester. J. C. (2016). Do You Think You Can? The Influence of Student Self-Efficacy on the Effectiveness of Tutorial Dialogue for Computer Science. *International Journal of Artificial Intelligence in Education. 27*(1), 130-153. doi: 10.1007/s40593-015-0091-7 (2015 2nd quartile Education Journals, SJR/Scimago)

Okumus, S., Lewis, L., Wiebe, E., & Hollebrands, K. (2016). Utility and Usability as factors influencing teacher decisions about software integration. *Educational Technology Research & Development*. *64*(6), 1227-1249. doi: 10.1007/s11423-016-9455-4 (2015 Impact Factor: 1.171; 5 yr Impact Factor: 1.425)

Shelton, A., Smith, A., Wiebe, E., Berhle, C., Sirkin, R., & Lester, J. (2016). Drawing and Writing in Digital Science Notebooks: Sources of Formative Assessment Data. *Journal of Science Education and Technology*. *25*(3), 474-488. doi: 10.1007/s10956-016-9607-7 (2014 Impact Factor: 1.214)

Buffum, P. S., Frankosky, M. H., Boyer, K. E., Wiebe, E. N., Mott, B. W., Lester. J. C., (2016). How Collaboration Improves Gender Equity in Middle School Computer Science: A Game-based Learning Study. *Computing in Science and Engineering Journal. 18*(2), 18-28. doi: 10.1109/MCSE.2016.37 (Impact Factor: 1.361)

Wiebe, E., Thompson, I., & Behrend, T. (2015). MOOCs from the viewpoint of the learner: A response to Perna et al. (2014). *Educational Researcher 44* (4), 252-254. doi: 10.3102/0013189X15584774. (2013 Impact Factor: 2.963; 5 yr Impact Factor: 3.914)

Lee, J. K., Spires, H. A., Young, C. A., Hollebrands, K., & Wiebe, E. (2015) Portraits of One-To-One Learning Environments In A New Learning Ecology. *International Journal of Learning, Teaching and Educational Research 10*(3).

Sharek, D. S. & Wiebe, E. (2015). Investigating Real-time Predictors of Engagement: Implications For Adaptive Videogames. *International Journal of Gaming and Computer-Mediated Simulations. 7*(1). 21-39. doi: 10.4018/IJGCMS.2015010102 (2013 SJR: 0.25, 3rd Quartile Computer Science Applications)

Unfried, A., Faber, M., Stanhope, D. & Wiebe, E. (2015). The development and validation of a measure of student attitudes toward science, technology, mathematics, and engineering. *Journal of Psychoeducational Assessment 33*(7), 622-639. doi: 10.1177/0734282915571160 (2013 Impact Factor: 1.120; 5 yr Impact Factor: 1.280)

Madden, L. & Wiebe, E. N. (2014). Multiple Perspectives on Elementary Teachers' Science Identities: A Case Study. *International Journal of Science Education. 37*(3), 391-410. doi: 10.1080/09500693.2014.987715. (2013 Impact Factor: 1.516; 5 yr Impact Factor: 2.023)

Madden, L. Bedward, J., Wiebe, E. N., & Benitez-Nelson, C. R. (2014; in press). Lessons Learned in Summer Camp: A Case Study of the Learning Paths of Three Campers. *Electronic Journal of Science Education*.

Sharek, D. & Wiebe, E. (2014). Measuring Video Game Engagement Through the Cognitive and Affective Dimensions. *Simulation and Gaming 45*(4-5) 569-592. doi: 10.1177/1046878114554176 (2013 SJR: 0.45, 2nd Quartile Computer Science Applications)

Wiebe, E., Lamb, A., Hardy, M. & Sharek, D. (2014). Measuring engagement in video game-based environments: Investigation of the User Engagement Scale. *Computers in Human Behavior 32*(3). 123-132. doi: 10.1016/j.chb.2013.12.001 (2013 Impact Factor: 2.273; 5 yr Impact Factor: 3.047)

Madden, L. & Wiebe, E. N. (2013). Curriculum as Experienced by Students: How Teacher Identity Shapes Science Notebook Use. *Research in Science Education 43*(6). 2567-2592. doi: 10.1007/s11165-013-9376-8

Spires, H. A., Wiebe, E., Young, C. A., Hollebrands, K., & Lee, J. K. (2012). Toward a new learning ecology*:* Professional development for teachers in 1:1 learning environments. *Contemporary Issues in Technology and Teacher Education*, *12*(2).

Branoff, T., Wiebe, E., & Shreve, M. (2011). How students use online instructional resources in a blended instruction introductory engineering graphics course. *Journal of Geometry and Graphics, 15*(2) 213-223.

Carrier, S., Wiebe, E. N., Gray, P., & Teachout, D. (2011). BioMusic in the classroom: Interdisciplinary elementary science and music curriculum development. *School Science and Mathematics. 111*(8), 425-434. doi: 10.1111/j.1949-8594.2011.00116.x

Cook, M., Wiebe, E., & Carter, G. (2011). Comparing visual representations of DNA in two multimedia presentations. *Journal of Educational Multimedia and Hypermedia, 20*(1), 21-42.

Behrend, T. S., Sharek, D. S., Meade, A. W. & Wiebe, E. N. (2011). The viability of crowdsourcing for survey research. *Behavior Research Methods, 43*(3), 800-813. doi:10.3758/s13428-011-0081-0

Wiebe, E. N., Branoff, T. J., & Shreve, M. A. (2011). Online resource utilization in a hybrid course in engineering graphics. *Advances in Engineering Education*, *2*(3).

Jones, M. G., Gardner, G., Taylor, A. R., Wiebe, E., & Forrester, J. (2011). Conceptualizing magnification and scale: The roles of spatial visualization and logical thinking. *Research in Science Education, 41*, 357-368. doi: 10.1007/s11165-010-9169-2

Behrend, T. S., Wiebe, E. N., London, J. & Johnson, E. (2011). Cloud computing adoption and usage in community colleges. *Behaviour & Information Technology, 30*(2), 231-240. doi: 10.1080/0144929X.2010.489118

Minogue, J., Madden, L., Bedward, J., Wiebe, E., & Carter, M. (2010). The cross-case analyses of elementary students' engagement in the strands of science proficiency. *Journal of Science Teacher Education, 21*, 559-587.

Minogue, J., Wiebe, E., Madden, L., Bedward, J., & Carter, M. (2010). Graphically enhanced science notebooks. *Science and Children, 48*(3), 52-55.

Wiebe, E. N., Roberts, E., & Behrend, T. S. (2010). An examination of two mental workload measurement approaches to understanding multimedia learning. *Computers in Human Behavior, 26*(3), 474-481. doi:10.1016/j.chb.2009.12.006

Branoff, T. & Wiebe, E. (2009). Face-to-Face, hybrid, or online?: Issues faculty face redesigning an introductory engineering graphics course. *Engineering Design Graphics Journal, 73*(1), 25-31.

Wiebe, E. N., Minogue, J., Jones, M. G., Cowley, J., & Krebs, D. (2009). Haptic feedback and students' learning about levers: Unraveling the effect of simulated touch. *Computers & Education, 53*(3), 667-676.

Carter, G., Cook, M., Park, J. C., Wiebe, E. N., & Butler, S. M. (2008) Middle grade students' interpretations of contour maps. *School Science and Mathematics, 108*(2) 71-79. doi:10.1111/j.1949-8594.2008.tb17806.x

Cook, M., Wiebe, E. N, & Carter, G. (2008). The influence of prior knowledge on viewing and interpreting graphics with macroscopic and molecular representations. *Science Education, 92*, 848-867.

Jessee, E. & Wiebe, E. (2008). Visual perception and the HSV color system: Exploring color in the communications classroom. *Technology Teacher*, *68*(1). 7-11.

Cook, M., Carter, G., & Wiebe, E. N. (2008). The interpretation of cellular transport graphics by students with low and high prior knowledge. *International Journal of Science Education, 30*. 241-263.

Wiebe, E., & Annetta, L. (2008). Influences on visual attentional distribution in multimedia instruction. *Journal of Educational Multimedia and Hypermedia. 17*(2), 259-277.

Annetta, L. A., Slykhuis, D., & Wiebe, E. (2007). Evaluating Gender Differences of Attitudes and Perceptions Toward PowerPoint™ for Preservice Science Teachers. *Eurasia Journal of Mathematics, Science & Technology Education*, *3*(4), 297-304.

Jones, M. G., Taylor, A., Minogue, J., Broadwell, B., Wiebe, E., & Carter, G. (2007). Understanding Scale: Powers of Ten. *Journal of Science Education and Technology 16*(2) 191-202. doi:10.1007/s10956-006-9034-2

Carter, M., Ferzli, M. & Wiebe, E. N. (2007). Writing to learn by learning to write in the disciplines. *Journal of Business and Technical Communication. 21*(3). 278-302. doi:10.1177/1050651907300466

Wiebe, E. N., Slykhuis, D. A., & Annetta, L. A. (2007) Evaluating the Effectiveness of Scientific Visualization In Two PowerPoint™ Delivery Strategies on Science Learning for Preservice Science

Teachers. *International Journal of Science and Mathematics Education. 5*(2). 329-348. doi:10.1007/s10763-006-9041-z

Carter, G., Wiebe, E. N., Reid-Griffin, A. (2006). Gestures: Silent Scaffolding within Small Groups. *Journal of Classroom Interaction, 41*(1), 15-21.

Patrick, M. D., Carter, G., & Wiebe, E. N. (2005) Visual Representations of DNA Replication: Middle Grades Students' Perceptions and Interpretations. *Journal of Science Education and Technology.14*(3). 353-365. doi:10.1007/s10956-005-7200-6

Slykhuis, D. A., Wiebe, E. N., & Annetta, L. A. (2005). Eye-tracking students' attention to PowerPoint photographs in a science education setting. *Journal of Science Education and Technology. 14*(5/6). 509-520. doi:10.1007/s10956-005-0225-z

Reid-Griffin, A., Carter, G., Park, J., Wiebe, E., Flynn, L., Parsons, E. C., Butler, S., & Haefner, L. (2004). Educators Working Smarter: A Closer Look At a Local Community of Practice. *Action in Teacher Education*, 26(3), 44-51.

Carter, M., Ferzli, M. & Wiebe, E. (2004) Teaching genre to English first-language adults: A study of the laboratory report. *Research in the Teaching of English. 38*(4), 395-419.

Wiebe, E. N., Branoff, T. J. & Hartman, N. W. (2003). Teaching geometry through dynamic modeling in introductory engineering graphics. *Engineering Design Graphics Journal, 67*(2), 12-20.

Butler, S. M., & Wiebe, E. N. (2003). Designing a technology-based science lesson: Student teachers grapple with an authentic problem of practice. *Journal of Technology and Teacher Education. 11*(4), 463-481.

Wiebe, E. N. (2003). Transfer of learning between 3D modeling systems. *Engineering Design Graphics Journal. 67*(3), 15-28.

Branoff, T. J., Hartman, N. W. and Wiebe, E. N. (2002). Constraint-based, three-dimensional solid modeling in an introductory engineering graphics course: Re-examining the curriculum. *Engineering Design Graphics Journal, 66*(1), 5-10.

Williams, L., Wiebe, E., Yang, K., Ferzli, M. & Miller, C. (2002). In support of pair programming in the introductory computer science course. *Computer Science Education*, *12*, 197-212.

Wiebe, E. N., Shaver, E. and Wogalter, M. S. (2002). Attitudes about the Internet: Implications for use in education. *Journal of Educational Technology Systems, 31*(2), 143-156.

Wiebe, E. N., & Clark, A. C. (2001). Understanding the diversity of student computing activity. *Journal of Educational Technology Systems, 29* (4), 291-311.

Wiebe, E. N., Clark, A. C., & Hasse, E. E. (2001). Scientific Visualization: Linking science and technology education through graphic communications. *The Journal of Design and Technology Education, 6*(1), 40-47.

Clark, A. C., & Wiebe, E. N. (2001) Comparing computer usage of students in education programs to technology education majors. *Journal of Technology Education 13*(1), 5-16.

Wiebe, E. N. (2000). Deep realities: The fit of usability in business. *ACM Journal of Computer Documentation, 24*(4), 220-226.

Clark, A. C. & Wiebe, E. N. (2000) Scientific visualization for secondary and post-secondary schools. *Journal of Technology Studies, 26*(1), 24-32.

Wiebe, E. N. (1999). Integration of electronic mail into schools. *Journal of Educational Computing Research, 21*(1), 55-73.

Wiebe, E. N. (1999). Future applications of geometry and graphics. *Engineering Design Graphics Journal, 63*(2), 13-20

Wiebe, E. N. (1999). 3-D constraint-based modeling: Finding common themes. *Engineering Design Graphics Journal, 63*(3), 15-31.

Clark, A. C. & Wiebe, E. N. (1998) Evolving technology and graphics in secondary education: A new curriculum in scientific visualization for North Carolina. *NCCTTE Technology Education Journal. 3*, 23-48.

Wiebe, E. N. (1998). The taxonomy of geometry and graphics. *Journal of Geometry and Graphics, 2*(2), 189-195.

Wiebe, E. N. & Clark, A. C. (1998). Evolving technical graphics in the high schools: a new curriculum in scientific visualization. *Engineering Design Graphics Journal, 62*(2), 4-15

Wiebe, E. N. (1997). Adding agility to CAD: Integrating product data management tools into an organization. *Human Factors and Ergonomics in Manufacturing and Service Industries*, *7*(1), 21-35

Wiebe, E. N. (1993). Visualization of three-dimensional form: A discussion of theoretical models of internal representation. *Engineering Design Graphics Journal*, *57*(1), 18-28.

Wiebe, E. N. (1992). Scientific visualization: An experimental introductory graphics course for science and engineering students. *Engineering Design Graphics Journal*, *56*(1), 39-44.

Conference Papers, Refereed

Boulden, D. C., Akram, B., Houchins, J., Catete, V., Lytle, N., Dong, Y., Wiebe, E., Barnes, T., Lester, J., Mott, B. W., & Boyer, K. E. (Submitted; June, 2018). *Forwarding computational thinking in middle grades science classrooms: A professional development strategy*. Northeastern Educational Research Association (NERA), Trumbull, CT.

Kite, V. J., Park, S., & Wiebe, E. N. (April, 2018). *From coding to computational thinking in science education.* AERA Annual Meeting, New York, NY.

Wiebe, E. & Creager, J. H. (April, 2018). *A clearer picture: Integration of multiple data sources in MOOC research*. Symposium presentation. AERA Annual Meeting, New York, NY.

Creager, J. H., Wiebe, E. N., & Kellogg, S. B. (April, 2018). *Time to shine: Extending certificate deadlines to support open online teacher professional development*. AERA Annual Meeting, New York, NY.

Acree, L., Creager, J., Wiebe, E., & Wolf, M. A. (2018). *The Impact of Micro-credentials on Professional Learning in a Massive Open Online Course for Educators*. AERA Annual Meeting, New York, NY.

Akram, B., Smith, A., Smith, C., Aksit, O., Wiebe, E. & Lester, J. (March, 2018). *Computationally-enabled Modeling Environments: Simulating Epidemic Diseases in Science Classrooms using Block-based Programming*. NARST Annual Meeting, Atlanta, GA.

Kite, V. J., Park, S., & Wiebe, E. (March, 2018). *Emerging trends in computational thinking research and best-practices for computational thinking education in science.* NARST Annual Meeting, Atlanta, GA.

Wiebe, E. N., Creager, J., Aksit, O., Chesnutt, K., Akram, B., Mott, B., Lester II, J. C., Reichsman, F., Dorsey, C. (April, 2017). *Evidence-centered Design & Usability Analysis: An Iterative Design Approach to a Genetics Digital Learning Environment*. NARST Annual Meeting, San Antonio, TX.

Aksit, O., Alexander, A., Wiebe, E. N., Mott, B., Lester II, J. C. (April, 2017). *Investigating Upper Elementary Students' Conceptual Knowledge of Magnetism through Writing*. NARST Annual Meeting, San Antonio, TX.

Alexander, A., Aksit, O., Wiebe, E. N. (April, 2017). *The Effect of Repeated Attendance in STEM Outreach Programs and Other Factors on Pipeline Persistence*. NARST Annual Meeting, San Antonio, TX.

Chesnutt, K., Alexander, A. & Wiebe, E. (April, 2016). *Pedagogical differentiation: A case study of classroom orchestration*. NARST Annual Meeting, Baltimore, MD.

Aksit, O., Behrle, C. & Wiebe, E. (April, 2016) *What Students Write versus What They Draw: Implications for Science Assessments*. NARST Annual Meeting, Baltimore, MD.

Wiebe, E. & Thompson, I. (April, 2016). *Self-Regulated Learning Analytics: Aligning data and their treatment to the assumptions of theory*. AERA Annual Meeting, Washington, DC.

Thompson, I., Creager, J., Frankosky, M. & Wiebe, E. (April, 2016). *MOOC learner subpopulations: A person-centric analysis of longitudinal course utilization classes with predicting factors*. AERA Annual Meeting, Washington, DC.

Frankosky, M., Creager, J., Wiebe, E., Buffum, P., Boyer, K., Min, W., Mott, B., & Lester, J. (April, 2016). *Game-based Programming Challenges: Stealth Assessment of Student Competencies*. American Educational Research Association Annual Meeting, Washington, D.C.

Alexander, A., Chesnutt, K. & Wiebe, E. (April, 2016). *Creating efficacious learning ecologies: The role of teacher orchestration within a digital learning environment*. AERA Annual Meeting, Washington, DC.

Behrle, C., Shelton, A., & Wiebe, E. (April, 2015). *Analyzing Effectiveness of Scaffolding to Promote Argumentation and Conceptual Understanding in an Electronic Science Notebook*. NARST Annual Meeting, Chicago, IL.

Shelton, A., Smith, A., Wiebe, E., Behrle, C., & Sirkin, R. (April, 2015). *Digital Science Notebooks as a Means for Assessing Student Understanding Through Drawing and Writing*, NARST Annual Meeting, Chicago, IL.

Frankosky, M., London, J., Thompson, I., Behrend, T., & Wiebe, E. (April, 2015). *Data Analytics for Modeling User Behavior within Massive Open Online Courses (MOOCs): a Comparison of Clustering Techniques*. AERA Annual Meeting, Chicago, IL.

Frankosky, M., Wiebe, E., Buffum, P., & Boyer, K. (April, 2015). *Spatial Ability and Other Predictors of Gameplay Time: Understanding Barriers to Learning in Game-based Virtual Environments*. AERA Annual Meeting, Chicago, IL.

LaPorte, L. & Wiebe, E. (April, 2015). *Operationalizing Metrics of Persistence and On-Track in the STEM Pipeline Using the National Clearinghouse Database.* NARST Annual Meeting, Chicago, IL.

Shelton, A., Wiebe, E., Behrle, C., Patterson, L., & Lamb, A. (April, 2014). *Effects of Scaffolding on the Quality of Elementary Students' Scientific Argumentation*. AERA Annual Meeting, Philadelphia, PA.

Grafsgaard, J., Boyer, K., Wiebe, E., & Lester, J. (April, 2014). *Affect Modeling in Multimodal Tutorial Dialogue With Hidden Markov Models*. AERA Annual Meeting, Philadelphia, PA.

Patterson, L., Wiebe, E., Okumus, S., Cayton, C., & Hollebrands, K. (April, 2014). *An Investigation of Teacher Pedagogical Strategies and Student Engagement in 1:1 Laptop Mathematics Classrooms*. AERA Annual Meeting, Philadelphia, PA.

Smith, A., Shelton, A, Leeman-Munk, S., Behrle, C., Corin, E., Wiebe, E., Taylor, R., Mott, B., & Lester, J. (April, 2014). *Investigating Tutor-Student Interactions with a Digital Science Notebook*. NARST Annual Meeting, Pittsburgh, PA.

Unfried, A., Faber, M., & Wiebe, E. (April, 2014). *Gender and Student Attitudes Toward STEM*. AERA Annual Meeting, Philadelphia, PA.

Behrle, C., Patterson, L., Shelton, A., & Wiebe, E. N. (April, 2014). Argumentation Opportunities and Support Using Traditional and Electronic Science Notebooks: A comparative study. NARST Annual Meeting, Pittsburgh, PA.

Milbourne, J., & Wiebe, E. N. (April, 2013). *How do High School Students Approach Ill-Defined Physics Problems?* Presented at the NARST Annual Meeting, Rio Del Mar, PR.

Bedward, J. & Wiebe, E. N. (April, 2013). *Exploring the Use of Students Self-Explanations when Exploring the Particulate Nature of Matter*. Presented at the NARST Annual Meeting, Rio Del Mar, PR.

Albert, J., Blanchard, M., & Wiebe, E. N. (April, 2013). *Using Student-Generated Animations to Assess Student Understanding of the Particulate Nature of Matter.* Presented at the NARST Annual Meeting, Rio Del Mar, PR.

Wiebe, E. N., Shelton, A., Patterson, L., Hardy, M., Carter, M., & Sheffield, C. (April, 2013). *Elementary Students Use of Argumentation and Evidentiary Support In Science Notebooks.* Presented at the NARST Annual Meeting, Rio Del Mar, PR.

Leeman-Munk, S., Wiebe, E. N., & Lester, J. (April, 2013) *Mining Student Science Argumentation Text To Inform An Intelligent Tutoring System*. AERA Annual Meeting, San Francisco, CA.

Wiebe, E. N., Carter, M., Patterson, L., Sheffield, W., Hardy, M., & Smaxwell, M. (April, 2013). *Electronic Science Notebooks and Argumentation: Analysis of Student Writing*. AERA Annual Meeting, San Francisco, CA.

Cayton, C., Hollebrands, K. & Wiebe, E. & Boehm, E. (April, 2012). *Characterizing discourse in technology-intensive high school geometry classrooms*. National Council of Teachers of Mathematics Research Presession. Philadelphia, PA.

Lester, J., Boyer, K., & Wiebe, E. N. (April, 2012). *Toward a Hidden Markov Modeling Framework for Real-time Assessment in Tutorial Dialogue*. Presented at the AERA Annual Meeting, Vancouver, BC.

Minogue, J., Bedward, J. C., Wiebe, E. N., Madden, L. P., & Carter, M. (April, 2012). *Storyboarding and Upper Elementary Students' Conceptions of Magnetism.* Presented at the AERA Annual Meeting, Vancouver, BC.

London, J., Wiebe, E. N., Sharek, D., Boyer, K., & Lester, J. (April, 2012). *Self-Report of Engagement: Analysis of Two Scales*. Presented at the AERA Annual Meeting, Vancouver, BC.

Wiebe, E. N., Hollebrands, K., Patterson, L., & Cayton, C. (April, 2012). *Ubiquitous Computing Environments And Mathematics Discourse: Differential Approaches By Teachers.* Presented at the AERA Annual Meeting, Vancouver, BC.

Wiebe, E. N., London, J., Bedward, J. C., Russo, M., Mott, B., Taylor, R., & Lester, J. (April, 2012). *Understanding Visual Characteristics in Virtual Digital Assistants that Support Positive Affect in Learning Elementary Science*. Presented at the AERA Annual Meeting, Vancouver, BC.

Wiebe, E. N., London, J., Jones, G. M., & Bedward, J. (March, 2012). *Avatar Attributes and a Third Space: Supporting Positive Affect in Learning Science through Virtual Digital Assistants*. Presented at the NARST Annual Meeting, Indianapolis, IN.

Albert, J. L., Blanchard, M. R., & Wiebe, E. N. (March, 2012). *Exploring Student-created Animations to Show Level of Understanding on the Nature of Matter Learning Progression*. Presented at the NARST Annual Meeting, Indianapolis, IN.

Shreve, M. A., Branoff, T. J., & Wiebe, E. N. (April, 2011). Online Solid Modeling Resources in a Hybrid Introductory Engineering Graphics Course: An Inventory and Assessment of Solid Modeling Concepts. Presented at the SE Region ASEE Meeting. Charleston, SC.

Behrend, T. S., Sharek, D., Meade, A. W., & Wiebe, E. N. (April, 2011). *The Viability of Crowdsourcing for Survey Research*. Presented at the Society for Industrial and Organizational Psychology Annual Meeting. Chicago, IL.

Madden, L., Wiebe, E. N., Bedward, J., Minogue, J., & Carter, M. (April, 2011). *Teacher Identities of Three Second-Grade Teachers: A Case Study From the Students' Perspective*. Presented at the AERA Annual Meeting, New Orleans, LA.

Sharek, D. & Wiebe, E. N. (April, 2011). *Measuring Learner Engagement: Understanding the Interplay of Awareness and Cognitive Load*. Presented at the AERA Annual Meeting, New Orleans, LA.

Madden, L., Bedward, J. C., Wiebe, E. N., & Benitez-Nelson, C. R. (April, 2011). *Lessons Learned in Summer Camp: Learning Paths of Three Campers*. Presented at the NARST Annual Meeting, Orlando, FL.

Minogue, J., Bedward, J. C., Wiebe, E. N., Madden, L., Carter, M., & King, Z. (April, 2011). *An Exploration of Upper Elementary Students' Storyboarded Conceptions of Magnetism*. Presented at the NARST Annual Meeting, Orlando, FL.

Albert, J. L., & Wiebe, E. N. (April, 2011). *Taking drawing digital: Using student-generated drawings to help students learn about molecules*. Presented at the NARST Annual Meeting, Orlando, FL.

Wiebe, E. N., Carter, M., Minogue, J., Madden, L., & Bedward, J. (June, 2010). *Abstraction and Re-representation in Visualizations: Understanding where the learning occurs.* Presented at the ICLS Biannual Meeting. Chicago, IL.

Madden, L., Wiebe, E., Bedward, J., & Carter, M. (January, 2010). *A Case Study of Three Elementary Science Teachers' Use of Science Notebooks After Professional Development*. Presented at the Association for Science Teacher Educators (ASTE) International Conference, Sacramento, CA.

Carrier, S., Wiebe, E., Gray, P., & Teachout, D. (January, 2010). *Universal BEATS (UBEATS): Connecting science and music in the natural world*. Presentation at the Association for Science Teacher Education (ASTE), Sacramento, CA

Minogue, J., Bedward, J., Wiebe, E., Madden, L., & Carter, M. (January, 2010). *Concrete experiences and abstract thought: The importance of student-generated graphics.* Presented at the Association for Science Teacher Educators (ASTE) International Conference, Sacramento, CA.

Wiebe, E. N., Minogue, J., Carter, M., Bedward, J., & Madden, L. (March, 2010). *A Graphic Framework for Understanding and Facilitating Student Science Learning.* Presented at the NARST Annual Meeting, Philadelphia, PA.

Bedward, J., Minogue, J., Wiebe, E. N., Madden, L., & Carter, M. (March, 2010). *Reasoning about Invisible Forces: The Use of Graphics and Written Text to Reveal Elementary Student Sense Making.* Presented at the NARST Annual Meeting, Philadelphia, PA.

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Jones, M. G., Gardner, G., Taylor, A. R., Wiebe, E., & Forrester, J. (April, 2010). *Conceptualizing Magnification and Scale: The Roles of Spatial Visualization and Logical Thinking*. Presented at the AERA Annual Meeting, Denver, CO.

Sharek, D. & Wiebe, E. N. (April, 2010). *Game Play: Rethinking How We Look at Learner Engagement*. Presented at the AERA Annual Meeting, Denver, CO.

Lee, J., Hollebrands, K., Spires, H., Young, C., & Wiebe, E. (April, 2010). *Toward a New Learning Ecology in 1:1 Learning Environments: Theory Into Practice.* Presented at the AERA Annual Meeting, Denver, CO.

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Minogue, J., Madden, L., Bedward, J., Wiebe, E. N., & Carter, M. (January, 2009). *The Cross-case Analyses of Elementary Students' Engagement in the Strands of Science Proficiency.* Presented at the ASTE Annual Meeting, Hartford, CT.

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Rodger, S. H, Wiebe, E., Lee, J., Morgan, C., Omar, K., & Su, J. (March, 2009). *Increasing Understanding in Automata Theory Via Visualization and Interaction - CHANGE?* Presented at SIGSCE 2009, Chattanooga, TN.

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Wiebe, E. N., Minogue, J., Jones, M. G., Cowley, J., & Krebs, D. (April, 2008). *Unraveling the Influence of Haptic Feedback on Students' Learning about Levers.* Presented at the NARST Annual Meeting, Baltimore, MD.

Cook, M. P., Wiebe, E. N., & Carter, G. S. (March, 2008). *Macroscopic and molecular representations of diffusion: A sequential analysis of eye movements*. Presented at the Annual Meeting of the American Association for Educational Research, New York, NY.

Cook, M., Wiebe, E. N., Carter, G. (April, 2008). *A comparison of visual representations of DNA replication*. Presented at the NARST Annual Meeting, Baltimore, MD.

Wiebe, E. N. & Smith, B. V. (April, 2007). *Science Education Research Using Advanced Recording Technologies.* Presented at the NARST Annual Meeting, New Orleans, LA.

Cook, M. P., Carter, G., & Wiebe, E. N. (April, 2007). *Influence of Prior Knowledge on Interpreting Graphics of Cellular Transport.* Presented at the NARST Annual Meeting, New Orleans, LA.

Wiebe, E. N. & Annetta, L. A. (April, 2007). *Animation and Narration: Using Eye Tracking to Understand Visual Attention Distribution.* Presented at the AERA Annual Meeting, Chicago, IL.

Windell, D. & Wiebe, E. N. (April, 2007). *Measuring Cognitive Load in Multimedia Instruction: A Comparison of Two Instruments*. Presented at the AERA Annual Meeting, Chicago, IL.

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Annual meeting of the European Association for Research on Learning and Instruction, Budapest, Hungary.

Wilson, P. H., Wiebe, E. N., Berenson, S. B., & Mojica, G. (October, 2007). *Innovative Data Collection Technologies for Design Experiments*. Presented at the Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education, Reno, NV.

Jones, M. G., Taylor, A., Minogue, J., Broadwell, B., Wiebe, E., & Carter, G. (January, 2007). U*nderstanding Scale: Powers of Ten.* Presented at the Annual Meeting of the Association for Science Teacher Education (ASTE), Clearwater Beach, FL.

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Wiebe, E. N. & Annetta, L. A. (April, 2006). *Narration and Attentional Distribution in Multimedia Science Instruction.* Presented at the NARST Annual Meeting, San Francisco, CA.

Wiebe, E. N. & Annetta, L. (April, 2006). *The Influence of Narration on Attentional Distribution in Multimedia Instructional Materials.* Presented at the AERA Annual Meeting, San Francisco, CA.

Cook, M. P., Carter, G., & Wiebe, E.N. (April, 2006). *Visual Representations of DNA: A Comparison of Salient Features for Experts and Novices.* Presented at the NARST Annual Meeting, San Francisco, CA.

Clark, A. C., Wiebe, E. N., Petlick, J. & Ferzli, M. (March, 2005). *VisTE: Visualization in Technology Education.* Presented at the International Technology Education (ITEA) Conference. Kansas City, MO.

Cook, M.P., Carter, G., & Wiebe, E.N. (October, 2005). *High school students' understanding of common textbook images.* Presented at the annual meeting of the Association for Science Teacher Education Mid-Atlantic (MA-ASTE) Region, Breaks, VA.

Wiebe, E. N. (April, 2005). *Graphic representations in science education: Multiple methodological approaches*. Paper set presentation at the NARST Annual Meeting, Dallas, TX.

Slyhkuis, D. A., Wiebe, E. N., & Annetta, L. A. (April, 2005). *Eye tracking students' use of science related PowerPoint presentations*. Presented at the NARST Annual Meeting, Dallas, TX.

Wiebe, E. N., Slyhkuis, D. A., & Savage D. M. (April, 2005). *Answering questions with 2D and 3D topographic maps: Use of eye-tracking to understand representational reasoning*. Presented at the NARST Annual Meeting, Dallas, TX.

Carter, M., Wiebe, E. N., & Ferzli, M. (February, 2005). *LabWrite: Students Learning Science through Writing Better Lab Reports.* Poster presented at the Annual Meeting of the AAAS. Washington, DC.

Wiebe, E. N., Slykhuis, D. A. (March, 2004). *Contributions of the HCI paradigm to science education software evaluation*. Poster presented at the NARST Annual Meeting, Vancouver, British Columbia.

Ferzli, M., Wiebe, E. N., Carter, M. (March, 2004). *College students' perceptions about lab reports: A response to in-depth instruction*. Paper presented at the NARST Annual Meeting, Vancouver, British Columbia.

Clark, A. C., Wiebe, E. N., Petlick, J. & Ferzli, M. (March, 2004). *VisTE: Visualization in Technology Education.* Presented at the International Technology Education (ITEA) Conference. Albuquerque, NM.

Ferzli, M., Carter, M., Wiebe, E. N. & Allen, T. (June, 2004). *Using the laboratory report to promote scientific thinking and learning in college biology students*. Paper presented at the Association of Southeastern Biologists Annual Meeting, Memphis, Tennessee.

Ferzli, M., Carter, M., Wiebe, E. (July, 2004). *Helping Students Learn Chemistry by Writing Better Lab Reports*. Paper presented at the 18th Biennial Conference on Chemical Education, Ames, Iowa State University.

Clark, A. C., Wiebe, E. N., Petlick, J. H, & Ferzli, M. G. (November, 2003). *Taxonomies in Graphics Instruction: Responding to the Accountability Movement.* Presented at the 58th Annual Mid-Year Conference of the Engineering Design Graphics Division of the American Society for Engineering Education. Scottsdale, AZ.

Ferzli, M. G. & Wiebe, E. N. (March, 2003). *LabWrite: Supporting science lab report writing.* Poster presented at the NARST Annual Meeting. Philadelphia, PA.

Ferzli, M., Wiebe, E. N., Carter, M. (March, 2003). *The Science Laboratory Report as a Pedagogical Tool for Promoting Scientific Literacy in College Students*. Paper presented at the NARST Annual Meeting, Philadelphia, PA.

Dickerson, D. & Wiebe, E. N. (March, 2003). *The Relationship of Spatial Visualization to Naïve Conceptions Concerning Groundwater*. Paper presented at the NARST Annual Meeting. Philadelphia, PA.

Clark, A. C., & Wiebe, E. N., Ferzli, M. & McBroom, R. (March, 2003). *Visualization in Technology Education*. Presented at the International Technology Education (ITEA) Conference. Nashville, TN.

Williams, L., Yang, K., Wiebe, E., Ferzli, M., & Miller, C. (November, 2002). *Pair Programming in an Introductory Computer Science Course: Initial Results and Recommendations*. Paper presented at the 17th Annual ACM Conference on Object-Oriented Programming, Systems, Languages, and Applications (OOPSLA 2002). Seattle, WA.

Wiebe, E. N., Branoff, T. J., Nathan W. Hartman, N. W. (October, 2002). *Application of dynamic modeling in introductory engineering graphics classes*. Presented at the 57th Annual Mid-Year Conference of the Engineering Design Graphics Division of the American Society for Engineering Education. Indianapolis, IN.

Clark, A. C., Wiebe, E. N. (October 2002). *VisTE: Visualization in Technology Education*. Presented at the 57th Annual Mid-Year Conference of the Engineering Design Graphics Division of the American Society for Engineering Education. Indianapolis, IN.

Wiebe, E. N. (March, 2002). *Graphics for thinking, writing, and talking about science*. Presented at the Conference on K-12 Outreach from University Science Departments. Raleigh, NC.

Clark, A. C., & Wiebe, E. N. (March 2002). *Scientific and Technical Visualization in Technology Education*. Presented at the International Technology Education Conference. Columbus, OH.

Alibrandi, M., Beal, C., Grable, L., Spires, H., Wiebe, E., & Moore, K. (March, 2002). *Direction, Magnitude, and Constructive Chaos: Identifying the Vectors of Technological Change in a College of Education*. Panel paper presented at SITE 2002, Nashville, TN.

Wiebe, E. N. (January, 2002). *Moving outside of the box: Alternative instructional delivery methods in engineering graphics*. Presented at the Engineering Design Graphics Division of the American Society for Engineering Education, Mid-Year Meeting, Berkeley, CA.

Clark, A. C., Wiebe, E. N., & Hasse, E. E. (April, 2000). *Scientific Visualization: A Basic in Design and Technology*. Presented at the Design and Technology Association Millennium Conference. London, England.

Wiebe, E. N., Jones, B., Kramer, R. & Wilson, B. (June, 2000). *3-D CAD modeling trends and issues: Impact on education*. Panel discussion at the Annual ASEE Meeting. St. Louis, MO.

Wiebe, E. N. (November, 1999) *What's involved with moving from one 3-D constraint-based CAD system to another?* Presented at the Engineering Design Graphics Division of the American Society for Engineering Education, Mid-Year Meeting, Biloxi, MS.

Wiebe, E. N. (January, 1999). *Future applications of geometry and graphics*. Presented at the Engineering Design Graphics Division of the American Society for Engineering Education, Mid-Year Meeting, Columbus, OH.

Wiebe, E. N. (January, 1999). *3-D constraint-based modeling: Finding common themes*. Presented at the Engineering Design Graphics Division of the American Society for Engineering Education, Mid-Year Meeting, Columbus, OH.

Wiebe, E. N. (August, 1998). *The integration of traditional technical graphics with scientific data visualization*. Presented at the 8th ICECGDG Conference, Austin, TX.

Baker, J. E., Cocchiarella, L., Kalic, I., Nauk, P. I., Suzuki, K., Weiss, G., Wiebe, E. N. (August, 1998). *The taxonomy of geometry and graphics*. Presented at the 8th ICECGDG Conference, Austin, TX.

Clark, A. C. & Wiebe, E. N. (April, 1998). *Evolving technology and graphics in secondary education: A new curriculum in scientific visualization for North Carolina*. Presented at the NC Council of Technology Teachers Conference, Raleigh, NC.

Wiebe, E. N., & Converse, S. A. (September, 1996). *Recognition of Shape and Metric Changes in 3-D Computer Models*. Presented at the Human Factors and Ergonomics Society 40th Annual Meeting, Philadelphia, PA.

Clark, A. C., Wiebe, E. N. & Shown, T. (October, 1996). *Future Directions for Graphics: A Look at the New Technical Graphics Curriculum in NC High Schools*. Presented at the Engineering Design Graphics Division of the American Society for Engineering Education, Mid-Year Meeting, Raleigh, NC.

Wiebe, E. N., & Bertoline, G. R. (January, 1995). *Mosaic, instruction, and the World Wide Web*. Paper presented at the Engineering Design Graphics Division of the American Society for Engineering Education, Mid-Year Meeting, Houston, TX.

Wiebe, E. N. (October, 1993). *The Effectiveness of Alternate 2D Projections of 3D Forms*. Presented at the Engineering Design Graphics Division of the American Society for Engineering Education, Mid-Year Meeting, Athens, OH.

Wiebe, E. N. (November, 1991). *A Comparison of Dynamic and Static Visual Display Techniques*. Presented at the Engineering Design Graphics Division of the American Society for Engineering Education, Mid-Year Meeting, Old Dominion University, Norfolk, VA.

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Rodriguez, F. J., Smith, C., Smith, A., Wiebe, E., Boyer, K. E., & Lester, J. (submitted; April, 2018) Toward an adaptive interface to support novices in block-based programming. *IEEE Symposium on Visual Languages and Human-Centric Computing (VL/HCC)*, Lisbon, Portugal.

Akram, B., Min, W., Wiebe, E., Mott, B., Boyer, K. E., & Lester, J. (July, 2018). Improving stealth assessment in game-based learning with LSTM-based analytics. *EDM 2018*, Buffalo, NY.

Buffum, P. S., Price, K., Zheng, X., Blackburn, D., Boyer, K. E., Wiebe, E. N., Mott, B. W., & Lester, J. (February 2018). Introducing the concept of variables in middle school science classrooms. *SIGCSE 2018*, Baltimore, MD.

Min, W., Mott, B., Rowe, J., Taylor, R., Wiebe, E., Boyer, K. E., & Lester, J. (October, 2017). Multimodal goal recognition in open-world digital games. *AIIDE'17*, Snowbird, UT.

Pezzullo, L. G., Wiggins, J. B., Frankosky, M. H., Min, W., Boyer, K. E., Mott, B. W., Wiebe, E. N., & Lester, J. C. (July, 2017). "Thanks Alisha, keep in touch": Gender effects and engagement with virtual learning companions. *AIED 2017*, Wuhan, China.

Min, W. Frankosky, M. H., Mott, B. W., Wiebe, E. N., Boyer, K. E., & Lester, J. C. (July, 2017). Inducing stealth assessors from game interaction data. *AIED 2017*, Wuhan, China.

Vail, A., Wiggins, J. B., Grafsgaard, J. F., Boyer, K. E., Wiebe, E. N., & Lester, J. C. (August, 2016). The Affective Impact of Tutor Questions: Predicting Frustration and Engagement. *EDM 2016*, Raleigh, NC.

Min, W., Wiggins, J., Pezzullo, L., Vail, A., Boyer, K. E., Mott, B., Frankosky, M., Wiebe, E. N., & Lester, J. C. (August, 2016). Predicting Dialogue Acts for Intelligent Virtual Agents with Multimodal Student Interaction Data. *EDM 2016*, Raleigh, NC.

Vail, A., Grafsgaard, J. F., Boyer, K. E., Wiebe, E. N., & Lester, J. C. (July, 2016). Gender Differences in Facial Expressions of Affect During Learning. *UMAP 2016*, Halifax, Canada. DOI: http://dx.doi.org/10.1145/2930238.2930257

Smith, A., Aksit, O., Min, W., Wiebe, E., Mott, B., & Lester, J. (April, 2016). Integrating Real-Time Drawing and Writing Diagnostic Models: An Evidence-Centered Design Framework for Multimodal Science Assessment. *ITS 2016*, Zegreb, Croatia. DOI: 10.1007/978-3-319-39583-8_16

Vail, A., Grafsgaard, J. F., Boyer, K. E., Wiebe, E. N., & Lester, J. C. (April, 2016). Predicting Learning from Student Affective Response to Tutor Questions. *ITS 2016*, Zegreb, Croatia.

Buffum, P. S., Frankosky, M. H., Mott, B., Boyer, K., Wiebe, E., & Lester, J. (March, 2016). Empowering All Students: Closing the CS Confidence Gap with an In-School Intervention for Middle School Students. *SIGCSE 2016*, Memphis, TN. http://dx.doi.org/10.1145/2839509.2844595

Vail, A. Boyer, K., Wiebe, E. & Lester, J. (June, 2015). The Mars and Venus Effect: The Influence of User Gender on the Effectiveness of Adaptive Task Support. *UMAP 2015*, Dublin, Ireland.

Leeman-Munk, S., Smith, A., Mott, B., Wiebe, E., & Lester, J. (June, 2015). Two Modes are Better Than One: A Multimodal Assessment Framework Integrating Student Writing and Drawing. *AIED 2015,* Madrid, Spain.

Min, W., Frankosky, M. H., , Mott, B., Rowe, J., Wiebe, E., Boyer, K., & Lester, J. (June, 2015). DeepStealth: Leveraging Deep Learning Models for Stealth Assessment in Game-based Learning Environments. *AIED 2015,* Madrid, Spain.

Buffum, P. S., Boyer, K., Wiebe, E., & Lester, J. (June, 2015). Mind the Gap: Improving Gender Equity in Game-based Learning Environments with Learning Companions. *AIED 2015, Madrid, Spain*.

Buffum, P. S., Lobene, E. V., Frankosky, M. H., Boyer, K., Wiebe, E., & Lester, J. (March, 2015). A Practical Guide to Developing and Validating Computer Science Knowledge Assessments with

Application to Middle School. *SIGCSE 2015*, Kansas City, MO. http://dx.doi.org/10.1145/2676723.2677295

Grafsgaard, J. F., Wiggins, J., Vail, A., K., Boyer, K. E., Wiebe, E. N., & Lester, J. C. (November, 2014). The Additive Value of Multimodal Features for Predicting Engagement, Frustration, and Learning during Tutoring. *ICMI '14*. http://dx.doi.org/10.1145/2663204.2663264

Wiggins, J., Grafsgaard, J. F., Boyer, K. E., Wiebe, E. N., & Lester, J. C. (April, 2014). Exploring the Relationship between Self-Efficacy and the Effectiveness of Tutorial Interactions. *AIEDCS 2014*.

Leeman-Munk, S., Shelton, A., Wiebe, E., & Lester, J. (April, 2014). Towards Domain-Independent Assessment of Elementary Students' Science Competency using Soft Cardinality. *BEA 2014 Workshop Proceedings*.

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Grafsgaard, J. F., Wiggins, J. B., Boyer, K. E., Wiebe, E. N., Lester, J. C. (April, 2014). Predicting Learning and Affect from Multimodal Data Streams in Task-Oriented Tutorial Dialogue. *EDM2014*.

Buffum, P. S., Martinez-Arocho, A. G., Frankosky, R. H., Rodriguez, F. J., Wiebe, E., & Boyer, K. (March, 2014). CS Principles Goes to Middle School: Learning how to teach "Big Data." *SIGSCE*, Atlanta, GA. http://dx.doi.org/10.1145/2538862.2538949

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Collins, T., Wiebe, E. N., & Van Dyke, P. (June, 2014). MISO (Maximizing the Impact of STEM Outreach Through Data-Driven Decision-Making): Building and Evaluating a Community of Practice. *Proceedings of the 2014 American Society for Engineering Education Annual Conference & Exposition*. Washington, DC: ASEE.

Leeman-Munk, S. P., Wiebe, E. N., & Lester, J. C. (March, 2014). Assessing elementary students' science competency with text analytics. *Proceedings of the Fourth International Conference on Learning Analytics And Knowledge (LAK)*, 143-147.

Hardy, M., Wiebe, E.N., Grafsgaard, J.F., Boyer, K.E., Lester, J.C. (October, 2013). Physiological Responses to Events During Training: Use of Skin Conductance to Design Adaptive Learning Systems. *Proceedings of the Human Factors and Ergonomic Society 57th Annual Meeting.*

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Grafsgaard, J. F., Wiggins, J. B., Boyer, K. E., Wiebe, E. N., Lester, J. C. (March, 2013). Modeling student programming with multimodal learning analytics. *SIGSCE'13*. Denver, CO: ACM.

Grafsgaard, J. F., Fulton, R. F., Boyer, K. E., Wiebe, E. N., Lester, J. C. (2012). Multimodal analysis of the implicit affective channel in computer-mediated textual communication. *ICMI'12*. Santa Monica, CA: ACM.

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Shreve M. A., Branoff, T. J., & Wiebe, E. N. (2011). What do Students Get Out of Solid Modeling Video Demonstrations? *Proceedings of the 2011 American Society for Engineering Education Annual Conference & Exposition*. Washington, DC: ASEE.

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Wiebe, E. N. (1994). Evaluation of Alternative Methods of Representing Three-Dimensional Objects on Computer Displays. *Proceedings of the Human Factors and Ergonomics Society 38th Annual Meeting.* Santa Monica, CA: HFES.

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Bertoline, G. R., Wiebe, E. N., Miller, C. L., & Mohler, J. L. (1997). *Technical Graphics Communication*. (2nd ed.) Chicago, IL: Irwin.

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Bertoline, G. R., Wiebe, E. N., Miller, C. L., & Nasman, L. O. (1995). *Technical Graphics Communication*. (1st ed.) Chicago, IL: Irwin.

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Book Chapter, Articles, Invited

Creager, J. & Wiebe, E. (2017) Understanding Motivations and Behaviors: User-centered Analysis of MOOC Participation. *User Experience Magazine*. Retrieved from: http://uxpamagazine.org/understanding-motivations-and-behaviors/

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Albert, J. L., Blanchard, M. R., & Wiebe, E. N. (2015). How high school students construct or create animations about water boiling. In K.D. Finson & J. Pederson (Eds.), *Application of Visual Data in K-16 Science Classrooms* (pp. 191-216). Charlotte, NC: Information Age Publishing

Wiebe, E. (2015). Memory and science learning. In R. Gunstone (Ed.), *Encyclopedia of Science Education*. Springer Dordrecht, New York. doi 10.1007/978-94-007-6165-0_122-2

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Wiebe, E. N. (2010). *Learning design: Creating contexts for learning experiences*. Future of STEM Curricula and Instructional Design: A Blue Sky Workshop (pp. 39-53). Landsdowne, MD: Center for the Study of Mathematics Curriculum.

Scheiter, K. Wiebe, E. N., & Holsanova, J. (2008). Theoretical and instructional aspects of learning with visualizations. In R. Z. Zheng (Ed.), *Cognitive effects of multimedia learning* (pp. 67-88). Hershey, PA: Information Science Reference.

Wiebe, E. N. (2008). Data visualization and gaming. In L. A. Annetta (Ed.), *Serious educational games: From theory to practice*. (pp. 47-55). Rotterdam, the Netherlands: Sense Publishers.

Wiebe, E. N. & Howe, J. E. (1998). Graphics design for the web. In Forsythe, C., Grose, E., and Ratner, J. (eds.). *Human factors and web development* (pp. 225-240). Mahwah, NJ: Lawrence Erlbaum Associates.

Wiebe, E. N., Howe, J. E., Summey, J., & Norton, J. J. (1997). Computing and organizational assessment in the furniture industry. In G. Salvendy, M. Smith, J., & R. J. Koubek (Eds.), *Design of computing systems: Organizational considerations*, (Vol. B). Amsterdam: Elsevier.

Wiebe, E. N. (1995). Evaluation of alternative methods of representing three-dimensional objects on computer displays. In Perlman, G., Green, G. K., Wogalter, M. S. (Eds.) *Human factors perspectives on human-computer interaction* (pp. 373-377). Santa Monica, CA: HFES.

Curriculum Materials

Kowolenko, C., Carrier, S., Wiebe, E., Gray, P. & Teachout, D. (June, 2010). *Biomusic module-Grades 2/3*. Greensboro, NC: UNC-Greensboro.

Hall, D., Patillo, C., Kowolenko, C., Carrier, S., Wiebe, E., Gray, P. & Teachout, D. (July, 2010). *Biomusic module-Grades 4/5*. Greensboro, NC: UNC-Greensboro

Wiebe, E., Carrier, S., Kowolenko, C., Gray, P., & Teachout, D. (July, 2010). *Biomusic concepts resource guide.* Greensboro, NC: UNC-Greensboro

Wiebe, E. N., Clark, A. C., Ferlzi, M. G., Petlick, J. H., Blue, C., & Ernst, J. (2007) *VisTE: Visualization in technology education—Units 9-12.* New York: Delmar Learning/Thomson.

Wiebe, E. N., Clark, A. C., Ferzli, M. G. & Petlick, J. H. (2006) *VisTE: Visualization in technology education—Units 5-8.* New York: Delmar Learning/Thomson.

Wiebe, E. N., Clark, A. C., Ferzli, M. G. & Petlick, J. H. (2005) *VisTE: Visualization in technology education—Units 1-4.* New York: Delmar Learning/Thomson.

Wiebe, E. N., Clark, A. C., et al. (1997). *Scientific and technical visualization I: T&I 7922*. North Carolina State Department of Public Instruction. Division of Instructional Services: Workforce Development, July 1997.

Electronic Media

Bedward, J., Wiebe, E. N., Carter, M., Madden, L., & Minogue, J. (2010). *GEES: Graphic Enhanced Elementary Science*. Last accessed February 9, 2011 at http://gees.ncsu.edu/

Carter, M., Wiebe, E. N., & Ferzli, M. (2004). *Labwrite: Improving lab reports*. Last updated May 16, 2005. Last accessed May 14, 2011 at http://labwrite.ncsu.edu

Wiebe, E. N., Hasse, E. E., & Clark, A. C. (1997). *Scientific Visualization: Resources for integrating graphics with science and technology education.* Last updated May 5, 2000. Last accessed May 15, 2011 at http://www.ncsu.edu/scivis/

Research Report

London, J. & Wiebe, E. N. (2011). Evaluation of Virtual Computing Lab in Community Colleges: Fall and Spring 2010. Raleigh, NC: The Friday Institute.

Spires, H. A., Wiebe, E., Young, C. A., Hollebrands, K. & Lee, J. K. (2009). *Toward a new learning ecology: Teaching and learning in 1:1 environments*. Friday Institute White Paper Series. Raleigh, NC: North Carolina State University.

Behrend, T., Wiebe, E. N., London, J., & Johnson, E. (2009). *Implementation of the Virtual Computer Lab (VCL) in community colleges – Fall 2008*. Raleigh, NC: The Friday Institute.

Behrend, T., Wiebe, E. N., & Sharek, D. (2008). *Implementation of the Virtual Computer Lab (VCL) at Wake Tech Community College*. Evaluation Report. Raleigh, NC: The Friday Institute.

Wiebe, E. N., Williams, L., Yang, K. & Miller, C. (January, 2003). *Computer Science Attitude Survey*. (Report No.: NCSU CSC TR-2003-1) Dept. of Computer Science, NC State University, Raleigh, NC.

Ferzli, M., Wiebe, E. N. & Williams, L. (November, 2002). *Paired Programming Project: Focus Groups with Teaching Assistants and Students*. (Report No.: NCSU CSC TR-2002-16) Dept. of Computer Science, NC State University, Raleigh, NC.

Technical Report, Non-Refereed

Wiebe, E. N., Mendick, M. & Summey, J. (1998). *Specification and development of intranet-based product data management tools for the furniture industry.* (Tech. Rep. No. 1998-1). Raleigh, NC: North Carolina State University, Furniture Manufacturing and Management Center.

Wiebe, E. N., Norton, J. J., Summey, J. & Howe, J. E. (1997). *Organizational assessment of integrating CAD and product data management tools in the furniture industry*. (Tech. Rep. No. 1997-3). Raleigh, NC: North Carolina State University, Furniture Manufacturing and Management Center.

Wiebe, E. N., & Summey, J. (1996). *Enhancing product development through parametric and product data management tools*. (Tech. Rep. No. 1996-1). Raleigh, NC: North Carolina State University, Furniture Manufacturing and Management Center.

Wiebe, E. N., & Summey, J. (1995). *Assessment of current trends in computer-aided design and manufacturing in the furniture industry* (Tech. Rep. No. 1995-3). Raleigh, NC: North Carolina State University, Furniture Manufacturing and Management Center.

Research Presentation, Invited

Wiebe, E. N. (March, 2016). *Goals and Engagement: Learners in Information Environments*. Invited Keynote at the ACM SIGIR Conference, Chapel Hill, NC.

Wiebe, E. N. (February, 2012). *Planning a research study on games and gaming.* Invited Symposium at the NSF CE-21 PI Meeting, Washington, DC.

Lester, J., Wiebe, E. N., Boyer, C., & Mott, B. (February, 2012). *The ENGAGE Project.* Poster presented at the NSF CE-21 PI Meeting, Washington, DC.

Wiebe, E. N., Mott, B., Lester, J., & Carter, M. (June, 2012). *The Leonardo Project: Thinking about multimodal interactions with an intelligent tutor.* Invited Symposium at the NSF DRK-12 PI Meeting, Washington, DC.

Lester, J., Wiebe, E. N., Mott, B., & Carter, M. (June, 2012). *The Leonardo Project.* Poster presented at the NSF DRK-12 PI Meeting, Washington, DC.

McDonald, S. P., Wiebe, E. N., & Zembal-Saul, C. (April, 2011). *Managing the Digital Intellectual Life(stream) of a 21st Century Science Education Scholar.* Presented at the NARST Annual Meeting, Orlando, FL.

Wiebe, E. N., Shapiro, R. B., & Dorsey, C. (December, 2010). *Deeply Digital Curriculum: The Changing Landscape of Teaching and Learning.* Presented at the NSF DRK-12 PI Meeting, Washington, DC.

Wiebe, E. N. (June, 2010). Professional Development for the New Learning Ecology of Ubiquitous Computing. Invited presentation at ISTE. Denver, CO.

Wiebe, E. N. (September, 2010). *Deeply digital classrooms*. Presented at the EDC/CADRE Deeply Digital Charrette, Washington, DC.

Wiebe, E. N. (November, 2010). I3: Maximizing the Impact of STEM Outreach (MISO) through Data-Driven Decision-Making. Presented at the I3 PI Meeting, Washington, DC.

Wiebe, E. N., Behrend, T., London, J., & Johnson, E. (May, 2009) *The VCL and Cloud Computing in K-16 Education: Current Realities and Future Possibilities*. Presented at IBM University Day, Research Triangle Park, NC.

Wiebe, E. N., Minogue, J., Carter, M., Bedward, J., & Madden, L. (November, 2009). Multimodal Science: Supporting Elementary Science Education through Graphic-Enhanced Communication. Poster presented at the NSF DRK-12 PI Meeting, Washington, DC.

Wiebe, E. N., Minogue, J., Carter, M., Bedward, J. & Madden, L., (November, 2008). *Multimodal Science: Supporting Elementary Science Education through Graphic-Enhanced Communication.* Presented at the NSF DRK-12 PI Meeting, Washington, DC.

Wiebe, E.N., Ho., C-L., Rouskas, G., Raubenheimer, D., Miller, C., Joines, J., Bullard, L. & Silverberg, L. (October, 2008). *Model of Computational Capabilities.* Presented at the CAC Seminar, North Carolina State University, Raleigh, NC.

Wiebe, E. N. & Grable, L. (January, 2007). *Middle Grades Science and Math in the 21st Century.* Invited presentation at the NCDPI leadership retreat, Raleigh, NC.

Clark, A. C., Wiebe, E. N., Ferzli, M. G., Petlick, J. H. & Shown, T. (May, 2004). *VisTE: Visualization in Technology Education.* Poster presented at the NSF K-12 Math, Science, and Technology Curriculum Developers Conference, Arlington, VA.

Conference Proceeding, Applied Research/Extension

Wiebe, E. N., Behrend, T., London, J., & Johnson, E. (March, 2009). *The Virtual Computer Lab in K-12 Settings.* Presented at the Annual CoSN Conference, Austin, TX.

Bedward, J. & Wiebe, E. N. (December, 2008). *Learning thermodynamics and classroom interactions: in middle school science with probeware and simulations*. Presented at the NC Educational Technology Conference (NCETC), Greensboro, NC.

Wiebe, E. N. & Hudnutt, B. S. (2007). Technology and Computer Usage in Middle School Classrooms: How VCL Approaches Can Address Educational Needs in K-12 Education. *Proceedings of the International Conference on the Virtual Computing Initiative.* Research Triangle Park, NC: IBM

Wiebe, E. N. (2003). Using Graphic Communication Design to Understand about Science and Technology. In Haase, D. G., Wojnowski, B. S. & Schulze, S. K. (eds.). *Proceedings of the Conference on K-12 Outreach from University Science Departments: 2003*. Raleigh, NC: The Science House.

Wiebe, E. N. (2002). Graphics for thinking, writing, and talking about science. In Wojnowski, B. S. & Haase, D. G. (eds.). *Proceedings of the Conference on K-12 Outreach from University Science Departments: 2002*. Raleigh, NC: The Science House.

Presentation, Applied Research/Engagement

Behrle, C., & Patterson, L. Shelton, A., & Wiebe, E., (November, 2013). *Argumentation and Inquiry with Electronic Science Notebooks*. Presented at the NSTA Regional Meeting, Charlotte, NC.

Collins, T., Townsend, T., and Wiebe, E.N. (October, 2013). *MISO: Maximizing the Impact of STEM Outreach Through Data-Driven Decision-Making*. Bridging the Gap Conference. Raleigh, NC.

Corn, J. O., Townsend, T., Faber, M., & Wiebe, E. N. (March, 2013). *Scaling your evaluation process*. Workshop presented at the Scaling STEM: Strategies that Engage Minds Conference. RTP, NC.

Wiebe, E., Shelton, A., Green, M., Behrle, C., & Patterson, L. (November, 2012). *Argumentation and Inquiry with Electronic Science Notebooks*. Presented at the North Carolina Science Teacher Association (NCSTA) meeting, Greensboro, NC.

Wiebe, E. & Bedward, J. (November, 2011). *Science Notebooks in Elementary Grades*. Presented at the North Carolina Science Teacher Association (NCSTA) meeting, Greensboro, NC.

Gray, P., Wiebe, E., Teachout, D., Carrier, S., & Scott, C. (March, 2010) *Biomusic in elementary school*. Presentation at the NCDPI Raising Achievement/Closing Gaps Conference, Greensboro, NC

Carrier, S., Wiebe, E., Gray, P., Scott, C., Teachout, D. (November, 2010). *Revealing science and music for elementary students,* Presented at the North Carolina Science Teacher Association (NCSTA) meeting, Greensboro, NC.

Madden, L., Bedward, J., Wiebe, E., Carter, M., & Minogue, J. (November, 2010). *GEES: Online PD tools for enhancing elementary science with graphics*. Presented at the North Carolina Science Teacher Association (NCSTA) meeting, Greensboro, NC.

Wiebe, E., Stein, S., Schaffer, H., & Hollebrands, K. (October, 2009). *Scaling up instructional innovations: Using the VCL to facilitate STEM instruction in rural high schools*. Presented at the 3rd International Conference on the Virtual Computing Initiative. Research Triangle Park, NC.

Wiebe, E. N., Bedward, J., Madden, L., Minogue, J., & Carter, M., (November, 2009). *GEES: Graphic-Enhanced Science*. Presented at the NCSTA Meeting, Greensboro, NC.

Wiebe, E. N., Behrend, T., Johnson, E., & London, J. (October, 2008). *Facilitating Pre-College Education with the VCL.* Presented at IBM University Day, Research Triangle Park, NC.

Wiebe, E. N., Minogue, J., Bedward, J., & Madden, L. (October, 2008). *Graphic-Enhanced Elementary Science.* Presented at the NSTA Area Conference in Charlotte, Charlotte, NC.

Carrier, S., Gray, P., Wiebe, E. N., Teachout, Hall, D., & Patillo, C. (October, 2008). *Bringing Music into the Elementary Science Classroom.* Presented at the NSTA Area Conference in Charlotte, Charlotte, NC.

Behrend, T. S., Wiebe, E. N., & Sharek, D. A. (May, 2008). *VCL in the community colleges: Strategies for maximizing effective usage*. Presented at the International Conference on the Virtual Computing Initiative. Research Triangle Park, NC.

Wiebe, E. N. & Ferzli, M. (November, 2007). *Making Sense of Scientific Data.* Presented at NCSTA, Greensboro, NC.

Wiebe, E. N. & Hudnutt, B. S. (May, 2007). *Technology and Computer Usage in Middle School Classrooms: How VCL Approaches Can Address Educational Needs in K-12 Education.* Presented at the International Conference on the Virtual Computing Initiative. Research Triangle Park, NC.

Wiebe, E. N. & Grable, L. (November, 2006). *21st Century Teaching and Learning in Middle School Science.* Presented at NCSTA, Greensboro, NC.

Wiebe, E. N., Carter, M. & Ferrzli, M.(March, 2005). *LabWrite: Improving Lab Report Writing.* Presented at the North Carolina AP Forum. Durham, NC.

Ferzli, M. & Wiebe, E. N. (November, 2005). *LabWrite: Lab report writing in high school.* Presented at NCSTA, Greensboro, NC.

Wiebe, E. N. & Snoke Harris, B. (October, 2004) LabWrite: Lab report writing in the middle grades. Science House-Asheville Workshop. Asheville, NC.

Wiebe, E. N., Ferzli, M., Clark, A. C., & Petlick, J. (November, 2004). *VisTE: Visualization of scientific and technical concepts in the classroom.* Presented at NCSTA, Greensboro, NC.

Ferzli, M., Wiebe, E. N., & Allen, T. (November, 2004). *LabWrite: Scientific inquiry and writing in science labs.* Presented at NCSTA, Greensboro, NC.

Clark, A. C., Wiebe, E. N., Petlick, J. & Ferzli, M. (January, 2004). *VisTE: Visualization in Technology Education.* Presented at the NCSDPI Technology Education Winter Meeting, High Point, NC.

Ferzli, M., Wiebe, E. N., & Allen, T. (November, 2003). *LabWrite II: An interactive lab report tutorial.* Presented at NCSTA, Greensboro, NC.

Wiebe, E. N., Clark, A. Ferzli, M. McBroom, R., & Petlick, J. (November, 2003). *Visualization and communication in science.* Presented at NCSTA, Greensboro, NC.

Wiebe, E. N., M. Ferzli, .& M., Carter, (November, 2001). *LabWrite: Improving lab report writing* Presented at NCSTA, Greensboro, NC.

Ferzli, M., Wiebe, E. N. & Carter, M. (2001). *LabWrite: A Web Site for Improving the Quality of Lab Reports*, Presented at the North Carolina Association for Research in Education Annual Meeting, Charlotte, NC.

Kimmons, R., Wiebe, E. & Hasse, E. (July, 1999). *Scientific visualization techniques in the classroom*. Presented at the SDPI Science Education Leadership Meeting, Southern Pines, NC.

Shown, T., Wiebe, E. & Kimmons, R. (February, 1999). *Scientific visualization integration project*. Presented at the SDPI Winter Leadership Conference, High Point, NC.

Wiebe, E. N. and Branoff, T. (November, 1995). *The World Wide Web in Education*. Workshop presented at the Engineering Design Graphics Division of the American Society for Engineering Education, Mid-Year Meeting, Iowa State University, Ames, IA.

Wiebe, E. N. and Branoff, T. (November, 1990). *Instructional Applications in HyperCard*. Workshop presented at the Engineering Design Graphics Division of the American Society for Engineering Education, Mid-Year Meeting, Arizona State University, Tempe, AZ.

Wiebe, E. N. (July, 1989). *An Integrated Database System for Facilities Management*. Presented at the Fifth International Forum on Micro-based CAD, Research Triangle Park, Raleigh, NC.

4. Membership in professional organizations

NC Science Teachers Association	2000-present
National Association of Research in Science Teaching	2002-present
American Educational Research Association	2004-present

5. Scholarly and professional honors

2014-2015 NC State University Faculty Scholar

IBM Faculty Research Awardee (2006-2011)

2008 NCTE Award in Technical and Scientific Communication in the category of Best Article on Pedagogy or Curriculum in Technical or Scientific Communication

2008 ASEE/EDGD Chair's Award for the Best Paper at the ASEE annual meeting

2002 ASEE/EDGD Chair's Award for the Best Paper at the ASEE annual meeting

6. Grants Awarded

August 2017 – July 2021. PI on a NSF-DRL/DRK-12 grant (DRL-1721000) titled *FLECKS: Fostering Collaborative Computer Science Learning with Intelligent Virtual Companions for Upper Elementary Students*. This collaborative project with PI Kristy Boyer (Computer Science, University of Florida) will design, develop, and iteratively refine FLECKS' intelligent virtual learning companions, which support dyads of students in a scaffolded learning environment where students solve challenges using computational thinking practices. These companions will enhance the classroom experience by adapting in real time to the students' patterns of collaboration and problem solving to provide tailored support specifically for that pair of students. The virtual learning companions will model crucial dimensions of healthy collaboration through their dialogue with one another, including self- explanation, question generation, attributing challenges to the task and not to deficits in each other, and establishing common ground through uptake of ideas. Collin Lynch (Computer Science, NCSU)

is co-PI. Value of the grant is $2,995,963 ($1,399,088 to NCSU) over four years.

January 2017 – December 2019. Co-PI on an internally funded NCSU GRIP project (Game-Changing Research Incentive Program) titled *Computer Science for All K-12 Students*. This project will establish NC State as a national center addressing critical needs in K-12 CS education by providing pre-college students with foundational knowledge and skills in Computational Thinking. The team will take a broad-based, systemic approach to addressing this challenge by fostering state-of-the-art educational innovations, conducting design research in partnership with K-12 schools, developing and implementing scalable and effective approaches to preparing teachers, and working with state government and business leaders to make NC a model in bringing computational thinking and digital-age workplace skills into K-12. PI on the project is Glenn Kleiman (Friday Institute). Also on the project are co-PI Tiffany Barnes (Computer Science), Sr. Advisor James Lester (Computer Science), and External Evaluator, Kimberly O'Mally (RTI). Value of the grant is $574,000 over three years.

December 2016 – November 2017. Senior Researcher on a contract with the North Carolina School of Science and Mathematics (NCSSM) and Duda|Paine Architects (DPA) to create an educational programming plan for the new NCSSM Western Campus (NCSSM-West). A research-practice partnership framework will support a collaborative and iterative process to coordinate the strengths of the practitioner partner (NCSSM), the design partner (DPA), and the research partner (Friday Institute) to develop a product (the NCSSM-West Plan) that is reflective of the goals, expertise, and needs of the practitioner and design partners while also incorporating data collected from local- and state level stakeholders via a research-based approach to information-gathering and analysis. Contract lead Trip Stallings (Friday Institute). Value of the contract is $481,000 over one year.

August 2016 – July 2019. Co-PI on a NSF-DRL/STEM+C grant (DRL-1640141) titled *ENGAGE: A Game-based Curricular Strategy for Infusing Computational Thinking into Middle School Science.* This project will develop, implement, and evaluate strategies and curricula for infusing middle grades science with computational thinking principles. The team will utilize the game-based learning environment developed in the previously funded ENGAGE project. A particular focus is the engagement and support for populations historically underrepresented in CS. James Lester, (Computer Science), PI; Brad Mott (Computer Science), Kristy Boyer (U of FL), and David Blackburn (U of FL) co-PIs. Value of the grant: $2,498,862 over three years.

August 2016 – July 2020. Co-PI on a NSF-DUE/IUSE grant (DUE-1626235) titled *PRIME: Engaging STEM Undergraduate Students in Computer Science with Intelligent Tutoring Systems*. This project will develop an intelligent tutoring system that provides individualized problem-solving and motivational support in an introductory computing course for STEM majors. A primary goal will be to infuse computational thinking into undergraduate STEM education and to support populations that have been historically underrepresented in STEM majors. James Lester, (Computer Science), PI, Brad Mott (Computer Science), Kristy Boyer (U of FL) co-PI. Value of the grant: $1,499,828 over four years.

November 2015 – December 2018. Co-PI on a Burroughs Wellcome Fund grant titled *iNnovative Exploration of Science and Technology (iNEST)*. This project, in collaboration with the Wake Young Women's Leadership Academy (WYWLA), will integrate targeted STEM activities into a new after-school maker club two afternoons per week throughout the school year. The project targets three goals: 1) develop students' problem solving skills associated with computational thinking through interest-driven inquiry; 2) develop students' leadership skills through interest-driven quests, collaboration and peer mentoring in a maker community, and opportunities to lead making events; and 3) develop students' understanding and appreciation of STEM college and career paths. Kevin Oliver, (TELS), PI. Value of the grant: $177,428 over three years.

September 2015 – August 2019. Co-PI on a NSF-HER/DRK-12 (DRL-1503311) titled *Guiding Understanding via Information from Digital Environments (GUIDE)*. This project will investigate how to capture meaningful data about student interactions with a high school genetics digital learning platform and utilize it to support student learning. The research will focus on how to interpret student interactions—individually and in small groups—and utilize it to provide both adaptive scaffolding within the system and support teachers' strategic decision-making around teaching. Chad Dorsey, (Concord Consortium), PI; James Lester (Computer Science) and Frieda Reichsman (Concord Consortium), co-PIs. Value of the grant: $2,991,839 over four years.

August 2014 – July 2017. Co-PI on a NSF-IIS/CHS grant (IIS-1409639) titled *CHS: Medium: Adapting to Affect in Multimodal Dialogue-Rich Interaction with Middle School Students*. This project will address the question: "How can we design learning environments that adaptively respond to students' affect to create the most effective, engaging learning experiences while simultaneously promoting improved attitudes toward learning?" Through a series of basic and applied research studies, this project will design, develop, and iteratively refine an integrated affect and dialogue management model that adaptively responds to students' affective states in the

course of their learning interactions. James Lester, (Computer Science), PI; Brad Mott and Kristy Boyer, co-PIs. Value of the grant: $1,184,073 over three years.

January 2012 – December 2014. Co-PI on a NSF-CNS/CE21 grant (CNS-1138497) titled *Type I: ENGAGE: Immersive Game-Based Learning for Middle Grade Computational Fluency*. This project will develop, implement, and evaluate a middle grades version of the CS Principles course that is fully situated within an immersive game-based learning environment. The team will research and evaluate the effectiveness of the game-based learning framework on student learning, computing interest, and self-efficacy, particularly for underrepresented groups. James Lester, (Computer Science), PI; Brad Mott and Kristy Boyer, co-PIs. Value of the grant: $1,031,996 over three years.

September 2010 – August 2015. Co-PI on a NSF-HER/DRL I^3 (Institutional Innovation through Integration) project (DUE-1038154) titled *Maximizing the Impact of STEM Outreach through Data-driven Decision-Making (MISO)*. The project's goal is to creatively integrate longitudinal evaluation with innovation within NC State's K-12 STEM outreach programs, particularly those funded by NSF, to help ensure the breadth and depth of the future U.S. STEM workforce. The vision for MISO is an integrated institutional structure that will allow pre-college programs to think and act strategically to meet their goals to enhance the STEM pipeline. Warwick Arden (Provost), PI; Jose Picart (Vice-Provost), and Scott Ragan (Science House), co-PIs. Value of the project: $1,248,874 over five years

September 2010 – August 2013. Co-PI on a NSF-HER/DRL REESE grant (DRL-1007962) titled *Emerging Research-Empirical Research--An Integrated Model of Cognitive and Affective Scaffolding for Intelligent Tutoring Systems*. This project will research cognitive and affective dimensions of intelligent tutors in introductory undergraduate computer science. James Lester, (Computer Science), PI; Brad Mott, co-PI. Value of the grant: $1,542,275 over three years.

August 2010 – July 2014. Co-PI on a NSF-HER/DRL DRK-12 grant (DRL-1020229) titled *The Leonardo Project: An Intelligent Cyberlearning System for Interactive Scientific Modeling in Elementary Science Education*. This project will look at the use of intelligent agents as part of an electronic science notebook to support learning in grades 4-5 science education. James Lester, (Computer Science), PI; Brad Mott (Computer Science), and Mike Carter (Graduate School/English), co-PIs. Value of the grant: $3,499,410 over four years.

September, 2009 – August, 2013. Co-PI on an NSF-HER/DRL ITEST grant (DRL-0929543) titled *Scale-Up: Scaling up STEM Learning with the VCL*. This project will investigate the scale-up of the twin innovations of a cloud computing infrastructure and using a 1to1 laptop environment to teach algebra and geometry. The goal is to enhance the STEM career interest and readiness of through a better understanding of how mathematics instruction can evolve in 1to1 environments. PI is Sarah Stein (Provost's Office and Communication). Other co-PIs include Karen Hollebrands (Mathematics Education) and Henry Schafer (Provost's Office). Value of the grant: $1,758,000 over four years.

July, 2008 – June, 2009. PI on an IBM Faculty Development grant titled *Pilot and Evaluation of VCL in High School Science Classrooms in North Carolina***.** This project will extend the current research work with the Virtual Computer Lab (VCL) technologies being developed at NC State University to high school STEM instruction. This pilot project will collect data on the challenges and strategies for VCL implementation in K-12 education and help support scaling of VCL technologies for statewide K-20 use. Value of the grant: $35,000 over one year.

January, 2008 – December, 2009. PI on a NSF-HER/DRL DRK-12 grant (DRL-0733217) entitled *Multimodal Science: Supporting Elementary Science Education through Graphic-Enhanced Communication*. This project will create teacher professional development materials to support the effective use of student-produced graphics in grades 2-5 science instruction. Co-PIs are James Minogue (Elementary Education) and Michael Carter (English). Value of the grant: $368,000 over two years.

January, 2008 – June, 2010. Co-PI on a NSF-HER/DRL DRK-12 grant (DRL-0732120) entitled *Universal BEATS: Modules to Help Educators Develop Universal BioMusic Education Achievement Tier in Science*. This project will create instructional materials for grades 2-5 that will support science instruction through music. PI is Patricia Gray (Music Education, UNC-G). Other co-PIs include Sarah Carrier (Elementary Education) and David Teachout (Music Education, UNC-G). Value of the grant: $333,000 ($153,000 for the NCSU sub-award) over 30 months.

July, 2007 – June, 2010. Co-PI on a NSF-CCF/CPATH grant (CNS-0722192) entitled *CPATH-CB: Computing Across the Curricula*. This project will develop undergraduate standards for computational literacy in the engineering curricula and propose academic and institutional reforms to support these goals. PI is George Rouskas (Computer Science). Other co-PIs include Lisa Bullard (Chemical Engineering), Jeffery Joines (Textile

Engineering), and Larry Silverberg (Mechanical and Aerospace Engineering). Value of the grant: $225,000 over three years.

August 2007 – June 2008. PI on a subcontract from ITD titled *Evaluation of Virtual Computing Environment (VCE) Readiness in NC Community Colleges.* This evaluation project is funded by a $1,000,000 initiative from the State of NC to pilot the use of VCL/VCE technologies in the community college system. The project team includes two graduate assistants, the VCL project team at ITD and Wake Tech Community College. Value of the contract: $55,000 over one year.

July, 2006 – June, 2007. PI on an IBM Faculty Development grant titled *Building an Information Management and Delivery Platform for Developing 21st Century Skills in Northeast North Carolina*. This project continues the work of the IBM SUR project and will develop scenarios for how advanced middleware and server technologies can support advanced math and science activities in middle school classrooms and its associated teacher professional development. Value of the grant: $30,000 over one year.

May, 2006 – June, 2007. co-PI on an internal Friday Institute grant titled *21st Century Teaching and Learning in Northeast North Carolina*. This project focuses on middle school math and science teacher professional development in rural school districts in North Carolina. The goal is to increase the use of data-rich investigative activities in the classroom that are aligned with both the NC standard course of study and future-ready workplace skill guidelines developed by the Partnership for 21st Century Skills. Value of the grant: $110,000 over one year.

May 2005 – April 2008. Co-PI on an interdisciplinary NSF Course, Curriculum, and Laboratory Improvement grant, entitled *An Interactive Approach to Formal Languages and Automata with JFLAP*. This project's goal is to develop an innovative way of teaching FLA and evaluate JFLAP's effectiveness through an implementation at six pilot sites. My role will be to head up the evaluation effort on this project. PI is Susan H. Rodger (Duke University, Computer Science). $350,000 over three years.

March, 2005. co-PI on an IBM SUR gift titled Next-Generation Education for Pervasive, Technology-Rich Learning Environments. This gift helped provide portions of the initial IT infrastructure of the Friday Institute. Value of the gift: $246,000 in IBM technology.

Febuary 2003 – January 2006. PI on a grant from the NC GlaxoSmithKline Foundation, titled *Visualization in Science Education.* This project will develop the infrastructure of the Mathematics and Science Education Collaboratory in the Friday Institute for Educational Innovation, focusing on applied research, materials development, and outreach in science education. The project team investigated how spatial visualization can be more effectively integrated into the science classroom and on investigating how the new Friday Institute, in conjunction with its partners, can more effectively support K12 science education in NC. The project team includes David Haase, Sharon Schulze, Beth Snoke-Harris (Science House), John Park, John Penick, Glenda Carter, a graduate student, and a research technician. Value of the grant: $1,000,000.

January 2003 – July 2005. Co-PI on a grant from NSF-EHR/DUE-CCLI-EMD (DUE-0231086), titled *LabWrite: Visualizing data and writing about laboratory investigations*. This national dissemination project is a continuation of an earlier pilot project investigating how instruction on the creation and use of lab reports in undergraduate science, engineering, and technology can be improved. My primary role in the project will be to look at the role of data visualization in the exploration and presentation of lab data. I will also be involved in the development of multimedia support materials and the evaluation of project. The team is headed by Michael Carter (English) and includes one graduate student, one post-Doctoral researcher, one undergraduate intern and contract programmers. Value of the grant: $487,000.

June 2002 – July 2005. Co-PI on a grant from NSF-EHR/ESIE-IMD (DRL-0137811), titled *VisTE: Visualization in Technology Education.* This project will develop instructional materials based around Scientific Visualization for use in the Technology Education curriculum. My role on the project will be to lead the instructional materials development team and assist in the project evaluation design. The team will be led by Aaron Clark and includes two post-Doctoral researchers and two undergraduate interns. Value of the grant: $923,000.

February 2000 - March 2001. Co-PI on a grant from NSF-HER/DUE-CCLI-EMD (DUE-9950405), titled *LabWrite: Instructional Modules Utilizing the Lab Report*. Value of the grant: $87,260.

September 1999 - August 2002. Senior Faculty on a grant from Dept. of Education (DOE), titled *MentorNet: A Consortium of NC IHEs, School Systems, and Teachers Partnering to Prepare Future Teachers to become Proficient, Critical Users of Instructional Technology*. Value of the grant: approximately $1,000,000.

July 1998- June 1999 Principal Investigator of grant titled *CAD/PDM Strategies In The Furniture Industry: Application Of Research* through the Furniture Manufacturing and Management Center, NCSU. Value of the grant: $29,718.

July 1998- June 2000 Co-PI of a grant titled *Scientific and Technical Visualization Curriculum Development and Dissemination* Tech Prep grant through the State Dept. of Public Instruction, State of North Carolina and Guilford Co. Schools. Value of the grant: $150,000.

July 1997- June 1998 Principal Investigator of grant titled *An Intranet PDM Toolset for the Furniture Industry* through the Furniture Manufacturing and Management Center, NCSU. Value of the grant: $29,718.

July 1996- June 1998 Consultant and member of the steering committee of a grant titled *Scientific and Technical Visualization Curriculum for High Schools* Tech Prep grant through the State Dept. of Public Instruction, State of North Carolina. Value of the grant: $270,000.

July 1996- June 1997 Principal Investigator of grant titled *Assessment of CAD and Product Data Management Tools in the Furniture Industry* through the Furniture Manufacturing and Management Center, NCSU. Value of the grant: $24,629.

July 1995 - June 1996 Principal Investigator of grant titled *Product Information Integration Through CAD in the Furniture Industry* through the Furniture Manufacturing and Management Center, NCSU. Value of the grant: $25,629.

July 1994 - June 1995 Principal Investigator of grant titled *Assessment of Current Trends in Computer-aided Design and Manufacturing in the Furniture Industry* through the Furniture Manufacturing and Management Center, NCSU. Value of the grant: $14,948.