UNIVERSITY OF MICHIGAN-DEARBORN
SCHOOL OF EDUCATION

University of Michigan-Dearborn Inquiry Institute
Faculty Research Projects

Elementary Science Program Revisions

Inquiry Institute members have described our overall philosophy and principles guiding our programmatic changes in several publications and presentations.

- Otto, C., Luera, G. & Everett, S. (2009). "An innovative course featuring action research integrated with unifying science themes." *The Journal of Science Teacher Education*, 20(6), 537-522.
- Luera, G. & Otto, C. (2005). "Development and evaluation of an inquiry-based elementary science teacher education program reflecting current reform movements." *Journal of Science Teacher Education, 16*(3), 241-258.
- Burke, C.J.F., Luera, G. & Moyer, R. (2004). "Preparing pre-service elementary school teachers to teach science: An evaluation of the development and implementation of a reformed program at the University of Michigan-Dearborn." *Michigan Journal of Teacher Education, 1*(2), 42-47.
- Moyer, R., Luera, G. & Nesmith, J. "A comprehensive approach to the evaluation of an inquiry-based science education program." Paper presented at the Hawaii International Education Conference, Honolulu, HI. January 10, 2003.

Inquiry-Based Science

Inquiry-based science has been a focus of research and scholarship. Inquiry Institute members have addressed topics such as how to create inquiry lessons, how content knowledge affects lesson-writing ability and how to model inquiry.

- Everett, S., Otto, C., Moyer, R. & Zitzewitz, P. "The Impact of an Inquiry-Based Science Education Program for Pre-Service Elementary Teachers." Paper presented at the National Association for Research in Science Teaching (NARST), Philadelphia, PA, March 21-24, 2010.
- Everett, S. & Moyer, R. "Examining the Scientific Reasoning Abilities of Pre-Service Elementary Teachers in an Inquiry-Based Science Program." Paper presented at the Association for Science Teacher Education (ASTE), Hartford, CT, January, 2009.
- Everett, S. & Moyer, R. "Analysis of pre-service elementary teachers' 5E learning cycle science lesson plans." Paper presented at the Association for Science Teacher Education (ASTE), St. Louis, MO. January 10, 2008.
- Everett, S. & Moyer, R. (2009). "Literacy in the Learning Cycle: Incorporating trade books helps plan inquiry-learning experiences." *Science and Children, 47*(2), 48-52.
- Everett, S. & Moyer, R. (2007). "Inquirize your teaching: A guide to turning favorite activities into inquiry lessons. " *Science and Children, 44*(7), 54-57.
- Moyer, R., Hackett, J. & Everett, S. (2007). *Teaching Science as Investigations: Modeling Inquiry through Learning Cycle Lessons*. Columbus, OH: Pearson Merrill Prentice Hall, 339 pages.
- Luera, G., Moyer, R. & Everett, S. (2005). "What type and level of science content knowledge of elementary education students affect their ability to construct an inquiry-based science lesson?" *Journal of Elementary Science Education, 17*(1), 12-25.

Unifying Themes

The Science Capstone course (EXPS 420) integrates one of the "big ideas" or unifying themes of science in each offering. Research focused on individual unifying themes such as energy, systems, and models has been presented and published.

- Everett, S. & Otto, C. (2009). "Giants Don't Exist in the Real World: Challenges of Teaching Scale and Structure." *Science Scope, 33*(4), 40-43.

- Otto, C. & Everett, S. (2008). "Using unifying themes with the K-7 Grade Level Content Expectations." *Issues in Education - Preschool Through Graduate, 1*(1), 37-42.
- Everett, S. & Luera, G. (2005). "Using unifying themes in a science capstone course for elementary education majors." *The Michigan Journal of Teacher Education*, *2*(2), 1-7.
- Luera, G., Otto, C. & Zitzewitz, P. (2005). "A conceptual change approach to teaching energy and thermodynamics to pre-service elementary teachers." *Journal of Physics Teacher Education Online*, *2*(4), 3-8.

Science Capstone Course

Research focused on specific content related to the Science Capstone Course (EXPS 420) has centered on a variety of topics such as writing, development of mathematical thinking and on integration of misconception research.

- Otto, C., Everett, S. & Luera, G. (2008). "Using a functional model to develop a mathematical formula." *School, Science and Mathematics*, *108*(6), 228-237.
- Everett, S., Luera, G. & Otto, C. (2008). "Improving pre-service elementary teachers' writing in a science context." *The Journal of College Science Teaching*, *37*(6), 44-48.
- Everett, S., Luera, G. & Otto, C. (2007). "Pre-service elementary teachers bridge the gap between research and practice." *International Journal of Science and Mathematics Education*, *6*, 1-17.

Natural Sciences Courses

Innovative curricula such as the *Physics for Elementary Teachers (PET)* and *Physical Science for Everyday Thinking (PSET)* have the focus of several presentations. Presentations on creative earth science inquiry-based activities have been conducted at teacher conferences.

- Hartshorn, P. & Boatin, H. "The Amazing Race: A lesson on how to use compasses." Paper presented at the Michigan Science Teachers Association (MSTA). Detroit, MI. March, 2009.
- Zitzewitz, P. & Devlin, J., Savage, R.M. & Smith, C. "Is special training necessary to teach "Physics for Elementary Teachers"?" Paper presented at the American Association of Physics Teachers (AAPT). Seattle, WA. January, 2007.
- Zitzewitz, P. "Impact of the technology-rich PET curriculum on future elementary teachers." Paper presented at the American Association of Physics Teachers (AAPT). Anchorage, AK. January, 2006.
- Hartshorn, P. & Swift, C. "Earth science in the teen's room." Presentation at the Michigan Science Teacher's Association Meeting. March 3, 2006.
- Hartshorn, P. & Swift, C. "Earth science in the kid's room." Presentation at the Michigan Science Teacher's Association Meeting. March 3, 2006.
- Zitzewitz, P. "Experiences teaching the new curriculum 'Physics for Elementary Teachers.'" Paper presented at the Michigan American Association of Physics Teachers (AAPT). April, 2005.
- Zitzewitz, P. & Devlin, J. "Student learning in physics for elementary teachers (PET)." Paper presented at the American Association of Physics Teachers (AAPT). Salt Lake City, UT. August, 2005.
- Hartshorn, P. & Swift, C. "Earth science in the kitchen I." Presentation at the Michigan Science Teacher's Association Meeting. March 3, 2005.
- Hartshorn, P. & Swift, C. "Earth science in the kitchen II." Presentation at the Michigan Science Teacher's Association Meeting. March 3, 2005.
- Luera, G. & Zitzewitz, P. "Elementary education students' reflections on what and how they learned physics." Paper presented at the American Association of Physics Teachers (AAPT). Madison, WI. August, 2003.

Pedagogical Content Knowledge

One of the more recent research interests of some of the Inquiry Institute members is a focus on pedagogical content knowledge (PCK). Several presentations featuring the results of this research have been given.

- Everett, S., Luera, G. & Otto, C. "Investigating the pedagogical content knowledge of pre-service elementary teachers concerning models." Paper presented at the National Association for Research in Science Teaching (NARST), Baltimore, MD, March, 2008.

- Luera, G., Everett, S. & Otto, C. “Progress towards developing a measure to assess the pedagogical content knowledge of pre-service elementary teachers concerning models.” Poster presented the National Association for Research in Science Teaching (NARST), New Orleans, LA, April, 2007.

Assessment

Assessment of both growth of student knowledge in specific courses and in teaching ability have been investigated by some Inquiry Institute members.

- Everett, S., Otto, C. & Luera, G. “Pre-service elementary teachers’ growth in knowledge of models in a Science Capstone course.” *International Journal of Science and Mathematics Education*, 7(6), 1201-1225.
- Luera, G., Otto, C. & Zitzewitz, P. (2006). "Use of thermal concept evaluation to focus instruction." *The Physics Teacher, 44*(3), 162-166.