Resource Exchange: A Taste of T2I2 (Transforming Teaching through Implementing Inquiry)

Ms. Sharon Wensel Bowers, Virginia Tech

Sharon Bowers is a doctoral student and graduate research assistant in Integrative STEM Education at Virginia Polytechnic Institute and State University.

She is also a Senior STEM educational specialist for the Center for Integrative STEM Education (CISE) at the National Institute of Aerospace (NIA). Sharon recently retired from Virginia Beach City Public schools after more than 30 years as a science educator. Her work with children earned her several honors, including recognition as a Secondary Science Presidential Award Winner for Virginia.

Sharon is developing and teaching five graduate courses for McDaniel College that lead to a certificate in elementary STEM education and is a consultant for Stevenson University.

Through her work with NIA, Sharon has developed resources that model best practice in the use of instructional technology to support 21st Century teaching and learning. Through partnerships with NASA and local school divisions, NIA has developed NIA Universe, a multi-user interactive, synchronous virtual world that brings together students, teachers, and experts for collaborative work. Sharon oversees the development and use of this emerging technology to support collaborative, inquiry-based instruction.

Dr. Jeremy V. Ernst, Virginia Tech

Jeremy V. Ernst is an Associate Professor of Integrative STEM Education at Virginia Tech and he is also the Associate Director for the School of Education/Office of Educational Research and Outreach. He is also a Fellow of the Institute for Creativity Arts and Technology at Virginia Tech. Jeremy specializes in research focused on dynamic intervention means for STEM education students categorized as at-risk of dropping out of school. He also has curriculum research and development experiences in technology, engineering, and design education.

Dr. Aaron C. Clark, North Carolina State University

Aaron C. Clark is a Professor of Technology, Design, and Engineering Education within the College of Education, as well as the Director of Graduate Programs and Associate Department Head for the Department of Science, Technology, Engineering and Mathematics Education. He has worked in both industry and education. Dr. Clark's teaching specialties are in visual theory, 3-D modeling, technical animation, and STEM-based pedagogy. Research areas include graphics education, game art and design, scientific/technical visualization and professional development for technology and engineering education. He is a Principle Investigator on a variety of grants related to visualization and education and has focused his research in areas related to STEM curricula integration.

What is T2I2? *Transforming Teaching through Implementing Inquiry* offers secondary technology teachers flexible and practical professional development experiences that can be applied directly and immediately into classroom instruction.

Eighteen professional development learning objects, organized within four units, are packaged within *T2I2*. The learning objects address these units and topics:

- **Demonstration Lesson**

- **Designing Standards Based STEM:** Align lessons and assessments to standards through specific benchmark alignment with STL, while identifying the natural intersections of NCTM, CCSS-M, AAAS, NSES, and NGSS standards in efforts to promote the quality of science, technology, engineering, and mathematics education.
- **Lab and Class Management:** Class and lab management that endorses positive student behavior in order to provide a safe environment, as well as manage individual, group, and rotational class structure
- **STEM Curricula:** Apply criteria and selection consideration for science, technology, engineering, and mathematics instructional materials
- **Engaging Females in STEM:** There is a significantly smaller number of women in STEM fields than men (Engineering in particular), and efforts in K-12 education can have a positive impact on increasing female interest and persistence in STEM at all grade levels.

- **Fostering Teamwork**

- **Best Practices:** Identifying and employing research informed educational models developed to increase achievement for all students
- **Classroom Quality:** The teacher ensures an effective educational environment by gauging quality indicators
- **Enhancing Classroom Creativity:** Managing inclusive learning environments to enhance classroom creativity by inquiry activities that support unique and independent thought, problem solving, and critical thinking
- **Implementing Learning Activities:** Incorporating differentiated instruction that caters to student learning while facilitating the application of knowledge through the implementation of student learning activities
- **Multiculturalism in the Classroom:** Promoting multiculturalism in the classroom through the appreciation and exploration of social and cultural differences
- **Working with Special Populations:** Actively engaging students with categorical disabilities and students at-risk through adapting instruction and creating an inclusive educational climate

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- **Assessment of Student Learning**
  - **Action Research:** Learning through the study and analysis of actual classroom practice, implementation approaches, and student successes
  - **Adapting Instruction:** Adjusting instruction after identifying preexisting knowledge and skills, identifying students' current level of competency, and determining approaches and techniques necessary to reach achievement goals
  - **Data Analysis:** Using analysis tools to define evidence of learning, sense patterns, and ultimately drive educational decision making
  - **Formative Evaluation Techniques:** Formative evaluation is evaluation using formal and informal feedback to assess teaching practice and student learning
  - **Initial Student Evaluation:** Evaluation of cognitive and psychomotor development to serve as an operational baseline to guide instructional practice
- **Documented Accomplishments**
  - **Professional Organizations:** Promote educators' knowledge base and understanding by active involvement in local, state, regional, and national organizations, professional learning communities, and other peer organizations that assist in further development as a professional educator.
  - **School and Community:** Provide educators with tools to build professional relationships that strengthen collaboration between schools, families and communities
  - **Student Organizations:** Amplify students' active involvement in learning by organizing and supporting participation in extra-curricular activities.

What components are in each Learning Object? Each Learning Object is organized around this outline:

- Overview
- Impact on Learning
- Procedures in the Classroom
- Determine Success
- Check for Understanding
- Artifact
- Appendix

Teacher Outcomes: Upon the completion of *T2I2 PD*, teachers will be able to:

- **Evaluate** the learning needs of students and **adjust instruction** to meet those needs.
- **Understand** the **standards-based content** of engineering design, and how to teach inquiry-based technology, engineering, and design education to students using innovative curricula.
- **Manage, monitor**, and **adjust** the learning environment to improve instruction and student learning.
- Use **self-assessment** techniques to improve their teaching.
- **Contribute** to the learning community and educational reform.