College of Education
Department of Secondary Education
University of South Florida

Ph.D. in Curriculum and Instruction with an Emphasis in Science Education

For additional information contact:

Dana L. Zeidler, Ph.D.
Professor of Science Education
Program Coordinator Science Education
Department of Secondary Education
College of Education EDU162
University of South Florida
Tampa, FL 33620-5650 (813) 974-7305
Zeidler@tempest.coedu.usf.edu
Brief History, Goals and Description of Program Goals

A. Overview of Goals

The doctoral program in Science Education is premised on a philosophy that focuses on quality, diversity, flexibility and individualization of graduate research in an effort to maximize the talents and interests of each student in the program. The purpose of our coursework is to expose students to knowledge in relevant fields and engage them in: (a) reflection on pedagogy issues and educational reform, (b) critical analysis, synthesis and evaluation of research literature, (c) construction of rational models of teaching, learning, and program development that are culled from the literature, and (d) the generation of new ideas. The fact that graduate students are regarded as professional colleagues with unique areas of expertise from the beginning of their association with the department contributes substantially to their development as science educators. The program is designed to develop leaders in various important areas of science education who are competent in teaching, research, and scholarship.

The Science Education program faculty agrees that the doctoral program should be in-step with national reform efforts. National and state reform initiatives, as well as the professional experiences of the faculty guide our decisions for the selection of program content and experiences. The professional experiences of the faculty stem from our on-going involvement and commitment to key national/international science education associations including (but not limited to):

- National Association for Research in Science Teaching
- Association for the Education of Teachers in Science
- American Educational Research Association
- American Association for the Advancement of Science
- National Science Education Leadership Association
- National Science Teachers Association
- European Science Education Research Association

The Science Education Program is committed to providing students with opportunities to examine and expand their pedagogical content knowledge and immerses them in the research process. In doing so, we believe that we can graduate exceptional leaders to our field. We perceive the overarching goal of reform to be the development of “Habits of Mind” which is a necessary condition to foster scientific literacy. Accordingly, the Science Education program aims to develop higher-order thinking and critical reflection skills—all which have to do with bringing the intellect to bear on important matters of research and practice. The collective philosophy of the Science Education Program, therefore, is to: foster a vision of science literacy that encourages: theoretical and practical knowledge of the natures of science, developing habits of mind open to multiple scientific perspectives, stressing skepticism and critical thinking, developing conceptual understanding of epistemology applied to pedagogical content knowledge, embedding science in cultural, moral and historical contexts, and providing opportunities for students to generate their own meaningful questions and design approaches to investigate original issues relevant to the science education community.

B. Description of Mission and Program Goals

The overarching mission of the Science Education Doctoral Program in the College of Education is consistent with the Graduate Catalog and the Graduate Handbook (Policies and Procedures): to provide a fertile and stimulating environment that enables students to develop abilities in intellectual inquiry, problem solving, and leadership in order to generate knowledge and improve professional practice. To fulfill this mission, the
program ensures that students will be exposed to a core knowledge base in the areas of Educational Curriculum and Instruction, Foundations, Measurement, Statistics, and Quantitative and/or Qualitative Research Design, Fields of Specialization in Science Education, and Supporting Cognate Fields within the College (e.g. Instructional Technology, other Education electives) or external to the College (e.g. Science Courses from the College of Arts and Sciences). The overall philosophy of this program focuses on quality, diversity, flexibility, and individualization of graduate research in an effort to maximize the interests of each individual student in the science education program.

The exploration of past, present, and future practices, and understanding how current decisions affect future trends is approached through a close professional and personal relationship between faculty and graduate students. This relationship includes advising, working together in directed studies and seminars, professional associations, and informal gatherings and discussions about issues in education in general, and science education in particular. The fact that graduate students are regarded as professional colleagues with unique areas of expertise from the beginning of their association with the department contributes substantially to their development as science educators.

The program is designed to develop leaders in various important areas of science education who are competent in teaching, research, and scholarship. The program’s faculty is committed to the dynamic needs of our community, and national trends in science education to ensure a more robust vision of education in a global market. Coursework in the doctoral program is, therefore, grounded in emerging trends with respect to national goals and professional science educational practices. Accordingly, our goals and coursework are informed by various professional organizations which include: National Association for Research in Science Teaching (NARST), Association for the Education of Teachers in Science (AETS), National Science Teachers Association (NSTA), National Council of Teachers in Mathematics (NCTM), and American Educational Research Association (AERA), among others. Hence, a concerted effort has been made in the design of coursework to study the past development of goals, to understand how those goals have shaped practice, and to remain current with present pedagogical aims, philosophical positions, and empirical research to direct the profession’s future growth. The purpose of our coursework, then, is to expose students to varying bodies of knowledge in relevant fields, provoke thought and discussion about different issues, encourage critical analysis, synthesis, and evaluation of available information, construct rational models of teaching, learning, and program development that are culled from the literature, and encourage the generation of new ideas.

C. Standards

There are six standards that serve as overarching themes for our program. These standards are derived from the aforementioned associations and are meant to focus on the skills, knowledge, and experience necessary for all science educators, regardless of where and by whom they are employed.

• **Standard 1: Knowledge of Science and Nature of Science**
  1.a Possess subject matter knowledge and skills exceeding those specified in the reform documents (National Science Education Standards or Project 2061).
  1.b Have active inquiry/research experiences within his/her discipline preparation in at least one science discipline and a strong functional knowledge in several other science disciplines.
  1.c Demonstrate both depth and breadth of subject matter knowledge with a strong knowledge of science process skills (regardless of level of focus).
1.d Possess levels of understanding of the philosophy, sociology, and history of science exceeding that specified in the reform documents.
1.e Understand the context of science by relating science to students’ lives and investigating relationships among societal problems, personal, social and cultural values, and moral and ethical issues with respect to science.
1.f. Possess an understanding of the nature of science that ensures the ability to engage students in activities defining the values, beliefs, and assumptions inherent to the creation of scientific knowledge within the scientific community, and can compare and contrast science with other ways of knowing.

**Standard 2: Science Pedagogy**

2.a Possess the formal credentials (or the equivalent) required of practicing teachers.
2.b Alternatively, those focusing on informal science education (e.g., museums, aquariums, etc.) should possess significant experience in such settings.

**Standard 3: Curriculum, Instruction, and Assessment**

3.a Document expertise in the development and implementation of curriculum and instructional materials in school settings.
3.b Incorporate broad definitions of technology in the teaching and learning of science.
3.c Possess expertise spanning a variety of assessment approaches, including “traditional” and alternative assessment.

**Standard 4: Knowledge of Learning and Cognition**

4.a Possess an extensive background in cognitive science and behaviorism and their applications to student learning. This knowledge should include the various applications of cognitive psychology and their relationships to the epistemology of science.
4.b Possess an in-depth knowledge of cognitive psychology, including a strong background in developmental psychology, constructivist epistemology, and conceptual change theory/instructional practice.
4.c Awareness of the practical interrelationships of the aforementioned knowledge structures.

**Standard 5: Research/Scholarly Activity**

5.a Possess the skills necessary to appropriately apply varied research approaches to answer significant questions in science education.
5.b Connect theory to practice.
5.c Possess expertise in the development of educational products/materials, professional development programs, or grant writing that are informed by the research literature.

**Standard 6: Professional Development Activities**

6.a Knowledge of, and experience in, science faculty development, including the design and implementation of workshops and institutes.
Using these standards as overarching themes, the current science education doctoral program specifically focuses on developing Ph.D. students who will:

(1) serve as agents for change to lead and support systemic reform in science education that are consistent with national and state goals;
(2) synthesize and apply research-based knowledge to design, implement, and evaluate present and emerging science education reform initiatives from various positions of leadership in the educational enterprise and in the community;
(3) be instrumental in reforming teacher education consistent with national and state goals;
(4) communicate and collaborate with diverse stakeholders
(5) articulate the biological basis of cognition and its relationship to science, technology, and society interaction as reform;
(6) develop well-grounded views in the epistemology and nature of science and their impact on pedagogical practices in science education;
(7) develop an in-depth understanding of fundamental ethical principles in various social-scientific contexts, identify philosophical and psychological theories concerning moral development and apply these concepts to topics appropriate for classroom practice and discourse in science education;
(8) analyze how intellectual development, critical thinking, problem solving and reasoning and are conceptualized in the current educational and psychological literature and apply these conceptualizations to science education; and
(9) apply multiple forms of inquiry and technology in social science research including quantitative, qualitative and philosophical analyses.

In summary, the purpose of the doctoral program in Science Education is to foster expression of individual creativity, encourage scholarly contribution to the field, and promote educational leadership at the local, regional, and national levels. The coursework provided by the program and supporting programs within the College of Education and those external to the College allows the flexibility necessary to meet the changing and diverse needs of our students, and the needs of the profession.