

# SCIENCE (SCIX)

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## **SCIX 500 Chemists in the Making: Fostering Inquiry with Science Notebooks 3 credits**

Scientific inquiry in chemistry asks students to answer real world problems like "How does nail polish remover work?" and "Why is cooking an art, but baking a science?" Through this process, students learn to conduct investigations and collect evidence from various sources to answer their questions. In this course, teachers will learn how to use science notebooks modeled after the notebooks scientists use during inquiry-based chemistry investigations to satisfy students' natural curiosity. Science notebooks help students develop, practice, and refine their understanding in chemistry, while also improving their reading, writing, math, listening, and speaking skills. By the end of the course, teachers will learn how to use science notebooks and inquiry to foster a shift from a teacher-centered to a student-centered approach in chemistry; restructure current lessons and experiments as inquiry-based investigations; align chemistry instruction to the Next Generation Science Standards and the Common Core State Standards; foster twenty-first century skills, including collaboration, creativity, communication, and critical thinking; actively engage students in learning and problem-solving; and support diverse learners with authentic, inquiry-based chemistry instruction. This course is offered through Advancement Courses.

## **SCIX 501 Crafting Engaging Elementary Science Instruction with Stories 3 credits**

When students engage in scientific inquiry, they pose questions and seek answers about the world around them. Scientific inquiry satisfies students' natural curiosity while building their understanding of science concepts. When coupled with captivating picture books and stories, it can also enhance literacy skills, interest in science, and engagement in authentic learning experiences that connect to problem solving in the real world. In this course, you will learn practical methods for using children's literature, reinforced with hands-on, inquiry-based investigations, to build scientific literacy. You will gather resources that you can use to engage students in lessons they will both love and remember. You'll be able to integrate science and reading, using children's literature to guide inquiry in a manner that motivates and excites students, supports science comprehension, and creates a lifelong interest in science. Using the strategies and resources from this course, you'll be able to grow both your students' reading comprehension and their ability to pursue scientific inquiry through engaging, student-centered lessons that you will all enjoy. This course is offered through Advancement Courses.

## **SCIX 502 Effective Teaching and Learning with Scientific Inquiry, Grades 3-8 3 credits**

Too often, students struggle to think critically, ask thoughtful questions, and analyze text. Teaching through inquiry is an effective way to address these issues while improving engagement and long-term retention. But what does inquiry look like? How do you and your students use it successfully, and how does a traditional science classroom evolve into an inquiry-based classroom? Inquiry enhances scientific literacy by engaging students in logical, scientific rationale and argumentation. Both the Next Generation Science Standards (NGSS) and science, technology, engineering, and mathematics (STEM) efforts emphasize the importance of inquiry in science education. In this course, you will learn how to transform activities and experiments into inquiry-based investigations regardless of what subject you teach. Because assessment is essential for any educational framework, you'll also build inquiry-based tools for pre-assessments, formative assessments, and summative assessments. In addition, you will create strategies for a developmentally appropriate, step-by-step approach for using all levels of scientific inquiry and argumentation. Using the techniques from this course, you will be able to transform your classroom into an inquiry-based environment that supports students and inspires them to become self-directed learners. This course is offered through Advancement Courses.

## **SCIX 503 Effective Teaching and Learning with Scientific Inquiry, Grades 9-12 3 credits**

Too often, students struggle to think critically, ask thoughtful questions, and analyze text. Teaching through inquiry is an effective way to address these issues while improving engagement and long-term retention. But what does inquiry look like? How do you and your students use it successfully, and how does a traditional science classroom evolve into an inquiry-based classroom? Inquiry enhances scientific literacy by engaging students in logical, scientific rationale and argumentation. Both the Next Generation Science Standards (NGSS) and science, technology, engineering, and mathematics (STEM) efforts emphasize the importance of inquiry in science education. In this course, you will learn how to transform activities and experiments into inquiry-based investigations regardless of what subject you teach. Because assessment is essential for any educational framework, you'll also build inquiry-based tools for pre-assessments, formative assessments, and summative assessments. In addition, you will create strategies for a developmentally appropriate, step-by-step approach for using all levels of scientific inquiry and argumentation. Using the techniques from this course, you will be able to transform your classroom into an inquiry-based environment that supports students, inspires them to become self-directed learners, and prepares them for college. This course is offered through Advancement Courses.

**SCIX 504 Engaging Students in the Study of Genetics 3 credits**

An understanding of genetics and heredity is essential for 21st-century scientific literacy. Students must have a fundamental understanding of genetics to be able to assess new technologies and their ethical implications, such as research on cancer and genetic diseases, genome definition, transgenic and genetically modified organisms, and cloning. Genetics also provides an excellent opportunity to bring current scientific research and debate into the classroom. Whether you are brand new to the study of genetics or are looking for fresh teaching ideas, this course will prepare you to teach genetics at any grade level. You'll develop concrete methods and content to engage students in understanding and applying principles of genetics, enhancing their scientific literacy, and critically evaluating bioethical issues. In addition, you'll be able to help your students analyze the rapidly changing developments in the world of genetics and their potential impact on society. Using the techniques from this course, you'll be equipped to instill your students with the scientific literacy they need to engage in cutting-edge research and debates in the field of genetics. This course is offered through Advancement Courses.

**SCIX 505 Integrating Engineering Design With Middle Age High School Science Instruction 3 credits**

Effective science instruction that integrates engineering principles teaches students to solve complex problems and contextualizes science within real-world settings, fostering critical-thinking skills. As such, the Next Generation Science Standards (NGSS), the most recent educational science standards, emphasize the importance of integrating a basic knowledge of engineering and the engineering design process in science education. They also include engineering as one of the core science disciplines and offer educators the flexibility of designing authentic learning experiences that engage students' interests and prepare them for college, careers, and beyond. This course provides middle- and high-school science teachers with practical steps for introducing engineering and the engineering design process to engross students in learning science. The course includes strategies for planning, delivering, and assessing engineering-infused lessons that engage diverse learners in science content while teaching them 21st-century skills such as communication and collaboration. Additionally, the course includes ready-made activities that are designed using the Biological Sciences Curriculum Study (BSCS) 5E Instructional Model, a planned sequence of instruction consisting of five student-centered phases (engage, explore, explain, elaborate, and evaluate), each of which helps students construct meaning in science. By the end of the course teachers will be able to integrate engineering with science instruction in a way that cultivates problem-solving skills and promotes scientific inquiry. This course is offered through Advancement Courses.

**SCIX 507 Nature Education and Environmental Literacy 3 credits**

Children today are increasingly indoors, overscheduled, and tied to technology, and many schools have had to cut back on nature education programs in favor of instruction tied to standardized tests. Consequently, fewer students are pursuing careers in environmental science and conservation. However, research has found that when nature education is supported by well-informed, engaged teachers, children develop an "environmental literacy" that greatly benefits them emotionally, creatively, cognitively, and academically. In this course, you will develop practical, actionable strategies to connect students with the natural world. You'll learn the importance and benefits of nature education and explore techniques for teaching environmental literacy to enhance student engagement and performance across disciplines. In addition, you'll create hands-on, creative activities that will nurture students' reflection and observation skills as well as their naturalist intelligence (one of Howard Gardner's multiple intelligences). Using the methods from this course, you will be equipped to instill in your students an appreciation and love of nature that will have a lasting positive impact in their lives. This course is offered through Advancement Courses.

**SCIX 508 Next Generation Science Standards: A New Framework for Authentic Science Instruction 3 credits**

The Next Generation Science Standards (NGSS) are a new set of science educational standards that address needs in K–12 science education, based on A Framework for K–12 Science Education (National Research Council, 2012). The NGSSs are aimed at improving science learning and engagement in the 21st century by (a) incorporating authentic science and engineering practices, (b) identifying crosscutting concepts that are fundamental to connecting knowledge across science and engineering, and (c) establishing disciplinary core ideas that support students' acquisition of new knowledge. In this course, you will take an in-depth look at the framework, including the learning progressions that track how science learning occurs at increasingly sophisticated levels as students get older. You will learn practical strategies for translating the NGSS to classroom practices that engage students in authentic learning, and inspire all students to succeed in science. By the end of the course, you will be able to make the shift to planning and teaching using the NGSS to improve student success in science. This course is offered through Advancement Courses.

**SCIX 510 Teaching Environmental Science 3 credits**

Environmental science is a hot topic on the national and international stage. Because of the political, economic, and ethical concerns surrounding the subject, teaching environmental science is no longer a simple matter of examining environmental processes. Rather, it is a complex interweaving of current events, the study of ecosystems, and the application of the scientific method. In this course, you will develop tools and strategies for teaching current environmental thought; physical, chemical, and biological principles related to environmental science; environmental economics and ethics; and current environmental problems. Using Vygotsky's Theory of Instruction and Development, you will examine how to nurture active learning and help students become critical consumers of information in the field of environmental science. By teaching students to interpret data using the scientific method, you'll foster their development of evidence-based reasoning skills and prepare them to sort through misconceptions and new concepts in the field. Using the methods from this course, you'll be able to produce students who are critical, unbiased scientific thinkers who can engage with environmental issues with a global view in mind. This course is offered through Advancement Courses.

**SCIX 511 Teaching Science to Elementary Students 3 credits**

According to the National Science Teachers Association (NSTA), learning science is vital for helping students “develop problem-solving skills that empower them to participate in an increasingly scientific and technological world.” It is our job as educators to provide students with highly engaging, rigorous, and authentic learning experiences that help them to develop these crucial skills. In this course, you will explore resources and techniques for teaching science to elementary students in accordance with the Next Generation Science Standards (NGSS). You’ll develop strategies for creating high-quality, captivating, and challenging science lessons for elementary students, including hands-on learning experiences, inquiry-based learning, and research assignments. In addition, you’ll cultivate techniques for creating a classroom environment conducive to learning science and differentiating your instruction to meet your students’ various learning needs and styles. Finally, you will learn how to plan cross-curricular lessons and units that integrate science into literacy instruction. With the knowledge and skills from this course, you will be equipped to teach science to elementary students in a way that engages and sticks with them far beyond your classroom. This course is offered through Advancement Courses.

**SCIX 512 Teaching Scientific Argumentation and Critical Thinking 3 credits**

Both the Common Core and Next Generation Science Standards emphasize the importance of argumentation in science education. That’s because argumentation requires students to generate and justify claims based on evidence, which leads to deeper understanding and more critical consumption of information. Using case studies and argumentation to engage students in thoughtful reasoning and debate is an effective way to teach not only academic content, but also process skills and critical thinking—all while allowing students to make connections between the classroom and everyday life. In this course, you’ll learn how to use case studies to engage students in science content while improving their critical-thinking skills. You’ll review numerous examples of case studies that address a variety of science learning objectives and choose ones that you can integrate into your own instruction. In addition, you’ll cultivate several strategies for scaffolding argumentation in the classroom and developing questioning techniques that will motivate students and enhance learning. Finally, you’ll gain tools for evaluating student work using this educational framework. By the end of the course, you will be able to incorporate case studies and argumentation into science instruction in a way that teaches critical thinking and deepens scientific understanding. This course is offered through Advancement Courses.

**SCIX 513 Teaching Tough Topics in Biology 3 credits**

Many students struggle to learn core concepts in biology, including proteins and genes, cellular respiration, and ecosystem stability. Because new discoveries are being made all the time, biology teachers have to constantly familiarize themselves with new concepts and figure out how to effectively teach these ideas to their students. In addition, many states are adopting the Next Generation Science Standards (NGSS), which are aimed at improving science learning and engagement in the 21st century. These new standards offer an opportunity to improve science instruction, but with that opportunity comes the challenge of planning and implementing NGSS-aligned lessons. In this course, you will learn practical, research-based methods for teaching biology concepts that traditionally have been hard to teach. You will engage in an instructional framework that you can use to plan and implement effective biology units, and learn how to select instructional strategies that support student understanding of fundamental biology concepts. With the techniques and strategies you learn in this course, you will be able to confidently teach your students about the ever-evolving field of biology while adhering to cutting-edge educational standards. This course is offered through Advancement Courses.

**SCIX 514 Understanding Our Universe: An Introduction to Astronomy 3 credits**

With so much going on in our world, it can sometimes be challenging to get students to look away from their screens and up toward the stars. Whether students realize it or not, the workings of the universe impact their lives every day, and with the right teaching strategies, you can make these workings come alive for your students. In this course, you will review foundational principles of astronomy, including the nature of our solar system and beyond. You will cultivate a variety of tools for creating engaging astronomy lessons on topics such as the celestial sphere, astronomical observation techniques, planets and moons, asteroids and comets, the lives and evolutions of stars, pulsars, black holes, galaxies, and dark matter. In addition, you’ll develop strategies for showing students how astronomical events connect to phenomena in the real world, thus making the subject matter more authentic and relevant to them. Armed with the techniques and knowledge from this course, you’ll be ready to introduce the study of astronomy to students in an authentic, engaging way that they’ll remember well beyond the school year. This course is offered through Advancement Courses.

**SCIX 515 Climate Change: Engaging Students in a Global Conversation 3 credits**

According to a recent statement from the United Nations, climate change is the defining issue of our time. With catastrophic flooding, droughts threatening our food supply, and temperatures on the rise, change is happening quickly, and the prospect of talking to students about it can feel daunting. Many teachers do not understand climate change well themselves, and those who do sometimes fear that teaching students about climate change may cause them anxiety and stress. In this course, you will learn strategies for teaching students about climate change in a way that is hopeful and inspiring. When students have a well-rounded picture of climate change, they will be empowered to discuss possible solutions, ideas for future mitigation, and personal accountability. Integrating science and solutions equips students to move forward as leaders of the next generation who can address climate change in a positive and productive manner. By the end of this course, you will be able to integrate hopeful and positive lessons on climate change into your curriculum to prepare your students for one of the most pressing challenges of our time.

**SCIX 516 Fostering Active Learning in Chemistry 3 credits**

Many students struggle to learn core concepts in chemistry, and teaching chemistry can be equally challenging at times. New discoveries are being made all the time, and chemistry teachers have to constantly familiarize themselves with new concepts and figure out how to effectively teach them to students. That's why the American Chemical Society created guidelines and recommendations for teaching the four big ideas that all high school chemistry classes should explore. In this course, you will learn how to implement the 5E model of science instruction to introduce students to the big ideas in chemistry that have traditionally been hard to teach. Using the 5E model will help you create lesson plans that are inquiry-based and engaging for students. With the 5E model in place, you can build hands-on activities to help your students reach beyond memorizing content and start thinking critically and scientifically. You will also learn how to make sure that your teaching aligns with NGSS standards for chemistry. Using the strategies from this course, you will be able to confidently teach your students about the ever-evolving field of chemistry with a focus on the American Chemical Society's four big ideas that all students should know.