Miami Dade College

Course Competencies Template - Form 112

GENERAL INFORMATION	
Name: Dr. Susan Neimand	Phone #: (305) 237-6152
Course Prefix/Number: SCE 4863	Course Title: Teaching and Learning the Nature of Science
Number of Credits: 3	
Degree Type	☐ B.A. ☒ B.S. ☐ B.A.S ☐ A.A. ☐ A.S. ☐ A.A.S. ☐ C.C.C. ☐ A.T.C. ☐ V.C.C
Date Submitted/Revised: 3/10/08	Effective Year/Term: 20081
☒ New Course Competency ☐ Revised Course Competency	
Course to be designated as a General Education course (part of the 36 hours of A.A. Gen. Ed. coursework): ☐ Yes ☐ No	
The above course links to the following Learning Outcomes: ☒ Communication ☐ Numbers / Data ☒ Critical thinking ☒ Information Literacy ☒ Cultural /Global Perspective ☒ Social Responsibility ☒ Ethical Issues ☒ Computer / Technology Usage ☒ Aesthetic / Creative Activities ☒ Environmental Responsibility	
Course Description (limit to 50 words or less, **must correspond with course description on Form 102**): This course is designed to introduce the pre-service teacher to the philosophical, historical, and sociological views of the nature of science and its role in science education reform. Students will develop instructional materials and strategies focusing on the nature of science. Fifteen contact hours of field experience are required.	
Prerequisite(s):	Corequisite(s):

Course Competencies: (for further instruction/guidelines go to: http://www.mdc.edu/asa/curriculum.asp)

Competency 1: The student will be able to analyze how science distinguishes itself from other ways of knowing and from other bodies of knowledge through the use of empirical standards, logical arguments, and skepticism, as scientists strive for the best possible explanations about the natural world by:

1. Discussing why science is done.
2. Describing what makes the doing of real science (not necessarily classroom science) different from the doing of other things, things like art, religion, or philosophy.
3. Identifying the characteristics of science.
4. Describing how scientific ideas depend on experimental and observational confirmation.
5. Differentiating between observation and inference and acquiring this disposition of observation.
6. Explaining that true scientific investigation frequently does not parallel the steps of the scientific method.
7. Distinguishing between an experiment and other forms of scientific investigation and explaining that not all scientific knowledge is derived from experimentation
8. Describing how scientific explanations must meet certain criteria such as: being consistent with experimental and observational evidence about nature; making accurate predictions about systems being studied.
9. Comparing and contrasting a theory, a law, data, evidence, and hypothesis.
10. Describing and comparing their own perceptions of "the scientific method" with those experiences of scientist actually doing science.
11. Defining science as "tentative" or "changeable" and giving examples that describe this.
12. Comparing and contrasting science and pseudoscience.

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13. Distinguishing between science and religion as different but compatible ways of knowing.

Competency 2: The student will be able to identify how individuals and teams in various scientific disciplines have and will continue to contribute to the scientific enterprise by:

1. Researching how people from underrepresented groups have contributed scientific knowledge and technological inventions.
2. Differentiating between scientific disciplines as to what is studied, techniques used, and outcomes sought, while noting that they share a common purpose and philosophy, and all are part of the same scientific enterprise.
3. Investigating the ethical traditions in science such as the value of informed consent, the peer review process, truthful reporting about the methods and outcomes of investigations, and making public the results of work.
4. Illustrating how scientists are influenced by societal, cultural, and personal beliefs and ways of viewing the world and that science is not separate from society but rather science is a part of society.
5. Relating how scientific knowledge is disseminated to the public and scientific community.

Competency 3: The student will be able to reconstruct selected episodes in the history of science (Copernican Revolution, Einstein's Theory of Relativity, String Theory, Big Bang Theory, Modern Atomic Theory, Newtonian Mechanics, The Theory of Gravity**,** The Cell Theory, Continental Drift and Plate Tectonic Theory, Geologic Time Scale*,* Germ Theory of Disease, Quantum Mechanical Theory) by:

a. Relating how changes in science occur as small modifications in extant knowledge.
b. Describing how scientific knowledge changes by evolving over time.
c. Describing how new technologies often extend the current levels of scientific understanding and introduce new areas of research which often results in new scientific knowledge.
d. Identifying current scientific-technical developments in their infancy today (genetic engineering, biotechnology, fusion, string theory) in news magazines, newspapers, the Web, and science magazines and comparing descriptions of this recent scientific advance in a popular newsstand science magazine and in a more professional journal (*Science, Nature*).

Competency 4: The student will be able to summarize how science and technology have a more direct effect on society by:

a. Explaining how science and technology alone will not resolve local, national, or global challenges.
b. Describing how progress in science and technology can be affected by social and ethical issues.
c. Identifying the process of how individuals/institutions and society decide on proposals involving new research and the introduction of new technologies into society including cost/benefit analysis, risk assessments, public welfare, and other ethical considerations.
d. Citing examples of the current impact of science and technology on natural and social environments.
e. Identifying and analyzing areas of scientific research that may contribute to ethical, legal, and social conflicts (e.g., reproductive and life-sustaining technologies; genetic basis for behavior, population growth and control; government and business influences on biotechnology).

Competency 5: The student will be able to explain the development of evolutionary thought and how it illustrates the processes of science by:

a. Reiterating the scientific processes by which Darwin developed his theory of evolution by natural selection.
b. Identifying and addressing K-12 students' misconceptions about evolution.
c. Comparing and contrasting evolution, creationism, and Intelligent Design in terms of scientific, cultural/religious, and legal perspectives.

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Competency 6: The student will be able to categorize the facets of the nature of science that are important to teaching in the classroom and how science pedagogy needs to be structured in order to model and explicitly teach the nature of science by:

1. Justifying the need for understanding the Nature of Science and its importance with regard to scientific literacy and science education reform.
2. Researching literature, methods, and results concerning the teaching and learning of Nature of Science.
3. Designing classroom instruction aligned to the current research and practices in Nature of Science teaching/learning.
4. Developing the knowledge, skills, and dispositions that are required to be a "reflective practitioner."

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