Earth and Space Science

I. Knowing the Content

The professional education program provides evidence that Earth and Space Science certification candidates complete a program of studies of Earth and Space Science the same as the academic content area courses and required electives of a major in a bachelor's degree. The program shall require the candidates to demonstrate their knowledge of and competence in teaching inquiry based laboratory experiences and the fundamental concepts of earth and space to grade 7-12 students including:

I.A. Basic principles of biology, chemistry, physics and mathematics as they relate to earth and space science

I.B. Concepts of earth and space science as they relate to interactions among the lithosphere, hydrosphere, atmosphere and biosphere

I.C. Physical geology including:

- flow of water, hydrologic cycle
- characteristics, origin, and formation of minerals and rocks,
- internal structure and processes of the earth including plate tectonics, mountain building, igneous activity and seismic activity,
- surficial processes of the earth including erosion, mass wasting, land sliding, subsidence

I.D. Historical geology including:

- nature of geologic time,
- origin and physical development of the earth through geologic time,
- fossil record and evolutionary history of life,
- use of stratigraphic principles to interpret life and earth history

I.E. Oceanography including:

- physical and chemical properties of ocean water,
- costal processes,
- geology of the ocean floor,
- interaction of organisms with the marine environment

I.F. Meteorology including:

- composition and structure of the atmosphere,
- atmospheric forces and motions,
- weather features, systems, and their prediction,
- climate and climatic change

I.G. Astronomy and space science including:

- origin of the universe and the solar system,
- dynamics of the earth/sun/moon,

- physical, chemical and dynamic properties of bodies in space,
- space exploration

I.H. Environment, natural resources, and the social impact created by human and natural activities including:

- relationship between humans and the environment,
- resource identification, management and utilization of water and mineral resources,
- environmental impact assessment

I.I. Scientific instrumentation and technology including:

- scientific methods and open inquiry,
- safe and ethical practices while conducting research and laboratory and field activities,
- geologic, oceanographic, meteorological and astronomical measurement,
- techniques of remote sensing and field observation,
- construction and use of maps, charts, and models,
- traditional and electronic means of research, data collection, analysis, modeling and reporting

II. Performances

The professional education program provides evidence of the candidates' participation in sequential and developmental field experiences and student teaching, under the supervision of college personnel and cooperating teachers who are well trained, have interpersonal skills and demonstrated competence in teaching. The program also provide evidence that the criteria and competencies for exit from the Earth and Space Science certification program are assessed in coursework, field experiences and student teaching and require the candidates to demonstrate their knowledge and competence in fostering student learning through:

II.A. Managing the instructional environment in order to:

- create a climate that promotes fairness,
- establish and maintain rapport with students,
- communicate challenging learning expectations to each student,
- establish and maintain consistent standards of classroom behavior,
- make the physical environment safe and conducive to learning

II.B. Planning of instruction based upon:

- knowledge of subject matter,
- promotion of higher order thinking,
- needs of local students and the community,
- Pennsylvania Academic Standards,
- application in the workplace and career opportunities of earth and space science,
- application of earth and space science to society, economics and in peoples daily lives

II.C. Adapting, assimilating and implementing effective instructional strategies

II.D. Effective use of curriculum resources and technologies in collaboration with educators and other outside resources
II.E. Selecting, analyzing and modifying instructional materials to meet the learning needs of diverse learners

II.F. Monitoring and assessing students' understanding of content through a variety of means, providing feedback to students to assist learning and adjusting instructional strategies

III. Professionalism

The professional education program provides evidence that Earth and Space Science certification candidates demonstrate knowledge and competencies that foster professionalism in school and community settings including:

III.A. Professional organization and journals of science and science education

III.B. Integrity and ethical behavior, professional conduct as stated in Pennsylvania's Code of Professional Practice and Conduct for Educators; and local, state, and federal laws and regulations

III.C. Professional relationships with school colleagues, business, industry and other community resources

III.D. Communicating and interacting effectively with parents/guardians, other agencies and the community at large to support learning by all students