Professional Development Institute

Flex Course Syllabus

Teaching STEM and NGSS at the Primary Level (K-2)

PDI Course Number: 2T02

UCSD Course Number: EDUC40112

If you would like information about receiving post-baccalaureate (graduate) credit for completing this course, please click here.

Course Timeline

Participants have one year to complete the course. Participants must spend a minimum of three weeks in this course.

Course Description

Have you been wondering how to incorporate the Next Generation Science Standards into your STEM classroom? Do you want to learn how to create a more hands-on science structure in your classroom? This course takes K-2 teachers through a step-by-step explanation of the standards and includes examples and suggestions of how to incorporate them into your science classroom. The course also guides you through how to interpret the science and engineering practices, crosscutting concepts, and disciplinary core ideas at the K-2 level. Then, teachers are taken through each dimension with details provided for how to translate the standards into daily instruction. The 5Es of inquiry-based science are discussed, as well as how Universal Design for Learning, multiple intelligences, and STEM strategies all work together to connect the design and implementation of science lessons, labs, and stations. Specific strategies for connecting math and science are also shared. Additionally, teachers will be introduced to an overview of assessment and how it applies to the Next Generation Science standards, as well as a brief overview of how to manage an inquiry-based classroom. By the end of this course, teachers will have a solid understanding of the NGSS Standards and how to create engaging lessons to put them into practice and action in the classroom.

Educational Outcomes

1. Teachers will understand the structure of the Next Generation Science Standards ("NGSS").
2. Teachers will learn about constructivist learning theory, the theory of multiple intelligences, and student-centered inquiry-based learning.
3. Teachers will learn about the design of the NGSS, which encourages three-dimensional thinking between the science and engineering practices ("SEPs"), crosscutting concepts ("CCCs"), and disciplinary core ideas ("DCIs").
4. Teachers will gain a basic understanding of the NGSS performance expectations and how to address them across various learning progressions.
5. Teachers will be introduced to each step of the 5E instructional model of inquiry and will understand how to use this model by viewing a specific example.
6. Teachers will be introduced to the guiding principles of Universal Design for Learning, and how this instructional framework is a perfect segue into teaching the NGSS.
7. Teachers will learn about the characteristics of effective STEM lessons and specific strategies for incorporating them into their science classroom.
8. Teachers will learn how to translate the NGSS standards into curriculum and instruction.
9. Teachers will be introduced to backward design as a great strategy for incorporating the NGSS into their STEM classrooms.
10. Teachers will understand the importance of using science standards to drive instruction.
11. Teachers will understand the importance of engineering and the role it plays in the scientific and engineering practices of the NGSS.
12. Teachers will have a basic understanding of the engineering design process.
13. Teachers will gain a deep understanding of the science and engineering practices, and what is required for implementing same at the K-2 level.
14. Teachers will gain a deep understanding of the crosscutting concepts, and what is required for implementing same at the K-2 level.
15. Teachers will gain a deep understanding of the disciplinary core idea of physical science, and what is required for implementing same at the K-2 level.
16. Teachers will gain a deep understanding of the disciplinary core idea of life science, and what is required for implementing same at the K-2 level.
17. Teachers will gain a deep understanding of the disciplinary core idea of earth and space science, and what is required for implementing same at the K-2 level.
18. Teachers will gain a deep understanding of the disciplinary core idea of engineering, technology, and applications of science, and what is required for implementing same at the K-2 level.
19. Teachers will understand how science and math are connected and will be introduced to examples of how to do same.
20. Teachers will understand what science stations are and the guidelines for implementing same in a student-centered inquiry-based science classroom.
21. Teachers will learn about the principles of inquiry and specific strategies for managing an inquiry-based science classroom.
22. Teachers will learn about the different types of assessment and the role each of them plays in student performance.

23. Teachers will be introduced to various forms of alternative assessment that can be used in the science classroom to assess student learning.

Instructional Media

- Online Discussions
- Online Engagement
- Online Collaboration
- Instructor Feedback
- Instructor Interaction
- Online Resources and Websites
- Supplemental Instructional Materials
- Printable Classroom Resources

Evaluation

- Test #1 (5% of final grade)
- Test #2 (5% of final grade)
- Test #3 (5% of final grade)
- Test #4 (5% of final grade)
- Test #5 (5% of final grade)
- Autobiography and Goals for the Course (10% of final grade)
- Article/Video Reflection (15% of final grade)
- Course Collaboration/Share Ideas with the Class (10% of final grade)
- Cumulative Assignment/Project: Plan and Assess a Science Activity Using the 5E's(20% of final grade)
- Culminating Practicum (20% of final grade)

Topical Outline

Unit One

- The Birth of the NGSS
- Overview of the Three Dimensions
- The Journey from Framework to Standards
- **Assignment #1**
  Write an autobiography including information about yourself, your grade level and what you specifically hope to learn about implementing the Next Generation Science Standards into your K-2 STEM classroom. Your autobiography should be a minimum of three paragraphs.
- **Test #1**

Unit Two

- Engaging Students in the Process of Science
- The Five E's of Inquiry
- Universal Design for Learning
- The Reach of STEM
- **Assignment #2**
  As an educator, it is important to be aware of the research, studies, and professional work done in the field. In the course, you will find an article and video that are relevant to the specific course content. Read the article and then write an essay with your thoughts.
- **Test #2**

Unit Three

- Translating Standards to Curriculum and Instruction
- Dimension 1: Science and Engineering Practices
- Dimension 2: Crosscutting Concepts
- **Assignment #3**
  Online Discussion Board Participation/Engagement: Please post a tip, strategy, or idea that specifically relates to effectively implementing the Next Generation Science Standards into your K-2 STEM classroom. Your assignment should be a minimum of three paragraphs and detailed enough for another teacher to easily follow. This is a great opportunity to share and collaborate with other teachers at your grade level around the country. Take time to review and respond to other postings that are relevant to your classroom population in order to gain effective ideas to use immediately in your classroom
- **Test #3**

Unit Four

- Dimension 3: Disciplinary Core Ideas — Physical Sciences
- Dimension 3: Disciplinary Core Ideas — Life Sciences
- **Test #4**

Unit Five

- Dimension 3: Disciplinary Core Ideas — Earth and Space Sciences
- Dimension 3: Disciplinary Core Ideas — Engineering, Technology, and Applications of Science
- **Test #5**

Unit Six

- Connecting Science and Math

- Science Stations
- Managing an Inquiry-Based Classroom
- Assessing the Science Classroom
- **Assignment #4**
  Review the Next Generation Science Standards for your grade level. Choose one of the performance expectations and create a detailed science lab, experiment, or station that students can actively participate in using the 5E's to accompany it. You can refer to the format which was presented in Unit Two to help you. Be sure to include the standard to which the activity applies and that the learning objective(s) is shared in easy to understanding "child speak." Then, create some type of assessment to accompany the designed activity. The chosen assessment must address the requisite content standards for your grade level and be related to the above-described activity.
- **Assignment #5**
  The culminating practicum is a three-step process. (1) In the first assignment, you were asked what goals you had and what you hoped to learn from the course. Think back to your original goals for this course. Write a minimum two-paragraph reflection specifically describing how what you learned can be used to help you reach those goal(s). (2) Next, write a minimum three-paragraph plan that specifically describes the ways in which you intend to implement a particular strategy you learned in this course into your own teaching situation. (3) Last, write a minimum two-paragraph reflection describing a student you have or have had in the past. Then, discuss how the strategies you learned in this course will specifically benefit that student as you put your plan into action.

Bibliography

The Professional Development Institute wishes to thank the Lead States, Partners, and Achieve for all of their hard work that went into creating the Next Generation Science Standards. The Next Generation Science Standards is a registered trademark of Achieve. Neither Achieve nor the lead states and partners that developed the Next Generation Science Standards were involved in the production of this product, and do not endorse it.

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