Title

Fostering Collaboration, Inquiry, and Critical Thinking in Middle School Science (Grades 5-8)

Target Audience

This course is intended for pre-service and in-service teachers of grades 5-8.

Course Description

The appropriate use of technology in the classroom encourages students to ask questions, collaborate with others, and explore and evaluate data—all of which are important components of inquiry in science education. This course presents proven critical thinking and cooperative learning strategies for teaching science that can be enhanced by today's classroom technology. Learners will explore both software and Web activities specifically designed to help students organize and consolidate their thinking, clearly communicate their ideas, and analyze and evaluate the ideas of others.

Instructor/Facilitator

See instructor/facilitator sheet

Credits

To be determined by college or university

Learner Outcomes

Learners will:
- Understand how collaboration, inquiry, and critical thinking can increase student learning of science.
- Be able to analyze science lessons to identify the critical-thinking skills and strategies developed.
- Be able to incorporate higher-level thinking questions into science discussions.
- Use technology to teach science lessons that incorporate collaboration, inquiry, and critical thinking.
- Develop lessons incorporating collaborative learning, inquiry, and critical thinking into the science curriculum.

Outline of Content and Assignments

A summary of course content and assignments is outlined below.

Session 1: Welcome to Collaboration, Inquiry, and Critical Thinking!

Learners will:

- Become familiar with the content, structure, and expectations of the course.
- Become familiar with TeacherLine tools used in the course.
- Reflect upon their classroom practices and science lessons that incorporate collaboration, inquiry, and critical thinking.
- Communicate and discuss cooperative learning with online classmates after reading an article on cooperative learning.

Read
- "Cooperative Learning"

Participate in an online discussion
- Visit the discussion board and introduce themselves in the "Virtual Cafe" discussion forum.
- Discuss the following: "What are the benefits and/or challenges to cooperative learning? What have you experiences been?"

Write in the online journal
- Reflect on professional goals and expectations.
- Reflect on prior knowledge.
- Reflect on ways collaboration, inquiry, and critical thinking have been incorporated into the science curriculum.

Session 2: Inquiry and Critical Thinking in the Science Classroom

Learners will:

- Identify ways that inquiry and discussion promote scientific thinking.
- Reflect upon how students think critically in their own classrooms.
- Describe how critical-thinking skills are integral to scientific inquiry.
- Analyze a technology lesson or activity to determine the critical-thinking skills it teaches, how it helps students develop scientific understanding, the value of the use of technology in the activity, and how it can help meet different learning styles.

Read
- "Strategies for Teaching Critical Thinking"
- "Art, Science, and Technology"

View videos
- "Science Talk in the Classroom"
- "Meeting the Standards"

Complete activity
- Explore one of the following: "Amazon Interactive - The Ecotourism Game," "Planetary Adventure Base Camp," "Rivers," or "The Next Billion"

Write in the online journal
- Reflect on how they define critical thinking and know that students are thinking critically about an issue.
- Reflect on the critical thinking activity they reviewed.

Participate in the online discussion
- Discuss ways the skills described in the article, "Strategies for Teaching Critical Thinking," are integral to critical thinking and inquiry.

Session 3: Cooperative Learning and Science

Learners will:

- Reflect upon group learning in their science classrooms.
- Consider differences between grouping strategies and consider ways that group learning can help achieve science curriculum goals.

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- Consider and discuss the benefits to using technology to create interactive group experiences and consider ways to use or adapt software simulations.
- Describe how a science activity could be adapted for cooperative group work.

  Read
  - "Student Learning Groups That Really Work"

  View video
  - "Interactive Group Software: Science Seekers"

  Write in the online journal
  - Reflect on the differences in the strategies and their effectiveness in the science classroom as outlined in the article.
  - Reflect on the video and the use of technology to help create cooperative experiences.

  Participate in the online discussion
  - Discuss the following: "How do you envision software and simulations being used in your classroom to create interactive group experiences and help students develop inquiry and cooperative learning skills? Can they meet the challenges in your science classroom?"

Session 4: Using the Web for Teamwork

Learners will:

- Analyze WebQuest, problem-based, and other collaborative Internet science lessons to determine the critical-thinking, cooperative, and inquiry skills they teach.
- Write an introduction for a WebQuest and analyze the introductions written by other learners.
- Analyze and select a science Web project appropriate for developing student critical-thinking skills, collaboration, and inquiry.
- Teach a Web lesson in his/her classroom.
- Write an analysis of the Web lesson.

  Read
  - "Why WebQuests?"
  - "Connecting Students Through Collaborative Projects"
  - "A Road Map for Designing WebQuests," an online slide show

  View video
  - "The Internet as a Tool for Learning"

  Write in the online journal
  - Reflect on ways the Web is used to foster crtic9ial thinking and cooperative learning skills in the video.
  - Reflect on meeting curriculum goals with WebQuests.
  - Reflect on problem-based learning in science.

  Complete activities and assignment
  - Review "Let's Build a City in the Solar System" WebQuest.
  - Examine two of the following WebQuests: "Paper or Plastic - An Internet WebQuest on Recycling," "Prisoners or Protected?", "Roller Coaster Madness," or "Will That Volcano Spoil Our Party?"
  - Endangered Species activity
  - Explore at least two of the collaborative projects.
  - Teach a Web lesson to students.

- Write a brief overview of the Web lesson.

Participate in an online discussion:
- After writing and posting a brief introduction to a WebQuest, discuss the introductions that other learners have posted and provide feedback.

Session 5: The Next Step

Learners will:

- Create a technology lesson plan incorporating cooperative learning, inquiry, and critical thinking to teach science standards.
- Teach and revise the lesson.
- Assess the lesson according to a rubric.
- Make recommendations to other learners by providing feedback about the critical-thinking skills developed in their lessons.

Complete assignment
- Complete Final Project using the Technology Lesson Plan Rubric as a guide. Learners will develop one technology-integrated lesson plan that addresses one topic in the science curriculum through the use of collaborative learning, inquiry, and critical thinking. The lesson plan can incorporate pre-existing Web projects and curriculum software programs (such as the programs described in Session 3).

Participate in the online discussion
- Discuss Final Project Critical-Thinking Skills.

Write in online journal
- Reflect on acquired knowledge.
- Reflect on goals and expectations.

Schedule

It will take about 30 hours to complete this course. Each session should take approximately 4-5 hours. If you find yourself spending several hours more than this in any given session, please contact your facilitator to make sure this is necessary to complete the given assignments.

Requirements

Learners are expected to:
- Complete all assignments.
- Maintain an online journal.
- Participate and actively engage in discussions with fellow learners while contributing to the social construction of knowledge.
- Be self-directed and self-motivated.
- Ask for assistance when they need it.

Materials (hardware, software, plug-ins)

Technical Requirements
- Word processor
- Internet service provider
- E-mail

Academic Dishonesty Policy

To be inserted by university institution only

Evaluation

This course can be taken for graduate credit on a pass/fail basis, or for a letter grade and graduate credit. See graduate credit details pertaining to specific graduate credit institutions.

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