

Title

Teaching Writing in Science

Target Audience

This course is intended for pre-service and in-service teachers of grades 6-12.

Prerequisites

To successfully participate and complete the assignments in this course, the learner must:

- Have access to a classroom and students to implement instructional strategies and a lesson plan.
- Be familiar with taking an online course or have completed the PBS “Practice Learning Online with TeacherLine” course.
- Be familiar with middle or high school science educational content.

Course Description

Teaching Writing in Science provides you with an opportunity to examine how writing fits into your science curriculum, offering instructional benefits for you and your students. Throughout the course, we will explore writing strategies that can help deepen students’ learning of science content, while providing you with opportunities to assess their understanding in order to inform your instruction. Each session will contribute to the development of an instructional plan for using writing effectively in your own classroom. As you develop your plan, you will have the opportunity to brainstorm ideas and receive feedback from your online colleagues. During the final session of the course, you will put your plan into action and reflect on your experience.

Instructor/Facilitator

See instructor/facilitator sheet

Credits

To be determined by college or university

Goals

The overall goal of this course is for learners to develop experience with using writing as a strategic pedagogical tool for learning science content.

By the end of this course, learners will:

- Gain insight into the benefits of integrating writing in the science classroom to promote student achievement
- Understand the elements involved in planning for and assessing writing in science
- Incorporate writing strategies using technology into their science classroom
- Expand teacher repertoire of writing-based strategies for learning and communicating science content and processes

Outline of Content and Assignments

After previewing the documents in the Course Information area, learners will proceed to Course Content to complete the following six sessions, working through each session in order. Throughout the sessions, learners are asked to articulate their ideas in various forms: reflections on their ideas and experiences in their online journals; online discussions that allow learners to glean information from other learners’ experiences, and written assignments that are submitted to the course facilitator. As a final project,

learners will design a lesson plan that integrates writing and then implement the lesson with students to meet a final project requirement. Finally, they will reflect on the lesson implementation.

This course is designed to address ISTE's *Educational Technology Standards and Performance Indicators for All Teachers*. These standards define the fundamental concepts, knowledge, skills, and attitudes for applying technology in educational settings.

This course specifically addresses the following ISTE NETS*T:

I. Technology Operations and Concepts

Teachers demonstrate a sound understanding of technology operations and concepts. Teachers:

- A. Demonstrate introductory knowledge, skills, and understanding of concepts related to technology (as described in the ISTE National Education [Technology Standards for Students](#))

II. Planning and Designing Learning Environments and Experiences

Teachers plan and design effective learning environments and experiences supported by technology. Teachers:

- A. Design developmentally appropriate learning opportunities that apply technology-enhanced instructional strategies to support the diverse needs of learners.
- C. Identify and locate technology resources and evaluate them for accuracy and suitability.
- D. Plan for the management of technology resources within the context of learning activities.

III. Teaching, Learning, and the Curriculum

Teachers implement curriculum plans that include methods and strategies for applying technology to maximize student learning. Teachers:

- B. Use technology to support learner-centered strategies that address the diverse needs of students.

IV. Assessment and Evaluation

Teachers apply technology to facilitate a variety of effective assessment and evaluation strategies. Teachers:

- A. Apply technology in assessing student learning of subject matter using a variety of assessment techniques.

Visit cnets.iste.org for a full list of the ISTE's *Educational Technology Standards and Performance Indicators for All Teachers* and more information about these standards.

Session 1: Writing in the Science Curriculum

In this session, learners will become familiar with the different types of writing that serve as vehicles to promote science learning. They will also have the opportunity to implement a writing-to-learn strategy in their classroom. Then, after a critical examination of their current practice, learners will identify how best to use writing to meet their instructional goals.

Learners will:

- Define their professional goals and expectations for this course in the online journal;
- Explain their prior knowledge about and experience with writing in the science classroom;
- Analyze and evaluate teachers' writing-in-science experiences.

- Identify three stages of the writing-to-learn process and evaluate use of writing-to-learn strategies.
- Assess the effectiveness of a writing-to-learn strategy.

View video

- “Connecting Science with Other Subject Areas”
- “Exploring Perspectives”

Read

- Teaching Standard D from National Science Education Standards
- “Reading, Writing, and Understanding”

Write in online journal

- Reflect on professional development goals and expectations for this course.
- Reflect on prior knowledge and experiences with writing in the science classroom.
- Reflect on the interrelatedness between the three reading-to-learn and writing-to-learn stages, your current use of writing-to-learn activities, how you could use writing in the near future to further develop students’ understanding of content, and the impact of writing on available instructional time.

Participate in an online discussion

- Introduce themselves to other learners.
- Select and post a dialectical journal entry to the discussion board. Then explain the rationale for your selection as well as whether you agree or disagree with the teacher’s perspective.

Complete activities and assignments

- Complete a dialectical journal.
- Implement a dialectical journal activity with students and analyze its effectiveness.

Additional Resources (not required)

- Grade-by-Grade Learning: 3rd-grade from *PBS Parents*
- Grade-by-Grade Learning: 4th-grade from *PBS Parents*
- Grade-by-Grade Learning: 5th-grade from *PBS Parents*
- The Challenge of Standards from *Frontline: Testing Our Schools*
- Testing. Teaching. Learning? from *Frontline: Testing our Schools*
- Parents’ Guide to Standardized Testing from *Colorín Colorado*
- Secrets of the SAT from *Frontline*

Session 2: Assessing to Inform Instruction

In this session, learners will examine how writing can be used as both a formative and summative assessment of students’ understanding of science-content knowledge. After studying writing prompts and rubrics, learners will have opportunities to develop an instructional writing prompt and rubric that clearly articulate their instructional goals to students. Then, learners will brainstorm ways to motivate students to participate in assessing their own learning.

Learners will:

- Evaluate classroom practices according to the NSES and the ISTE NETS assessment standards.
- Identify how writing can serve as a formative and summative assessment tool with benefits for both teachers and students.
- Create a writing prompt with scaffolded guiding questions.
- Design an instructional rubric for use with students.
- Explain how you plan to use and promote the use of an instructional rubric with your students.

Read

- Teaching Standard C from *National Science Education Standards*
- Assessment and Evaluation Standard for teachers from the International Society for Technology in Education (ISTE)
- “Assessing Student Understanding with Interactive-Collaborative-Electronic Learning Logs”
- “Assessing Performance Tasks”
- “Evaluation” from *The English Language Arts Handbook: Classroom Strategies for Teachers – Second Edition*

View video

- “Developing Assessment Tools” (not required)
- “Introducing Rubrics to Students” (not required)

Write in online journal

- Reflect on how your current classroom practice addresses Teaching Standard C from the *National Science Education Standards*. What areas could use more attention to fully address the standard? How can technology assist in assessment tasks?
- Reflect on how you will introduce and motivate students to use the instructional rubric you developed during this session.

Participate in an online discussion

- Respond to the following question: “What benefits and challenges do you see for both teachers and students in using writing as an ongoing assessment?”

Complete activities and assignments

- Explore the “Supersize Crocs: Are They Gone for Good?” lesson plan from PBS.
- Explore online games and interactives from PBS.
- Create an instructional-writing prompt to accompany an online interactive game.
- Conduct a peer review of an online colleague’s writing prompt.
- Explore the “Raising Awareness” and “The Legendary Raptors” lesson plans from PBS
- Design or modify a rubric to assess the writing prompt assignment.

Additional activities (not required)

- Talk to an English teacher in your school about his/her writing program. Discuss how you can support his/her efforts.

Additional Resources (not required)

- “Standards-Based Writing for ELLs” from *Colorín Colorado*
- “Strategies for the Reluctant Writer” from *LD Online*
- “Watering Up the Curriculum for Adolescents with Learning Disabilities, Part II: Goals of the Affective Dimension” from *LD Online*

Session 3: Writing-to-Learn Strategies

In this session, learners will review writing-to-learn strategies that actively involve students in the process of thinking about their own learning. Learners will then select one strategy to implement with students during this session.

Learners will:

- Describe ways to provide effective direct instruction of metacognition.
- Implement and evaluate the effectiveness of a writing-to-learn strategy.

Read

- “How can teachers help students reflect on and communicate their own learning?”

- Summarizing Strategies
- “Building Better Instruction: How Technology Supports Nine Research-Proven Instructional Strategies”

Write in online journal

- Reflect on your experience implementing a writing-to-learn strategy with students. Describe the strategy used, the context of the lesson, impressions of the strategy’s effectiveness, any suggested adaptations, and supportive technology applications.

Participate in an online discussion

- Respond to the following questions: “How would you use the Hypothesis Generator in your classroom? What other strategies could you use to provide direct instruction in metacognition during an inquiry-based lesson?”

Complete activities and assignments

- Developing Conceptual Understanding Activity, in which you explore the concept of metacognition.
- Experiment with the Hypothesis Generator interactive.
- Explore Internet resources such as 2Learn Teacher Tools and those listed in the article “Building Better Instruction: How Technology Supports Nine Research-Proven Instructional Strategies.”
- Explore the “Survival in Antarctica” and “Creating the ‘Perfect’ Horse” lesson plans from PBS.
- Complete the Integrating Writing, Technology, and Learning Planning Sheet.
- Implement one of the writing-to-learn strategies from this session with students.

Additional Activities (not required)

- Consider using Jim Burke’s classroom connection “Draw it,” from his book *Illuminating Texts: How to Teach Students to Read the World*, as a means for students to communicate observations of objects or phenomena.
- Explore visual literacy resources on the Internet

Session 4: Writing to Communicate or Convince

In this session, learners will examine classroom opportunities in which students use writing in order to communicate and justify their proposed explanations as well as how students can engage in persuasive writing tasks to convince others based on evidence.

Learners will:

- Describe experiences with incorporating writing to communicate during inquiries in science class.
- Analyze the integration of writing as students conduct a guided inquiry.
- Reflect on the benefits of writing an organized essay to learn science concepts.
- Evaluate the “silent debate” strategy as a way for students to contend a current event in science.

Read

- Content Standard A for grade levels 5-8 or 9-12 from *National Science Education Standards*
- Select and read a scenario about using inquiry in science:
 - Examples from the National Research Council for grades 5-8 and 9-12
 - Examples from the Alaska Department of Education and Early Development for “intermediate level”
 - NSES for grades 5-8
 - NSES for grades 9-12
 - Review four types of writing—descriptive, narrative, expository, and persuasive, as described in *Differentiated Instructional Strategies for Writing in the Content Areas*

View video

- Writing Inquiry video – “Part 1: Introducing the Inquiry”
- Writing Inquiry video – “Part 2: Inquiry Essay”
- Writing Inquiry video – “Part 3: Mystery Solved”
- “Silent Debate Strategy” video

Write in online journal

- Based on your experience with the Expository Writing in Science interactive, describe the most important learning that took place. Reflect on how writing an organized essay can be beneficial for your students in learning science concepts.
- Evaluate your experience with the “silent debate” strategy by reflecting on the following questions: How could you use the silent debate strategy in the classroom? What silent debate topics (issues) might you use?

Participate in an online discussion

- Respond to the following questions: “How do your students typically use writing to communicate during inquiries in your science class? What are some novel ideas that you have used to incorporate writing to communicate in science? What are some of the successes and challenges you have had in the area of writing to communicate in science?”

Complete activities and assignments

- Compare and contrast the *National Science Education Standards*’ emphasis on inquiry and communication with your state or district-level standards.
- Investigate how writing can be integrated with inquiries by completing the Writing to Communicate for an Inquiry Assignment
- Experiment with the Expository Writing in Science interactive.
- Conduct an electronic “silent debate” on a controversial science topic with an online colleague.

Additional activities (not required)

- Try the NROC activity in your class. Have students record their prediction and data. Then, have the students use the Expository Writing in Science interactive with pre-existing statements to build an essay. They can add supporting details from their actual data.
- View samples of some of the [Step Up to Writing™ program materials](#) used in the NROC lesson. Source: *Step Up to Writing Program*. Copyright 2005 by Maureen Auman. Published by Sopris West Educational Services.
- Explore the “Shark Attack” and “A Reflective Look” lesson plans from PBS.

Additional Resources (not required)

- “Differentiated Instructional Strategies for Writing in the Content Areas”
- “Teaching Content Areas” from *Colorín Colorado*

Session 5: Successful Writing for All Students

In this session, learners will focus on differentiated instruction, issues of plagiarism, and how each of these are important considerations in order for all students to be successful in writing in science.

Learners will:

- Describe and explain times in which meeting the standard of equal opportunities for student participation has been a challenge in your classroom
- Describe the challenges you have encountered when differentiating your instruction and explain how you can overcome these obstacles
- Develop a written communication about plagiarism that is most appropriate for your situation



- Explain how you will adapt your instruction to meet the needs of your students
- Create a lesson plan that incorporates writing strategies in your science classroom

Read

- Teaching Standard B from *National Science Education Standards*
- Page 95 from *Differentiated Instructional Strategies for Writing in the Content Areas*
- “Responses: What Can I Do?” from *Misunderstood Minds*
- “Key Components of Differentiated Instruction” and “Implementing Differentiated Instruction,” excerpts from *Meeting the Needs of Culturally and Linguistically Diverse and Special-Needs Students in Rural Communities*
- “How Do I Teach Them All?: Academic Diversity in Today’s Science and Math Classrooms”
- “Adjustable Model for Research” from *Differentiated Instructional Strategies for Writing in the Content Areas*

Listen to audio clip

- “Adaptations for students with special needs”

View videos

- “Using Cooperative Learning Strategies” (not required)
- “Addressing Learning Styles” (not required)
- “Helping Quiet Students Succeed in Cooperative Groups” (not required)

Write in online journal

- Think about how you can differentiate your instruction by answering the following questions: What are some practical ways that you can “help each child get the most out of what makes him or her unique” in a science writing assignment? Which step or steps of differentiated instruction would you want to improve on as a science teacher? Which challenge in using differentiated instruction mentioned is one that you can relate to the most? How does Tomlinson suggest that you meet the challenge?
- Reflect on the following quote and questions:
 “That students differ may be inconvenient but it is inescapable. Adapting to that diversity is the price you have to pay if you want students to be productive.” Theodore Sizer
 In terms of what you learned in this session, and in light of the comment (above) by Sizer, describe how you can adapt your current instruction to better assist the diverse learners in your classroom.

Participate in an online discussion

- NSES Teaching Standard B states that all students have equal opportunities to participate in learning activities. Share a challenge that you have in meeting this standard in your current teaching situation. Then contribute a possible solution for this and/or challenges shared by other participants.

Complete activities and assignments

- Develop a new plan or educate students about an existing plan that helps them avoid plagiarism.
- Complete Part 1 of the Final Project – develop lesson plan and give as well as receive feedback from an online colleague.

Session 6: Implementing Writing in Your Science Curriculum

In this session, learners will consider first how to modify their lesson plan based on the peer feedback they received during the previous session. Next, to complete the final project, learners will implement the lesson plan they have developed throughout this course. Once learners have implemented the lesson

plan, they will conduct a self-assessment of their learning and consider how to apply what they have learned in this course to their science classroom.

Learners will:

- Evaluate the implementation of a science writing lesson based on pre-determined criteria.
- Assess learning in this course by comparing prior knowledge and acquired knowledge.
- Analyze the learning experience in this course by reflecting on professional goals and expectations.

Final project (Part 2)

- Learners will revise the lesson plan they created based on feedback received from a peer during Session 5 of this course. Elements of the lesson plan will include:
 - Goals
 - Objectives
 - Standards Addressed
 - Prior Knowledge
 - Materials
 - Lesson Overview
 - Lesson Procedures
 - Introduction
 - Main activity
 - Writing-to-Learn Strategy
 - Writing to Communicate or Convince
 - Differentiated Instruction Strategies
 - Conclusion
 - Extension
 - Assessment
- Then, learners will implement the lesson plan and submit a written reflection to the course facilitator using the “Post-Implementation Self-Assessment and Reflection” document.

Write in online journal

- Reflect on the knowledge and skills you acquired through this course. Identify the essential ideas and strategies you gained from this course and how you plan to incorporate them into your current or future classroom.
- Reflect on your professional goals by responding to the following questions: How does this learning experience compare with your goals and expectations? Were there any professional goals you were unable to achieve? Why? How do you plan to address these areas of professional development in the future?

Participate in an online discussion

- Take a moment and visit the discussion forums. Post any final discussions to discussion prompts of interest and say goodbye to your classmates.

Schedule

This course is scheduled to take approximately 30 hours to complete readings, activities, video, assignments, reflections and a final project.

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.
- Have access to a group of students for implementing lessons.

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 is evaluated on a letter grade basis, and may be available for graduate credit. See graduate credit details pertaining to specific graduate credit institutions.

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