Session 5

Integrating Technology in the Classroom

Acknowledgments

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Objectives

1. Identify, describe, and evaluate the components of a classroom environment that supports integrated math, science, and technology problem-based activities.
2. Understand ways to structure a classroom to support technology integration in problem-based activities.
3. Develop a process for evaluating student work in integrated math, science, and technology problem-based activities.

Facilities

- A room with Internet access, a data projector, speakers, tables, and space for participants to spread out in groups and work comfortably
- Electricity as required for powering participants' computers

Equipment/Materials

- Computer with Internet access and data projector for facilitator
- Laptop computers with Internet access (1–2 per group of 12 participants)
- Chart paper and stand per group
- Chart markers (2–3 per group)

Software

- Internet browser
- Plant growth simulation software (several available online)
- Idea mapping software (Diagramly, used in this session, is available online and free to use; other programs are also available)

Participants
Up to 25 teachers

Time Required
6 hours

Handouts

- ❑ 1: Rubric for a Neighborhood Project
- ❑ 2: Rubric Development Process
- ❑ 3: A Classroom Environment to Support Integrated Problem-Based Activities
- ❑ 4: Generic Rubric
- ❑ 5: Using Online Simulations
- ❑ 6: Analysis With Idea Mapping
- ❑ 7: Quick Guide for Diagramly
- ❑ 8: Testing Scenarios Using Spreadsheets
- ❑ 9: Quick Guide for Google Docs Spreadsheets
- ❑ 10: Goal Setting Tool

- Spreadsheet software (Google Docs Spreadsheet, used in this session, is available online with a free Google account; other programs are also available. Please note that Google Docs is soon changing to Google Drive. Exact instructions for accessing and using the software may change.)

Facilitator Preparation

- Read the session guide and familiarize yourself with the activities and handouts 1–10.
- Copy the handouts or upload them to a file-sharing site, such as Google Docs.
- Familiarize yourself with all software used in the session, including Diagramly and Google Docs Spreadsheet.
- Preview all the websites used in the session to ensure the links are current. Bookmark each site.
- Ensure adequate numbers of materials for all participants and groups.
- Review the BSCS 5Es Instructional Model (see Session 1: Handout 1).
- Review the related Texas Essential Knowledge and Skills (TEKS) Technology Applications standards listed at the end of this session.
- Set up the room as follows:
  - Prepare learning centers (one for each of the three software activities) with four chairs and one laptop computer at each center. Depending on the number of participants, you will need three centers per every 12 participants. **Note:** It is important to create one center with a computer for each software activity to allow groups to rotate around the room. This design is to illustrate a classroom management technique that participants can then use in their classrooms.
  - Arrange the rest of the room with additional tables and chairs to accommodate groups of three to four participants.

Prerequisite Skills of Facilitator

- Basic computer skills
- Experience with the software at the centers
- Experience designing problem-based lessons in math and science supported by technology
- Knowledge of the Texas Essential Knowledge and Skills (TEKS) and/or district curriculum

Prerequisite Skills of Participants

- Basic computer skills
- Basic understanding of Web navigation
- Experience designing lesson plans aligned to state standards and district curriculum

Grouping Strategy

Use a heterogeneous grouping strategy. To the extent possible, ensure that each group of three to four members includes some math and science teachers, as well as elementary school teachers who teach in self-contained classrooms. In addition, group members should preferably all teach the same grade level.

Session Sequence

The sequence of activities in this session will extend participants' knowledge of classroom environments that support the integration of technology with problem-based learning activities in math and science. Participants will also experience how to assess both the extent of technology integration in their classrooms and the quality of student work in such activities or lessons.

Participants will begin the session by exploring how technology can support problem-based math and science instruction. Next, they will examine, develop, and use rubrics to identify and analyze classroom components critical to technology integration in such instruction. Participants will then learn how to organize a classroom for technology integration by experiencing learning centers where they explore different software for learning math and science concepts. The session concludes with an exploration of how to assess student projects and the level of technology implementation in the classroom.

Equipment/Materials

- ❑ Computer with Internet access and data projector for facilitator
- ❑ Laptops with Internet access (1–2 per group)
- ❑ Chart paper and stand
- ❑ Chart markers (2–3 per group)

Engage

Whole Group

1. Say to participants, *"Today, we are going to look in-depth at how you can integrate technology in your classroom practice in mathematics and science. We have experienced some lessons previously that modeled an approach to problem-based lessons that employ technology.*

   "Think back to those sessions and your own experiences and reflect on the following problem:
   - *How might we use technology to support student learning in mathematics and science in a problem-based manner?*
   - *What factors would you need to consider in planning such a lesson (e.g., learning objectives, room arrangement, role of students)?*

   "Reflect on these questions and take about 3 minutes to jot down a few ideas that come to mind."

Pairs

2. **Think, Pair, Share.** After 3 minutes, ask participants to partner with a person nearby and share their ideas with their partner. Then, after a few minutes, ask participants to share their ideas with the whole group. Record the ideas on a T-chart. On one side of the chart, list factors to consider in planning this type of lesson. On the other side, list any ideas participants have regarding the problem in general. Continue until no new ideas are shared.
3. Participants should have identified factors such as the following:
   - Physical arrangement of the classroom
   - Placement and use of technology
   - Curriculum objectives(s) and content
   - Classroom management strategy (e.g., rules)
   - Methods of assessment

- Student roles and activity
- Teacher role and activity
- Questioning strategies

Explore

Equipment/Materials

- ❑ Laptops with Internet access (1 per center; 6–9 total)
- ❑ Chart paper and stand (per group and facilitator)
- ❑ Markers (1–2 per group and facilitator)

Handouts (1 per participant)

- ❑ 1: Rubric for a Neighborhood Project
- ❑ 2: Rubric Development Process
- ❑ 3: A Classroom Environment to Support Integrated Problem-Based Activities
- ❑ 5: Using Online Simulations
- ❑ 6: Analysis With Idea Mapping
- ❑ 7: Quick Guide for Diagramly
- ❑ 8: Testing Scenarios Using Spreadsheets
- ❑ 9: Quick Guide for Google Docs Spreadsheets

Whole Group

4. Say to participants, *"In this session, we are going to apply what you have learned in previous sessions about the BSCS 5Es Instructional Model and problem-based lessons and examine a range of technologies that may be used in your classroom to support those lessons.*

   "First, let's look at the list of factors you identified. Think about how these factors would look in a problem-based lesson supported by technology. For example, how would the classroom be arranged? What would the teacher be doing? What would the students be doing? How would technology be used?

   "You have likely developed rubrics in the past for a variety of purposes. Rubrics can be as simple as listing the pros and cons of purchasing something or accepting a job offer. Rubrics can also help students understand the expectations you have for their learning and provide a tool for assessing their learning. This type of rubric lists the elements of a task and how many points students will receive for each element. The rubric then provides a description of what is unacceptable, acceptable, and, perhaps, superior work for each of the elements of the task."

5. Tell participants they are going to look at a sample rubric, Handout 1: Rubric for a Neighborhood Project. Give each participant a copy of the handout.

6. Ask, *"What are the critical elements for the neighborhood project?"* (appearance, content/depth, communication, resources)

   "Notice how each element has some descriptors that indicate the level of attainment for that element. A superior project would be eye-catching, have precise content, employ a variety of resources including technology, and use complex vocabulary."

7. Ask participants to discuss the strengths and weaknesses of the rubric.

Table Groups

8. Give each participant copies of Handout 2 and Handout 3.

9. Tell participants, *"To develop a rubric like the one we examined, you would follow a process similar to that outlined on Handout 2: Rubric Development Process. We are going to practice*

that process now using Handout 3. Use this handout to create a rubric for an integrated math, science, and technology lesson that focuses on a problem."

10. Place participants in heterogeneous groups of three to four. Plan for a 3-minute transition from whole group to table groups.
11. Do one of the following: (a) assign two or three of the elements previously identified to each group or (b) ask each group to select from the list in the T-chart. If you have at least an hour to devote to this activity, ask each group to work on more elements.
12. Tell participants, "*You will begin by breaking down the assigned (or selected) element into subcategories. For example, physical arrangement of the classroom might be broken down into the subcategories of 'classroom library,' 'student desks and chairs,' 'teacher's desk,' or 'access to computers.'"*

    For each of these subcategories, ask participants to determine what variations might exist. For "classroom library," for instance, variations might range from "no classroom library" to "only fictional books," "fictional books and an encyclopedia," "fiction, nonfiction, and reference books," as well as other possibilities.
13. Direct participants to arrange the subcategories as follows from left to right: unacceptable, undesirable but acceptable, acceptable, outstanding or ideal. They should repeat this process for each subcategory, as needed.

    If the element does not have any subcategories, tell participants to define the variations for the element itself. For example, "questioning strategies" might range from "only recall-level questions are asked of a few students" to "all students in the class are included in questions that call for elaboration and clarification." Or that category could be broken down into the subcategories of "number of students" and "types of questions."
14. Tell participants they will have 20 minutes for this activity. They can use Handout 3 as a work copy and then transcribe their finished rubric to chart paper with text large enough for everyone to see. Ask them to post their rubrics on the wall near their work areas when finished.

Whole Group

15. At the end of 20 minutes, ask each group to share its results. Facilitate a discussion of the rubrics among the whole group.

Table Groups/Centers

16. Say to participants, *"We will be using these rubrics later today, but for now, we will turn our attention to two of the elements: (1) integration of technology and (2) organizing the classroom for student use of technology."*
17. Explain to participants that one method for organizing a classroom for integrating technology into math and science lessons is to create learning centers. Students rotate through the centers to experience different activities related to learning the concepts being taught. One or more of the centers should include technology tools (depending on availability), such as computers, digital cameras, and digital microscopes.

18. Tell participants, *"We are now going to experience a classroom organized in learning centers designed to allow you to explore different software for learning mathematics and science concepts. As you explore the software through the activities at each of the centers, work with your group members to generate ideas that you can use later to design your own problem-based lesson."*

    Direct participants to rotate through the centers in their groups. Explain that each center activity is designed to focus on a problem and employ some type of technology in the process of understanding the concepts posed by that problem. Each center also features a quick guide for the software in case participants need assistance. Tell participants they may call on you for additional help, but should ask their peers for help first.

19. Tell participants, *"You will have 20 minutes at each center. We will rotate three times so that each group has a chance to visit each center. When I call time, please gather your things and move quickly to the next center."*

20. Assign each group to a center and instruct them to rotate clockwise around the room through the centers. Depending on the number of participants, you may need to set up two or three sets of centers to prevent overcrowding at each one. The chart below lists the handouts for each center.

Center 1: Online Simulations	Handout 5: Using Online Simulations
Center 2: Concept/Idea Mapping	Handout 6: Analysis With Idea Mapping Handout 7: Quick Guide for Diagramly
Center 3: Spreadsheets	Handout 8: Testing Scenarios Using Spreadsheets Handout 9: Quick Guide for Google Docs Spreadsheets

21. After the participants have completed rotating through all three centers, distribute to each group a copy of the TEKS (including the Technology Application standards) for the grade levels represented. Ask the small groups to look through the standards to identify how the center activities are related, if at all, to the standards for their grade levels. Allow 10 minutes for this activity.

Whole Group

22. After 10 minutes, ask the whole group, *"What new information or skills did you acquire as you rotated through the centers? What did you learn? What skills did you apply? How is that content or skill related to the standards?"*

23. Facilitate the discussion about what participants learned until no new ideas or comments are generated.

Elaborate

Equipment/Materials

- ❑ Chart paper and stand (per group and facilitator)
- ❑ Markers (2–3 per group and facilitator)
- ❑ Handout 4: Generic Rubric (1 electronic copy per participant)

Whole Group

24. Tell participants, *"As a teacher, you need to know if students have learned the content and skills that you intended they learn when you planned your instruction. This requires some type of assessment. Classroom and student assessment is an essential component of good instruction and requires collecting data in a variety of ways. Formal methods may include tests, and informal means may include student work or responses to questions during instruction."*
    - Formal (summative) assessments are usually used to give grades, communicate with parents, or compare students with other students in the class or statewide.
    - Informal (formative) assessments are typically used to identify student strengths and weaknesses, guide instruction, and make decisions on how to assist individual students.

25. Say, *"One of the challenges of implementing integrated project-based units like those on which we have been working is assessment of student learning. As educators, we need to conduct continual formative assessments while students are working in their groups. We then need to provide a summative assessment, often represented by a grade, at the end of a lesson or unit. These assessments should be planned at the start when designing a problem-based learning unit."*

    Formative assessments for integrated project-based units may include:
    - Interim products or work samples turned in at designated times during production
    - Explicit questioning during class and at the end of class

    Remind participants that conducting group project summative assessments is often challenging. For example, decisions have to be made whether to assign one grade to everyone in a group or individual grades to each member of the group.

26. Lead a whole-group discussion about the ways in which participants have conducted group project- or problem-based formative or summative assessments in the past. On chart paper, record the different methods participants have used to assess students both informally and formally. Afterward, recap and categorize the assessment strategies.

    Formal and informal assessments may be categorized in multiple ways:
    - Whole class
    - Group
    - Individual students skills
    - Team or group skills
    - Content development

27. Say to participants, *"Depending on the type, method, and purpose of the assessment, there may be a variety of criteria on which student work is judged.*

    "*Suppose you are assessing students on the center activities we just completed. Think about the center activities and the related standards you identified. What are some of the elements that you would want to assess as the teacher?"*

28. List the criteria or elements participants identify on chart paper. Then ask participants to refer back to Handout 1: Rubric Development Guide as you distribute blank electronic copies of Handout 4: Generic Rubric.

Pairs

29. Instruct participants to pair up with a partner with whom they have not worked today. Direct each pair to create a rubric for a formative assessment of student learning in the centers. Tell participants they may use the elements the whole group just generated or add their own. Provide 20 minutes for this activity.

Whole Group

30. After 20 minutes, lead a whole-group discussion in which you ask participants to share the elements they wanted to assess and the criteria they applied to those elements to evaluate student work. Have participants also discuss how they can apply this type of assessment in their own practice.
31. Ask, "*Based on your assessment rubric, how would you assign 'grades' to students? Should students have access to the rubrics prior to the center activities? Why or why not?*"

Evaluate

Equipment/Materials

- ❑ Handout 10: Goal Setting Tool (1 electronic copy per participant)

Whole Group/Table Group

32. Say to participants, *"At the beginning of this session, you created a rubric for the components that need to be considered when implementing a problem-based lesson supported by technology in the classroom. Look back at the rubric you created. Use the rubric to assess today's session, focusing on the components you addressed. Write down the reasons and rationale for your ranking. If the ranking is low, what are some suggestions you would make to improve the score? You are welcome to work together with a partner or your small group on this task. Take about 5 minutes to review the rubric and then score today's activities for the components on your rubric."*
33. After 5 minutes, ask participants to share their rankings of the day's activities for the component(s) in their rubrics and to provide their rationales. Discuss how to make the session better for the future.
34. **Reflection.** Say to participants, *"Between now and the next session, be prepared to share how you would evaluate your own classroom environment using the rubric we designed today. Think about how you will include the characteristics of a classroom environment that supports high-quality integrated math, science, and technology problem-based activities. What changes will you need to make in your classroom environment, instructional practices, and assessment strategies? In your everyday practice, choose three things that you can work on between now and the next session. You will not be able to change everything overnight, so what are some things you can change quickly or begin to change?"*

35. Give each participant an electronic copy of Handout 10: Goal Setting Tool. Tell participants they can use this tool to create goals for their practice that they can start on immediately. At the next follow-up meeting, the whole group will review these goals and identify what things are working, what things are not working, and some potential strategies for overcoming barriers.

Technical Assistance Follow-Up

The technical assistance provider will meet with each teacher and review progress on lesson plan development, including the grouping strategies, classroom management approaches, and assessments planned. Provide feedback and share other ideas on the lesson that you may have.

Review Handout 10: Goal Setting Tool, which the participants completed at the end of this session. Ask the teacher if he or she has achieved any of the goals or implemented any of the strategies discussed during the session. Identify problems he or she may have encountered and provide suggestions for overcoming these barriers. Set a day and time for your next visit and come to agreement on what the teacher will have done by that time.

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Texas Essential Knowledge and Skills

Note, not all of the Texas Essential Knowledge and Skills (TEKS) for grades 4 through 8 relate to this session. Avoid "stretching" the session to make it apply to TEKS other than those listed below, which would not be an appropriate use of students' learning time.

Technology

§126.3. Technology Applications, Grades 3–5.

(b) Knowledge and skills.

(8) *Solving problems.* The student uses research skills and electronic communication, with appropriate supervision, to create new knowledge. The student is expected to:

(A) use communication tools to participate in group projects;

(B) use interactive technology environments, such as simulations, electronic science or mathematics laboratories, virtual museum field trips, or on-line interactive lessons, to manipulate information.

(11) *Communication.* The student delivers the product electronically in a variety of media, with appropriate supervision. The student is expected to:

(A) publish information in a variety of media including, but not limited to, printed copy, monitor display, Internet documents, and video; and

(B) use presentation software to communicate with specific audiences.

(12) *Communication.* The student uses technology applications to facilitate evaluation of communication, both process and product. The student is expected to:

(A) select representative products to be collected and stored in an electronic evaluation tool;

(B) evaluate the product for relevance to the assignment or task; and

(C) create technology assessment tools to monitor progress of project such as checklists, timelines, or rubrics.

§126.12. Technology Applications (Computer Literacy), Grades 6–8.

(b) Knowledge and skills.

(6) *Information acquisition.* The student evaluates the acquired electronic information. The student is expected to:

(A) determine and employ methods to evaluate the electronic information for accuracy and validity;

(B) resolve information conflicts and validate information through accessing, researching, and comparing data; and

(C) demonstrate the ability to identify the source, location, media type, relevancy, and content validity of available information.

(7) *Solving problems.* The student uses appropriate computer-based productivity tools to create and modify solutions to problems. The student is expected to:

(B) create and edit spreadsheet documents using all data types, formulas and functions, and chart information.

(9) *Solving problems.* The student uses technology applications to facilitate evaluation of work, both process and product. The student is expected to:

(A) design and implement procedures to track trends, set timelines, and review/evaluate progress for continual improvement in process and product; and

(B) resolve information conflicts and validate information through research and comparison of data.

(12) *Communication.* The student uses technology applications to facilitate evaluation of communication, both process and product. The student is expected to:

(A) design and implement procedures to track trends, set timelines, and review and evaluate the product using technology tools such as database managers, daily/monthly planners, and project management tools;

(B) determine and employ technology specifications to evaluate projects for design, content delivery, purpose, and audience, demonstrating that process and product can be evaluated using established criteria or rubrics.

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