Intel Teach Elements:
Project-Based Approaches

Abe's Action Plan

Instructions: Use the bookmarks on the left to navigate Abe's Action Plan.

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Module 1: Projects Overview
Lesson 1: Project Basics

Activity 1: Your Knowledge of Project-Based Learning
Estimated Time: 10 minutes

1. Complete the first two columns of your own Know-Wonder-Learn-How chart.

What do you already **know** about project-based learning?

What do you **wonder** about project-based learning?

What I **Know**	What I **Wonder**	What I **Learned**	**How** I Learned
Students work in groups during projects. Projects take more time. Students seem engaged during projects.	How much time will projects take? What teaching strategies should I use during projects? How will low-performing students do with projects? *(After Module 4, Lesson 1, Activity 1)* How can I use technology to manage projects? How do I handle absences during projects? How can I keep all the pieces of a project together? *(After Wrap-Up, Summary)* How can I involve students in developing assessments? How exactly will I assign project	*(After Module 1, Lesson 4, Activity 1)* Projects can be small and address a few standards. Teachers who do projects and act as facilitators free up time so they can better meet students' needs. Lower-performing students may do very well at projects. *(After Wrap-Up, Summary)* Technology tools can be used for project management, such as a wiki for storing all documents related to the project. A wiki can help with absences—students can access group members and project work on	*(After Module 1, Lesson 4, Activity 1)* I talked to Maria. I thought of ways to change a lesson into a project or how to make a lesson meet more project characteristics. *(After Wrap-Up, Summary)* I started to plan the various pieces of my playground project, and this helped me think through the project details. I learned more about assessment by developing project assessments.

grades?	the wiki.	
	21st century skills can be addressed in projects.	
	I can use an Assessment Timeline and Assessment Plan to help plan my assessments.	

Module 1: Projects Overview
Lesson 1: Project Basics

Activity 3: Project-Based vs. Conventional Instruction
Estimated Time: 15 minutes

Setting goals in this course will help you apply what you learn in your classroom. Goals you set now will be revisited later in the module and course. Think about project-based approaches you may currently use and also how you incorporate technology in your classroom

Based on your understanding of project-based learning so far, what goals would you like to set for yourself during this course/month/school year (choose one)? Write your goals. Below are some examples:
- Try some project-based learning strategies
- Make my classroom more student-centered
- Incorporate group work
- Do at least one project this year
- Do more than one project this year
- Improve a particular project
- Integrate technology in classroom learning

My project-based learning goals:

- Do at least one project in my class

- Include more project-based strategies in my class, particularly connecting classroom learning to the real world and improving students' self-direction skills

- Observe Maria's (my mentor) class and see what a project looks like in action

(Additional goals after Module 1, Lesson 2, Activity 4)

- When planning my project, develop ways to meet the needs of all learners, particularly low-performing students

- Use technology tools that I have not used before

(Additional goals after Module 1, Lesson 4, Activity 1)

- Use the Project Characteristics checklist when planning my project

(Additional goals after Wrap-Up, Summary)

- Focus on targeting specific 21st century skills

- Improve my questioning strategies, especially for student self-reflection

- Try to do a couple mini-lessons

2. What challenges do you face or expect to face when doing project-based learning? Use the following chart to record your challenges and possible solutions for overcoming the challenges. You will revisit this chart.

Challenges	Solutions
Projects will take too much time, won't connect to my standards and I will not be able to teach what I am required to teach.	Start small, look at standards first, and choose short, narrow topic, Plan project well to free up time during class to help students (Module 2)
My lower-performing students will struggle with projects.	Tap into students' talents and skills
My students will not have the skills required to work independently and manage their projects.	Do mini-lessons to teach skills (Module 5)

Additional challenges after Module 1, Lesson 2, Activity 4:

I am not sure how to assess the project.	Use assessment throughout the project—combine self, peer, and teacher assessment; use journals and self-reflections (Module 3)

Additional challenges after Wrap-Up, Summary:

I am not sure how to target specific 21st century skills.	Do mini-lessons, focus on a few skills for the project, include the skills in the objectives
I am not sure how to assess 21st century skills.	Use rubrics, review journal entries, conduct group conferences
I am not sure how to grade the project.	Generate individual and group grades

Module 1: Projects Overview
Lesson 2: Project-Based Learning Benefits

Activity 1: Benefits Based on Research
Estimated Time: 15 minutes

Identify particular students in your class and consider how you think they might benefit from project work, or how project work might pose a challenge for them.

Mark – benefits

Mark is a high-achieving student. He often seems bored in class. He asks for additional work and does research projects on his own. He is very bright and could benefit from a more challenging and creative learning environment. I think Mark would benefit by a project because it would allow him to dig deeply into a topic and get excited about schoolwork. I think it would help him develop his collaborative skills by working with a group in an ongoing project, even though he seems to prefer working independently.

Tracy – challenges

Tracy is a special needs student. She has a very low reading level, has difficulty staying focused and on task, and is often absent from class because she is pulled out for special support services. I am not sure how she would do in a setting with less directed instruction and less structure. I am also not sure how she could best contribute to a group project so the group would benefit from her and she would feel part of the project. I am concerned that her skills are too low to participate in a project.

Fiona – benefits

Fiona is a very active student. She is on several sports teams and does not like to sit still in class. She often dominates class discussions and has many ideas to contribute. She is social, and her peers see her as a leader. She has many ideas and is always giving suggestions. I believe she is involved in some community service work with her church. I could imagine how Fiona would take on a leadership role with projects and how her experiences outside the classroom could be tapped in the classroom.

Module 1: Projects Overview
Lesson 2: Project-Based Learning Benefits

Activity 4: Self-Assessment
Estimated Time: 10 minutes

Revisit and add to your goals and challenges established in *Module 1, Lesson 1, Activity 3.* Record them there.
- Have you established more project-based learning goals?
- Do you expect to face more challenges?
- Have you come up with solutions to some of your challenges?

Module 1: Projects Overview
Lesson 3: Project Characteristics

Activity 2: Roles
Estimated Time: 10 minutes

Project-based learning involves a change of classroom roles for the teacher, students, and community members. Consider how roles could change in your classroom for you, students, parents, and community members. Record your ideas below.

> I could step back and create opportunities for students to work with their peers and more independently from me. I could act as a facilitator, guiding the students but allowing them more opportunities to pose questions, pursue their own answers, engage in discussions with each other, problem solve, and learn from others, not just me, their teacher.
>
> When I plan a project, I could look at some issues in our community and see how the project could address those issues. I might be able to bring in guest speakers or get the students out into the community. I could also ask parents to help at times throughout the project.

Module 1: Projects Overview
Lesson 3: Project Characteristics

Activity 5: Project Improvement
Estimated Time: 20 minutes

A Project Characteristics checklist is useful for planning and implementing a project. Review the checklist located in this activity. Then, look at a particular project, unit, or lesson that you teach. Use the checklist to assess which characteristics are included in the project, unit, or lesson. How could you improve the project, unit, or lesson to include more characteristics?

When I teach data analysis and probability, students conduct surveys in the class on different topics. I choose the topics, and then, in pairs, students pull a topic out of a hat. They work in pairs. They identify two different populations in the class to survey, they develop survey questions, conduct the survey, create graphs, analyze the data, and create posters to explain their results. I hang the posters around the room.

Adult and Student Roles

- o I will create a scenario where students take on the role of an expert as they present their analysis and posters

- o I will look for more opportunities where students make decisions and manage their time.

Project Structure

- o I like the idea of an over-arching Essential Question that I may use across the semester.

- o I will review the questions I have used for this project and distinguish unit from content questions

The Learning Experience

- o I will have the students use spreadsheets and graphing to record, display, and analyze their data

- o I will need to do a mini lesson on spreadsheets

Module 1: Projects Overview
Lesson 4: Module Review

Activity 1: Module Summary
Estimated Time: 15 minutes

Revisit the Action Plan work you started at the beginning of the module.

1. Look at your K-W-L-H chart in *Module 1, Lesson 1, Activity 1.* Review your chart. What can you add to the Learned and the How columns? What did you learn

about project-based learning and how did you learn it? Add to the Know and Wonder columns, if desired.

2. Revisit the goals you established at the beginning of the module in *Module 1, Lesson 1, Activity 3* for project-based learning. How have you worked towards these goals? Have you made progress? Change or add to your goals, if desired.

3. Review the challenges you faced or expected to face at the beginning of the module in *Module 1, Lesson 1, Activity 3.* Can you add any suggestions for overcoming the challenges in the Solutions column? Do you have additional challenges to add?

Module 2: Project Design
Lesson 1: Project Planning

Activity 2: Project Ideas from Standards
Estimated Time: 20 minutes

In this module, focus on a single project as you complete each Your Turn activity since the planning steps build on each other.

The first step in the project design process is to review your standards.

1. Search your curriculum standards.

2. Identify some project ideas that might align with specific standards, like Abe and Maria have done.

3. Note your ideas and their associated standards below.

Note: See sample Elementary, Middle School, and High School samples in the Appendix.

Standards	Project Ideas
Number and Operations: Understand numbers, ways of representing numbers, relationships among numbers, and number systems	Students create a business and use fractions, decimals, and percentages for figuring out profits and losses. They could focus on a business that could be run in the school (school supplies, flowers for Mother's Day, and so forth).
Geometry: Use visualization, spatial reasoning, and geometric modeling to solve problems	Students work as inventors, building a new invention based on their two-dimensional plans. Or, they could engineer a new product by drawing two-dimensional plans for production.
Measurement: Apply appropriate techniques, tools, and formulas to determine measurements	Students work as designers or architects to plan a building, community center, or park.

Module 2: Project Design
Lesson 1: Project Planning

Activity 3: Project Ideas from the Community
Estimated Time: 15 minutes

Develop a project idea that both strongly targets your standards and connects to the real world.

1. Brainstorm a project scenario like Maria and Abe did.
2. Write the project description below.

Note: See sample Elementary, Middle School, and High School samples in the Appendix.

Students become designers and engineers as they develop plans to redesign the playground for the nearby elementary school. They create proposals and get input from project planners and architects.

As students develop their plans, they use measurement skills to draw a blueprint to scale, data analysis skills to collect input from the community, and communication skills to share their plans.

Module 2: Project Design
Lesson 2: Learning Goals

Activity 1: 21st Century Skills
Estimated Time: 10 minutes

You will learn strategies for teaching 21st century skills in Modules 3 and 5. To prepare for those activities,

1. Review the list and description of 21st century skills located in this activity.

2. Identify the top four 21st century skills that you want to target in your classroom. If you are creating a single project during this course, identify the top four 21st century skills for that specific project.

3. Note your ideas below.

21st century skills:

- Communication and Collaboration
- Critical Thinking and Problem Solving
- Initiative and Self-Direction
- Creativity and Innovation

Module 2: Project Design
Lesson 2: Learning Goals

Activity 2: Learning Objectives
Estimated Time: 10 minutes

1. Review the 21st century skills and the Standards and Objectives Rubric referenced in this activity. Identify the standards you are targeting for your project:

    - Develop, analyze, and explain methods for solving problems involving proportions, such as scaling and finding equivalent ratios

    - Draw geometric objects with specified properties, such as side lengths or angle measures

    - Select and apply techniques and tools to accurately find length, area, volume, and angle measures to appropriate levels of precision

    - Select, create, and use appropriate graphical representations of data, including histograms, box plots, and scatter plots

    - Communicate mathematical thinking coherently and clearly to peers, teachers, and others

2. Brainstorm observable, specific, standards-based, and 21st century skills-focused learning objectives for your project.

    Note your ideas below.

    - Create a drawing to scale of an original, innovative, and safe playground design

    - Conduct a survey and analyze results to prioritize wants and needs for a new playground

    - Design and build a three-dimensional representation of a playground design to scale from two-dimensional plans

    - Communicate thoughts and ideas clearly and persuasively through speaking and writing to a variety of audiences

Module 2: Project Design
Lesson 3: Questions that Frame Learning

Activity 2: Curriculum-Framing Questions in Action
Estimated Time: 25 minutes

1. View additional samples of Curriculum-Framing Questions located in this activity. Consider any questions or ideas you could use in your classroom.

   Use the Curriculum-Framing Questions worksheet located in this activity to help you create Curriculum-Framing Questions for your own project. Write your draft Curriculum-Framing Questions below.

Essential Question	How is math used in the real world?
Unit Question(s)	What playground should we choose?
Content Questions	How do we use math to help persuade others? How do we make a map to scale? How do you use a measuring tape?

Use the CFQ Rubric located in this activity to assess your questions. Revise your Curriculum-Framing Questions above, if needed.

Essential Question	How can our voices be heard?
Unit Question(s)	How do we design a playground that is safe and enjoyable for everyone?
Content Questions	How do you create a map to scale? What is the best way to represent data from a survey? How do you make accurate measurements?

Module 2: Project Design
Lesson 5: Activity Design

Activity 1: Activity Planning
Estimated Time: 10 minutes (25 minutes if completing the optional activity)

1. Keeping your targeted 21st century skills in mind, brainstorm some types of student-centered activities you may want to incorporate into your classroom regardless of project. Consider ways you could integrate technology. Note your ideas below.

   - Work with experts and community members

   - Collaborate with others to solve a real-world problem

   - Use wikis to share ideas, plans, and resources

   - Provide students with opportunities to design their own solutions

2. **(Optional)** If you are designing a project, keep your objectives in mind and brainstorm a draft sequence of activities below.

   - Discuss students' experiences with having adults listen to their opinions. Introduce the Essential Question, *How can our voices be heard?*

   - Students brainstorm a list of items that they believe should be included in the new playground design.

   - Students research playground safety requirements.

   - Students discuss concerns associated with the current playground and seek creative solutions.

   - Students poll their schoolmates and the faculty on playground priorities and analyze and report results.

   - Students accurately measure and design a playground.

   - Students present their findings and recommendations to the school board.

Module 2: Project Design
Lesson 6: Module Review

Activity 1: Module Summary
Estimated Time: 10 minutes

Reflect on your learning in this module.

I was a little overwhelmed by the idea of projects at the beginning, but this step-by-step approach to the overall design process was really helpful. I was worried about how projects would meet standards, but since we start with identifying standards and 21st century skills before planning any activities, I can see that standards are critical for project planning.

I like the structure of Curriculum-Framing Questions that address important concepts at many levels from big interesting ideas to very specific content knowledge. Talking through them with Maria was very helpful. I'm interested in someday using an Essential question as kind of an overarching theme across several units. But, I am wondering how well it actually go over in my classroom.

I was also interested to learn about the different ways to assess during projects since most of my assessments so far have been tests and quizzes. I was concerned about accountability when students are working in a group, and this introduction helped me to see some ways to assess both group and individual work. I had not thought too much about ongoing assessment, so I am looking forward to going deeper into assessment in the next module and learning more about how to create an Assessment Timeline.

Module 3: Assessment
Lesson 1: Assessment Strategies for Projects

Activity 2: Purposes of Assessment
Estimated Time: 15 minutes (30 minutes if completing the optional activity)

1. Save at least one assessment instrument for each of the following purposes to your Course Folder. Note which assessment instrument you select for each purpose and how you might use it in a project.

    Assessment Purposes

    - Gauging Student Needs Assessment

    > Students will respond to this prompt in their journals:
    >
    > How will you use math to design a new playground?

    - Encouraging Strategic Learning Assessment

    > I would use conference questions to get students to think about their learning processes.

    - Demonstrating Understanding Assessment

    > A project rubric will be used during the project and at the end of the project by students and by me to assess content learning.

2. **Optional:** Open at least one of the saved assessment instruments and modify or create an assessment to meet your classroom needs. Note how and when you might use the assessment instrument.

    > The Playground Project Rubric will be used by students while they work on the project to make sure they are meeting the project criteria. I will use it at the end of the project to assign a grade.

Module 3: Assessment
Lesson 2: Assessment of 21st Century Skills

Activity 3: Assessment of Thinking
Estimated Time: 15 minutes (30 minutes if completing the optional activity)

1. Explore the assessments shown in the table in this activity and save at least one assessment for a learning process and one assessment for a thinking skill to your Course Folder. Note how and when you would use each assessment.

   Learning Process Assessment:

Collaboration Checklist

   How I would use the assessment:

My students will fill out a collaboration self-assessment checklist every three days while they work on the project.

   Thinking Skill Assessment:

Problem Solving Rubric

   How I would use the assessment:

Students will use this rubric to self-assess their problem solving skills during the project.

2. **Optional:** Modify or create at least one assessment on a learning process or a thinking skill to meet your classroom needs. Note how and when you would use the assessment.

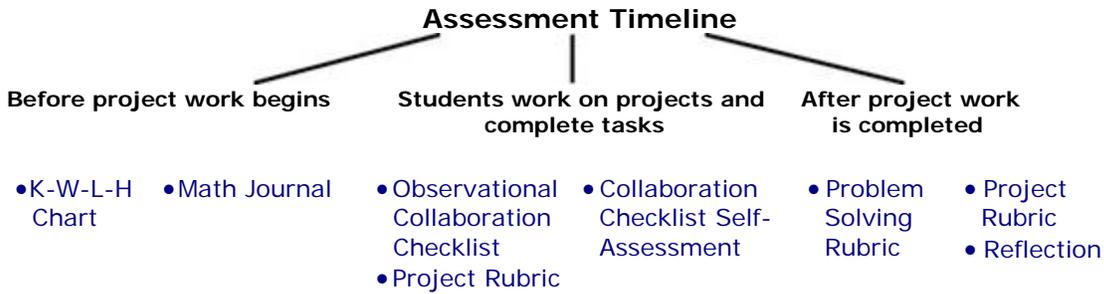 | |
   |---|
   | Playground Problem Solving Rubric—Students will use this rubric as part of their end-of-project reflection to think about the problems they faced during the project and how they solved them. Then, they will set goals for improving their problem solving skills in the next unit. |

Module 3: Assessment
Lesson 3: Assessment Planning

Activity 2: Assessment Plans
Estimated Time: 30 minutes

1. Create an Assessment Timeline for your project.

Assessment Timeline

Before project work begins	Students work on projects and complete tasks	After project work is completed
• K-W-L-H Chart • Math Journal	• Observational Collaboration Checklist • Project Rubric • Collaboration Checklist Self-Assessment	• Problem Solving Rubric • Project Rubric • Reflection

2. Fill in the table below to complete the Assessment Plan for your project

Assessment	Purpose and Process of Assessment
K-W-L-H Chart	At the beginning of the project, I will have a class discussion to fill in a K-W-L-H chart about the math needed for the playground project. I will use what I learn to plan what to teach.
Math Journal	Students will write in their journals about the math they think they will need to use to design the playground. I will use this information to plan instruction.
Observational Collaboration Checklist	I will use the observation checklist to assess students' collaboration skills throughout the project. I will use this information to plan instruction in different collaboration skills and to give students individual feedback so they can set goals and monitor their own progress.
Project Rubric	Students will use the project rubric to self- and peer-assess how well their project meets the project criteria. In addition, I will use the rubric at the end of the project to assign a grade.
Collaboration Checklist Self-Assessment	At different times throughout the project, students will fill out a collaboration checklist assessing their collaboration skills. They will use this information to set goals for future projects.
Problem Solving Rubric	Part of the students' final reflection will involve using a problem solving rubric to reflect on how well they solved problems while they were working on the project. Students will use what they discover to set goals for the next project.
Reflection	At the end of the project, students will write a reflection on their math learning, collaboration and problem solving experiences, and thinking skills. In the reflections, they will discuss how well they reached their goals and will set goals for the next project.

Module 3: Assessment
Lesson 4: Grading Projects

Activity 1: Rubrics and Scoring Guides
Estimated Time: 15 minutes (30 minutes if completing the optional activity)

1. Explore the rubrics shown in the table in this activity and save at least one assessment for a product and another assessment for a performance. Note how and when you might use the assessments.

    Product Assessment:

Electronic Publication Rubric

    How I would use the assessment:

I would use this rubric when my students write a newsletter for parents that describes how math fits into our school fundraising project.

    Performance Assessment:

Multimedia Presentation Rubric

    How I would use the assessment:

I would use this assessment for the presentations my students give on different ways to show a million.

2. **Optional:** Convert a rubric to a scoring guide and note how and when you would use it.

    Scoring Guide:

Fundraising Newsletter Scoring Guide

    How I would use the assessment:

I would use this scoring guide to assign grades to final newsletters.

Module 3: Assessment
Lesson 4: Grading Projects

Activity 2: Group Grades
Estimated Time: 10 minutes

Outline a group grading strategy for your project: .

I will use a combination of group points on the final group presentations and points for collaboration.

About 50% of the project grade will be individual work. The other 50% will be related to group work and collaboration as shown below

- 35%: Group project grade (for final product or performances)—everyone gets the same points

- 5%: Combination of self- and peer-assessment on collaboration

- 10%: Teacher assessment on collaboration within group (points will vary by individual)

Module 3: Assessment
Lesson 4: Grading Projects

Activity 3: Process Grades
Estimated Time: 10 minutes

Think about the various instruments and methods you might use to assess collaboration, self-direction, and thinking skills.

Note how you might include these 21st century skills in assigning grades to your students.

Students' final reflections will be graded with a rubric that includes criteria for collaboration and problem solving.

Module 3: Assessment
Lesson 5: Module Review

Activity 1: Module Summary
Estimated Time: 10 minutes

Reflect on your learning in this module.

I learned new ways to assess student learning that I had not thought about before. Now that I have completed this module, I see how assessing students throughout a project makes more sense than just assessing their work at the end. It seems obvious now, but I always depended on end-of-unit tests to let me know how my students were doing.

I had never really thought about assessing skills such as problem solving or collaboration before. Now that I have explored different ways to assess these skills, I feel confident that I can do a better job of helping my students improve their 21st century skills.

Module 4: Project Planning
Lesson 1: Project Organization

Activity 1: Project Challenges
Estimated Time: 5 minutes

Review the K-W-L-H chart and add any questions that you have related to project planning and management.

Activity 2: Project Timelines
Estimated Time: 15 minutes

Now that you have reviewed sample project timelines, use any format you wish to outline a rough draft for a unit you plan to teach. Note the name below and save it in your Course Folder.

Project Timeline file name:

Playground Project Timeline

Module 4: Project Planning
Lesson 2: Management Strategies

Activity 1: Management Scenarios
Estimated Time: 15 minutes

After you read the two classroom management scenarios, think about how the teachers' situations relate to your classroom experience. Note ideas you can use in your classroom.

- Set up stations when students are doing research on topics
- Use online survey tool to survey parents and community
- Create a wiki for project directions and tasks, and have each student group create a wiki for collaborating
- Teach students how to use social bookmarking sites for research and sharing information

Activity 3: Strategies for Communicating about the Project
Estimated Time: 10 minutes

After reviewing the sample wrap-up scenarios, think about a wrap-up experience you want to try for your project. Record your ideas.

> Invite professional planners, children from the local elementary school, parents, and other community members to a showcase of student projects. Students can share their plans for the new playground. Or, simulate a school board meeting where students present their ideas to the school board and try to convince the board to adopt their plans for the elementary school playground.

Activity 4: Strategies for Managing Timing and Transitions
Estimated Time: 15 minutes

When planning for managing timing and transitions, consider:
- Project schedule
- Student attendance

Record ideas about any strategies you want to use in your classroom.

> Project Schedule: Concentrate on playground project for three weeks, working on the project every day
>
> Attendance: Set up a wiki for students to find all directions, handouts, and plans, and have each group set up a wiki for their work

Activity 5: Strategies for Managing Collaboration
Estimated Time: 15 minutes

After following the student/teacher conference, think about the following questions:
- How do you think the teacher conference went?
- Did it give you ideas for your conferences with students?

Record your ideas about any strategies you want to use in your classroom.

> - Check in with groups regularly
> - Look at project checklists
> - Ask probing question
> - Ask questions of each student to check individual understanding
> - Encourage students to problem solve
> - Assign next steps
> - Provide positive feedback
> - Give date for next check-in

Activity 6: Strategies for Managing Resources
Estimated Time: 15 minutes

When planning for managing resources, consider:
- Technology management
- Student file management
- Materials management
- External resources

Record ideas about any strategies you want to use in your classroom.

> - Set up a project wiki before the project starts
>
> - Learn how to use Google SketchUp
>
> - Set up computer stations
>
> - Get brochures from playground companies—organize in files for each group

Module 4: Project Planning
Lesson 3: Project Tasks and Activities

Activity 1: Implementation Plans
Estimated Time: 15 minutes (30 minutes if completing optional the activity)

1. After reviewing the sample implementation plans in different formats, consider a format that would work for you. Use the implementation plan template to help guide you in developing your own implementation plan.

2. Plan specific strategies for at least one of the management categories and record below:
   - Communicating about the project
   - Timing and transitions
   - Fostering Collaboration
   - Managing Resources

   > Communication: Send home a letter and encourage parents to check the project wikis
   >
   > Timing: Do the project in Spring for three weeks
   >
   > Fostering Collaboration: Have each group use a group wiki
   >
   > Managing Resources: Wikis, folders

3. **Optional:** Draft an implementation plan, using any format that works for a project you plan to teach. Note the name below and save it in your Course Folder.

   Implementation plan file name:
   > Playground Project Implementation Plan

Module 4: Project Planning
Lesson 4: Module Review

Activity 1: Module Reflection
Estimated Time: 10 minutes

Reflect on your learning in this module. Note any of the project management ideas that you would like to put more time and attention into to improve your project-based approaches in your classroom.

> I like the idea of using a project timeline and an implementation plan to manage my project. I think this will help me with planning as well as staying organized during the project. I know that I need to do a lot of pre-work, but I think it will pay off during the project.
>
> I plan to develop some templates for students to use for research during the project as well as for data gathering. I also think that using a wiki will be very helpful. I am excited to get students started on wikis. I know it will take some time for me to set up my wiki, but once I do this, I can use this for future projects. I am also looking forward to learning Google SketchUp.

Module 5: Guiding Learning
Lesson 1: Questioning in Classrooms

Activity 1: Questions for Different Purposes
Estimated Time: 15 minutes

In this activity, you learned about six purposes for using questions in the classroom. Review the purposes and think about how you typically use questions in your classroom. Choose purposes that interest you and write additional questions for your students.

Motivate and engage students' curiosity and interests
- How would you cook a meal without electricity or fire?
- What would you give up if you had to cut down on electricity use at your house?

Which playground equipment is the most popular? Why?

Determine student knowledge and understanding
- What are the characteristics of a good insulator?
- What are three types of heat transfer?
- Since we have learned that . . ., now what do you think . . .?
- What do you mean by that?

How would we find out how big our playground is?

Prompt observation and description of phenomena
- What do you notice about...?
- Can you see a difference (or similarity) between...?

Which playground equipment is the most popular?

Which equipment is the most dangerous?

Encourage reflection and metacognition
- What strategies did you use to solve this problem?
- What did you learn?
- What would you have done differently?

What was the biggest mistake you made during this project?

What did you try for the first time with this project to help you work better with your group?

Promote critical thinking and problem solving
- What kind of information would you need to solve that problem? Where would you find it?
- What is the evidence for your opinion?
- Can you look at the problem from a different perspective?
- Which option would save more energy and why?
- Using your data, which features are best for your design and why?

> How can you collect accurate information about playground use?

Encourage creativity, imagining, and hypothesizing
- Are there some other ways you might . . .?
- What if everyone . . . ?
- Can you look at the problem from a different perspective?

> Can you think of new ways to use everyday playground equipment?

Module 5: Guiding Learning
Lesson 2: Collaboration and Self-Direction

Activity 1: Teaching Collaboration and Self-Direction
Estimated Time: 20 minutes

1. Open Collaboration and Self-Direction Skills from your Course Folder.

2. Identify one or two subskills of collaboration or self-direction that your students need to work on for your project. Describe when you would introduce these subskills with a mini-lesson.

> I would conduct a mini-lesson on constructive critiquing when students share their presentation outlines for peer review. Depending on how well they do, I might conduct another mini-lesson near the end of the project when they give each other feedback just before completing their projects.

Create a Mini-Lesson

Create a mini-lesson on a collaboration or self-direction subskill for your project. Use the four steps and questions below to create a mini-lesson:

    a. Model the subskill

    b. Discuss when and how to use and modify the subskill

    c. Practice the subskill

    d. Apply the subskill

1. How will you model the subskill?

> I will show how to give constructive feedback on a presentation outline.

2. What content related to the project will you use?

> I will use a presentation outline for a playground design.

3. How will you demonstrate how to use the subskill with that content?

> I will use a think-aloud:
>
> I will tell the students, "I'm going to pretend I'm a student looking at another team's presentation outline to give them good feedback."
>
> "I wonder if the audience will know whether kids would like the new playground. I will make a note to the team that made the presentation suggesting that they explain why kids will like it?
>
> When, I look at the order of their outline. I wonder if the audience might like to know how much the new playground would cost first. I make a note to ask the team if they could describe the cost of the playground first. The team can decide if they think that is a good idea or not.
>
> I don't understand the part about talking to parents and I think maybe the school board might not understand it either, so I tell the authors of the presentation that I'm confused there and ask them to explain a little more."

4. What discussion questions will prompt thinking about how to use and modify the subskill?

> What kind of feedback do you want about your work?
>
> Do you ever ask people for feedback about something you have done outside of school? What kinds of comments help you?
>
> Does the kind of feedback that is useful change depending on the project?

Module 5: Guiding Learning
Lesson 3: Information Literacy

Activity 2: Teaching Information Literacy
Estimated Time: 20 minutes

1. Review your standards for those standards that address information literacy subskills. You may want to refer to Information Literacy Subskills saved in your Course Folder or downloaded from the Resource tab. Note any connections between the units you teach and relevant subskills.

> Identify areas for further investigation (5.1.b)—Unit on baseball statistics
>
> Begin to distinguish between fact and opinion (5.1.p)—Probability unit

2. Identify the subskills that your students have and those that they need to work on during your project. Note when and how you might teach the skills they need.

   Information Literacy Subskills My Students Have:

   > Recognize the need for information
   >
   > Identify a variety of potential sources of information
   >
   > Distinguish among fact, point of view, and opinion (beginning)

Subskills My Students Need for This Project	Stage of Project
Formulate questions based on information needs	When students begin research
Select information appropriate to the problem or question at hand	During research
Organize information for practical application	After research

- How will students practice the subskill and get feedback?

  > Select appropriate information
  >
  > I will show a Web page and ask students to work in groups to highlight where would be the best place to find information. While they are working, they will do think-alouds, describing their thinking and getting feedback on their processes.

- How will you ask students to use the subskill while they work on their projects?

  > "When you look at a Web site that might have information that will help you with your project, think about the strategies that will help you find information you can use efficiently."

Module 5: Guiding Learning
Lesson 4: Student Reflection

Activity 2: Reflection Planning
Estimated Time: 15 minutes (30 minutes if completing optional activities)

1. Save Reflection Ideas to your Course Folder. Browse through ideas for encouraging effective student reflection and goal setting. Record any reflection ideas you might use and note how and when you would incorporate them into your teaching.

    > Exit Slips—I like the idea of doing a quick reflection at the end of class. This would be especially useful during times when students are working independently for most of the class time.
    >
    > Journals—I like the questions that ask students to think about when they do their best work.

2. Review and modify your Assessment Timeline from *Module 3, Lesson 3, Activity 2*, if necessary, to include reflection activities.

3. **Optional:** Design a reflection and goal-setting activity for the end of your project.

    > Reflect on your project by answering the following questions. Remember to give specific examples to illustrate your thoughts.
    >
    > 1. What was the most important concept you learned about math during this project?
    > 2. What did you do well while working with your group, and what could you have done better?
    > 3. What problem solving strategies did you try? What worked well and what did not work so well?
    >
    > Based on your learning and experiences during this project, set three goals for the next project.

Module 5: Guiding Learning
Lesson 5: Module Review

Activity 1: Module Summary
Estimated Time: 10 minutes

Reflect on your learning from this Module.

I benefited from learning how the skills of collaboration, critical thinking, and other 21st century skills can be broken down into more specific subskills. Thinking about how to model these subskills is challenging, but I can see how students would benefit from this kind of instruction.

I am a little concerned about the number of subskills I might need to teach. It might be challenging to do a good job with them, but that is the reason why we need to think of instruction throughout a school year, and even throughout a student's entire school career.

Course Wrap-Up
Summary
Estimated Time: 20 minutes

Revisit the Action Plan work you started at the beginning of the module.

1. Go to your K-W-L-H chart in *Module 1, Lesson 1, Activity 1.* Review your chart and add to the Learned and How columns.

2. Revisit the goals you established at the beginning of the course in *Module 1, Lesson 1, Activity 3* for project-based learning. How have you worked towards these goals? Have you achieved your goals? What new goals do you have for project-based approaches in your classroom?

3. Review the challenges you faced or expected to face at the beginning of the course in *Module 1, Lesson 1, Activity 3.* Add any ideas for overcoming these challenges in the Solutions column.

Appendix
Sample Project Ideas

Elementary

Module 2: Project Design
Lesson 1: Project Planning from the Beginning
Activity 2: Project Ideas from Standards

In this module, focus on a single project as you complete each Your Turn activity since the planning steps build on each other.

The first step in the project design process is to review your standards.

1. Search your curriculum standards.

2. Identify some project ideas that might align with specific standards, like Abe and Maria have done.

3. Note your ideas and their associated standards below.

Standards	Project Ideas
4th Grade Science 112.6.b.(6) Science concepts. The student knows that change can create recognizable patterns. The student is expected to: (A) identify patterns of change such as in weather, metamorphosis, and objects in the sky.	Students take on the role of weather reporters to present weather information, patterns, and warnings.
4th Grade Science 112.6.b.(8) Science concepts. The student knows that adaptations may increase the survival of members of a species. The student is expected to: (A) identify characteristics that allow members within a species to survive and reproduce; (B) compare adaptive characteristics of various species; and (C) identify the kinds of species that lived in the past and compare them to existing species.	Students take on the role of biologists and create a collaborative wiki to discuss and compare frog species with other classes and experts.
4th Grade Math 111.16.b.(4.2) Number, operation, and quantitative reasoning. The student describes and compares fractional parts of whole objects or sets of objects. The student is expected to: (A) use concrete objects and pictorial models to generate equivalent fractions; (B) model fraction quantities greater than one using concrete objects and pictorial models; (C) compare and order fractions using concrete objects and pictorial models; and (D) relate decimals to fractions that name tenths and hundredths using concrete objects and pictorial models.	Students create a cookbook with their own pictures that describes and depicts fractions used in cooking and serving, and use multiplication of fractions to change quantities served for each recipe.

Module 2: Project Design
Lesson 1: Project Planning from the Beginning
Activity 3: Project Ideas from the Community

Develop a project idea that both strongly targets your standards and connects to the real world.

1. Brainstorm a project scenario like Maria and Abe did.
2. Write the project description below.

Students take on the role of weather reporters to present weather information to lower grades. Students discuss and use images to indicate weather patterns, identify warning signs of weather change, wear appropriate clothes as a model, and identify how to be safe in a particular type of weather. Students give presentations to younger students and/or digitally videotape their presentations and include those videos on a weather wiki that tracks and predicts weather patterns in the local area. The wiki could also be used to partner with other schools around the country or world to discuss, track, and compare weather patterns.

Middle School

Module 2: Project Design
Lesson 1: Project Planning from the Beginning
Activity 2: Project Ideas from Standards

In this module, focus on a single project as you complete each Your Turn activity since the planning steps build on each other.

The first step in the project design process is to review your standards.

1. Search your curriculum standards.

2. Identify some project ideas that might align with specific standards, like Abe and Maria have done.

3. Note your ideas and their associated standards below.

Standards	Project Ideas
Grade 7 Language Arts 2.1 Students write fictional or autobiographical narratives: a. Develop a standard plot line (having a beginning, conflict, rising action, climax, and denouement) and point of view. b. Develop complex major and minor characters and a definite setting. c. Use a range of appropriate strategies (e.g., dialogue; suspense; naming of specific narrative action, including movement, gestures, and expressions).	Students become authors and create stories/books that follow a standard plot line for the local upper elementary students.
Grade 7 History/Social Science 7.1 Students analyze the causes and effects of the vast expansion and ultimate disintegration of the Roman Empire.	Students create a newspaper exposé on the expansion and expected disintegration of the Roman Empire as if written during the end of the Roman Empire.
Grade 7 Science 6.0 Physical principles underlie biological structures and functions. As a basis for understanding this concept: c. Students know light travels in straight lines if the medium it travels through does not change. d. Students know how simple lenses are used in a magnifying glass, the eye, a camera, a telescope, and a microscope. e. Students know that white light is a mixture of many wavelengths (colors) and that retinal cells react differently to different wavelengths. f. Students know light can be reflected, refracted, transmitted, and absorbed by matter.	Students research the workings of the eye and how sight is impaired when the lens and structure of the eye do not let light in as intended. Students create a pamphlet on vision problems and work with local ophthalmologists and optometrists to provide a vision screening for the public.

Module 2: Project Design
Lesson 1: Project Planning from the Beginning
Activity 3: Project Ideas from the Community

Develop a project idea that both strongly targets your standards and connects to the real world.

1. Brainstorm a project scenario like Maria and Abe did.
2. Write the project description below.

Students research and create experiments to understand the workings of the eye and how sight is impaired when the lens and structure of the eye do not let light in as intended, thereby causing farsightedness, nearsightedness, astigmatism, glaucoma, and so forth.

Students create a pamphlet for the public that describes and visually depicts how the eyes work, and shows what can happen when the structure of an eye or lens does not properly process incoming light.

Students work with local ophthalmologists and optometrists to provide student-created pamphlets and a basic vision screening to help the public understand the causes and symptoms of vision problems.

High School

Module 2: Project Design
Lesson 1: Project Planning from the Beginning
Activity 2: Project Ideas from Standards

In this module, focus on a single project as you complete each Your Turn activity since the planning steps build on each other.

The first step in the project design process is to review your standards.

1. Search your curriculum standards.

2. Identify some project ideas that might align with specific standards, like Abe and Maria have done.

3. Note your ideas and their associated standards below.

Standards	Project Ideas
Grade 10 Language Arts 10.8 Students analyze the causes and consequences of World War II.	Students act as reporters or authors who research the causes and consequences of WWII and create a product to share with the community for Veteran's Day or Memorial Day such as a story from the viewpoint of a fictional character, an Internet-based multimedia flowchart, newspaper articles from interviews, and so forth. Students use primary resources as well as interviews of local WWII veterans.
Grades 9–12 Science Dynamic Earth Processes 3. Plate tectonics operating over geologic time has changed the patterns of land, sea, and mountains on Earth's surface. As the basis for understanding this concept: b. Students know the principal structures that form at the three different kinds of plate boundaries. c. Students know how to explain the properties of rocks based on the physical and chemical conditions in which they formed, including plate tectonic processes. e. Students know there are two kinds of volcanoes: one kind with violent eruptions producing steep slopes and the other kind with voluminous lava flows producing gentle slopes.	Students create a book of geological formations of the local area to share with the local community, geological society, and schools.

Grades 9–12 Geometry 12.0 Students find and use measures of sides and of interior and exterior angles of triangles and polygons to classify figures and solve problems.	Students determine and diagram appropriate angles needed to win a game of pool, miniature golf, croquet, or other game that depends on angles for ball movement, put the theory into practice, and then modify their plans as needed.

Module 2: Project Design
Lesson 1: Project Planning from the Beginning
Activity 3: Project Ideas from the Community

Develop a project idea that both strongly targets your standards and connects to the real world.

1. Brainstorm a project scenario like Maria and Abe did.
2. Write the project description below.

Students research the formation of rocks and geological formations through Internet research, books, presentations by experts, and local field trips. Student teams are assigned different types of geological formations to discover in the local area. Using digital cameras and guidance from a mentor, students create chapters for a book on their particular geological formations to include:

- Pictures of geological formations in the local area
- Explanations of how the formations were formed
- Analysis of expected movement or future events
- Description of the impact on the community

Students will assemble the chapters into a single book on geological formations in the local area to sell to the community, geological society, libraries, and schools.