

Project-Based Learning Through a Makerspace Lens

Christina Naruszewicz, Cathy Vaughn, Morgan Myers
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Time Frame 100-120 session(s)

Essential Question(s)

- Why is it important for students to participate in project-based learning experiences?
- How do I create a PBL for my students?

Summary

This activity aims to prepare faculty to design effective, technology-integrated project-based learning (PBL) experiences that leverage the opportunities afforded by a robust Makerspace or STEM lab. It is based on the "Design a Project" Project-Based Learning PD, which introduces participants to the components of PBL and immerses the participants in mini project-based learning experiences.

Learning Goals

- Participants will be able to identify and explore the essential elements of project-based learning.
- Participants will be able to identify and evaluate resources to support the creation of PBL lessons.
- Participants will be able to create a plan for the implementation of PBL around student standards that integrate the use of a Makerspace technology.

Attachments

- 8 Essential Elements of Project-Based Learning—Project-Based Learning Through a Makerspace Lens.docx
- 8 Essential Elements of Project-Based Learning—Project-Based Learning Through a Makerspace Lens.pdf
- Card Sort Set 1—Project-Based Learning Through a Makerspace Lens.docx
- Card Sort Set 1—Project-Based Learning Through a Makerspace Lens.pdf
- Instructional Strategy Notes—Project-Based Learning Through a Makerspace Lens.docx
- Instructional Strategy Notes—Project-Based Learning Through a Makerspace Lens.pdf
- KWHLAQ Blank Chart—Project-Based Learning Through a Makerspace Lens.docx
- KWHLAQ Blank Chart—Project-Based Learning Through a Makerspace Lens.pdf
- KWHLAQ Explanation Sheet—Project-Based Learning Through a Makerspace Lens.docx
- KWHLAQ Explanation Sheet—Project-Based Learning Through a Makerspace Lens.pdf
- Math and Science Card Sort—Project-Based Learning Through a Makerspace Lens.docx
- Math and Science Card Sort—Project-Based Learning Through a Makerspace Lens.pdf
- Online Learning Resources—Project-Based Learning Through a Makerspace Lens.docx
- Online Learning Resources—Project-Based Learning Through a Makerspace Lens.pdf
- Presentation Slides—Project-Based Learning Through a Makerspace Lens.pptx
- Project-Based Learning Action Plan—Project-Based Learning Through a Makerspace Lens.docx
- Project-Based Learning Action Plan—Project-Based Learning Through a Makerspace Lens.pdf
- SS and ELA Card Sort—Project-Based Learning Through a Makerspace Lens.docx
- SS and ELA Card Sort—Project-Based Learning Through a Makerspace Lens.pdf

Materials

- Presentation Slides (attached)
- 8 Essential Elements of Project-Based Learning (attached; 1 per participant)
- Card Sort (Set 1) (attached; 1 set per group)
- Math and Science Card Sort (attached; 1 set per math/science group)
- Social Studies and ELA Card Sort (attached; 1 set per social studies/ELA group)
- KWHLAQ Blank Chart (attached; 1 per participant)
- KWHLAQ Explanation Sheet (attached; 1 per participant)
- Project-Based Learning Action Plan (attached; 1 per participant)
- Online Learning Resources (attached; 1 per participant)
- Instructional Strategy Notes (attached; 1 per participant)

Engage

Go to **slide 1** of the attached **Presentation Slides**. Introduce yourself and the session topic.

Go to **slide 2**. Introduce the problem of being stranded on a deserted island. Ask participants to select three items they would bring with them to help them get off of the island. Invite participants to share answers at their tables before soliciting a few answers from the group.

Presenter's Note: Transition

To make the connection between this problem and today's session explicit, discuss the participants' engagement with the conundrum posed and how students can experience similar engagement when they are given a problem to solve using project-based learning.

Technology Option

If you would like to expose participants to an instructional technology tool during this activity, invite them to post their three items using Mentimeter, an interactive presentation software. Create an account, create a new presentation, and select a question type. Word Cloud or Open Ended are recommended for this particular question. Once you have typed your question and created your presentation, post menti.com and the 6-digit code into slide 2 for participants to access. Display the menti you've created during the presentation so participants can see others' responses as they populate on the screen.

Go to **slide 3**. Pass out the **Project-Based Learning Action Plan**. Ask participants to identify a topic students struggle with in their class and write it on their handout. They will use this topic for their action plan later in the session. Possible examples of topics to pose to participants as they consider their topic include: Why are fractions so difficult? Why is slope-intercept the preferred form? What is the most important type of essay? Should books be banned under any circumstances? Why is code switching important in life?

Go to **slide 4**. Introduce today's learning goals and connect the learning goals with the deserted island conundrum. A problem was posed, and the group brainstormed possible solutions for that problem. This might be something participants would do to help engage their students with a problem associated with a standard in their classrooms. The selection of a topic and standard will help support the goal of developing a plan of implementation later in the session.

Go to **slide 5**. Share with participants that you recognize the elements of project-based learning may be overwhelming to a teacher who is just beginning to plan lessons using PBL. Research suggests it is better for students to immerse themselves in projects, even if the project design is not perfect or does not have all the elements included in a "true" PBL cycle. In other words, "Try it, anyway!" is a fitting motto to keep in mind for the session and implementation of PBL.

Explore

Go to **slide 6**. Introduce the scenario and driving questions. The participants are the group of dedicated teachers to which the Real-World Scenario refers.

Go to **slide 7**. Pass out the **KWHLAQ Explanation Sheet**, which includes instructional strategies and tools for each element of a KWHLAQ, and also the KWHLAQ Blank Chart. In an effort to connect to participants' prior knowledge about KWL charts, share with participants that a KWHLAQ is similar to a KWL with some additions that were added to support PBL. Use this strategy to facilitate participants' learning about PBL, similar to how they might use the strategy with their students as part of a PBL experience. The following is the intent of the KWHLAQ strategy:

- K- What do you know? (Elicit prior knowledge)
- W- What do you want to know? (Set personal learning goals)
- H- How will you find out? (Specify tools used to answer or address learning goals)
- L- What have you learned? (After research, form connections from prior knowledge to new knowledge)
- A- What action will you take? (Make a plan)
- Q- What further questions do you have? (Set goals for continued learning)

Go to **slide 8**. Participants will use the Think-Pair-Share strategy to discuss their KWHLAQ, beginning with the KW. Invite participants to first write down what they already know about project-based learning in the K column and then what they want to know about project-based learning in the W column of their Blank Chart. After they have written down their thoughts on these two questions, participants will discuss their answers with a partner. Allow a couple of participants to share out with the group after partner sets have had time to share with each other.

Go to **slide 9**. Share with participants that they will learn about PBL from this presentation, videos, internet research, and conversation with any participants who have created PBLs. Invite them to add this information to the H section of their handout.

Go to **slide 10**. Show participants the Project-Based Learning: Success Start to Finish video, asking them to focus on the topic of PBL as they watch. Address any concerns that participants may bring up with the video (e.g. "The school and students in the video are different than our school and students").

Embedded video
https://youtube.com/watch?v=-OWX6KZQDoE

Go to **slide 11**. Use the I Notice, I Wonder strategy to ask participants to consider what they noticed and what they wonder about PBL after viewing the video. Solicit a few answers from the participants.

Go to **slide 12**. Pass out the **Instructional Strategy Notes**. Allow time for participants to begin their LEARN Strategy Reflection by considering how the KWHLAQ and I Notice, I Wonder strategies have been used in the activity and how they could be used in their classrooms.

Explain

Go to **slide 13**. Invite participants to get into groups of 3-4 by subject area, with ELA and Social Studies making groups, Math and Science making groups, and Electives teachers going to whichever of the two group types they prefer. Give participants the **8 Essential Elements of Project-Based Learning** reading. Instruct participants to Why-Light this reading, highlighting the information they find useful and jotting down in the margins why they think it is useful or important. After participants have had time to read and Why-Light, ask for a participant to share something they Why-Lighted from each element of the reading.

Presenter's Note: Prior Preparation

The Card Sorts in the next portion of the activity require preparation before you facilitate this session. There are three sets of Card Sorts that will need to be printed, cut out, and bagged.

Go to **slide 14**. Participants will use a Card Sort to order the steps of project-based learning planning in the sequence they think makes sense. Give each group the attached **Card Sort (Set 1)**. Instruct participants to engage in the card sort activity. After groups have had time to arrange their cards according to how they would design a project from start to finish, allow them to share out. Encourage them to explain their reasoning for the sequence they chose.

Go to **slide 15**. Share with participants the suggested sequence for PBL planning, but also make it clear that slight variations are fine, as some of the steps are more recursive in nature. Ask participants to keep their card sort and the order they chose intact for the next activity.

Extend

Go to **slide 16**. Give participants the second card sort that is associated with their content area. Math/Science groups will receive the **Math/Science Card Sort**, and Social Studies/ELA groups will receive the **Social Studies/ELA Card Sort**. Participants can use the first card sort as a resource to support them as they arrange their second set of cards. Allow them time to match the activity to the correct steps and then compare with like groups.

Go to **slide 17**. Invite participants to fill out the L and Q portions of their KWHLAQ Chart with what they have learned about project-based learning and what further questions they may have. Allow participants to share with each other and then the whole group using a Think-Pair-Share.

Go to **slide 18**. Allow time for participants to reflect and complete their LEARN Strategy Reflection on the Instructional Strategy Notes handout, noting how the Why-Lighting, Card Sort, and Think-Pair-Share strategies have been used in the session and how they might use them in their own classrooms.

Evaluate

Presenter's Note: Makerspace List

Before presenting this activity, consult with the school to determine what technologies teachers have available to them. Create a list of these technologies to share with participants as they will be designing a PBL experience utilizing one or more of these technologies.

Go to **slide 19**. Give participants the **Online Learning Resources** handout. They may use the handout to access resources that can be used to support them as they design PBL experiences for their students. Also, share with participants the list of technologies available in their school's Makerspace. Allow some time for the participants to explore resources and consider their technologies.

Go to **slide 20**. Have participants use the Project-Based Learning Action Plan handout they received at the beginning of the session to develop an action plan for implementing PBL around the topic they identified and a Makerspace technology. Protect time for participants to develop their action plan. They may also continue to view the resources on their Online Learning Resources handout for additional ideas and exploration.

Presenter's Note: Scaffolding

To scaffold this activity for participants, the PBL planning steps from the Card Sort are included on the Project-Based Learning Action Plan handout and on **slide 21**. Remind participants who are overwhelmed or hesitant to begin their planning of the motto for the day: "Try it, anyway!" Encourage them to take their planning one step at a time, beginning with identifying the standard associated with their selected topic.

Go to **slide 22**. After the participants have had time to begin designing a PBL experience for their students and when it is time for the session to end, thank participants for attending.

Follow-up Activities

The aim of this professional development is to introduce participants to project-based learning and allow them time to design a tech-integrated PBL. Follow-up activities would include checking in with participants to see what success and/or struggles they had completing the design and implementation of their project. If participants are not yet comfortable with the components of PBL after this session, the "Design a Project" Project-Based Learning PD would afford them the opportunity to increase familiarity with the PBL cycle by engaging in a mini-PBL experience.

Research Rationale

Project-based learning (PBL) is a learning design that organizes student learning around projects (Thomas, 2000). Projects are complex tasks, based on authentic, challenging questions or problems, that involve students in design, problem-solving, decision making, or investigative activities. Project-based learning gives students the opportunity to work over extended periods of time and culminate in products or presentations for audiences beyond the classroom. Project-based learning is not new (Holm, 2011). Essential elements to creating project-based learning experiences have emerged over time. These essential elements are important to consider when teachers are designing a project-based learning experience for students (Everette, 2015). According to Everette, teachers should include driving questions and an entry event that engages or activates the students' interest. PBL Works, a leader in project learning design, identifies components that make project-based learning different from having students just complete projects (Larmer & Mergendoller, 2015). These elements include identifying significant content or key knowledge to engage students with a challenging problem, providing opportunity for sustained inquiry, allowing for student voice, choice, reflection, and revision, and creating a public product or presentation (Larmer & Mergendoller, 2015). In a review of the literature surrounding project-based learning, researchers reported that students who had participated in high quality project-based learning had higher levels of engagement with content, greater depth of understanding of concepts, student development of problem-solving skills, and transfer of skills to new situations (Holm, 2011; Thomas, 2000). Professional development that also has a Makerspace focus should provide teachers with opportunities to discuss content-specific connections to illustrate how the technology can integrate with their existing classroom activities (Oliver, 2016). Research recommends that educators follow common instructional design processes, such as backwards design, when tying classroom content to the Makerspace technology, first considering objectives and skills, then their available materials, and then questions or problems to address the objectives using the technology (Oliver, 2016). Educators are more likely to adopt making in their classroom if they have access to professional development that trains them to plan for technology integration with their curriculum (Oliver, 2016).

Resources

- Edutopia (2012, May 23). Project-Based Learning: Success Start to Finish. [Video]. YouTube. https://youtu.be/-OWX6KZQDoE
- Everette, M. (2015). Eight essential elements of project-based learning. Scholastic.com. https://www.scholastic.com/teachers/blog-posts/meghan-everette/8-essential-elements-project-based-learning/
- Holm, M. (2011) Project-based instruction: a review of the literature on effectiveness in kindergarten through twelfth grade classrooms. *Rivier Academic Journal*. 2011,Vol. 7(2). http://www.bie.org/object/document/project_based_learning_a_review_of_the_literature_on_effectiveness
- K20 Center. (n.d.). Card sort. Strategies. https://learn.k20center.ou.edu/strategy/d9908066f654727934df7bf4f506976b
- K20 Center. (n.d.). I notice, I wonder. Strategies. https://learn.k20center.ou.edu/strategy/d9908066f654727934df7bf4f507d1a7
- K20 Center. (n.d.). KWHL graphic organizer. Strategies. https://learn.k20center.ou.edu/strategy/d9908066f654727934df7bf4f505dd47
- K20 Center. (n.d.). The "Design a Project" project-based learning PD (shorter version). Activities. https://learn.k20center.ou.edu/pd/fc74060730ea745c8c4f356aa203e67c
- K20 Center. (n.d.). Think-pair-share. Strategies. https://learn.k20center.ou.edu/strategy/d9908066f654727934df7bf4f5064b49
- K20 Center. (n.d.). Why-lighting. Strategies. https://learn.k20center.ou.edu/strategy/d9908066f654727934df7bf4f505e7d5
- Larmer, J. & Mergendoller, J. (2015). Why we changed our model of the 8 essential elements of PBL. Buck Institute. http://www.bie.org/object/document/why_we_changed_our_model_of_the_8_essential_elements_of_pbl
- Mentimeter. (n.d.). https://www.mentimeter.com/
- Oliver, K. M. (2016). Professional development considerations for makerspace leaders, Part one: Addressing "What?" and "Why?" *Tech Trends*. 60, 160-166.
- Oliver, K. M. (2016). Professional development considerations for makerspace leaders, Part two: Addressing "How?" *Tech Trends*. 60, 211-217.
- Thomas, J. (2000). A review of the research of project-based learning. The Autodesk Foundation. https://documents.sd61.bc.ca/ANED/educationalResources/StudentSuccess/A_Review_of_Research_on_Project_Based_Learning.pdf