3-P Learning in Michigan

The Michigan policy context for STEM learning is advantageous yet, curricula and instructional resources have been historically fragmented. The MiSTEM network aims to coalesce key industries, communities, and organizations to support STEM education through interdisciplinary teaching and learning within a coordinated and flexible resource system. This vision is built on four pillars: create a STEM culture, empower STEM teachers, integrate business and education, and ensure high quality STEM experiences.

The main thrust of the fourth pillar, high quality STEM learning, is "3-P learning," which stands for problem-, project-, and place-based learning. Problem- and project-based learning are both student-centered approaches focused on learning through experience. While problem- and project-based learning are frequently used together or interchangeably they are distinct pedagogical approaches.

In *problem-based learning* children learn about a subject through the experience of solving an open-ended problem found in observable phenomenon. The end-goal is to solve a problem, whether real or simulated by the teacher. Rather than focusing on a defined solution, problem-based learning encourages exploration and experimentation, as well as for the development of knowledge acquisition, enhanced group collaboration, and communication.

In contrast, *project-based learning* revolves around creating something tangible, such as a product, performance, or event. As the name suggests, children learn in the context of a sustained, real-world projects, which typically includes interdisciplinary activities such as research, scientific exploration, writing, and multimedia production. The *S3 Outlier* study highlight the positive influence of problem- and project-based learning on children's dispositions towards science and STEM careers (LaForce, Noble, & Blackwell, 2017).

Place-based learning is aimed at solving community problems. Place-based approaches seek learning opportunities derived from the cultural, economic, environmental, and geographical aspects of a specific community. Students employ anthropological and field-based methods to address community problems, immersing themselves in the reality of what it means to address issues specific to a location. Research indicates that place-based learning supports scientific engagement (Zimmerman et al., 2016), sustainability (Kates et al., 2001), and inclusive educational practices (Davison-Hunt & O'Flaherty, 2007).

Examples:

PROBLEM-BASED LEARNING

- Our water supply was compromised due to high flooding last year, which contaminated our local reservoir. To prevent recurrences in the future, should we re-design our reservoir? Should we devise a less expensive but more comprehensive system for filtering water? Which is more economical? How can we present these solutions to City Hall?

PROJECT-BASED LEARNING

- There is a small, unused plot of land behind the middle school building. Let's devise a use for the land (eliciting suggestions from students), determine what's best (A mini playground? A picnic area? A garden? A small grove of trees? Something that you, the teacher, haven't thought of?), write letters to the stakeholders, apply for grants for materials, brainstorm sustainable ways to make our idea happen, and actualize our vision.

PLACE-BASED LEARNING

- Students from East High School visit the Ecology Center at a nearby preserve to investigate algae blooms in a pond located there.
- West Middle School students explored the (cultural, ethnic, demographic) diversity of the local community and, through interviews, collected stories of cultural belonging and class struggle in order to create a book, titled *Staying Power*.