Strategies for Discovery

THIS CHAPTER WILL GUIDE YOU TO:

- Think critically about the qualities of effective projects (and avoid the pitfalls of those that fall short)
- Consider a variety of sources for project inspiration
- Start mapping out your project with a plan to reach key learning goals

A cross-grade team of teachers from Oulu, Finland, wanted to expand their use of inquiry as a springboard for student learning. Specifically, they wanted to encourage primary students to make observations and raise questions about what they were seeing in the world around them. Learning through observation occurs in real life, so teachers began imagining how to bring inquiry into students' daily activities—traveling to and from school, pursuing hobbies, or just spending time at home.

Finland, respected internationally for its high-performing educational system, also has one of the highest per-capita uses of mobile phones in the world. That meant teachers in Oulu knew their students would have ready access to mobile devices. As then-primary school teacher Pasi Mattila explained, "The camera phone is familiar for pupils and a meaningful tool for communicating and working. The benefit of a mobile data terminal [such as a smartphone connected to other networked technologies] is that it goes where the learners go."

The Finnish teachers, working within a school system that encourages teacher collaboration, continued brainstorming about how to connect all the pieces of their project—instructional goals and accessible technologies, plus student collaboration and problem-solving skills. They designed a project to make use of camera phones, GPS, and a networked learning environment to support the process of inquiry learning. Mattila called the result "meaningful and motivating learning."

In one authentic project, student teams gathered and analyzed data about recycling to make observations about recycling habits at home and in the community. They then developed recommendations for a school recycling program. After leading students through innovative learning experiences such as this one, Mattila has gone on to become an international advocate for inquiry-based, student-driven learning and immersive learning environments.

This chapter focuses on selecting and designing projects. You may decide to adapt a project plan that has been developed—and already classroom tested—by another teacher or teaching team. Or, like the creative teachers from Oulu, you might want to design your own project from scratch, integrating technology in new ways to reach your instructional goals. Either way, the same critical thinking goes into planning. By the end of this chapter, you will have worked through a process to create a basic project idea that encompasses your most important learning aims.

Reviewing Projects

If you decide to start with a project plan designed by someone else, remember *caveat emptor* ("let the buyer beware"). With a multitude of projects to choose from, you need to be aware that quality varies widely. Be selective.

Even if you ultimately decide to design your own project plan, it helps to review other plans first. This gives you an opportunity to be a critical consumer. It is also an excellent activity to do with colleagues, especially if you are collaborating with teachers you do not yet know well. By reviewing existing plans together (such as those online at iEARN or Global SchoolNet), you will start to get a sense of the sorts of projects that interest your colleagues. You can also practice giving critical feedback without having to critique each other's project-planning efforts just yet.

Overcoming Pitfalls

How can you apply your own critical thinking skills when it comes to reviewing project plans? Look past the "window dressing" of projects that seem appealing or make use of dazzling technologies. Instead, pay attention to the quality of the student experience. Are important learning aims addressed? Does the project plan include samples of student work, which you can also critique? Now, imagine your students doing the same project. Will students master rigorous content? Will they engage in activity that helps them become independent learners? Learn to make inquiries? Carry out effective research and make new meaning? Learn to learn from and with others? Use tools for important purposes? As you examine the work of others, you are engaging in just the kind of critical thinking and information literacy you want to see in students.

Here are a few pitfalls in project design to watch for:

- **Potential pitfall: Long on activity, short on learning outcomes.** If the project is busy and long but reaches small or lower-order learning aims, it is not worth investing your students' time—or yours. A project should be "right sized" for what it accomplishes. If students could learn as much through a brief lecture or by reading about the topic, then the project falls short. Also, look at the learning outcome. If every student product is similar, or if what students produce could be found easily in any reference material

(i.e., "Googleable"), this is an indication that the learning accomplished is lower-order, at the level of recall and understanding. The project may be limited, but it might also offer you the germ of a good idea. As a critical thinker, you might say to yourself: *This caught my attention but falls short. Where could my students and I go with this idea?*

- **Potential pitfall: Technology layered over traditional practice.** Having students research a topic on the internet and then present it in an electronic slideshow is not a quality project—it is just a dressed-up version of a research report. Good projects focus on reaching significant learning outcomes, not merely making use of technology applications. If learning aims are lofty and technology helps your students reach them, then the integration of technology is essential to the project. As you are reviewing a project plan, consider whether technology is used to meet authentic learning goals. For example, does it bring people together, connect students to rich data or primary sources, enable students to connect with an authentic audience, or provide some other way for students to create and share unique and high-quality learning products?
- **Potential pitfall: Thin thematic units.** Picture a third-grade class that studies the ocean each year. Students write reports and draw pictures of sea creatures, learn fractions with shells in math class, read stories about sea adventures, and even visit an aquarium. Although the ocean is everywhere, the work is not interdisciplinary, collaborative, or especially rigorous. Rather than learning through rich inquiry experiences, students are likely to be following the teacher's lead through a series of activities that tie to the ocean theme.

  Thematic teaching is not necessarily project-based learning—but it can be. Structured differently, an oceans project might have elementary students learning about fisheries, commerce, and transportation when they research where the seafood in their grocery store comes from and how it rates on a sustainability scorecard. They might study the lives of fishermen and document how fishing has changed over time. They may poll the student body or the larger community to learn about patterns of fish consumption, and then examine their data in light of USDA dietary recommendations and report their findings and advice to their peers or community. This treatment is narrower but richer and more naturally interdisciplinary than the thematic project about oceans first described.

A thematic approach can be trivial, but it does not have to be. Some classes use a unifying theme for a whole year's work. In the prior example, the project on ocean fish could be one in a series of related projects structured under the ocean theme. Imagine, for example, how the themes *change* or *power* could be addressed repeatedly over the year through a variety of projects. Think about how a theme would unify a year's worth of projects and help students make important connections. Other quality themes to consider are *survival, justice, interdependence, designed and natural worlds*, and *chaos and order*. When examining thematic projects or creating your own, look for ways a theme elevates and connects the learning to big ideas. Look for opportunities to investigate a theme through an inquiry lens.

- **Potential pitfall: Overly scripted with many, many steps.** The best projects have students making critical decisions about their learning path. Be wary of over-prescriptive project plans that have many discrete steps. You and your students may be following a recipe that leads to limited and predictable results. That said, you may also be looking at a complicated project that is worth all those steps. Look to the description of learning objectives and student outcomes as you evaluate a plan. If students end with cookie-cutter work products that look much the same, or if the outcomes otherwise do not justify the steps, you can probably find a better approach.
- **Potential pitfall: Not enough focus on formative assessment.** Assessment needs to happen early and often in PBL. Planning for check-ins on student understanding and adjustments to your teaching plan along the way will help students get to quality results by the end, when it is time for summative assessment. When you read a project plan, think about whether it has phases with natural milestones and work products that you and others can weigh in on with constructive feedback.
- **Potential pitfall: Assessment that does not feel authentic.** When students are doing real-world projects, their work should be assessed in a way that mirrors real-world measures of quality. Avoid this pitfall by making sure students will have an authentic task or project and an authentic audience for their efforts.

If you come across a project that looks promising but comes up short, either find another treatment of the same topic or remodel the project for more significant learning. Consider how these aspects of critical thinking might frame a project and improve quality:

- **Compare and contrast.** Students studying community safety compare "broken windows" policing with other approaches and advise the city council on their findings.
- **Predict.** As they prepare to launch a new cookie brand, student entrepreneurs conduct taste tests and consumer response to varied marketing campaigns in order to predict potential market share.
- **Understand causal relationships** (cause and effect). Students parse data from the National Highway Traffic Safety Administration road crash database to identify significant factors contributing to accidents in their city and recommend ways to make travel on their city's streets safer.
- **Determine how parts relate to the whole** (systems). After viewing the movie The Martian, student teams use the free modeling software program STELLA to determine how myriad factors influence the continuation or collapse of a planetary biosphere of their own design.
- **Look at change over time.** In a city history project, second-grade students examine photographs of downtown shot over decades and, based on their findings, make recommendations about future enhancements to the city.
- **Identify patterns or trends.** Fourth-grade students wishing to reduce food waste at their school measure the weight of discarded foods over a menu cycle and use tabulation and graphing features of spreadsheets to draw conclusions.
- **Examine perspectives and alternate points of view.** High school language arts students examine news articles for examples of bias and sort fact from opinion before writing their own op-ed pieces about controversies that concern them.
- **Make a well-founded judgment or informed decision.** After fourth-grade students identify trends in their "thrown-away food" research data, they survey student preferences and use both as the basis for a proposal for changes in the cafeteria's offerings.
- **Extrapolate to create something new.** After studying the effects of healthy nutrition and exercise, students take on the role of personal trainers and develop customized wellness plans for clients referred by a local health center.

Designing Terrific Projects: Getting Started

By now, you and your colleagues should have a good idea of what to look for in a project. You are probably eager to start designing your own project or adapting a plan to meet your goals. But first, let's spend a few minutes "listening in" as experts talk about how they launch into the project design process. Where do their good project ideas come from? Think of those who have developed expertise in project-based learning as your advance scouts. They can help you find your way to your own excellent project. Sometimes, the journey involves avoiding the very pitfalls discussed in the previous section.

Canadian educator Sylvia Chard, professor emeritus of early childhood and elementary education at the University of Alberta, highlights many effective teacher-developed projects on her Project Approach website (projectapproach.org). Chard recommends a flexible framework to guide project design.

What is the value of flexibility? Take a look at the thinking behind The Boat Project, developed by primary teacher Cheryl Weighill at Minchau Elementary School in Edmonton, Alberta, and previously featured on Chard's website. Weighill describes how the idea naturally emerged from the interests of her first- and second-grade students (Chard, 2007).

Originally, the primary team had planned a thematic unit on the topic of water. But then, on a cold winter day, the school organized a special event that caused the teachers to reconsider their plan. As a break from the chilly Canadian weather, children were invited to wear beach clothes during the school day. Activity centers gave children a choice of beach-related materials to explore. Weighill and her colleagues noticed that many of their students were enthralled with using blocks to make a model of a boat. As Weighill relates:

> The study of the ocean as a project was thought to be too broad and not part of these children's experiences or their real world; therefore, we discarded "the ocean" as the project topic. But, since many of the children had begun constructing a boat out of the large blocks in the block center and interest was shown by the children through their conversation, questions, dialogue, anecdotes, and even their disagreements of how boats are constructed, the topic of "boats" was chosen for our project. As the block boat was being constructed, more and more of the children joined

> in to the role-playing of a boat experience. The children were interested in sharing their personal experiences and anecdotes. This was the birth of the boat project. One of the children announced, "We should build a boat, a real boat!" And so our journey began. (S. Chard, personal communication, April 16, 2007)

Weighill's team could have stuck with their original thematic unit on water. Instead, they were wise enough to let students' interests and curiosity drive the learning experience by focusing on a question: *How can we build a real boat?* The resulting project allowed teachers to reach a number of important instructional goals, such as grade-level science standards relating to buoyancy, boats, and design; language arts goals; and using math problem-solving and measurement in authentic ways. The interdisciplinary project naturally led to activities that developed students' inquiry skills and taught them to engage in internet research to answer their own questions. Throughout the seven-week project, students took part in experiences that helped them become better at making decisions, working in teams, and providing evidence of what they had learned.

Author Diane McGrath (2002–2003), a retired education professor, emphasizes the importance of getting away from traditional thinking when you begin to design a project:

> To really engage learners, you have to set up a situation in which they want to ask questions, want to learn more, need to know something they don't already know, and believe it is really important to them and, especially, to the larger community to find out. Your project will not be a lab in which students replicate what someone else has done. A good project will instead be an extended investigation in which students design the subquestions and the ways of trying to answer them because they believe in what they are doing.

What might this look like in practice? To make her point, McGrath challenged secondary science teachers to design a project inspired by *New York Times* columnist Andrew Postman. Postman chronicled his attempt to go on an "energy diet" to reduce his household consumption of fossil fuels. McGrath suggested that teachers ask students the open-ended questions: *How can my household lower our energy use by 5%? And what will it cost (in comfort, convenience, and money)?* She suggested steering students toward resources such as online energy calculators, multimedia sites about climate change, and web resources from government agencies and environmental organizations.

Another project came about because two teachers with a passion for politics wanted to activate their students' interest in the electoral system. Michael Kaechele (@mikekaechele), a teacher from Michigan, teamed up with Joe Urschel (@RealJoeUrschel), a self-described "political nerd" from Indiana, to launch #MyParty12 during the 2012 election season. Rather than teaching students about political parties from a textbook, they challenged students to formulate their own party platforms and broadcast their positions in YouTube videos. The project gained momentum throughout election season (fueled on Twitter with the #MyParty12 hashtag), as students from across the country joined in the conversation, eventually debating issues via Google Hangouts with peers from across the country.

Four years later, Kaechele invited teachers across the United States to take part in #MyParty16. This time, the project emphasized civil discourse along with political action. As Kaechele explained in a blog post, "Most of the rhetoric coming out of the two camps [in the 2016 presidential election] focuses on personal attacks, rather than policy. What an opportunity for educators to teach students about political activism, important issues, third parties, and civility!"

For the 2016 project, students developed party platforms, produced campaign advertisements, and conducted primary elections on their own campuses. Winners from each school went on to compete in statewide elections. The top five candidates debated their platforms via Google Hangout as a lead-in to national voting. Students did not just learn about the democratic system but joined it as active participants who could think critically and communicate civilly about vital issues.

Side Trip
Project Design Resources

Many experts have contributed research and effective strategies to our understanding about how to design effective projects. If you are interested in learning more about the research in this area, take a look at these resources:

- **Buck Institute for Education (BIE).** With a quarter century of experience as a PBL leader, BIE offers project-based learning research, professional development, and publications that focus on designing, managing, and assessing projects for 21st-century success. The website (bie.org) includes

a range of downloadable resources for project design, a searchable project library, readings and videos, and a PBL do-it-yourself tutorial.

- **Understanding by Design.** Grant Wiggins and Jay McTighe's excellent book (2005) has helped thousands of educators apply the process of "backward design" and learn how to frame curriculum around essential questions. See also *The Understanding by Design Guide to Creating High-Quality Units,* 2010.
- **Bobpearlman.org.** Bob Pearlman, an education reform leader and longtime advocate of PBL, maintains a comprehensive website (bobpearlman.org) with resources and recommendations, including professional development opportunities and PBL schools worth a visit.

The Best Projects Share Important Features

Research-based frameworks for project design share distinguishing features. Keep these features in mind as you design your own project.

The best projects share the following qualities. They:

- are loosely designed with the possibility of different learning paths
- are generative, causing students to construct meaning
- center on a driving question or are otherwise structured for inquiry
- capture student interest through complex and compelling real-life or simulated experiences
- are realistic, and therefore often cross multiple disciplines
- reach beyond school to involve others
- tap rich data or primary sources
- are structured so students learn with and from each other
- call for iterative work with cycles of feedback, reflection, and revision
- have students working as inquiring experts might

- get at digital-age skills and literacies, including communication, project management, information and media literacy, and technology use
- get at important learning dispositions, including persistence, risk-taking, confidence, resilience, self-reflection, and cooperation
- have students learning by doing
- connect students with an authentic audience or allow public sharing of what they know

Where Project Ideas Come From

Good projects are everywhere. Even a classroom irritant can be the impetus for a quality project, according to a teacher who repurposed students' (disruptive) portable music players into devices for inquiry.

At Sherman Elementary, a school with a STEAM/PBL focus in Tacoma, Washington, kindergarten teacher Ron Stanley does not have to look far to find worthy project ideas. When the community banned plastic grocery bags, he parlayed students' new environmental awareness into an action project. "We had experts talk with the kids about single-use plastics. Before long, and with a little prompting, they were noticing single-use plastic cups and utensils in the lunchroom. We started gathering these materials, washing them, counting them, and sorting them according to recycling symbols," he says. Students eventually presented their data to school officials and lunchroom staff, and the school agreed to switch from plastic utensils to reusable stainless steel. The teacher artfully guided students' investigation and analysis, "but if you ask the kids, this was all their idea," he says. "That's the way it should be."

Another project grew out of crowded playground conditions, a consequence of the school's popularity. "We've grown from 270 to about 430 students," Stanley says, as families have embraced the school's STEAM/PBL approach. "But the playground's the same size. Kids are waiting to go on the swings and other things. That raises questions: Do we have enough stuff to play with? Who likes what?" Kindergarteners conducted surveys to find out classmates' preferences. They analyzed potential solutions, such as adjusting recess times, as they developed recommendations to address "this real-world kid problem."

Whether students are focusing on issues involving their own campus, the local community, or the wider world, Stanley recommends putting students into the role of problem-finder. "Even from a young age, students can discover problems that they will want to work on solving."

Consider looking in the following different directions in search of project ideas. An example for each is included elsewhere in this book. Use these ideas to inspire your own projects.

- A tried-and-true project with potential for more meaningful, expressive learning (including opportunities for students to teach others what they have learned) (see *Of Mice and Men*, Chapter 5)
- Project plans developed by and for other teachers. (see Global SchoolNet and iEARN, Chapter 2)
- News stories and current events. (see MyParty16, Chapter 4)
- Community issues. (see Learning in Place, Chapter 9)
- Student questions or interests. (see The Boat Project, Chapter 4)
- A classroom irritant put to educational use. (see iHistory, Chapter 8)

Finally, keep in mind that one successful project will often lead you to another. Robert Griffin, the Canadian educator introduced earlier, says:

> I was looking for learning activities that would meet the needs of tactile learners. When I began doing some collaborative projects about seven years ago, I noticed that the tactile learners became engaged using technology. Regardless of learning styles, all students began to do better when engaged with projects using technology. As I began to do more and more research on meeting the needs of students with learning difficulties, research showed authentic projects and authentic assessment benefited all students.

Now several years into using the technology-rich project approach, he can see how new opportunities grow out of previous successes. He relates:

> Everything we have done using technology projects has led to another level of projects. We began doing SchoolNet GrassRoots projects for Industry Canada. Students built websites about our community. The skills they learned doing these projects led to our first collaboration, a project involving six schools in New Brunswick themed on Antarctica.

These projects led our school in becoming a member of the Network of Innovative Schools in Canada. These two projects led to our school receiving our first HP grant. The expertise teachers and students gained in these projects led to our school being chosen to participate in a research project.

Technology Focus
Collect and Track Assets Online

As your project starts to come together, consider using technical aids to identify and manage your bountiful assets.

To solicit expertise and resources, create an online survey in Google Forms (google.com/drive/apps.html). When you construct the survey, be sure to include a question that is open-ended and elicits creative responses from recipients about how they might contribute to or support the project.

Send your project sketch and a link to the survey through email to everyone who might care about your project, and then watch as offers to assist with expertise or materials pour in. The survey results will come to you in the form of a spreadsheet. Use the spreadsheet not only for tracking assets identified through the survey ("digital video equipment") and people and their specific skills ("knows about astronomy") but also for mundane yet critical information such as phone numbers and email addresses.

Consider how you might turn this repository into a bigger resource for your school community. For example, parents from previous years might be willing to continue sharing their expertise as their children move on to new grades. Imagine what a gift it would be to welcome a new teacher with access to your online assets!

Spotlight
Science Leadership Academy

Science Leadership Academy (SLA) in Philadelphia started as a magnet public high school in 2006 and has grown to include two high schools and a middle school. SLA's core values around inquiry and PBL are evident in the intentional design of all three schools, with adaptable learning spaces, longer periods for deep investigations, and flexible schedules that allow students to pursue internships and dual enrollment in local universities.

SLA's growth resulted from increasing demand from Philadelphia students and families. When the original Center City campus received 1,200 applications to fill only 125 slots, CEO and Principal Chris Lehmann (@chrislehmann) knew it was time to grow.

A sustained focus on inquiry is the through line connecting the three schools. Every integrated humanities, science, technology, mathematics, and entrepreneurship project follows an established investigative process that includes design, research, collaboration, presentation, and reflection. The school also relies on a common rubric [described in detail in Chapter 5].

The spirit and scope of students' cross-disciplinary projects are apparent in their titles—The Bureaucracy Project: Navigating FAFSA; Jerry Springer: Based on Antigone (a play); and Crossing Boundaries, where students study norms relating to everything from race and religion to pregnancy and what is deemed "excessive celebration" on the sports field. Students recently took on the real challenge the school faced in selecting the site on which to build a new, larger campus. Deliberations took students into studies of ethnography and architecture as they considered, "What's the best fit for SLA in our community?"

Teachers who join SLA schools (after a rigorous interviewing process) sign on for a different kind of teaching experience. Not only are they committing to student-centered, inquiry-based approaches, but they are committing to continuous professional development as well. Teachers design projects collaboratively, guided by a common rubric, and belong to one or more professional learning networks (PLNs) that take on school improvement challenges. In 2018, PLNs focused on tuning their approaches to teaching methods of inquiry.

The SLA model has gained fans and attracted visitors from around the world, due in no small part to the fact that the Center City campus opens its doors

to educators every year for a teaching and learning conference called EduCon (educon.org). Built around several plenary sessions with education visionaries, EduCon is otherwise a "for-us-by-us" conference planned by students and participants in order to share innovative practices.

Educators who are rethinking what schools can be frequently call on SLA for advice. Out of this steady interest, the nonprofit organization Inquiry Schools (inquiryschools.org) was born. Inquiry Schools supports new and reimagined school development through all its stages, from administrative planning to faculty development to pedagogy and guidance on establishing school culture from the ground up.

Why does our learning matter? is the key question that drives efforts to start or transform a school. Executive Director Diana Laufenberg (@dlaufenberg), one of the original teachers involved in designing SLA, says, "For schools to truly be successful, they must first create a culture that values the naturally inquisitive nature of their students. Schools need a framework and curriculum that allows students to explore what is relevant to them, all while mastering the skills needed to thrive in academic environments and beyond." In the development process, Inquiry Schools facilitators ask educators thought-provoking questions such as, "In your class, are students following instructions or making decisions?" and, "What are you doing to and for kids compared to what could be done by and with them?"

To date, Inquiry Schools has supported the start or redesign of fifty schools.

Your Turn
Design Your Project

In the previous chapter, you established the learning objectives that are important to you and your students. Now, whether you decide to remodel a project you like or design one from scratch, plan how to put your ideas into operation by working through the following design process. At the end, you will write a project sketch—a short description of the project that you can share with others for critical feedback.

Suggestion: Return to your individual or group project space on your wiki where you last worked. Refresh your memory about the conceptual framework you established at the end of Chapter 3. You will bring these ideas forward as you continue planning. Start a new page in your wiki called "Project Sketch." Make notes as you follow these key design steps and then write a project sketch to share with others.

1. Revisit the conceptual framework you established based on the Your Turn section at the end of Chapter 3.
    a. Make a final list of learning objectives for core subjects and allied disciplines. Keep your focus on the big ideas and power standards of your content area.
    b. Decide on the specific skills you want to address. It can help to identify roles that students will take in the project. For example, students may be taking on a disciplinary role (such as historian, engineer, or artist) related to your content area. Or perhaps students will assume one or more of the open-ended roles described by the ISTE Standards for Students: Empowered Learner, Digital Citizen, Knowledge Constructor, Innovative Designer, Computational Thinker, Creative Communicator, or Global Collaborator. For each role, you can identify skills required to accomplish project tasks.
    c. Consider how you will build students' project management skills, such as effective teamwork and time management.
    d. Identify learning dispositions you want to foster, such as persistence or reflection.
2. Establish evidence of understanding. What should students know or be able to do to show they have learned? (Remember, students will have input into their products. At this stage, you are considering which learning outcomes these artifacts of learning *reflect*, not what the products *are*.) (Look ahead to Chapter 5 for assessment ideas.)
3. Plan the "vehicle" (the project theme, challenge, or narrative). Think: *What would students inquire about, do, create?* Strive for "optimal ambiguity"—that is, both enough structure and enough flexibility to serve the needs of the project. Remember the many project examples you have read about so far. Imagine the true-to-life connections. Imagine ways experts (historians, economists, business people, mathematicians, playwrights, consumer

advocates, engineers, doctors, and others) interact with the topics you have identified and design the project to incorporate these roles for students.

4. Plan entrée into the project experience. What are the first things you might say to get students' attention and build excitement for the learning ahead? What will captivate your students? What will happen on Day One to ignite inquiry?

At this point your project is coming into view, but it still may be blurry around the edges and lack detail. Great! If you were to design down to the last action right now, you might constrain the project and limit where students could take it. Consider the following metaphor for planning:

> Planning a student-centered project is like planning a voyage across uncharted seas. You have a destination in mind, but not knowing your route, you and your students build a trusty ship, and, bringing all your seamanship to bear, get wind in your sails and set off. It helps to have a clear picture of your destination so you'll recognize it when you see it! (Krauss, 1998)

Also, if you go too far you may become overly wedded to your own ideas. Let planning be an iterative and collaborative process. Get feedback on your ideas from your colleagues. Revise and rework your plan a few times. Your project will be better for the effort.

You may be anticipating next steps, including designing learning tasks, preparation, guiding the learning, and evaluation. These will be addressed in the next chapter. For now, sum up the plan so far in a project sketch.

Write a Project Sketch

Pause here and write a project sketch—a brief account of your project. A project sketch is a light, quick treatment, not a painting that captures every detail. The project sketch is a synthesis of what you have thought about so far. Describe the project in a paragraph. Give it a title if that gets your ideas flowing. Write it again from another angle.

Flesh out the picture just enough so you can share it with peers and get critical feedback. Make sure the most essential learning outcomes are evident.

Here is a sample project sketch to get your thoughts flowing:

MICROBES ATE MY DRIVEWAY

Subjects: Science, Math

Driving Question: What is the best bioremediation strategy for mitigating oil on our school parking lot?

Equipped with a basic understanding of the hazards of motor oil to the environment, students study microbes, bioswales, and other bioremediation methods, and plan investigations that ultimately lead to recommendations for ridding the pavement of motor oil before it runs off into the groundwater system.

Share your project sketches with your colleagues. Together, ask hard questions and suggest ways to make each project better. Imagine how it might become more comprehensive or realistic. Think of ways to capture students' interests and involve other teachers, school specialists, or professionals in the community. For example, share your sketch with colleagues who teach the grade band above or below yours. Ask school specialists who can give you ideas for incorporating the arts, physical education, or music. Meet with special education and English language specialists to plan scaffolds that will help diverse learners succeed. (This is a good time to use the tuning protocol described in Chapter 2.)

Engage with experts from outside education at the project design stage, too, to make sure you are heading in an authentic direction. For example, a science teacher whose students were going to be designing solar cookers for a nonprofit in Haiti asked engineers to consult at the project design stage. They helped her establish design specifications, constraining costs and materials in a real-world way. In fact, the engineers were so interested in the project, they agreed to return later and give students feedback on their product designs!

Imagine the paths of inquiry that teams might take as they make the project their own. Give your project a name or involve students in generating a project name later. An appealing name will give the project a "brand" and help to generate buzz.