

TEACHING INNOVATION Global-Age Skills **More information can be found at [www.thommarkham.co](http://www.thommarkham.co)** Markham, Thom. Project Based Learning Design and Coaching Guide . HeartIQ Press. Kindle Edition.

A decade ago, educators began to compile a list of skills essential for postsecondary education, work, and citizenship in an information-based, global world. The Partnership for Twenty-First-Century Skills breaks the list into three categories:

#### Skills related to twenty-first-century life

- Global awareness ,
- Financial, economic, business and entrepreneurial literacy
- Civic literacy
- Health and wellness awareness

#### Learning and thinking skills

- Critical thinking and problem-solving
- Communication
- Creativity and innovation
- Collaboration
- Contextual learning
- Information and media literacy

#### Life skills

- Ethics
- Accountability
- Leadership
- Adaptability
- Personal productivity
- Personal responsibility
- People skills
- Self-direction



- Social responsibility

What is wrong with lists like this? Nothing, except how do you choose what to teach in your projects? The best approach is to familiarize yourself with the new basic skills and then focus on a limited number of skills and attitudes that your students should master. Don't get caught up in the need to teach everything. A few skills, well learned, will make the difference in the lives of your students. Teach and assess no more than two skills per project.

## TEACHING INNOVATION Assessing Creativity


Can we really teach or assess creativity? That question challenges educators under increasing pressure from society to produce a new generation of problem solvers and innovators.

Why is it a challenge? Because teaching creativity— or even its close cousin, critical thinking— is not remotely similar to teaching the photosynthesis cycle or the causes of World War I. The skills of innovation and creativity can be lumped into a mysterious set of processes that human beings use to make sense of their world; they enter a dark tunnel of confusion and reemerge with a solution. How this occurs no one knows. How we teach the process we're not quite sure. Assessing the journey though this dark tunnel and evaluating the end product are even more difficult. Think of judging a piece of modern art. It's that subjective.

Teaching creativity requires that we “go deep” with students rather than provide them with more information. Given that human performance is not directly teachable, it means setting up conditions under which creativity flourishes. It also means, as in the case of the modern art example, that we may not know creativity until we see it. Such vagueness doesn't fit well with a data-driven, standards-based accountability system.

In fact, the evolution in the mission of schools places the current system at direct odds with the future. Teaching people instead of stuff requires educators to draw upon the fields of psychology and human performance,





which consider the industrial structure and mindset as barriers to peak performance and creativity. But thoughtful educators can apply important lessons from the human performance field to the classroom.

Nearly every teacher hopes to instill in students the essential values and habits of mind that make for good citizenship, fulfilling lives, and lifelong curiosity. But no one has invented a method for teaching love of learning. PBL, however, does offer you a unique process for fostering the fundamental qualities of character associated with love of learning.

Each of us has a personal view on character, so any list of defining qualities is incomplete. But you have to start somewhere. In *Character Strengths and Virtues: A Handbook and Classification* (Oxford University Press, 2004), positive psychologists Christopher Peterson and **Martin Seligman** identified the most commonly accepted strengths of character. Here are seven strengths that fit well with any PBL project:

**Creativity.** The ability to produce ideas or behaviors that are recognizably original is closely tied to innovation: the ideas must be adaptable and useful to oneself or others. *The PBL solution? Use the breakthrough rubric for creativity.*

**Curiosity.** Curiosity is an intrinsic desire for experience and knowledge, plus an active pursuit of challenging activities. *The PBL solution? Create a challenging project focused on an engaging Driving Question.*

**Open-mindedness.** A person who possesses this strength willingly searches for evidence against favored beliefs, plans, or goals and weighs such evidence when it is available. *The PBL solution? A good Driving Question requires problem solving and critical thinking—the hallmarks of open-mindedness.*

**Persistence.** Persistence is the voluntary continuation of a goal-directed activity in spite of obstacles, difficulties, or discouragement. Nothing defines a good learner more than this strength. *The PBL solution? Use a work ethic*



*rubric and have students keep journals on their ability to work through difficult challenges.*

**Citizenship.** Citizenship includes social responsibility, loyalty, and teamwork. Students who learn citizenship feel a sense of obligation that includes the self but extends beyond their own self-interest. *The PBL solution? The collaborative environment of PBL offers numerous opportunities for students to reflect on their character, measure their growth as individuals, and exhibit their character in relationship to others.*

**Empathy and kindness.** An empathetic person appreciates others, regardless of background, culture, gender, or similar reasons for bias. The larger strength is the ability to love and feel compassion. *The PBL solution? Learning empathy and kindness begins with listening to others attentively, using respectful language, and supporting one another. When students work in focused teams in PBL, these attributes become evident and can be measured.*

**Hope.** This strength encompasses optimism and future-mindedness. Hope enables confidence, goal-directed actions, and high expectations. *The PBL solution? Design projects that matter and help students solve important challenges while they hone their skills. When reflecting on projects at the end, talk about the future. What problem do we tackle next?*


## **Focus on Quality**

Build Collective Knowledge through Collaboration

1. Prepare the Teams
2. Insist on Norms
3. Empower Students to Coach One Another
4. Challenge the Teams
5. Value Beautiful Work

Teaching Innovation: The Value of Critique





Once the project is under way, the focus shifts from organizing to performing. Your ultimate goal is to have students take responsibility for the quality of their products and learn tools for reflection, analysis, and judgment that result in peak performance and outstanding products. In projects, this process occurs through collaboration, either using whole-group collaboration in lower grades or forming high-functioning teams with older students. Research in learning confirms that collaboration leads to deeper understanding, higher-order thinking, and better performance on complex tasks. But the ultimate power of collaboration stems from the experience of discovering solutions that cannot be found by the individual alone. Teaching how to work together as a coherent team, in pursuit of quality or a purpose, is one of the most profound gifts you can give to your students.

Use a set of proven best practices to encourage successful collaboration. You may want to review Chapter 4, Teach Teamwork, before planning this section of the project.

### 1 Prepare the Teams

Forming teams that will do quality work is a crucial task in the first days of the project. The earlier team members begin to work together, the more responsibility for the project they take on. Follow a step-by-step process. Allow for these steps in your Project Schedule (see the form at the back of this book).

- Discuss teams versus groups. Remind students of the difference between a group and a team. A team relies on each member's commitment to one another's success, has a well-defined purpose, and uses the combined resources of the team to produce a better product.
- Issue guidelines. The process of actually forming teams can be highly directive (you may choose all members beforehand), or it can be a longer process of self-selection based on interests and abilities. If you opt for the longer process, have strict guidelines in place when you introduce the project. Decide the



size of teams (teams of three to five members work well, but use your best judgment), how teams will function, and the criteria that students will use to decide how teams are formed. One rule of thumb: If teams have not worked well before, take more time with the team selection and formation process

- . Balance teams. No team exists in which every member contributes exactly the same amount of time, energy, and expertise. Humans vary— and it is your job to get the best combination of students on each team. Introduce exercises to help students identify their strengths and potential contributions, or simply assign team membership based on past performance, your knowledge of the students, and goals for the project.
- Require team roles. Assign roles for team members, or let students decide on their roles. Give them time to work out issues. Determining roles is a valuable lesson in negotiation and teamwork.
- Teach the cycle of reflection and perfection. Link the conversation to the expectations of the work world. Establish the idea that reflection and revision lead to quality work. Consistently test teams to make sure they are moving in the direction of higher quality. Never wait until the conclusion of the project to review and assess student work.
- Early in the project, introduce the concept of continuous improvement and the cycle of quality. Many variations exist in this cycle, but all contain the same basic elements. One simple version, for example, looks like this:

2 Insist on Norms At the beginning of the project, set expectations and lay the foundation for smooth team functioning. Expect teams to operate by agreements and norms. At the same time, recognize that this process is ongoing. Early in the project, all team members should be able to answer the following five questions:

1. What do I bring to the team?
2. What are our commitments to one another?



3. What differences exist between us?
4. How will we operate?
5. How will we know we are succeeding?

You can take a number of actions to develop performance standards and direction:

**Help teams set norms.** With younger students, this step may require more time. Teams should begin with agreements on how they will operate, speak to one another, honor their commitments, and handle breakdowns. Each time a new member joins a team (if a new student arrives, or if teams get reshuffled for any reason), the team needs to readdress their norms. Approve contracts and operating documents. Norms vary, from informal short lists of agreements to more comprehensive contract documents. If you want teams to write a longer document, allow time in the Project Schedule.

**Reflect on commitments.** Have students discuss their commitments to one another's success—and why they could fail. How will they regroup?

**Reflect on strengths.** After students understand the project, have them examine and reflect on the strengths and challenges they bring to the team.

**Review rubrics.** Teams should review the assessments for the project so that their tasks and objectives are clear.

**Mine for conflict.** Take time to discuss differences and potential personality conflicts.

**Have teams identify the skills necessary for success.** Discuss problem solving, communication, listening, objectivity, empathy, and asking for help.



**Emphasize first meetings and initial actions.** Start fast. Give teams a task to accomplish right away. Review results. Set a quick pace, with high expectations.

**Intervene early.** Be ready to regroup and go back to basics if a team falls apart. Remember that introducing a new team member requires revising the norms.

**Use positive feedback.** Becoming a good, contributing team member takes time and maturity. Look for what students are doing right as team members. Use positive feedback to instruct other team members.

**Celebrate success.** If a team finishes tasks early or shows signs of good performance, allow them downtime and the opportunity to ce

The ultimate power of collaboration stems from the experience of discovering solutions that cannot be found by the individual alone.

Review the tools for teams in Chapter 4. Incorporate into your project plan the use of contracts, work ethic rubrics, or collaboration rubrics. These tools will enable you to gauge and direct team performance.

3 Empower Students to Coach One Another PBL incorporates best practices for inquiry, and these practices should be evident within teams. Are students having a sustained conversation about the quality of their work? Do they demonstrate a continuous effort to address the complexities of their task? As teams move through the work of the project, look for opportunities for students to teach each other. A number of methods are available.

- **Make students answer their own questions.** Instead of students forming a line to ask you a question, make



sure they have first asked each of their teammates that same question.

- **Use experts.** Instead of teaching an entire team, draw together team leaders (for example, the test engineers) and explain to them how a process or procedure will work. Their responsibility is to return to their teams and become the trainer.
- **Turn an open-ended, debatable issue into a teachable moment.** If teams are wrestling with a common issue, take time for each team to come up with their best ideas— then share with the class.
- **Ask students to brainstorm and share.** Break teams into pairs or triads to brainstorm a difficult solution. Have them report results back to the teams.
- *Jigsaw the teams.* Have members of teams rotate through other teams to share solutions, offer ideas, or reflect on drafts and prototypes.

4 Challenge the Teams your goal is to have teams develop a “growth mindset.” Keep them challenged. Use fresh thinking strategies. Consider the following ideas:

- Introduce the Driving Question in the second week of the project. Occasionally, letting your students grapple with information or wrestle with an issue before you share the Driving Question with them works better. After a bit of research and thinking, they may find the question more provocative.
- **Introduce a twist.** In classic problem based learning, teachers introduce a “twist” or new piece of information that changes the direction or parameters of the project. Use this technique by withholding— and then disclosing— a key set of facts or conditions that forces students to rethink and replan.



- **Use "Big Think" tools.** Use the visible thinking routines cited in Chapter 5 or similar thinking games to stimulate argument, inquiry, and exchange. For example, in *The Big Think* (Hi Willow Research and Publishing, 2009), authors David Loertscher, Carol Koechlin, and Sandi Zwaan suggest that students "stretch their thinking" by asking questions:
  - How is \_\_\_\_\_ related to \_\_\_\_\_?
  - What perspectives are (not) represented \_\_\_\_\_?
  - Why is \_\_\_\_\_ important to \_\_\_\_\_?
  - Is there another way to \_\_\_\_\_?
  - How might \_\_\_\_\_ change in the future?
- Use the "sandbox approach." Encourage fun and creativity by having teams construct interpretive visuals, string webs to connect information, brainstorm how a concept "feels" or what it "sounds like," build a collage of ideas, or create a short skit.

**5 Value Beautiful Work** In the work world, quality results matter. Many jobs require an understanding of the cycle of quality improvement and excellence. Allowing students to reflect and revise their work teaches this approach and leads to improved results.

**Review the rubrics.** Well-written rubrics constitute the best guide for quality. Carry the rubrics with you as you work with teams; constantly bring students back to the expectations and standards contained in the rubrics. Use the rubrics as a coaching tool to improve products.

**Grade drafts and prototypes.** In the Project Schedule, establish clear due dates for drafts, prototypes, or any other products that give you a clear view of progress. Grade these products, with extensive feedback.



**Allow time for practice for exhibitions or presentations.** The bigger the audience for the final presentation, the more practice students need. Allot time in the last week for peer-to-peer practice and final run-throughs under conditions as close as possible to the real event. Many students find that practicing their presentation in the hall or auditorium helps make the final product sharper.

**Make the work public.** If the project does not include presentations, make sure that the core product will be posted in a public place or be viewed outside of class— or school.

**Replan the final week.** As the project comes to a close, review your schedule and replan if necessary. A coach knows thayour schedule and replan if necessary. A coach knows that flexibility is essential; always respond to changed circumstances with a revised plan to fill gaps, anticipate unexpected delays, or teach essential information that dropped out along the way.

**Turn an open-ended, debatable issue into a teachable moment.**

TEACHING INNOVATION The Value of critique The phrase “doing beautiful work” was coined by Ron Berger, author of *An Ethic of Excellence* (Heinemann, 2003). His protocols for peer critique of student work— which results in far higher quality— has been adapted by other teachers. Consider the following adaptation.

**PURPOSE** The purpose of the critique is to teach students particular skills. Do not use this time as an opportunity for the whole class to give a student feedback on his or her work.

### **CRITIQUE RULES**

1. Be kind.
2. Be specific.
3. Be helpful.

THE PROTOCOL



**1. The lesson.** Think about what lesson you are trying to teach your students. After looking at a draft of student work, what big idea are students missing? What is troubling about the work? What next step are many of the students ready to take? List three to six skills that you want students to improve.

**2. Selecting the work.** Find student work that serves as great examples of what you are looking for, or else great examples of what you are not looking for. Examining merely mediocre work will not lead to helpful discussion. (If you show an example of poor work quality, use work done by students your students don't know—and be sure no names appear on it.)

### **3. The critique**

- Give students one or two pieces of student work for in-depth critique. Examples could include excerpts from student writing, architectural blueprints, solutions to math problems, or lab write-ups.
- Give students time to look silently at the work and think about what makes the work beautiful or where it falls short.
- Depending on age level, have students discuss in small groups.
- Lead a group conversation about the work. The goal is to identify the attributes of great work for this particular assignment. Once those attributes are identified, they need to be named in simple language so that they can be used by students. Keep in mind that your students may name other useful skills.

4. Next draft. Students now create a new draft of the assignment, incorporating the skills identified during the critique session. Let students know in advance how many drafts the



assignment will require to be completed. Each draft should be somewhat different from the preceding one, to avoid student burnout. For example, students' first draft could be a rough sketch of a storyboard. The next draft could be a detailed sketch of the storyboard. The final draft could be a high-quality storyboard utilizing materials that professionals in the field use.

#### End with Mastery Make Learning Memorable

- Plan for Exhibitions and Presentations
- Reflect on Performance and Learning
- Reteach If Necessary Teaching Innovation: Parents as Learning Partners

Projects can start right but end poorly. Poor endings include rushed work for un-meet able deadlines, mediocre presentations, low-quality products, and lack of mastery of critical content as reflected in tests.

Projects normally encounter problems in the final week; some can be solved by quick adjustments to the schedule, but others can be avoided by keeping the end in mind as you coach students through the project. To a great extent, success at the end will reflect careful planning during the project. As with any sustained effort, key steps you take anchor the learning, celebrate the accomplishments, and prepare for the next project.

1 Plan for Exhibitions and Presentations Big projects should have big endings, and big endings require significant preparations. If you are planning an exhibition or public presentation, know that much of the time during the last half of the project will be spent on preparing for the final event. Consider the following as you plan for the end of the project.

- **Know why students will exhibit.** Be sure to scale exhibitions. Sometimes a poster presentation in the hallways is sufficient to make work public. At other times, a community event is the best



venue for student work. Vary exhibitions during the year according to your time and needs. One large, high-stakes presentation per school year may be sufficient.

- **Plan according to the school calendar.** Identify an important date on the school calendar, such as Open House, when exhibition of work is particularly appropriate. Plan projects around that date.
- **Allow for practice and mastery.** Schedule sufficient practice time in the last week of the project. Have students do their last practice presentations in the same room as the final students.
  - **Use an exhibition checklist.** Develop a comprehensive list of the tasks necessary for a successful exhibition. Assign responsibilities and due dates.
  - Have students do the planning. Planning exhibitions teaches teamwork, logistics, and other useful skills. As the project winds down, assign a team of students to be your planning committee.
  - Showcase PBL. If you would like your students' parents and community to better understand PBL, create a showcase event. Have students present work, answer questions, and engage in conversation with parents and other adults about what they've learned—and how they like it. Invite your fellow teachers and the local press as well.

2 Reflect on Performance and Learning the project does not end on the day of the presentations or the final test. On your project schedule, allot time after the final presentations for reflection. Use a formal process of your choosing— such as a survey, whole-group discussion, or reflection form— to debrief all aspects of the project. This appraisal includes your performance as well as that of students. A two-day reflection process is preferable. On Day One, focus on the “how” of the project:

- How well did we perform?



- What did we learn?
- How engaged were we?
- How meaningful was the project?
- How clear were our goals and instructions?
- How well planned was the process?
- Were the evaluations fair and accurate?
- Did we answer the Driving Question?

On Day Two, help students find personal meaning in the project:

- What do I/ we do with this knowledge?
- What new questions do I/ we have?
- How have I/ we improved as learners?
- What new skills do I/ we have?
- What else can I/ we explore?
- How am I/ we different after this project?

At the end of the reflection, gather potential ideas for other projects. Even if you can't yet plan for them, the ideas may be handy in the future. To build team spirit and enthusiasm for another project, remember to celebrate after the end of the reflection. Use the Reflection Matrix in the Online Folders (see the index of them at the back of this book) for additional guidance. 3 **Reteach if necessary** As you review the project and participate in the reflection, note any gaps in knowledge or obvious concerns about the learning. If necessary, fill the gaps by reteaching a lesson or incorporating the gaps into subsequent lessons.

TEACHING INNOVATION Parents as Learning Partners Involving parents in projects is productive for several reasons. Projects show parents what quality learning in the twenty-first century can be. Parents enjoy seeing their children as motivated, enthusiastic students. And parents recognize that the skills taught through projects will be critical to their children's success. PBL teachers have effectively involved parents in various ways:





**Ask parents to serve as judges.** Parents can sit on panels for presentations and use rubrics you provide to assess student performance.

**Use parents to raise the stakes.** During an exhibition, have students circulate among students and ask questions. Give parents prompts before the exhibition.

- **Debrief with parents.** Have a student-teacher-parent discussion after the project. What did parents see that they liked? What do they question? What suggestions do they have?
- **Plan with parents.** Thinking about projects for the year ahead? Sit down with a small team of parents and plan together.

Resources:.

Most notable are the Project Based Learning Handbook: A Guide to Standards-Focused Project Based Learning for Middle and High School Teachers, written by myself and colleagues at the Buck Institute for Education; and the PBL Starter Kit and PBL in the Elementary Grades, also published by the Buck Institute for Education. See [www.bie.org](http://www.bie.org) for more resources.

Online links and assistance can be found as well through the George Lucas Educational Foundation ([www.edutopia.org](http://www.edutopia.org)). A number of projects have been filmed and documented, and are available at [www.edutopia.org](http://www.edutopia.org) and [www.bie.org](http://www.bie.org), or on YouTube channels.

**More information can be found at [www.thommarkham.co](http://www.thommarkham.co)**

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