unboxed

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Above: Ryan, a twelfth grader at High Tech High Media Arts, welds his independent project for his senior internship

Cover: A cardboard car created by a tenth grade student for "Cruisin' Into Revolution," an investigation into San Diego history led by humanities teacher Celina Rodriguez at High Tech High Chula Vista

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Welcome

Lately I've been listening to a podcast about a group of well-meaning people who tried to make schools more equitable and ended up making things worse. The show is well-made, and the story is important, but it's got me thinking about how much of my media diet consists of stories of either "well-intentioned people who ended up making things worse for interesting reasons," or "ill-intentioned people who made things worse for predictable reasons," and how little time I spend with stories of people succeeding at making some bit of the world a bit more fair, humane, and livable for everybody in it.

Stories of interesting failure and ubiquitous oppression are important, but they aren't the only stories, and they tend to make me feel comfortable with doing nothing, because while I may not be HELPING anyone, at least I'm not making things worse like those people did! There's also a danger that studying failure and oppression can feel like its own form of action.

So here's a story about a success that you may not know about: in 2020, a high school student in St. Paul, Minnesota started a group that got the state supreme court to overturn the state's ban on high schoolers receiving unemployment benefits, and got academic credit from his school for doing it. You can find out how he did it in this issue.

In fact, this issue is full of inspiration: Ben Sanoff explains how a group of educators helped more students get into college by designing tracking software, even though none of them knew how to code; Western Carolina Associate Professor of Educational Research Brandi Hinnant-Crawford tells Stacey Caillier about how she uses improvement science to "dismantle [the] structures that keep so many of us down"; and Joanna Collazo writes about how she helped a kid get up again after everything went wrong in his project.

As well as stories to inspire you, we have expert advice to help you get where you want to go! Michelle Pledger shares how to liberate your curriculum; Randy Scherer unpacks what we mean when we say "project-based learning"; veteran teachers Britt Shirk and Ted Cuevas share their (very different) approaches to grouping students in projects; Jen Roberts helps you make good choices about what tech to bring into your classroom; Max Cady explains what teachers can learn from game designers; and Ben Daley makes a case for "Planned Experiments" as a way for teachers to do collaborative inquiry in continuous improvement.

Thanks for joining us!

Alec Patton
Editor-in-chief

Students share their learning with the local community at the High Tech High International spring 2022 exhibition.

What is PBL?

Randy Scherer
High Tech High Graduate School of Education, San Diego, CA

I was in an Oakland high school cafeteria leading a workshop for teachers focused on the question, "How will we know if we are doing project-based learning well?" Suddenly, the school's principal walked in and confidently answered our question for us: "I know it when I see it!"

This principal illuminated a key problem of practice for PBL educators: there is no universally-accepted definition of the term. "I know it when I see it" is subjective and reveals a larger problem: It is hard to get better at something if we cannot identify what it is.

Many educators have a feeling about PBL, but when asked to articulate their vision I've seen teachers and leaders grasp for words. Researchers note that the variety of definitions challenges their ability to examine PBL as a practice (Thomas, 2000). One explained, "No two teachers implement PBL in the same way. This makes it difficult to define exactly what PBL is and then study its effectiveness" (Ravitz, 2010). In schools, the lack of a shared understanding creates well-intentioned disagreements: Does PBL require long timelines? What about materials? Does PBL need to be interdisciplinary? In PBL, do students choose the products? The academic content? Both, or neither? Does PBL allow for direct instruction?

Lack of clarity or consistency in our vision of PBL means it sometimes goes well, but not always, leading educators to question its applicability in their context. They say things like, "We tried PBL, but we're not sure if it's appropriate for students who struggle with math." Or, "We tried PBL, but it doesn't seem like a good fit at the elementary school level."

When I hear this, I ask, "What did you try?" The responses often reveal ideas about PBL that diverge dramatically from what I've seen within experienced PBL teachers' classrooms. Educators have explained their PBL challenges to me by saying: "In PBL, you need expensive resources, long timelines, and structural changes like student cohorts." Or, "In PBL, students don't get rigorous content, basic skills, or structured learning." These, of course, are not what I mean by "PBL," and therein lies the problem: we're using the same words, but we mean different things.

Because we lack a shared understanding, PBL becomes something of a Rorschach test—an image of a pedagogical inkblot that elicits one's preconceptions. When educators expect PBL to look like interdisciplinary collaboration, they find it. When educators expect PBL to look like unstructured student choice, they can find that, too. PBL can shapeshift into an exhausting, chaotic experience when we struggle with it, just as it unfolds as innovative, equitable pedagogy when we practice it well.

Working with the teachers in Oakland, we wondered, "If we walked into a great PBL classroom, what would we see?" And we wanted to know: How might a day-to-day PBL practice align with, and achieve, an ambitious vision for education?

To succeed as PBL educators, we need to share a high-level view of PBL, engage with its fundamental principles and paradoxes, and develop a detailed understanding of the rhythms and signature practices of PBL.

A bird's eye view of PBL

At its core, project-based learning is a method for facilitating learning made up of three ideas, which we can define clearly, even if their sum is complex:

- **Project:** An individual or collaborative endeavor designed to accomplish a goal.
- **Based:** To provide the context or foundation for something.
- **Learning:** The acquisition of knowledge or skills through practice, experience, study, or being taught.[1]

At a high level, project-based learning is the acquisition of skills or knowledge through the process of engaging in an individual or collaborative endeavor that accomplishes a goal.

Three foundational principles of PBL

A PBL educator collaboratively designs and facilitates an educational environment in which learning is contextualized in a larger, purposeful undertaking. Typically, that means that within a project, students pursue meaningful questions and create a product or experience for an important community, all of which provide the basis for teaching and learning. In my experience, three related principles define the foundation of a successful PBL practice:

- Projects create the context for learning.
- The elements of quality in a project are the learning targets.
- Rigor is found in authenticity, quality, and equity.

Projects create the context for learning

As educators, we know that all teaching and learning is contextual; the open secret is that the context may be contrived or irrelevant to students. Students intuitively question their context when they ask, "Why do we need to learn this?" Our stock answers reveal contextual weakness: "Because it is on the test (contrived); "Because you'll need this in your future" (irrelevant, at least now).

In contrast, PBL situates teaching and learning in an authentic context. Thoughtfully-designed PBL forms a coherent narrative for students, teachers, and their community, in which learning is essential to achieving an important goal, and achieving project goals facilitates teachable moments. In PBL, the project focuses everyone's energy on purposeful activity. Each element of learning, from student motivations to a range of relationships, daily activities, resources, and more, fits together cohesively. When a student might wonder, "Why do we need to learn this?" the project reveals simple and immediate answers: "This research will help us next week when we interview recent immigrants for our documentary." Or, "Solving this equation will help us predict where our rocket will land." Or, "We need to make sure our well-water quality data is accurate because we're sharing it with the people who drink that water."

The elements of quality in a project are the learning targets

In PBL, the elements of quality in a product or experience, and in the goals that the project accomplishes, are the learning targets for students. What makes a kite fly, what makes a community garden thrive, what makes a graphic novel pull readers in? When a PBL class embarks on these, or any other, projects, the elements of quality found in those projects become the students' learning goals.

Think of a PBL class in which the students make documentary films chronicling the stories of local veterans: through their analysis of high-quality examples, the teacher and students uncover what students must learn to produce their own work. The elements of quality in an outstanding documentary include disciplinary practices and industry standards for research, the construction of an accurate and compelling narrative, and the establishment of a thesis, as well as unique components of the form such as filming, lighting, sound production, and editing. In another PBL class, students test environmental water quality and share the results with local community organizations. The elements of quality in their water quality project lead them to maintain standards for experimental design, meaningful water sampling locations, rigorous lab work and data analysis, and greater goals of scientific inquiry and the communication of their findings. PBL students and teachers examine exemplary projects, and their own drafts or prototypes, and ask, "What makes this great?" to identify and pursue student learning objectives.

The inverse is also true: when PBL is done well, student learning targets lead to the elements of quality in the products or experiences they create. One role of the PBL teacher is to illuminate disciplinary practices that are foundational to the inspirational products and experiences that spark their students. Digging into our example, a great documentary film relies on rigorous research and the careful construction of a compelling narrative—complex skills that depend on numerous competencies and require deliberate practice. A PBL teacher identifies, sequences, and scaffolds learning so students, at their readiness levels, create meaningful, beautiful work exemplary for its own elements of quality.

The symmetry between elements of quality and learning targets, and the symmetry between learning processes and production methods, convey much of PBL's power. The more the processes for making a product or having an experience are inseparable from the processes for learning skills or content, the more deeply one is engaged in project-based learning.

Rigor is found in authenticity, quality, and equity

Outside of PBL, the idea of rigor is often associated with quantity, sometimes with quality, and a narrow sense of equity: the number of chapters covered in a textbook, the number of advanced classes offered, and the final scores on standardized tests. In contrast, PBL associates rigor with a rich vision for authenticity, quality, and equity.

In rigorous PBL, students and educators engage in the behaviors and practices of experts or professionals as a matter of daily routine. PBL guides teachers and students to develop and learn from the habits and standards of scientists, mathematicians, journalists, anthropologists, and more, and they

can do this with a high degree of professionalism.

This type of authenticity leads to the pursuit of quality. Perhaps the most visible display of quality is when community members attend a PBL exhibition and exclaim, "Wow, a student made this?" To get to that point, PBL students and educators pursue learning, doing, making, and being with a high degree of what EL Learning Senior Advisor Ron Berger called "an ethic of excellence" (2003).

PBL grounds academic work in authentic contexts, unlocking the potential for schoolwork to be true to students' lives, identities, and communities. Students learn from and share their learning with communities beyond the classroom, which leads to critical questions in their school and the broader world. Ron Berger explained it to me this way: "This leads directly to work for equity, social and racial justice, environmental stewardship, and positive citizenship—working for positive, equitable opportunities and outcomes for all people" (personal communication, June 7, 2022).

PBL is a student-centered practice that offers multiple entry points and varied scaffolds for diverse learners to develop expertise with content, skills, and mindsets. Projects offer students multiple modalities to explore, learn, grow, and shine. And, PBL leads to presentations, exhibitions, and showcases—all teeming with opportunities for students to share the full range of their identities. While it has been established that PBL fosters a range of academic achievements, including among traditionally marginalized students (De Vivo, 2022), PBL has the greater potential to support all students in growing as thinkers, leaders, entrepreneurs, and citizens (Berger, personal communication, June 7, 2022).

Another way Berger suggests that we think about equity is to consider the schools that families with the greatest wealth or power choose for their own children: almost universally, they choose school settings with abundant opportunities for student leadership and expression in programs like athletics, Model United Nations, student government, theater, the arts, music, drama, robotics, and much more. PBL, which is intended to be in classrooms driving the core of the curriculum, is a method to bring these experiences to all students (Berger, personal communication, June 7, 2022).

Three paradoxes of PBL

The three foundational principles of PBL frame a powerful PBL practice, yet PBL educators often confront three types of paradoxes:

- The paradox of products.
- The paradox of guidance.
- The paradox of perception.

The paradox of products

PBL can lead teachers to get lost in a paradox: in PBL, aren't we here to make products, like solar-powered cars, community gardens, or graphic novels? The truer we are to the product, the better, right? The answer, perhaps surprisingly, is not necessarily. We are true to the product for specific reasons: to generate a powerful vehicle for learning, provide models for disciplinary practices, and engage students in work that matters.

The paradox of products is that in PBL, the highly visible nature of a "product" can cause it to crowd our field of view to become synonymous with the "project," even at the expense of learning. A product or experience, like building a solar-powered car or publishing a graphic novel, is a component of a project, but a project does more: a project orients products toward accomplishing a goal. And, of course, in PBL, the project provides the basis for the deep work of student learning.

In the day-to-day processes of PBL, we do some very normal academic things, like analyze books and articles, diagram content on the board, complete practice problems, and look to experts and exemplars for guidance. Importantly, PBL situates these types of learning activities in the purposeful context of a project to maximize their impact.

In PBL, there are challenges, tensions, and joy in finding the right products that will elicit significant learning for all students. The crucial question to address to resolve the paradox of products is: to what extent does the project drive the curriculum?

The paradox of guidance in PBL

PBL grows out of constructivist pedagogy that emphasizes the active role of the student in building their own knowledge through inquiry, discovery, and experience. As a result, PBL educators confront a paradox of guidance. The more the teacher can get out of the way, the more students can shape their own learning, right? The answer is, again, not necessarily.

PBL is often misunderstood as minimally-guided—or even unguided—instruction, and those who critique it as such construct a straw man. Though PBL is a student-centered pedagogy that empowers students to pursue inquiry, discovery, and experience, that student learning journey is facilitated by the design and support of a skilled teacher—this is the paradox of guidance.

Perhaps an educator (or administrator) who is new to PBL might not notice the pedagogical structures in place because those scaffolds are not what they expect to see. Take one key PBL practice: a critique. At first glance, a

critique may seem like one student telling another what they like or don't like in their work. However, practicing critique well raises two truths about PBL structures: first, a critique is itself a student-centered structure, and second, a powerful critique makes use of specific scaffolds to function as a productive method for teaching and learning. Experienced PBL educators use protocols so that critiques are synonymous with equitable, collaborative peer assessment and peer instruction focused on progress towards important learning targets.

PBL practices are composed of protocols, norms, and routines designed and facilitated to cultivate collaborative, dynamic, and productive student-centered classrooms. Protocols provide roles and responsibilities for students and teachers, frameworks for specific types of interactions, and channel participant energy into a process that accomplishes a goal. Norms and routines establish a classroom culture of worthwhile roles and responsibilities and supportive relationships.

One core competency of PBL educators is the ability to collaboratively design and facilitate protocols, norms, and routines to develop the skills of inquiry, discovery, and choice with all of their students.

When the teacher is not the immediate focus of each student's attention, and the classroom is humming with learning, that is an indication of the quality, not quantity, of structures in place. PBL does not raise a question of whether to structure learning; the crucial questions to address to resolve the paradox of guidance are which structures to use, when, how, why, and who decides.

The paradox of perception

Harvard University recently conducted a study with its own students in introductory physics classes. Some participated in the traditional class, based on lectures and textbooks and termed "passive learning," while others engaged in group work and similar practices which were labeled "active learning." The "passive" and "active" students studied the same content and took the same tests. Unsurprisingly, at least to PBL practitioners, the students who participated in "active learning" outperformed their "passive" peers on the academic tests, which fits with a large body of research that shows that active methodologies lead to better learning outcomes (Crouch & Mazur, 2000). The surprise was in the students' feelings about their learning: the students in the active group believed they had learned less, not more, and wanted passive classes (Deslauriers et al., 2019).

Because they did not understand how active learning works, the Harvard students often perceived active opportunities for greater learning as frustrating or confusing, especially in comparison to a neatly packaged lecture. Louis Desauliers, the lead author of the study explained, "Deep learning is hard

work. The effort involved in active learning can be misinterpreted as a sign of poor learning. On the other hand, a superstar lecturer can explain things in such a way as to make students feel like they are learning more than they actually are" (Reuell, 2019).

Complex learning opportunities like group work, open-ended problem solving, and social discussions require metacognition and clarity of purpose. When the Harvard researchers tried a similar experiment with an added intervention of teaching students how active learning works, they found dramatic increases in students' perceptions of the quality of their learning (Deslauriers et al., 2019).

The paradox of perception is found in the fact that PBL educators must simultaneously help students learn and learn how to learn; lack of clarity in either can lead students to believe they are learning less, even when they are learning more. Although the evidence shows that facilitated active learning—a hallmark of PBL—is superior to passive consumption of lectures (Lambert, 2012), the simplicity and familiarity of lectures, textbooks, homework, or a quiz can make students feel comfortable, and even make them believe they are learning more when they are not.

Harvard's study made me wonder: If Harvard students believed that a blind foray into active learning leads to less learning, I wonder what it is like for our less experienced students in K–12? If Harvard students require proactive interventions to understand how active learning leads to real, deeper learning, it seems that our K–12 students, and their families, would benefit from similar support.

PBL students may find themselves in ambiguous situations, following unfamiliar structures, depending on the support of equally unsure peers—the possibility for frustration is real. To address the paradox of perception, educators must engage with students regarding all domains of their learning. The crucial question is reflective: to what extent can we be clear and collaborative in supporting student learning in skills, content, and mindsets?

The signature practices of PBL

At a high level, PBL is a pedagogical approach in which learning is contextualized in a purposeful endeavor. The promise of PBL is that the agency, coherence, and purpose offered by the project will engage diverse learners in deeper learning. On a practical level, the "what" of PBL is inseparable from the "how." Like any method of teaching and learning, PBL has its signature practices. These are based on a resource that we developed at High Tech High—our PBL Design Kit:

- **Project Launch:** Students and teachers participate in an engaging, active, shared experience in an authentic context with multiple entry points for diverse learners that invite varied perspectives and foster multifaceted, innovative thinking.
- **Essential Questions:** Students and teachers pursue open-ended inquiry relevant to academia, students' lives, and the world beyond school, expressed in student-friendly language that encourages deep, multidisciplinary thinking, rigorous reflection, and differing conclusions.
- Ideation: Students and teachers collaborate to generate and share unique and meaningful ideas in response to authentic questions that drive project design and deeper learning.
- **Critique:** Students and teachers use structures to analyze work samples for meaning, unpack the principles that contribute to their effectiveness, and identify important learning targets.
- **Drafting and revision:** Students and teachers generate multiple iterations of their work informed by critique, models, or instruction, in a trajectory towards increasingly meaningful and beautiful work.
- **Academic skills, content, and mindsets:** Students and teachers collaborate to understand and apply core academic skills and content, ask and address complex questions, apply skills and content in dynamic contexts, and develop academic mindsets. Student learning reaches outside of the classroom through fieldwork, service, internships, and community partnerships.
- **Exhibition:** Students and teachers bring their work and learning into the "real world" to interact with important community members and to serve a meaningful purpose in the community.
- **Assessment:** Projects lend themselves to multiple forms of assessment from multiple perspectives, and assessment is informative, reflective, and collaborative.
- **Reflection:** Students and teachers look at their work, consider their growth, and push their thinking, asking questions designed to foster thoughtful, deliberate practice. Reflective practices foster cycles of inquiry and frame the culture and values of the school and community.

The PBL Design Kit practices are not meant to follow a singular, linear order. For example, following a project launch, a class might critique an example of a finished product, to identify elements of quality and a list of learning targets. Another common example: PBL teachers and students assess their progress before, during, and after key learning experiences. Exhibitions should happen regularly, on a small scale, just as sports teams have many games before a championship.

Because PBL is a method, the scope and sequence of PBL practices directly impact what students and teachers understand PBL to be. Outside of PBL, teaching and learning are typically organized into units, often spanning a week or two, or maybe a month. And, outside of education,

many professionals organize work into manageable units like design sprints, continuous improvement cycles, or various agile business models.

The consensus study *How People Learn II* identifies a "sweet spot" of two weeks in developing and retaining memorable learning (2018). As a teacher, I found that any project that was longer than two weeks worked better as a series of mini-projects each approximately two weeks long or shorter. Two-week cycles teach everyone in the community what each PBL practice is meant to accomplish and how to make the most of it. Two-week cycles ensure that the PBL experience is not a long, possibly ambiguous marathon, but rather a series of steps planned and scaffolded so that everyone makes progress and stays on course.

Project-Based Learning is everywhere

Here's another open secret about education: PBL is already in schools, hiding in plain sight in the elective classes and career-technical education (CTE) programs such as theater, art, music, journalism, robotics, engineering, agriculture, and more, that typically operate at the periphery of the traditional academic experience (Mehta & Fine, 2020). Perhaps because these classes are rarely subject to standardized testing, their teachers and students have flourished as long-term PBL practitioners.

Perhaps more importantly, we naturally learn through projects throughout our lives. We regularly work to make or do something to accomplish a goal, and we build skills, knowledge, and mindsets along the way. We prepare memorable holiday meals for family and friends; we design and build furniture for our homes; we volunteer our time and energy in community groups and engage in civic life; we practice and pursue athletics, music, and much more. These endeavors are projects, and we learn a lot from them.

Over twenty years at High Tech High and within the High Tech High Graduate School of Education professional learning workshops, we asked thousands of educators on every continent except Antarctica to respond to this prompt: "Describe an experience of significant learning that was truly memorable. What did you learn? Why is this learning significant to you?"

We did not conduct a scientific study, but the results were clear. Most participants write about experiences like learning to cook an important family recipe with a grandparent, stumbling over a foreign language the first time they traveled abroad, something that went awry while they were babysitting, or the responsibilities of their first job. If they write about school, they tend to write about elective classes, sports teams, or extracurricular clubs.

Every adult in school has some familiarity with PBL from their own life and from a colleague down the hall. It can feel like we are on divergent paths

marked by individual experiences of learning through projects. When we share a common vision for PBL, engage with its principles and paradoxes, and consistently use its signature practices, we will move toward actionable PBL expertise that works for diverse students and educators.

What really matters in PBL?

When a student walks into school, they may not see themselves as a rocket scientist, an author, a dancer, a mathematician, or any of the many things that they just might become. Yet young people naturally try on many identities in the process of growing up. PBL—which situates learning in context, connects students with authentic communities, and brings their ideas and identities to the fore—offers the opportunity to do more than learn by doing; rather, to learn by becoming.

We build rockets because doing so changes the trajectory of students' lives. We make documentaries and publish original novels because that experience changes young people's personal stories. As PBL educators, our students might launch pop-up restaurants, stage original plays, build kinetic sculptures, or make many other unique, meaningful contributions to their communities. However, that is not our real project. As PBL educators, our project is people.

So, how then might we understand PBL, with its principles, paradoxes, and signature practices? PBL may look like many things to many people—it is our job to see that diversity as a strength, a unique blend of traits that encourage innovation and adaptation. Because in all of its forms, PBL is a method for all students to access authentic, deeper learning.

Endnotes

1. These definitions are based on those found in the Oxford English Dictionary.

Resources

In addition to the references noted in this article, the following books and articles have been valuable for me as both a PBL teacher and a professional learning facilitator.

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Online examples of PBL

These websites curate examples and related resources of PBL in action, in classrooms.

EL Education. *Models of Excellence*: modelsofexcellence.eleducation.org
Created in collaboration with Harvard Graduate School of Education, Models of Excellence is an open resource featuring exemplary pre-K to 12th-grade student work.

High Tech High. *Changing the Subject*: changingthesubject.org
Changing the Subject documents 50 exemplary projects from kindergarten to grade twelve from the first twenty years of the High Tech High schools.

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Michelle Pledger at the 2022 Deeper Learning Conference.

Liberate Your Curriculum

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In March 2022, Michelle Pledger published her first book, LIBERATE! Pocket-Sized Paradigms for Liberatory Learning. *It is our great pleasure to share this excerpt with you.*

To order a copy of the book, visit **livingforliberation.com**

I believe that most educators in most educational institutions want to do right by all young people. Yet we educators face competing commitments that monopolize our time, energy, and attention. Capacity building for any education initiative necessitates time, professional development, and coaching, but not all teachers have access to these resources, and definitely not in equal measure.

To address this, I wrote a (literally) pocket-sized compendium of practical resources to support your efforts in cultivating a decolonized, and subsequently liberated classroom.

Classrooms can be spaces of liberation for the young people we serve as well as for ourselves. In liberated education spaces, we can achieve freedom for self, others, systems and society. We have spent so much of our lives suffering from one form of oppression or another, so it is going to take time and intentionality to discover what it truly means to be personally free and

professionally free. I say we, because liberation work is lifetime work and it is collective work. We must all actively liberate our thoughts and actions on a daily basis. And by doing our own liberation work, we will also create spaces that free young people from unnecessary limits on their thoughts and behavior in school.

This pocket guide consists of six areas you need to liberate: your consciousness, your classroom, your curriculum, your cognitive capacity bias, your communication, and your conduct constructs.

What follows is Part Four of the guide, "Liberate your Curriculum":

Liberate your Curriculum!

curriculum: the subjects comprising a course of study in a school or college

What?

A liberated curriculum is a curriculum that represents, elevates, honors, and integrates all young peoples' cultural and linguistic backgrounds and cultural ways of being. A liberated curriculum is not Eurocentric in nature, nor is it isolated in social science courses. Rather, it provides multiple and diverse perspectives in all subject areas, including math and science. A liberated and culturally responsive approach to content means that we analyze what content our students are learning before we concern ourselves with content mastery. We have to discern whether the content we teach is perpetuating an ethnocentric view of the content area, or if it integrates diverse authors, experts, and contributors. Emily Style said, "education needs to enable the student to look through window frames in order to see the realities of others and into mirrors in order to see her/his own reality reflected" (Style, 1988). To put it plainly, a balanced and liberated curriculum includes mirrors and windows. It also infuses joy throughout the learning journey.

Why?

The University of Wisconsin-Madison School of Education Cooperative Children's Book Center's 2018 Diversity in Children's Books report is super telling. White people accounted for 50% of the characters in children's books published in 2013. Not only that, the second largest group was animals, who had more representation than all people of color combined! (Huyck & Dahlen, 2019).

Current education content features disproportionately low representation of LGBTQ+, neurodiverse, or emergent bilingual protagonists. These omissions occur from kindergarten to college in literary works as well as textbooks. Poet Adrienne Rich said, "When someone with the authority of a

teacher describes the world and you're not in it, there is a moment of psychic disequilibrium, as if you looked into a mirror and saw nothing."

When we make discretionary decisions about who and what to include in our curriculum, the choice is not neutral. It is often steeped in bias. We are deciding what content is worthy of mastery. We are deciding who and what is included or excluded. These decisions have the power to reveal narrow or expanded worldviews, to impede or empower, to damage or heal. There is deep psychological damage inflicted on young people who do not see themselves in the curriculum. While it may be tempting to believe this only applies to English Language Arts or Social Science courses, that is not the case. Diverse representation is essential and imperative in all subject areas-math and science especially given their disproportionate inclusion and representation of Black, Indigenous, Latinx, and women. And it can be achieved via direct instruction and collaborative learning.

When culturally and linguistically diverse (CLD) young people are continually confronted with content that does not include exemplars, historical figures, scientists, mathematicians, or models of excellence who look like them, or when representations of their cultural identity are overwhelmingly negative, it has harmful impacts on their self and cultural group perception (Pledger, 2018). At the same time, all young people enhance their understanding of others when content provides them with windows into the experiences of others. Exposure is an essential step toward the development of empathy, or the ability to understand and share the feelings of another. **Content that elevates the cross-cultural triumphs and inequities faced by individuals genuinely merits mastery, as it impacts positive racial identity development and community compassion.** How we create and deliver curriculum truly matters. Our curriculum can either transfer content from one repository to another or it can transform young people's reflections about themselves, others, and the world around them.

How?

- We can commit to a process of learning, unlearning, and relearning when it comes to writing or choosing curriculum. Center our young peoples' sociocultural identities first and foremost in our courses. For instance, social science teachers will need to reject the common practice of Eurocentric history as a required course, and Black and Latinx history as electives. English Language Arts teachers will need to assign books by diverse authors and with diverse protagonists. Math and science teachers will need to research and elevate CLD mathematicians and scientists who have made significant contributions in their fields. Teachers of art, language, or computer science will need to elevate the work and expertise of women, people of color, LGBTQ+ community, neurodivergent community and more.

- Design learning experiences that are relevant and applicable to CLD young peoples' lived experiences. This not only develops a positive sense of identity, it increases the likelihood of content integration and mastery. In most cases, to achieve mastery in a content area, a young person needs to care enough about the subject matter to invest time, energy, and effort to develop expertise. In contextualized learning, content mastery is evidenced by skillful application of the concept or skill. Whether it's social science lessons that center on a current election, math lessons about the exponential growth in the use of vape pens, or science lessons that examine the water quality in their neighborhoods, relevant inquiry-based learning can be meaningful and memorable. I encourage you to check out High Tech High Graduate School of Education's *Unboxed* Cards and EL Educations Models of Excellence for more ideas on how to do this in your content area.
- Include young people in a co-construction of curriculum by inviting their input through surveys, focus groups, or whole class ideation sessions. Chris Emdin's "7C's for effective teaching" aka Reality Pedagogy model is a great place to start. Provide opportunities for young people to share from their funds of knowledge, or their personal knowledge, skills, and life experience, which will expand content coverage while reducing status differentials. Young people learn by doing, by experiencing, and by applying their learning in current and future contexts. It is up to us to design or co-design these meaningful moments of mastery for and with the beautifully diverse humans in our care.

Resources

For links to all these resources, visit **hthunboxed.org** and search for "Liberate your Curriculum."

Farmer, G. (2020, August 6). How schools and teachers can get better at cultural competence. *Education Next.*

This article introduces practices that teachers and school leaders can employ to improve cultural competence.

Huyck, D. & Dahlen, Sp. P. (2019, June 19). Diversity in children's books 2018. *sarahpark.com blog*. University of Wisconsin-Madison. https://ccbc.education.wisc.edu/literature-resources/ccbc-diversity-statistics/books-by-about-poc-fnn/.

This infographic shows the percentage of books published in 2018 depicting characters from diverse backgrounds.

Ramos-Brannon, I & Muhammad, G. (n.d.). Teaching toward genius: an equity model for pedagogy in action. *American Consortium for Equity in Education.*

This article discusses Dr. Gholdy Muhammad's Histories, Identities, Literacies and Liberation (HILL) model as an equity framework for teaching and learning across all differences. The HILL model helps teachers design for five key learning pursuits: identity, skill, intellectualism, criticality, and joy.

Style, E. (1996, Fall). Curriculum as window and mirror. *Social Science Record.*

This paper discusses the need for curriculum to function as both a window and a mirror in order to reflect and reveal the multicultural world in which we live.

Style, E. (2014). Curriculum as encounter: selves & shelves. *English Journal*, 103.5 , 67– 74.

This article discusses the importance of integrating the life-text of young people and recognizing how their lived experiences shape their perceptions of the world.

Backwards Design Template

This template supports the design and co-design of student-centered projects and units that lead to enduring understanding. You can find a link in the online version of this article at **hthunboxed.org**

The following are websites with lesson plans, simulations, classroom activities, resources and more!

- Zinn Education Project Teaching Materials
- Woke Kindergarten
- Science in the City
- Social Justice Math
- Abolitionist Teaching Network Resources for Agitators
- Teaching Tolerance Classroom Resources
- Facing History and Ourselves Educator Resources

sam seidel at the 2022 Deeper Learning Conference.

Building Bridgemakers

sam seidel, Michael Lipset, and Tony Simmons
High School for Recording Arts, St. Paul, MN

In 2011, the education world was introduced to Hip Hop Genius: Remixing High School Education, *by sam seidel. The book showed educators a vision of high school education that honored urban students' creative resourcefulness through the story of the High School for Recording Arts (HSRA) in St. Paul, Minnesota. To mark the tenth anniversary, seidel collaborated with Tony Simmons, HSRA co-founder, and Michael Lipset, co-founder of HSRA Los Angeles, on* Hip Hop Genius 2.0.

In this new edition of the book, they describe the work of a current HSRA student, Walter Cortina.

When Walter arrived at HSRA he was already an activist—he had founded a student-led group called "Changemakers" at a previous school. Work like this doesn't normally show up on a high school transcript, but HSRA offers a "validation system" that empowers students to work with their advisor to translate the work they're passionate about into academic credit. During his time at HSRA, Walter has compiled "learning artifacts" including legislative testimony, grant proposals, video of meetings, and personal reflections to demonstrate his learning. Using HSRA's validation guide, he has identified the competencies that he developed through his experiences, such as "effective communication," "collaboration," "entrepreneurship," and "analysis of inequity and prejudicial systems." Walter also secured a "community validator" letter from a mentor, Jon Bacal, who spoke to the

quality, depth, and impact of the work Walter has done. As a result, Walter has received the support and guidance to do personally meaningful work and receive academic credit for it, even though it falls outside of the confines of a traditional school setting.

The following excerpt from Hip Hop Genius 2.0 tells the story of where Walter's activism took him when the pandemic started, and St. Paul went into lockdown.

Walter brought his passion for student voice to HSRA even before the school year began. With the support of HSRA's leadership and coaching from his advisor Haben, Walter and Lincoln Bacal, a fellow Changemaker from Walter's prior school, launched a "TC Changemakers" team with students from each of their schools. Walter met with interested HSRA students over the summer of 2019 and organized a two-day team-building retreat to plan activities. In January 2020, Walter decided to expand the Changemakers group he and Lincoln had formed into "Bridgemakers"—a paid, mentored experience to provide intensive coaching and support for young activists of color. The 17-year-old junior soon pitched two funders on his idea. As a result, Bridgemakers secured two $10,000 pledges. This provided Walter with a chance to turn Bridgemakers' mission into a living reality: to amplify the stories and mentor the leadership of youth to reimagine and revitalize Minnesota communities through the power of passion, purpose, and relationships that break cycles of miseducation, poverty, violence, and addiction.

When the pandemic and subsequent shutdown hit, Walter lost his job at a local car wash. For the first time since his mother had been deported to Mexico three years earlier, he had no source of income; no way of helping to cover the rent for his aunt, who had opened her home to him but due to her own illness could not pay the rent; no way to pay for meals or other living expenses; and no way to help out his mother and baby brother in Mexico. He had to put his plans for Bridgemakers on hold. After a few very anxious weeks, he saw in his crisis an opportunity to put his organizing skills to work: Walter and his friend Lincoln Bacal discovered that they and other out-of-work Minnesota high school students weren't eligible for unemployment benefits due to a state law that had been passed in 1939 banning otherwise eligible high school students from access to benefits. While other states had a similar law at one point in time, almost every state except Minnesota had since rescinded those laws.

At 11:00 am on April 11th, 2020, Walter welcomed a group of peers to their first video conference together. Walter opened the call by sharing his personal story and his plans and hopes for the future. Each participant then presented their own personal stories and struggles with the passions that had brought them to this conversation about addressing unemployment caused by COVID-19.

The team discussed a documentary about civil rights hero John Lewis, who had died two weeks earlier, and the lessons his life offered for their road ahead. Most immediately, they agreed that in the next three months their key priorities were: to engage Minnesota youth in the campaign Walter and other students had launched to convince state leaders to give out-of-work high school students access to unemployment benefits on the same basis as other workers, to encourage and support youth voter registration, and to organize forums for youth to develop and share perspectives on key policies like reimagining education.

Through their work together, the young people shared their stories of unemployment as a result of the pandemic. One young woman started them off:

> Hello I'm Omariasha Houston and I go to [HSRA] and I'm in the 11th grade. I was working at Appetite for Change and they had to close down. Some people don't have support systems and they gotta feed theirself and clothe theirself. Unemployment benefits will help our family with food. You know how we go to school and we have breakfast and we have lunch. Now we have to eat all of our food at home. And our bills, you know, it's just added on.

After her, another young man named Kojak shared his story:

> I'm 20 years old. My job was not deemed an essential job so that establishment had to close. I'm unable to apply for COVID benefits because I'm a high school student even though I'm 20 years old. But I still have to support myself.

Then it was Walter's turn:

> Hello, I'm Walter Cortina Martinez. I live on the Northside of Minneapolis, I'm also an 11th grader at the High school for Recording Arts. My mom got deported when I was 13 and ever since then I've been on my own. Ever since the age of 14 I've been working and I've been sending a lot of money back to my mom and my little brother that lives with her. My mom can't work because she's been diagnosed with breast cancer. I also support myself.

The young people slowly began to recognize a shared experience in each other. The need was clear, the path was not. While each story built, from one to the next, a sense of release as well as a sense of urgency, the last two stories lit a particularly furious fire inside the group:

> My name is Carlos Jimenez. I was unable to get the COVID relief fund because my parents are immigrants. I'm also a cancer patient. I suffer

> chronic leukemia and I have to take oral chemotherapy every day to stay well and stay alive. To take this medication I have to go to the pharmacy every single day. I have to take my car to get there because I can't take public transportation since I'm immunocompromised. In order to take my car I have to be able to afford gas. Because I can't work, I can't do that and I can't afford my medication.

Silence, and some tears. Then came Ezra's story:

> I'm Ezra Augustine. I'm unable to access COVID 19 because my parents are undocumented. I'm also a transgender person of color, I have to pay out of pocket for my hormone replacement therapy because I do not have insurance and I have no income to, you know, pay for that. I'm also an at-risk person and that makes it really hard for me to get a job.

By the end of the meeting, those present vowed to continue working on behalf of unemployed young people like themselves for whom access to COVID unemployment benefits might mean the difference between life and death. On May 8th, the *Pioneer Press* daily newspaper published an opinion piece by Walter asking the State to reverse its benefit denial: "We've lost our jobs. Many of us high school students need benefits to get through this," it read (Cortina, 2020). Four days later, local news station KARE11-TV ran a story on Walter's fight for benefits (Melon, 2021). These two were the first of 54 total media features on the youth-led campaign over the next eight months, seen by hundreds of thousands of readers/viewers, including stories in the *Star Tribune* (five separate articles), the *New York Times*, and *Teen Vogue*.

Walter and his team began to organize a student-led campaign for access to benefits. Like Walter, many of Minnesota's 20,000+ newly out-of-work high school students depended on their work income to cover core household expenses, and yet Minnesota was denying them access to either regular state unemployment benefits or the federal pandemic unemployment help that had just been approved in the $2.2 trillion CARES Act (Davis et al., 2020). At the end of May, Walter received a call from Youthprise, a national foundation eager to promote youth engagement in the 2020 elections. Two weeks later, the Bridgemakers proposal was one of only six "Civic Spring" projects selected out of 147 applications nationwide to receive a $90,000 grant from Youthprise (Youthprise, 2021). By the end of 2020, Walter and his team had raised a total of $124,000 from four funders. Over the next two months, with the support of a coalition of allies, Walter and his colleagues converted their testimonies into short videos and social media posts on Facebook and Instagram and, with the support of HSRA advisors, organized several online "Town Meetings" to share student stories and engage more young people. The young leaders started meeting with an aide to Minnesota Governor Tim Walz; his employment commissioner Steve Grove; and key legislators and legislative aides of both parties, including two meetings with

Minnesota Senate President Jeremy Miller. They drafted emails and made outreach plans in collaboration with HSRA advisors Haben and Maureen as well as Bridgemakers mentor Jon Bacal, Lincoln's father. On May 15, 2020, after consulting with one of the nation's top unemployment benefits experts, Walter wrote the Governor a four-page letter explaining point by point how the State's policy was unjust. Walter copied top state officials and legislative leaders on the emailed letter. Within hours, the Governor's aide called Walter, pledging the Governor's support for overturning the 1939 state law (Stevens, 2021).

On June 3, 2020, Walter, Lincoln and other students testified in front of the Minnesota House Jobs Committee, the first of five times youth campaign leaders would testify at the State Capitol. Despite bipartisan support, the campaign's efforts to pass state legislation in the June and July special legislative sessions stalled because of disagreement between the Republican-controlled State Senate and Democratic-controlled State House on how to pay for benefits. Inspired by the youth-led campaign, in August of 2020, Minnesota's U.S. Senators Smith and Klobuchar and four U.S. Representatives introduced legislation in Congress to clarify high school student eligibility for benefits (Craig, 2020).

The youth-led campaign for student benefit-access achieved success beyond Walter's wildest expectations. After partisan bickering had blocked action at the State Capitol, Walter and his colleagues filed a lawsuit against the State in October 2020 with the pro-bono support of a Minneapolis law firm, Youthprise, his school, High School for Recording Arts and, later, Minnesota Attorney General Keith Ellison. On December 1st, 2020, the State Court of Appeals unanimously reversed the State's denial of pandemic unemployment benefits to eligible high school students (Turtinen, 2020).

The Court ordered the State to immediately begin paying benefits to all of the 20,000+ eligible youth. As a result, by early March 2021, young people throughout the state had received at least $30 million in benefits, with at least $40 million more yet to be processed. The Court's decision cited many of the same points that Walter had stated in his public letter to Governor Walz seven long months earlier. Governor Walz invited Walter and four youth teammates to meet with him, Lieutenant Governor Flanagan, and Commissioner Grove in late December as they publicly pledged that permanently repealing the law denying student access to benefits would be a top priority of the Walz Administration in the 2021 Legislative Session.

By early 2021, Walter and his teammates had recruited a board of directors, a fiscal sponsor, and raised an additional $150,000 to support the team's activism and social entrepreneurship of eight Bridgemakers youth Ambassadors into 2021 and beyond.

HSRA's role throughout Walter and the Bridgemaker's incredible journey has been to catch whatever balls the young people threw their way, support them in their mission, and validate the strengths/learning they demonstrated. In many ways, the school got out of the way of the learning the young people were already doing on their own, offered its support and resources, then said, "Yes, you did that. We see you. You deserve the following recognition for your work…" As a school that's designed to adapt and respond to students' interests, HSRA was ready, willing, and able to support the work of Walter and the other HSRA Bridgemakers through its advisory model.

Walter, the Bridgemakers, and their amazing organizing and legislative successes are in some ways unusual. But, While some of the outcomes are exceptional, this story says a lot about HSRA's approach to learning: hustling hard to support students' work outside the school building and unapologetically focusing on social justice. This update demonstrates what is possible when we move away from forcing students to follow school rules to instead nurturing and supporting students to change societal rules.

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Joanna Collazo discusses a research project with her 4th grade student.

Rock Stars, Eggs, and Teaching

Joanna Collazo
High Tech Elementary Explorer, San Diego, CA

People talk about a moment that changes your life. It's usually dramatic and leads to a shift in reality, but it doesn't necessarily need to be so abrupt to lead to change. For me, I was watching a musical with my mother at the Mater Dei High School in Chula Vista. I was an 8th grader at the time and going through adolescent angst about the prospects of high school. We started a conversation with a gentleman behind us and one thing led to another before he recommended I attend a school called High Tech High Chula Vista (HTHCV). I remember him saying, "Your daughter will love it." That brief interaction was a moment that changed my life. I remember hearing about the school and feeling an electricity spark within me. After attending the play, I did research about HTHCV and the electricity powered through me, making me excited at the idea that I could attend a school that was so engaging and meaningful and different from the rest. I filled out an application on my own and dragged my parents to an information session they held at the high school. On August 30th, 2011 I started my first day as a freshman at HTHCV. I was so excited, I wore this pink and white dress and a black blazer to look professional. The other students at the school mistook me for a teacher. Now, so many years later, I am a teacher at High Tech Elementary Explorer. That same electricity hums through me now…

I start my mornings off by singing in the car with a microphone. I figure if I can be a rock star during my 30 minute commute to work, I will be energized, zesty, and invigorating for the kids. Sometimes it works. After

all, performing on stage in front of thousands of cheering fans is not much different from teaching a room full of 4th grade students.

Then I arrive at school and the daydreamed ambiance of off-key pitches and mumbled lyrics I don't actually know fades into the background. Still, an electricity only rock stars and teachers have fuels my ego and passion as I start the day.

Today, we are going to finally drop our egg carriers off the top steps of the school to see if our eggs can survive the dangerous fall. Students have been researching, designing, prototyping, and creating egg carriers to land their fragile eggs safely to ground.

It's not about the eggs, though. It never is. As eggscellent as the egg challenge is, the purpose of this experiment is rooted in the essential question, "How does our brain help us solve problems?" I wanted my students to grapple with challenges, to critically and creatively think about solutions, but most importantly to learn the difference between failure and quitting.

So here we are, all of our eggs in one basket (pun intended), with sweaty palms and jittery energy to see if maybe just maybe our eggs will survive. I gather the students outside and climb the steps with each group one by one and drop their egg carriers. The students wince as each carrier lands with a thud and they eagerly await to see if their egg survived.

I bring the students back into the class and we gather on the carpet. I open up each egg carrier one by one to reveal an unbroken egg. The students cheer and we repeat this pattern until we get to the last egg carrier.

The last egg carrier was designed by a single student. He opted out of working with a group. Since the start of school, I have only heard this student's voice once during a reading assessment. He has not, to this day, spoken to me or his peers in class.

I open up his egg carrier and my heart sinks to see yellow yolk dripping down. I look up to find him, but he's retreated into the corner of the room. It's hard to know what he's thinking or feels when he doesn't speak to me. So I bring our message notebook over and write to him instead.

As we pass the notebook back and forth, we fill it with questions, sentence starters, sketches, feeling scales, and repetitive prompting. After an hour, I learn he's feeling mad and sad because his egg broke and he doesn't want to try again. I ask him if he thinks failing is equal to giving up or to the egg breaking. He circles "giving up." I ask him what makes him more sad; giving up or the egg breaking? He circles the "egg breaking." He is adamant about not wanting to try again. I am even more adamant in insisting that he does.

After all, this was the essential question. This was a moment I knew students would have when designing egg carriers. I knew challenges would arise, I wanted to equip students with tools and skills necessary to help them overcome challenges. I wanted students to adopt a growth mindset and at this moment I was willing it out of him to no avail.

There's this song called, "Home Sweet Home", by the legendary rock stars Mötley Crüe. In the song it says,

> You know that I've seen
> Too many romantic dreams
> Up in lights, falling off the silver screen
> My heart's like an open book
> For the whole world to read
> Sometime nothing keeps me together at the seams
>
> I'm on my way
> I'm on my way
> Home sweet home

This song was playing in my head during my interaction with this student. I was filling my head with romantic notions about idealistic goals for this student: that he would talk to me one day, that he would sit with us during morning meeting circles, that by the end of this year he'd engage with our class community. I felt that my heart was an open book and this student could read my thoughts and desires clearly. These ideas were supposed to bind our relationship, but like in the song, it appeared like nothing was keeping the seams together. I was trying to serenade him into the idea that this class, or at least I, could be a home sweet home.

Multiple times throughout the day I ask myself if it's worth it. Is it worth working with this one student over the other twenty-one students? Is it the right call to push him so hard? Is it worth it? Sometimes it's not and that's okay, but sometimes it is and this moment was the golden egg. If this student didn't try re-designing the egg carrier, I was afraid of how he would respond when faced with a challenging math problem or a difficult reading passage. What would he do when he had a conflict with another student or when he wasn't having his needs met?

It's really not about the egg, it never is. It's about the challenge and the growth that comes with struggle. So I pushed and I pushed hard. I told him he could take a break, we looked at other egg carrier models and pointed out similarities and differences between his design and others, and then I told him he had to do it. There wasn't a choice.

After silent tears and whispered resistance, I found him working on his egg

carrier again. He added a parachute and switched the padding for a lighter material. When he was ready we dropped the egg carrier a second time.

This was it: another rock star moment.

Stage lights shine down on us, the crowd cheers in the background, the rhythm guitarist starts strumming, and the tempo begins to pick up. Our hearts beat quickly to the drums as the egg carrier leaves my hands and heads down to earth. It lands with a thud.

We check the egg: a smooth, white oval, completely intact.

Our fans go wild, cheering in the background. Success rattles in our bodies, but growth blossoms in our minds. Mötley Crüe starts their chorus in the background, and I hear Vince Neil's voice sing, "Home sweet home."

Afterwards, I asked the student to write about his experience from start to finish. He opened his piece with the words "I'm happy…" I don't have the words to describe how it felt to read that. To have a student in front of you who is experiencing complete defeat is heartbreaking. To endure that and still overcome the challenge is exhilarating, a rock star moment at its finest. He still wasn't actually talking to me, but for that brief moment we were on stage together performing, singing our songs, microphones in our hands so our voices were heard.

A student dresses up as Dee Snider of Twisted Sister, for a "Kid History" episode about the 1980s congressional hearings over obscenity in popular music.

Two Approaches to Grouping Students in Projects

Britt Shirk & Ted Cuevas
High Tech High Chula Vista, San Diego, CA

Early in the spring, we got a phone call from a school principal asking what Unboxed *had on group roles in projects.*

This got us thinking about what we mean when we talk about "group roles" in projects. Here's how we look at it:

The first two questions a teacher asks when designing a project are "what are we making?" and "what will students learn from the process of making it?"

After they come up with (provisional) answers to those questions, they ask the next three questions:

1. *How is this thing going to get made?*
2. *How will we ensure that everyone makes a meaningful contribution to making it?*
3. *How will everyone learn what we want them to learn from this project?*

In the process of finding answers to these three questions, a teacher starts thinking about how to put students into groups, and how to make sure everyone makes a contribution in their group. They also start distinguishing between the skills that they want to make sure everyone learns in the project, and the tasks that aren't at the heart of the project, but nevertheless need to be completed in order for the

product to be made. For example, if you are publishing a book, someone will need to lay it out, probably in a specialist program such as InDesign, but if "proficiency in InDesign" isn't a learning goal for the project, you only need one or two students to do it.

Every experienced project-based teacher thinks about these challenges, but they do not respond to them in the same way. With that in mind, we talked to Britt Shirk and Ted Cuevas, two experienced ninth grade teachers at High Tech High Chula Vista, to find out how they approach these questions. It's our way of answering that question the school asked me about "group roles."

Visit the online version of this article to download a model "We Before Me" planning doc, Project Process Flowchart, and list of the Habits of Heart and Mind.

Britt Shirk, 9th Grade Humanities, High Tech High Chula Vista

The best way to describe my approach to this is to tell you about the project I'm doing right now, which was inspired by a comedy show in which celebrities describe the biographies of historical figures from memory, and actors provide full in-costume reenactments (including lip-synching the dialogue from the person telling the story). We share a campus from an elementary school, so my idea was "what if we do this with elementary schoolers retelling the biographies, and we call it "Kid History"? I've been doing it for four years and I love it.

After I had the initial concept, I started planning by dissecting an episode of the show, figuring out the process the team used to make this effortless-looking TV, and then translating that process into something ninth graders could do. And that's the fun in developing projects is reverse engineering a professional product.

How I make the groups

Before students even know what the project is, I give them a project attribute sheet that says "these are all of the types of talents and skills that we need." Then there's a list of all of the kids in their class, and I say "tell me who you see as being all of these things," because I want them to recognize and value what other people can do and what they can do themselves.

Then I collect the sheets and spread them out on my living room floor. I look for the commonalities, and try to give the kids at least one person that they feel comfortable working with that I think has a completely different skill set than they do, because by the time I'm doing this project, we're in November and I know them pretty well. It's like a puzzle, but I love puzzles. So putting

grouping together is my favorite thing.

One thing I do that's probably controversial is that I put the kids who tend to have a tough time with motivation all in the same group. I think it gives the students that kind of fall into that category a chance to shine on their own, and also they can't hide behind other students. And on the flip side, I put together teams of four leaders, where the challenge is "how are they going to be able to share the air?"

I know that other teachers will deliberately put a kid who's inclined to take a leadership role into each group, but in my experience, when you do that, one person ends up doing all the work.

Part one: research

Once the groups are made, we have to research. And so each kid has to actually individually research different topics. And I do a scaffolded activity where they investigate unknown people of history, then we kind of really narrow down that. And then they come to the table to their group with their top three choices. And then from that, they teach basically each person in their group their three choices. And they use the dry erase board.

They finish this process with four choices, and make a plot diagram for each one, to figure out which has the most cohesive story. From there the writing happens, then storyboarding, then costume design, then they read their script aloud to professionals at the end of first semester and get feedback.

Part 2: filming

In second semester the groups start filming, and at that point, I assign those four roles: director of photography, head of audio (in charge of recording and editing the narration, which is provided by an elementary-school student), film editor, and head of costume and props (who also manages the actors when they're on-set).

The role I DON'T assign is "actor". Everybody's an actor. You need an actor? Get someone from another group. And it works surprisingly well.

I state very clearly at the beginning of the semester that I don't want to stick too heavily to the roles, I just need a point person so I know who to talk to in the group to find out, for example, what a group's costume needs are.

The daily task list

At the beginning of class the groups sit together, and read through the daily checklist and divide up the tasks within their group.

Dealing with drama in groups

To be honest, major drama happened a lot more when I first started doing PBL, and dealing with it has gotten a lot easier. And one thing I learned to do is that I always try to be really, really, really positive with the kids. And at the end of every class, I always tell them, "Good job today. I'm so proud of you guys. Look at the work that you've been doing." And I'm naming kids, like "if you need help with editing audio clips, Okalani can help you out," just making it feel like we're not in a room in a school, we're in a production company.

What I've noticed is that kids will perform at a high level if they know that I'm going to say something nice about them in front of the class, and I'm going to take pictures and put it in the "week ahead" email that will go to their parents.

I was not always this positive. I was not always this nice, but I've just learned as a PBL teacher, patience and calmness goes a long way. And I'm like, "Okay, I'm ready to scream right now, but I'm not going to because I know that tomorrow's a new day. And if they feel positive energy from me, they're going to continue to be positive. If they feel the negative, then it's going to just go downhill."

Ted Cuevas, 9th Grade Physics

Our team is called the co-op. Same every year. That started years ago, when Sara Islas was my teaching partner, and it was a name we put a lot of thought into. We both had experiences in college working in co-ops. They're places where everybody is supportive, everybody cares for each other and everybody listens. This addresses equity in creating a real positive, brave—in addition to safe—community.

I apply the co-op ethos to project groups: it's important to me that everybody learns the key skills, and everybody learns to be a leader. I don't assign students specific "roles" unless they would have those specialized roles if they were doing this work in the professional world.

To give an example, our first big project every year is "Casa de Miedo," in which the students create a haunted house in the ninth grade hallway. There's a lot to coordinate within groups as well as between groups, so everybody can learn how to interact with one another in a positive way, or at least have good challenging moments so that we can reflect later and process those challenging moments.

The thing is, they're really invested, because a lot of them went through the Casa de Miedo when they were in eighth grade, they feel the responsibility

of that tradition, so they persevere and when it's all done we can look back at the experience and address where conflicts came up, and how they could have handled them differently.
The Casa de Miedo groups are the hardest ones to make by far, because we've only just met the kids. But before we even make these groups, we've created a structure that allows everybody to learn a huge amount in their project, even (maybe especially) if their group has a tough time. That structure is the Critical Friend Forever, or CFF.

We assign everyone their CFF in the second week of school. We try to be intentional about those pairings, but inevitably they're a bit random. And it generally doesn't matter, because what's important about the CFF is the consistency of meeting once a week, and the fact that at least initially they aren't in a project group with their CFF, so they can offer an outside perspective.

Back to those groups, I try to never have more than five students in a group. And every day starts with what we call a "We Before Me" meeting. In that meeting, they look at what they need to accomplish today, and each of them writes what we call a "to-due" which is just an index card with what they, individually, are going to get done that day. This is a small way for students to take ownership of their work, and their role in the group, because without this structure, most groups will default to one person telling everyone else what to do, which tends to be unsatisfying for all of them.

This goes back to the co-op ethos, and the idea that everybody should be able to step up, and to ensure that, every team has a binder where they keep everything they're working on. At this point normally there's a physical binder in the classroom and its digital counterpart online, but they both serve the same purpose, which it to ensure that no matter who shows up to class from the group, they can keep making progress for the group, and we don't get into "Well so-and-so has the technical drawing and they're sick, so we can't do anything today."

What brings all of this together is how I assess students' contributions: I use a system of badges that they earn, and these include social and emotional skills, collaborative skills, specialist knowledge such as physics concepts, and project-specific skills like soldering. I use a program called Inkwire that links assignments to the badges those assignments will help them to earn.

Now, to earn a badge, students need to present a "claim" that they have earned the badge, and provide evidence and reasoning. And that evidence will usually be a piece of work, which means that over the course of the year, they're naturally developing a portfolio of their work. Then, when they present their learning at the end of the year, they have a rich collection of work to share and reflect on!


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love
xPLORER
THRIFT

Poppin' Tags

Mara Gonzales & Melina Aguirre
3rd Grade
High Tech Elementary Explorer

Our Poppin' Tags project helped students learn about fast and slow fashion and the environmental and social impacts of both. Students learned about fashion in different social contexts and cultures and explored more sustainable choices to become informed consumers and influence the buying choices of others. Students learned basic sewing skills and discovered fun ways to reuse and repurpose clothing items before discarding them. Students also designed and curated a space for our 3rd grade thrift store and removed the stigma of thrift store shopping. This thrift store helped support our students in feeling more comfortable and even proud of using gently used clothing.

Teacher Reflection

It was amazing to see our students developing their sewing skills throughout this project. Students also enjoyed shopping in the thrift store taking great pride in the clothing they chose. They would come to school the next day wearing the donated clothing from their peers. Students also became empowered by the information and knowledge gained about the environmental impact of fast fashion and helped their families make more sustainable choices. Students also became empowered to host their own expert speakers in the fashion industry through Zoom.

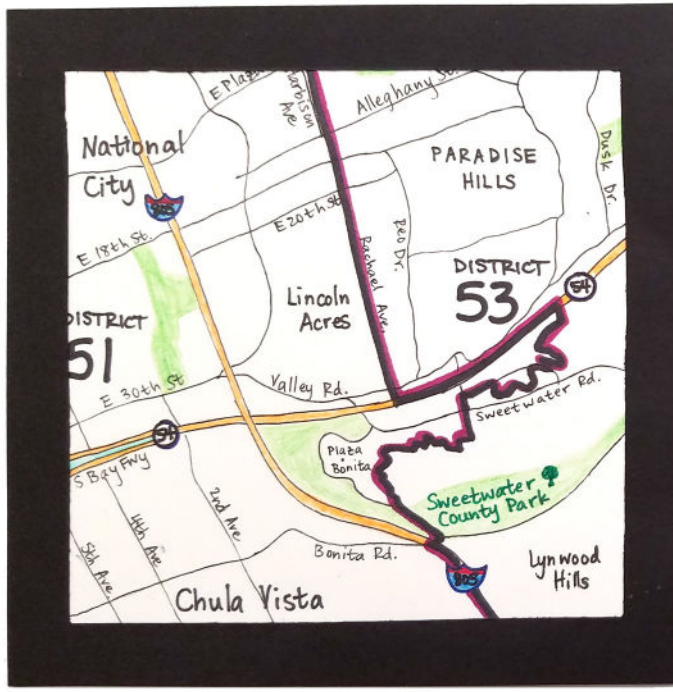
—Mara Gonzales

Student Reflection

This project changed me because I had no idea fast fashion was polluting the earth. Now I know in my mind that we need to help the environment get better. And it doesn't just pollute the earth, the people who make fast fashion aren't getting a lot of money. That's unfair to humans, not just to nature.

—Avi

To learn more about this project and others, visit
https://meaguirre2.wixsite.com/mysite/projects


National City
PARADISE HILLS
Lincoln Acres
DISTRICT 53
DISTRICT 51
Valley Rd.
Sweetwater Rd.
Plaza Bonita
Sweetwater County Park
Bonita Rd.
Lynwood Hills
Chula Vista
E 18th St.
E 20th St.
E 30th St.
Allegheny St.
Dusk Dr.
Rachael Ave.
Peo Dr.
S Bay Fwy
4th Ave.
2nd Ave.
5th Ave.


Mission Gorge Rd.
Santee
Mesa Rd.
Prospect Ave.
Weld Blvd.
Gillespie Field
50
Grossmont College
N Cuyamaca St.
WBradley Ave.
Harshall Ave.
53
52
Fletcher Hills
Fletcher Pkwy.
Cajon Heights
E Main St.
El Cajon

How Does My Vote Matter?

Mele Sato, Math
12th Grade
High Tech High Media Arts

In their senior year, many students first become eligible to vote. Some are excited while some are not. We launched our project with a mock election in which students vote using systems such as one-person-one vote, an electoral college, instant runoff, and a two-party election. We showed that with the same votes, different systems generate different outcomes. Students exclaimed: "Wait, what? That's not fair!"

Given most teenagers' strong sense of justice, this motivated students to examine voting systems using the mathematical methods of measuring "fairness." Throughout the project, students ask, "If current voting systems are unfair, what would a fairer system look like?" Students analyzed local districts for compactness and proportional representation using census data and historical boundaries. They proposed new, fairer district boundaries and tested their proposals using mathematical tools like the Polsby Popper and Reock measures.

Students created mathematical posters that show fairer voting systems for different elections and demonstrate how these systems, gerrymandering, and other techniques impact the results. They created data visualizations that answer the questions: "Why is this important in my life? How has this change impacted me?" Students host a voter information night in which they teach the public about voting systems and the guests vote to determine the system that they think is most fair.

Teacher Reflection

The most memorable moments are when students' curiosity is piqued, because of an article we read, a podcast we listened to, or from calculating compactness, proportionality, and efficiency gap measures. Current events increase the relevancy and urgency of the mathematics that we're learning and make the classroom a dynamic environment.

—Mele Sato

Student Reflection

The voting project was really engaging because of the intersections between history, political science, and math, which I had only looked at through separate lenses in the past. This project gave me the tools to back up my own opinions with math and data. I also enjoyed learning about the different mathematical ways to measure fairness because I didn't previously know that fairness was something that could be measured. Talking about fairness also led to a lot of philosophical conversations about mathematics.

—Olivia E.

San Diego to Hawaii
Matt Leader, Biology
Chaz Parker-Olafs, Humanities
11th Grade
High Tech High North County

How has imperialism affected the biodiversity of two unique areas? This semester-long project was focused on telling the stories of San Diego and Hawaii and how imperialism has affected those places. Modeled after a UC San Diego PHD program, students developed focus questions by highlighting San Diego species that students had a connection to and engaged in deep inquiry to those research topics. Each student had a focus organism while developing a research study that they completed throughout the project. Some studies included coyote habitat interaction, ocean temperature affecting sea lion sun basking, and ocean acidification affecting coral health. The culmination was a defense of their knowledge and creation of a scientific poster at a school wide exhibition. Additionally, the students published their research findings in a book that will be used for subsequent classes to refer to when engaging in similar biology research projects.

Teacher Reflection

We modeled it after how UCSD has students really develop a form of study and dissertation in a PHD model. I had some collaborators help me to design that. Over the course of the semester it's like a six-year UCSD study essentially in four months on a high school level. They went through a period of getting some background info like in a master's degree, defending their knowledge with that and then using that knowledge to develop a part of study relating to biodiversity of the species. A good two months of the project was the research in which they spent each day pushing the study further and then every Friday they defended what they did for that week.

—Matt Leader

Student Reflection

I had the opportunity to work with a coral researcher who lives in Hawaii. Part of working with them was asking questions and working out our dilemma. She was really insightful only not with questions about my organism but also how to better conduct my experiment. Looking back, my experiment was kind of a flop but I realized what mistakes I made. I left the water open and it changed the PH while I wasn't technically conducting the experiment. My research paper reflected the information about cauliflower coral as well as my experiment data.

—Sinqi C.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Living History

Michelle Nho, Grace D'Antuono
8th Grade, Humanities
High Tech Middle Chula Vista

For this project, students explored two essential questions: Whose story gets remembered? How am I a part of San Diego history? In collaboration with the San Diego History Center, our 8th graders grappled with the hard history of America's Finest City by interviewing people living within the community. Taking on their own approach to oral history, students developed a capacity for curiosity and compassion as they each uncovered new truths. Students made their thinking visible by creating a megatimeline that lived in our classroom—San Diego from the time of the land's first people, the Kumeyaay, to the modern-day. Informed by the work of critical thinkers like Howard Zinn, these brilliant minds interrogated what and who was important to the megatimeline (and more interestingly, why). As a way to process their new learning, students confronted two controversial figures in a mock trial, Father Junipero Serra and John D. Spreckels. Students were invested in serving as conduits to the past, uplifting the legacies of groups less heard about in popular history. After a memorable day taking the Old Town Trolley Tour, students applied their new expertise by designing a tour experience that was dynamic, inclusive, and representative of the real San Diego.

Teacher Reflection

I learned that shared experiential moments are a powerful tool for bringing history to life. Being new to San Diego myself, I enjoyed my preparation for this project and felt like a true learning partner. Our collaboration with the San Diego History Center was invaluable to our students' understanding of their role in history. In a future version of Living History, I would love for students to experience more of San Diego through the self-guided walk in Kumeyaay Period in Mission Trails Regional Park.

—Michelle Nho

Student Reflection

I have grown so much during this project. I have learned how to deeper dive into research and how to find important and useful sources that I can rely on. I will be using this in the future and taking this away to high school or other places when this becomes necessary. I exhibited many skills that included projection in my voice and clarity. I spoke at a good pace and practiced so much.

—Abby R

The Art of Folding Paper

Shira Feifer, Joanna Collazo, Jessica Stapp
4th Grade
High Tech Elementary Explorer

In this project students answered the essential question, "What can we learn from the art of folding paper?" Students learned tangible, social, and culturally relevant skills through creating origami which allowed them to work with their hands and have fun. Through origami, fourth graders explored essential social emotional skills like communication, collaboration, patience, feedback, and perseverance. They also dove into symbolism in Japanese culture and history of Japanese Americans, ultimately creating a display of 1,000 paper cranes to honor Sadako Sasaki's story. Finally, using their geometry, communication, and writing skills, students worked together to publish a how-to book with over 50 different folds.

Teacher Reflection

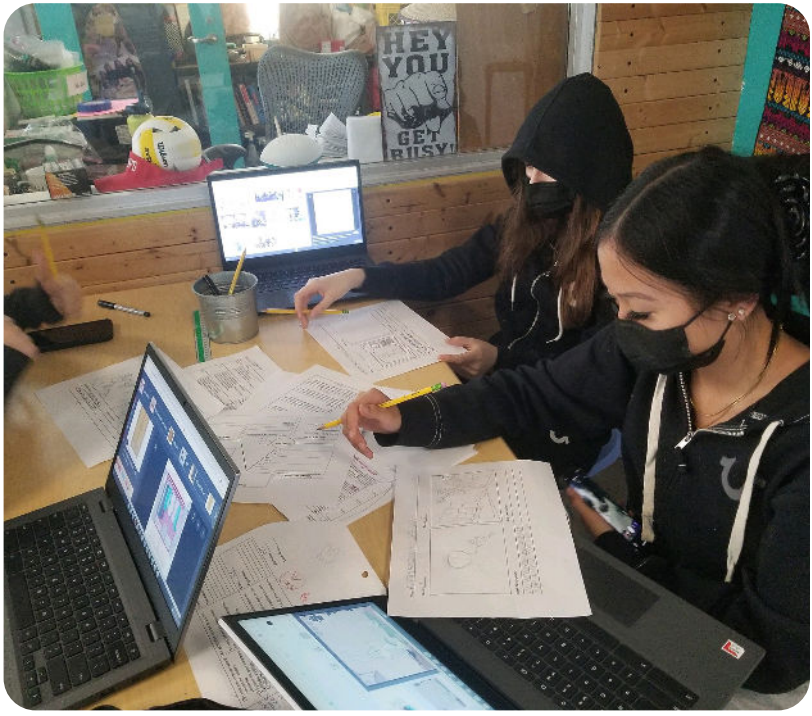
This was an incredible project to start the year with. Students were engaged and working with their hands from day one. They faced the challenge and frustrations that origami presents head on and are now experts at using those skills in everything they do. It is also a project that lends itself perfectly to differentiation with the myriad of different types of folds. Not only did our students latch onto the challenge of learning and teaching difficult folds, they surprised us with their engagement and excitement about learning the history and symbolism of origami. One class ended up focusing on the message of hope and resilience, another focused on pushing through, and a third zoomed in on the message of using the tools around you. It was so cool to see the ways each student, and each class, adapted this project and its questions to fit their needs. Finally, we were blown away by the commitment and excitement our students had when it came to folding our 1,000 paper cranes and publishing our book.

—Shira Feifer

Student Reflection

This project has been hard but fun. It is cool to see what folds look like once you are done. My favorite part of this project has been learning how to make an origami cat for my final fold that I will teach others. This has been my favorite part because cats are my favorite animal. I tried a few different folds to be sure I found the right fold because some were too easy for me and others were too hard. I knew I had found the just right fold when it was challenging but I could do mostly all of the steps.

—Isla H


HEY
YOU
GET
BUSY!

Kid History

Britt Shirk
9th Grade
High Tech High Chula Vista

In The Kid History Project, ninth grade students researched, wrote, and filmed the story of an important, but overlooked event from history.

There was just one catch: their narrator was an elementary student, telling the story from memory, and all their performances had to match the story as it was told.

Teacher Reflection

The Kid History Project has taught me how to relax and be a colleague with my students. I am a very organized teacher, but sometimes I can micromanage which takes me out of the creative nature of projects. This experience has helped me get "messy" with my students and troubleshoot problems on the spot. This experience has also taught me that transformation of space and using professional jargon sets the atmosphere which helped my students become fully immersed as writers, directors, editors and actors. This is the fourth year I have done this project and each year it gets better and better, so it is difficult to pinpoint specific changes I have made from past iterations. My biggest piece of advice to all PBL educators is do a project multiple times with different classes and be patient with the way it naturally develops. We never do something perfect the first go around, so be patient and give your projects the space and time to grow and evolve.

–Britt Shirk

Student Reflection

My favorite moment during the Kid History Project was creating the end credit scenes. I wanted to create an ending scene that was just as enjoyable and memorable as the episode itself. The idea for the ending came to me by memory. Suddenly, my mind was like an old moving picture. It showed me flashbacks of old sitcoms, Disney movies, and teenage dramas. During class I scrambled from table to table, person to person, trying to gather as much footage as I could. At home, my legs became a body of their own and carried me to my desk in front of my computer. I immediately started to compile the videos and pictures that I had taken. I used funny gimmicks, bloopers, nostalgic music, and visual/font effects to create an ending that was just as humorous as the tale our video told of the Y2K Crash.

–Isabella B


DTX
DTX
DTX
DTX
YAMAHA

What's That Sound?

Jamelle Jones, Jen Street, Paige Robison, Kari Shelton, Roxanne Sepehri, Sandy Giang, & Johanna Fenton
1st Grade
High Tech Elementary North County

In this project, students explored the science of sound by doing a variety of experiments and investigations in science and engineering exploratories from tinkering with instruments to attending performances to get a live experience of the power of music. After detailed research, students wrote opinion pieces on their favorite song, string instrument, and music genre. Finally, students created prototypes to design their own instrument.

The second part of the project, students focused on the ways humans and animals communicate through sound. First graders learned that sound can be used to teach through songs and performances and that animals use sound to communicate and survive. First graders created a Youtube Channel to share their learning in the form of music videos and digital audio books. To see details of our project, and student work, visit the HTeNC YouTube Channel online.

Teacher Reflection

Students are naturally curious and interested in music. We were happy to provide shared experiences for students who had never seen live music performances or have played an instrument. We brought in percussion instruments from around the world for students to play, as well as string instruments such as the guitar and keyboard. Students also had a chance to make their own instruments and experiment with different sounds and sound waves. Our favorite moments of the project were our HTENCoachella Concerts where teachers and musicians from all over our village came to perform and all students were invited to enjoy the music. In addition, curated digital research rooms were a great way to differentiate the research process and give students access to high quality, diverse texts. Learning about sound, music, and feelings provided a platform for rich conversations about the world we live in and how to be kind, conscious members of society.

—Jamelle, Jen, & Paige

Student Reflections

The part that I'm most excited about is to come up with the song and actually sing it.

—Elliot

I liked when we took notes about the different instruments. I love the electric guitar!

-Ximena

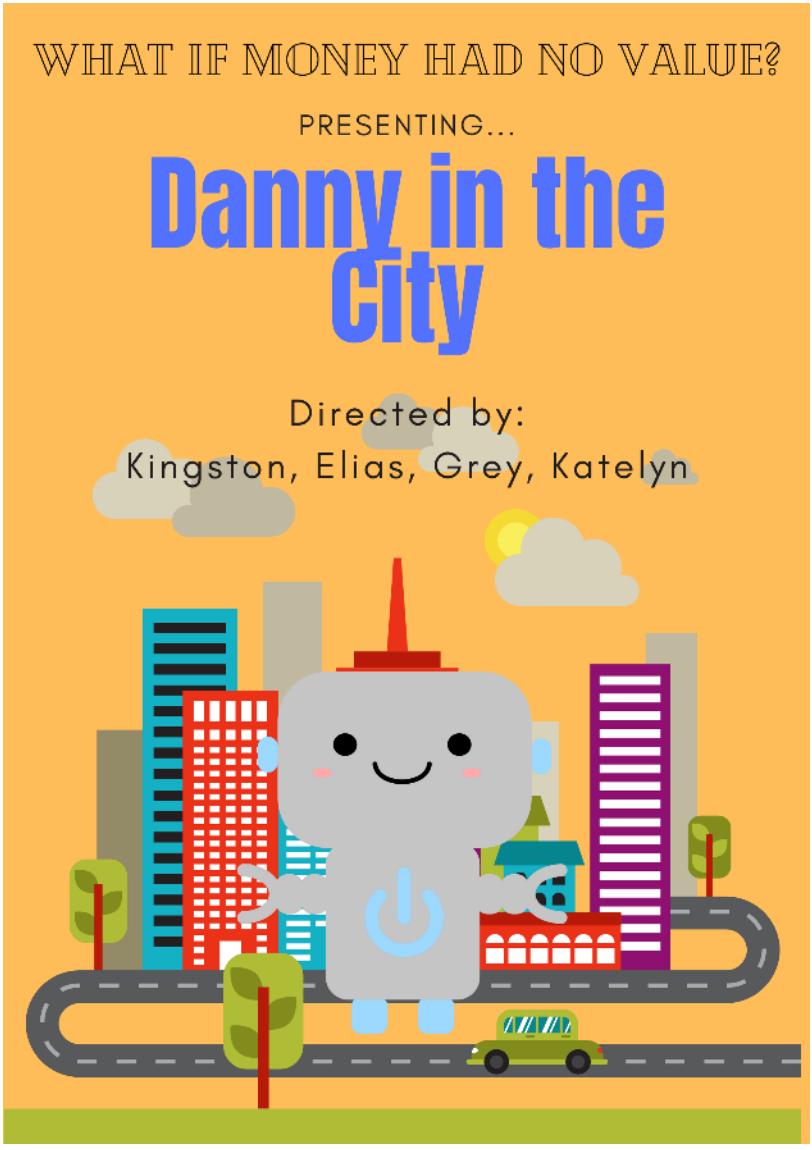
WHAT IF MONEY HAD NO VALUE?

PRESENTING...

Danny in the City

Directed by:

Kingston, Elias, Grey, Katelyn



The Pixar Project
Emily Kyle, Humanities
Conrad Farrow, Humanities
7th Grade
High Tech Middle North County

In this project, students worked with professional artists and producers affiliated with Pixar Animated Studies to create and publish their own individual short films centered on the theme "Metamorphosis". Over ten weeks, students were mentored by peers and professionals to write and edit a complete story using Pixar's story-telling structure, create and draw original artwork and animation, and produce voice-overs and unique sound effects. The project culminated in an official screening of all student films by Pixar on their own platform. The films were also shown at High Tech Middle North County as a community event for family and friends.

Teacher Reflection

This experience is something that we were missing during distance learning. Students were forced to look back on their work rather than just moving on to the next thing. For their videos, they had to go back to add color, they had to go back to add sound effects and dialogue in order to make a more in depth film. Every Friday they submitted their current iteration, in whatever stage it was in for for feedback from Pixar team members as well as design school students to ask questions about the story content and the illustrations.

—Emily Kyle

Student Reflection

I want to be an animator when I grow up so it was very intresting seeing the process of developing a story to become a film. My drawing style and skills changed a lot during the project. I learned to draw bodies and expressions to look more realisitic rather than just round cartoons. We had deadlines to get each act done in about three weeks and wished we had more time to add more in but I feel accomplished with our final draft of the film.

—Sam

Two students test their CD-wheeled vehicle

Four Ways Game Design Levels Up Engagement in Your Classroom

Max Cady
High Tech Middle Media Arts

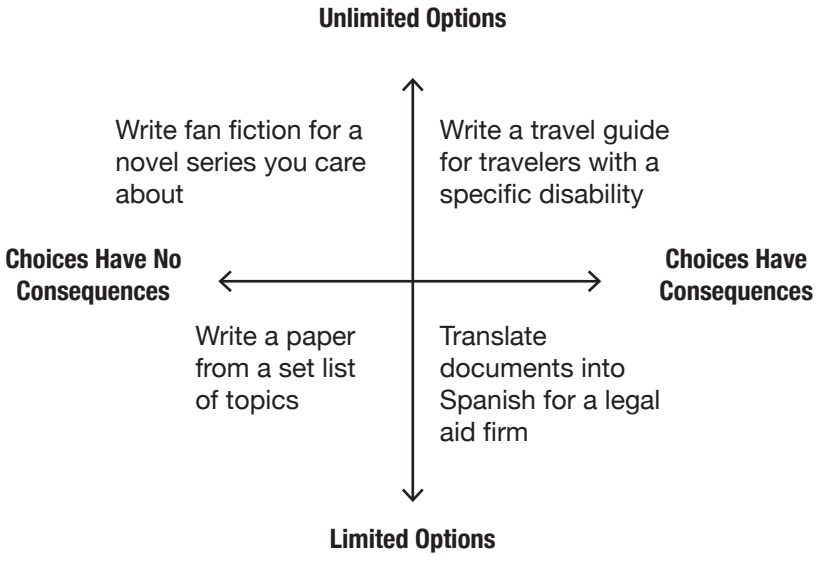
The ideal classroom project is addictively engaging. Students don't want to leave class, they ask to come in during their free time to work on their project, they spend their time with friends talking about their project, and they lay in bed at night thinking about what they can do to make their project better. This type of engagement might also be called, more simply, fun. This unicorn level of engagement is not easily obtainable, but game design techniques can help get us a little closer.

To begin, what is "engagement?" In 2016, a group of researchers described it as "the heightened, simultaneous experience of concentration, interest, and enjoyment" (Shernoff, 2016). According to those researchers, engagement in learning is brought about through "multiple aspects of environmental challenge, including clear goals (Dickey, 2005), clear and high expectations (Wang & Eccles, 2013), providing opportunities for exploring and solving meaningful problems (National Research Council, 1999), the mastery of new skills (Ladd, 1999), teachers' high expectations for students' success (Allodi, 2010), and relevance of school activities to students' real lives (Meece, 1991)" (Shernoff, 2016). In other words, most of what engagement means in the classroom is also what engagement means in video games. Of course, when we're playing video games, we don't call it "engagement", we call it "fun." So it's no surprise that game designer Raph Koster says, "fun is just another word for learning."

So, what is "fun"? Nicole Lazzaro, a game experience designer and researcher, identified four different types of fun in games (Lazzaro, 2004). "Hard fun" is fun because it is challenging, it is focused on a goal and often involves obstacles or strategy. "Easy fun" is fun that comes from exploration and imagination. "People fun" is fun with other people and it comes from communication, cooperation, or competition. "Serious fun" comes from working towards a purposeful accomplishment. It can be repetitive but also rewarding. The best games incorporate at least three types of fun. The best projects should do the same. However, it's not especially easy to figure out how to add "hard fun" or "serious fun" to a project design. So, in order to tap into the elements that make videogames fun in multiple ways, I have begun adding four specific questions to my project planning. Each question is based on an engagement technique that was intentionally implemented by game designers in many popular video games.

1. How does the project allow students to make choices that matter?
2. How can the project adjust for difficulty levels?
3. How can the project show progress and accomplishment?
4. How can we incorporate stories, themes and world building to give context and meaning to what students are doing?

Figure 1: Two axes of choice: consequences and options



1. How does the project allow students to make choices that matter?

Student voice and choice is a key element of project design and good classroom teaching, but game designers have a more nuanced understanding of "choice" than most teachers do. In game design, "choices" fall on two axes: consequence and options (see figure 1). This combination of consequences and options leads to a greater sense of agency because it positions students so that they can make strategic and creative decisions towards a goal.

This pushes us to consider whether the choices students are making are meaningful and strategic and if the opportunities for choice are maximized both at a project level (being able to steer the direction of the project, for example) and at a moment-to-moment level (having freedom to solve problems as they come up). Many game designers believe that it is having choices that matter that makes games fun. In fact, Sid Meier, designer of the iconic video game "Civilization," once stated that "Games are a series of interesting decisions" (Meier, S. 2018). Choices matter when they are strategic choices that make a difference towards a goal, some choices are better than other choices (although it is not always obvious in the moment which is the better choice), and the choices you make have consequences. Some of examples of this include:

- In just about any sport, players are constantly making micro choices to achieve the goal of winning. Some choices are better than other choices and players can learn from the bad choices they make (e.g. "I shouldn't have thrown that," "I should have passed then," etc.)
- If the goal of a design project is to engineer a chair for a kindergarten classroom, but a student can choose from an assortment of available materials, all of the strategic choices of material are meaningful and motivational. A student is required to make choices that matter in terms of price versus quality, durability and strength versus aesthetic, etc.

After guiding students towards a goal and providing space for them to make meaningful and strategic choices, the next important step as a project facilitator is to allow time and space for students to receive feedback on their choices. Responsive feedback can make choices feel more meaningful in a project. This feedback could come from classmates, mentors, an audience, the teacher or even the work itself (a sand castle lets you know when it doesn't have enough structural support, which is also an example of hard fun and serious fun). The more responsive the feedback cycle the more quickly the students can learn the impact of their choices.

As a Media Arts teacher I think that one of the reasons students find coding and digital editing tools such as Photoshop engaging is that they allow students to make many choices. There is rarely just one way to achieve something: students can try out different strategies to achieve their goal

and some of them work and others don't. As a bonus, the feedback students receive when their choice doesn't work, paired with the opportunity to try again with a different strategy, works towards creating hard fun. To create space in projects for choices to matter, educators should think about the ways in which they can increase agency and consequence with choice in their project design.

One additional way to think about choices in projects is to categorize them as micro or macro choices. Educators can then think about how to adjust options and consequences for those choices in order to maximize engagement and agency. Micro choices are small choices that students make frequently. Micro choices also have a more immediate feedback loop. Macro choices involve thinking about the future and usually have more delayed feedback (see Table 1 for examples).

How can a project adjust for difficulty levels?

Educators are already aware of the fact that all learners learn differently. "Differentiated instruction" is instruction that is tailored to each individual learner through individualizing the concept, product, process, or learning environment. The concept of "low floor, high ceiling," captures the idea that good learning tasks should have a low floor that allows for an easy entry into a task and a high ceiling that allows for potential growth.

Game designers are masters of adjusting for difficulty levels. The best games meet players at their competency levels and provide experiences for them to learn and improve their skills. Games that make it either too hard to show progress, or too easy to show mastery, are not fun. Adjusting the difficulty level is a way to add to the feelings of growth and progress. Mastery is the point at which games become unfun, which is why game designers are constantly challenging players with evolving environments in order to prevent the feeling of mastery and continue the fun associated with growth and progress. Additionally, failure is an integral part of game design. Often in the classroom failing is demotivating, or at the very least a cause for anxiety. Meanwhile, in the world of games losing is just an opportunity to revise and try again!

A great project should not only provide access points for all students, but it should also provide opportunities for all students to learn and grow at their own rate. One way to think about adjusting the difficulty levels in a project is to ask three questions: "How can a student feel consistently challenged at all points in the project? What opportunities does a student have to learn from failure mid project, and what opportunities does the student have to practice and try again?"

Another way to provide these opportunities and add to the complexity of

Table 1: Examples of micro and macro choices:

Learning Outcome	**Student micro choices that matter**	**Student macro choices that matter**
Creating an animated story about a pollinator	What tool am I going to use to make this shape that matches my drawing? How do I pick a color that matches the color I want? How do I make the arms move without spinning around?	What is the story I am going to tell? What pollinator am I going to choose? What social media platform am I going to use?
Creating a farmer's market with harvested plants and compost made by students	Where will we place the compost bins today? How can I get better at teaching a first grader to use the compost bin? How do I put compost into the bin without making a mess?	How will we market what we are selling? What method of composting are we going to use? When do we plant our seeds so we can harvest them at the same time?
Designing and implementing a plan to reduce rates of children drowning	How do I make my swim student feel comfortable enough in shallow water to learn to float? How do I make water look transparent for my water safety poster?	What do I need to teach first for my student to learn how to swim? What water safety messages will have the largest impact?

work is to avoid prescribed solutions. The best games don't prescribe solutions and neither should projects. A project with prescribed solutions will struggle to appropriately challenge all students as it may not be accessible for some students and it may be too easy for others. Game design asks us to consider how to adjust projects to adapt to the right level of challenge for each learner.

Some ways to adjust project difficulty levels are:

- Ensuring a low floor so that all students are able to feel successful
- Ensuring a high ceiling, which requires allowing opportunity for the student to create something that goes beyond what the teacher was able to previously envision
- Incorporating student roles that can evolve and allow for added challenge and responsibilities

How can projects show progress and accomplishment?

One reason that games are so motivating is because players always feel like they've accomplished something. Games constantly give feedback to make players aware of their progress and games provide opportunities to practice and make growth. Many games use an experience system that rewards growth with new experiences and challenges. The traditional letter grade system highlights failure and hides opportunities for progress and growth. In games most players start with no experience and as they improve, regardless of how many times they fail along the way, they gain more and more experience. When students start with 100% at the beginning of a class and only have opportunities to go down or maintain their grade, they are stuck in a system that highlights deficiencies and they miss out on the motivational potential of a system that highlights progress. To counter this and draw from the lessons of game design, it is important to design projects with opportunities for students to see their learning journey, and feel motivated by their accomplishments.

Ideas for how to show progress:

Break down project components into smaller tasks and use a **Scrum board** to capture progress (see table 2).

Build a **badge system** with different competencies that are needed for the project. A badge system is a system where students collect various badges that reflect growth or achievement in various skills or competencies. The badges can be digital or physical and are often built into portfolios.

Table 2: Scrum Board (based on an actual scrum board from an 8th grade media arts project)

Done	Today's Story	In Progress	Bottleneck
Animate page 5 and edit text	Working on page 18	If I finish faster I will do 9 & 10	Figure out how to start animating page 7
Write down page 7 and 8	Animating Page 8	Animate Page 4 Fireflies	
Animate page 11	Working on page 26	Share images of what book looks like	

Use a **Gantt Chart** to show progress on a project. A Gantt Chart is a tool used in project management that also works well in the PBL classroom to show tasks and project timelines.
Build a digital portfolio or project journal to visualize and document growth and progress. Digital portfolios showcase and capture student work and are often made available for a public audience. There are various online platforms that are specifically designed or easily adopted for this purpose (e.g. Inkwire, Weebly, Google Sites, etc.).

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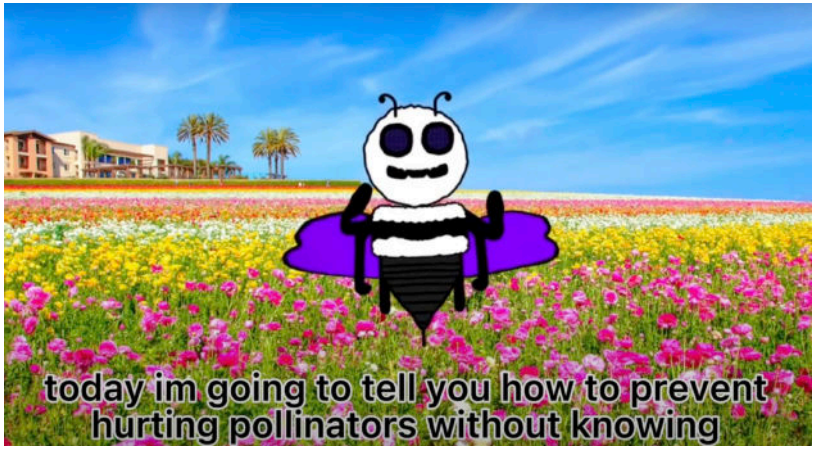
Whatever system or strategy an educator chooses, if the goal is for students to be actively engaged with their learning, game design shows that feelings of accomplishment, challenge, and progress are motivational and increase engagement.

How can educators use story as a design element in their projects?

One particularly engaging element of games is the story (as well as the fantasy world in which it is told). A project doesn't need to have a rising action and a climax, but to increase engagement it should incorporate narrative and world building as much as possible. Learning happens when students have a conceptual framework to add new information to. Games either have a theme that players are already familiar with, (Tony Hawk's Pro Skater, Madden NFL, Fifa, Gran Turismo) or they build on a world through



Stills from the short animated films that student produced in Max Cady's "Pollinanimator" project

narrative and often fantasy (Zelda, Pokemon, Mass Effect, Witcher). Once the theme and story are established in a player or learner's mind, it becomes easier to acquire new information. A good project narrative is usually tied in with the purpose of a project. When the project has a clear purpose, there are endless opportunities for students to connect and engage with stories related to the work. Engaging stories could come from mentors or experts who have personal stories related to the project. They could also include students' personal stories and identities that they can then connect to the work and purpose. Ultimately, If a project has a good purpose it probably also has a lot of good stories that can connect to it and the more educators draw on the stories and narratives that matter to a project's purpose, the more engaged students will be.

Learning is fun and fun is learning. Game designers are masters of engagement and getting us to learn things that don't matter much in the real world. Educators should be able to take some game design ideas and get students to learn things that do matter in the real world. Feel free to use the questions below to help with project planning. Have fun out there.

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High Tech High eleventh graders collaborate on a project.

Intentional Integration: Technology Choices for Teachers

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Everywhere I turn, teachers are craving more tech knowledge. After a year of virtual teaching, you would think they had learned enough about educational technology for a lifetime, but more often I find that my colleagues are now asking more nuanced questions. With a better understanding of what digital tools can do for their students and themselves, teachers are eager to take their digital pedagogy further.

I have been considered the "techy" teacher at my school since the first cart of laptops arrived in my classroom in early 2008. As such, my colleagues have often come to me for advice, ideas, and coaching about the technology they want to use in their own classrooms. My passion for using educational technology led me to become a Google for Education Certified Innovator and to co-author a pedagogy book for teachers who were new to teaching with a device for every student. Digital teaching is an understandably challenging shift for many educators and that process usually takes several years. So, it is completely reasonable that teachers embrace an ongoing process when learning how to leverage new learning tools.

Technology in classrooms is not new, though. Most of my colleagues remember having an Apple IIE in a corner of one of their elementary classrooms or weekly trips to a computer lab. Some of us even remember taking students to the computer lab. But we have moved from a place of

computing scarcity to laptop ubiquity. Technology is no longer an occasional variation in a paper based learning environment. Increasingly, the laptop is the learning environment. The design of learning experiences now relies on educators who can navigate and build with digital tools.

And there are a multitude of tools. They all work a little differently, provide different benefits and drawbacks, come in free, freemium, and paid versions. Some support real time collaboration, some don't. Some can only be accessed through a district or school wide license, some can be accessed by any teacher who wants to create an account. It is this labyrinth of choices that causes teachers to feel overwhelmed and unsure where to spend the limited time they have to learn how to use a new tool.

There is a lot about educational technology that is beyond my control as a teacher. I don't get to choose the laptop my district gives me, or the display board for my room. District-wide subscriptions to our learning management systems, Canvas and Google Classroom, are not up to me. But there is still a huge range of free tools that I can take advantage of to support student learning and make my teaching experience more efficient. I have years of experience about what does and does not work well for my students when it comes to using digital tools for learning. That's why my colleagues come to me with their questions and these are the questions they are asking most often:

1. How do I learn about new digital tools that support student learning?
2. How do I know if this piece of technology is worth adding to my classroom practice?
3. How do I introduce a new digital learning tool to my class?

These are questions we have to ask ourselves continuously because the answers will change as the technology and our students' levels of experience with digital tools changes. Just as I would for a colleague, or any of my former graduate students from the University of San Diego, I'll give you the best advice I have now.

Question One: How do I learn about new technology tools that support student learning?

The world of educational technology is an exciting and evolving space where everyone is welcome. If you want to learn more about digital tools for your classroom, there are lots of people ready to support you.

The likely first place to start is your own school. You work with lots of other educators who are all learning more about how to use educational technology better every day. Make it a priority to share what you have discovered. Want to have fun at a staff meeting? (Don't laugh, this is totally possible.) Divide

into teams, have each team spend 5–10 minutes learning about a tech tool and then present what you found. Or organize a "slam" with prizes, where the person to present the most useful tool wins. Everyone learns something new, and learns which colleague can teach them more, in just a few minutes of time.

Social media is the next step for many educators. There are Facebook groups, twitter chats, webinars, and hashtags like #edtech, all devoted to supporting teachers who want to use more technology in their classrooms to support student learning. In 2020, when I found out I would need to use Canvas with my students, I joined a Facebook group called Canvas for Secondary Educators. Reading the questions and conversations other teachers were having about Canvas helped me to learn the basics and consider some of my options. I don't think anyone should join a social media platform just to learn about educational technology, but if you are already on Facebook, Twitter, or another large social app, keep your eyes peeled for groups and hashtags that relate to educational technology.

YouTube is also a great resource for learning more about specific tools. By searching the name of the tool plus the word "tutorial" you will find videos to help you get started. I would suggest that you look for tutorials posted by the company that makes the tool, but also look for things posted by other teachers. Consider limiting your search to videos from the last twelve months so that you are seeing current information. Tools change, and older videos won't be as helpful. I really like a tool called Formative, but searching for it on YouTube includes things that are five years old. I scrolled past those to one with fewer views, but it was made in the last year, so that's more useful to me.

There are also numerous virtual and in person conferences devoted to teaching and learning with technology. Once you begin to look, there is a tremendous range of offerings to help you. I've been a member of CUE (Computer-Using Educators) for more than ten years. Membership is free and it gives you access to invitations to lots of free and low cost local and statewide events. When you join you also sign up for a local affiliate. There are 21 affiliates all over California, where I teach, and teachers from across the United States can join. In the US, most states will have a local or regional group of techy teachers ready to welcome you as well. Organizations like CUE can connect you with other educators who are experts about tools sure, but many of these folks are also leading educational change in their own schools and districts. They can be a huge source of inspiration, and we could all use more of that right now. Full disclosure, CUE did just name me the Outstanding Educator for 2022, so I may be slightly biased, but how can you go wrong joining an organization of educators, for free, that will inspire you, and support your own growth and learning?

If your comfort zone is professional books there are some great options to consider. In the K-5 space, I really like *Amplify* by Muhtaris and Ziemke. Secondary teachers would probably find my book helpful, *Power Up: Making the Shift to 1:1 Teaching and Learning* by Neebe and Roberts. Books by Matt Miller, Catlin Tucker, and Alice Keeler are also worth considering. Any of these would be good for a staff book study too.

This, though, is my favorite piece of advice on this question: ask your students. They are an often overlooked source of knowledge. Many have more experience than you do using educational technology and could provide valuable insight on which tools they like, have experience with, or wish they could learn more about. At the very least you'll find out what they have already used, and at best you may get to learn about something fabulous.

Question Two: How do I know if this piece of technology is worth adding to my classroom practice?

Our choices and intentions will make all the difference in how our students experience learning with technology. The following questions can help determine if a piece of technology is worth adopting.

1. What do you want digital tools to do for your students?

A common pitfall for teachers new to technology is to get excited about a new tool and then try to find ways to use it in the classroom, sometimes without obvious educational benefit to students. This makes sense when all the tools are new and exciting. With so many options though, it is possible to be intentional about choosing tools that are not only new and exciting, but also work to help your students reach specific learning objectives. Remember to keep your learning goals in mind, and then consider which digital tools can help your students reach those objectives. Instead of asking, "How can I use -slick new tech tool- in my classroom?" try this: "To help my students learn [objective] I could use ____, ____, or ____. Let me spend a few moments considering the benefits and constraints of each tool." Considering multiple tools will help you make the most intentional choice about what will best support student learning.

For example, if I want my students to work on their speaking and presentation skills I might compare the pros and cons of several options: a. having them present slides in class, b. having them present on video using Flipgrid, or c. having them create and record in Adobe Creative Cloud Express. The best choice for my classes will depend on what my students have used before, how much time I have for the project, what skill I most want them to develop, and perhaps I may even take into account technology skills I want to build for future projects.

To be able to go through a decision process like this, you have to be very clear about what your objective is. Then begin asking yourself "What if.." questions, as in "What if I use Flipgrid? What would that process be like for students?" Play through the assignment steps in your mind, or try writing out the steps you would want students to follow to see if this tool or process will support students in meeting your objective (See Table 1).

It is incredibly helpful to turn to a colleague to talk through the process of choosing digital tools for learning. You will benefit from explaining the way you want to use the tool to meet the learning objective. Your colleague will learn from your thinking and they may also be able to suggest alternate tools that could help you meet the same objective. If you teach the same course, you can both benefit from the collaborative creation of digital materials and that will support even more students.

Table 1: example advantages/considerations chart for my 9th grade English class

Tools	**Advantages**	**Considerations**
Google Slides	Easy to create and collaborate on slides Familiar tool Can present to audience	No built in recording option Easy for students to add too much text
Flipgrid	Record privately Familiar tool Students can see each other's presentation videos Allows screen recording for slides.	Students have to record in one take and that could take several tries Students need to make slides in another tool and screenrecord, which involves multiple skills
Adobe Creative Cloud	Students can record each slide separately and make a movie Could import movies made in Adobe to Flipgrid Supports collaboration with peers or teachers Significant design support	Less familiar tool (but we might want to use it more later) Design constraints are sometimes limiting

2. What do you want digital tools to do for you?

Yes, consider your needs here! Do you need to be able to see the student work while it is in progress? Do you need to be able to grade the results quickly, or even have them graded automatically? Do you need something that will sync nicely with your learning management system (LMS)? (A Learning Management System, or LMS, is an online learning platform—for example, Google Classroom, Canvas, or Schoology.) Do you need to be able to share your digital curriculum materials with your colleagues?

Something digital tools do well is accelerate the feedback loop. I can see my students' work in progress when I preview their documents in Google Drive, or watch their answers show up in Formative. I don't have to wait for them to turn in a paper at the end of the period or the next day, and then take home all those papers to read through. I can leave feedback faster with comment banks. I can paste in a sentence frame for a student who is struggling. My response time is faster, my support is more confidential, and my carefully constructed multiple choice questions are graded by the computer and sync to my online gradebook.

Any tool that allows teachers to make something and share it with colleagues is extra useful. One of my colleagues really likes to use Formative when students are reading a text for the first time. She creates the Formative with a PDF of the text and then embeds digital questions to help guide students as they are reading. She gives me a share code so that I can make a copy of her Formative. With my own copy I can edit or add questions, but I don't have to start from scratch. In return, I often share assessments I create in Google Forms. When we can share with each other we save everyone time. Almost all digital tools now include sharing options for teachers. Ask your colleagues what they are creating and freely share what you create. A shared folder online can make sharing resources even easier. Teachers like to joke about not recreating the wheel, but that is even more true than ever. Save yourself time making digital materials by working as a team.

3. What will the workflow look like?

When selecting digital tools to use in your classroom, you will need to consider the workflow. Workflow is a catch-all word for the way digital materials will move through the learning process.

Workflow includes:

- **Distributing digital materials to students:** Will you have your LMS make a copy for each student? Will they work in teams on one shared slide deck for the class? Is this a material you need to distribute, but not collect?

- **Observing student progress:** Will you be able to see their work in progress like in a Google Doc, or will you need to actually see their screens as with a Canva project that they need to download and submit?
- **Collaboration and peer feedback:** Are students working alone or collaborating? Have you given them a tool to use that supports collaboration? How accountable do you want the collaboration to be? Do they need peer feedback? How can they share their work with peers for feedback?
- **Collecting student work:** How will students 'turn in' their work? When they submit it are they turning in a doc, a pdf, a link to their work? Are there any settings they need to adjust so that you can see it?
- **Returning feedback to students:** How will students know how they did? Does the tool support an attached rubric or comments from you? This is often where teachers need to get the most creative with digital tools. And, it is totally fine to resort to printing out a rubric, scoring it on paper and handing that back to the student as feedback on their digital work.
- **Publication:** Can this work be shared with a larger audience? How will it be collectively presented? How can students help create that collective presentation? (You don't want to lose sleep curating student work into one publication space.) How will that collective work be shared with an audience? Are there any technical barriers to sharing student work? (In some districts student's Google Docs can only be viewed within the district domain. For me this means I have to be the "owner" of any published work. Student owned work won't be viewable by parents and others without district accounts. It's a barrier I have to work around.)

Before assigning any project to students you should know how they will turn it in and, even more importantly, how you will give feedback to them about their work. Bonus points if you can also predetermine how students will collaborate, and/or publish their amazing work. Thinking through how student work will move from draft, to feedback, to grade, to publication is the art of teaching with digital tools. Sometimes it requires some creative solutions.

Question Three: How do I introduce a new technology to my class?

Adding a new tech tool to my class workflow is always still a scary moment for me. I don't really know how it's going to work. I'm not sure my students will want to engage with it. I worry the sign in process or navigation won't be intuitive and I'll need to stop and help a lot of students individually. No matter how many tech tools I've tried or how much time I spent learning about it before class, the moment I introduce a tool to my class for the first time is always a moment of truth. I have found that it is okay to be nervous, and it is also a good idea to know what your backup plan is.

Students at High Tech High International share how they used Adobe Illustrator and a laser cutter to make lamps representing significant places around San Diego.

When I try a new tech tool with my students, I always tell them we are testing it. Even if I am using a tool I've used before, there are likely changes and new features every year. If it is a creative tool, I will give my students time to play with it and discover. If it has specific steps to follow I will model those for them. When I ask them to do a technical task that has several steps, I will make a screencast that students can rewatch as needed. I'll be on the lookout for students who become experts quickly and ask them to help their peers when I am spread thin.

If I think a tool will require a lot of my support, I'll introduce it to students in small groups over several days while we do a station rotation. You have all kinds of options for how you bring these tools to your students and you get to decide what's going to work best in your classroom.

After using a tool with students the first time, and then again later after more use, I will ask them for their feedback about the tool. Their answers to questions about things like, what was easy and what was hard, inform the way I introduce and use the tool in the future. My students like getting to "beta test" a tool in our classroom. They like having a voice in deciding which tools we will use. In my classroom, the student feedback on tools we have been using for writing informed the way we support each other with writing. My students are well versed in running writing response groups in person,

but they also like it when we use PeerGrade, where the process is digital, silent, and anonymous. Taking their feedback about the pros and cons of both options helps me decide which will work best for each writing project.

You got this

Digital educational tools can feel daunting. And, yes, it gets easier when you have more tools in your box to choose from. But, you don't need to learn everything at once. Ask your colleagues and your students for their advice about your next steps. Move at your own pace. Remember that though there is a time investment to learning about digital pedagogy up front, there is often a lot of time saved later, when you can skip the line at the copier, or borrow a digital resource from a colleague.

Teachers and students have seen what educational technology can do to engage, accelerate, and inspire their learning. Our students will live in the future. If we look ahead five or ten years we can make some predictions about what life might be like when our students are older. The educational technology we use now, in the service of learning content and skills, is their foundation for future success. By continuing to ask the right questions, we can use technology tools to enhance the student learning experience, teaching experience, and build everyone's skills for the future.

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Educators Building Software
Two Case Studies

Ben Sanoff
High Tech High Graduate School of Education

Over the past three years, a small team convened by the Center for Research on Equity and Innovation (CREI) at the High Tech High GSE has iteratively developed a software application called the CARPE College Pathways Course. We developed the College Pathways Course in collaboration with the 19 schools participating in the HTH GSE's CARPE College Access network that supports school teams in increasing the number of low income and students of color attending colleges they are most likely to graduate from. In designing Pathways we sought to build custom software that addressed three key challenges facing students and school staff in the network:

1. How can we efficiently and effectively provide critical information to 11th and 12th grade students about the college process?
2. How can we maximize the time counselors spend directly supporting students in navigating the college process?
3. How can we get real-time data about where students are in the college application process so counselors can provide support to those who need it most?

Our design team included a data analyst, educators, college access professionals, and high school students, but no software engineers. Accordingly, we set out to build our Pathways Course without writing code

ourselves. We approached this challenge with a method known as "low code" or "no code" software development. "Low code" or "no code" development uses visual tools to stack together existing applications as if they were Legos. We found that we could use the automation tool Zapier to stitch together familiar web-based apps like Gmail, Google Sheets, Typeform, and Airtable. The "low code" or "no code" approach gave us the ability to quickly develop customized workflows or automations by connecting web applications that we already use.

Based on our experience, we see tremendous potential in educators working collaboratively (or with their students) to build useful tools without the need to learn to code. For example, a student explained she was excited to continue the Pathways Course because: "I feel more courage knowing I don't have to do this alone". Specifically, we envision these tools being used to create meaningful learning experiences for students, automate recurring classroom or school processes, proactively identify students who need more support, and engage families in their child's learning. With the goal of getting you started building your own software, we will provide a detailed case study of the CARPE College Pathways Course for inspiration, a shorter case study on tracking student growth at High Tech Elementary Chula Vista, and then conclude with some important learnings and considerations.

Case Study One: CARPE College Pathways Course

The CARPE College Pathways design team was formed in August 2020 to develop this software that would help address the three key challenges we were facing. Team members included Ben Sanoff (the author), who is the director of data analytics at the High Tech High GSE, Chris White, a member of the CARPE team and an experienced college counselor, Dr. Sofia Tannenhaus, also a member of the CARPE team, and Donald Kamentz, former executive director of the Character Lab and an experienced college counselor. We received ongoing feedback and guidance from Lindsay Page a Professor of Education Policy at Brown University, Itzel Martinez an High Tech High Chula Vista alumnus and now a graduate from University of California San Diego, and Isaac Rivera, a High Tech High Media Arts alumnus and a current student at University of California Davis.

The Pathways design team iteratively developed the CARPE College Pathways Course as a set of six 20 to 30 minute asynchronous learning experiences (called "episodes") that guide students through the process of completing college milestones over their junior and senior year. Each episode provides students with relevant information about the completion of a specific college milestone, such as building a balanced list, completing FAFSA, applying to college, and ultimately making an informed college decision. Episode content consists of two to eight-minute video clips featuring Chris White, an expert college counselor and current college students discussing

the challenges they faced and overcame. As part of each episode, students respond to questions about their progress in and confidence about completing that milestone. This data feeds into each school's Pathways tracker (which we built in Airtable) where school staff can see their students' progress and build segmented lists of students who need help with a specific milestone.

One advantage to building the College Pathways Course using this no code approach is that it allowed us to flexibly weave together our favorite web applications. Each episode was built using the survey design tool Typeform, which we selected due to its beautiful aesthetic, simple interface for students, easy integration of video content, and ability to only share content or surface specific questions based on a student's prior responses. We used Airtable as the database for schools to identify specific students in need of additional counseling support. We selected Airtable as an easy-to-use relational database with a user interface that resembles a Google sheet. One particularly powerful feature in Airtable allows the user to create views where they can save a specific set of filters, groups, and sorts. Zapier is the automation tool that allows us to stitch together Typeform and Airtable. Zapier provides a graphical user interface in which we could set a trigger and the corresponding following actions that we want to happen when that trigger is activated. For example, when a student completes an episode this serves as a trigger in Zapier to push the data that the student inputted into the episode to Airtable.

Another advantage to using these no code tools is that they are cheaper than acquiring licenses to commercial education software. Airtable, Zapier, and Typeform all offer a free tier and you can build some powerful automations for free. However, most teams will likely want to use the paid version. Keep in mind that all of these tools offer discounts to educational institutions and you can reduce Airtable costs significantly by limiting the number of editors. The total annual cost for a school to use the Pathways application (Zapier + Airtable + Typeform costs) is approximately $500 dollars as compared to approximately $10 per student for the use of commercial college access software like Naviance. Most importantly, once you make the initial investment in Zapier and Airtable you can build as many custom applications as you want without significantly increasing your costs. You can see how these tools fit together in figure one, on the following page.

After each episode, we used Zapier to trigger a series of follow-up actions across the different web applications we are using. For example, after students completed episode two (which focuses on making a list of colleges to apply to), we created a series of follow-up actions meant to scaffold the process of building a balanced college list for students and their support network. We automated a follow-up email that includes a table of key statistics about the "colleges of interest" the student identified including graduation rates, retention rates, net cost, and admission rates. Next, we created a customized

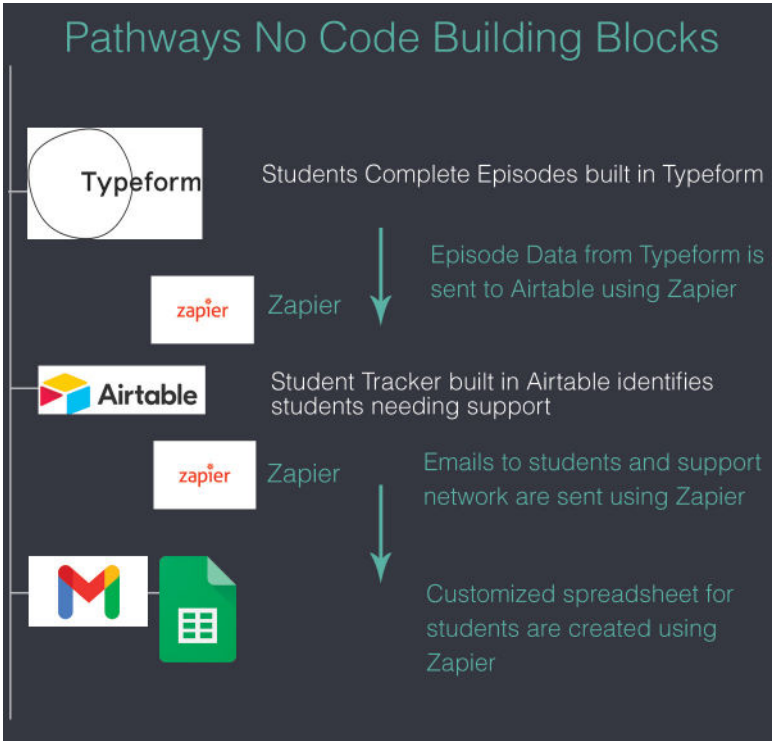


Figure 1: A diagram of the digital tools used by the Pathways team to build their software

Google Sheet for each student and instructed them to copy and paste the "colleges of interest" table from the email. We applied conditional formatting within the Google Sheet to highlight colleges with higher graduation rates because network data has validated this measure as accurately predicting student college outcomes. This Google Sheet becomes a living document where students can update their college list as it evolves heading into the fall of senior year. The unique URL for this Google sheet is passed into each school's Pathways tracker so counselors can see an updated college list for each student. You can use the QR on the following page to access Episode 2A and 2B ("Building my Balanced List") so you can experience an episode and the follow up actions.

The goal of the Airtable Pathways tracker is to provide real-time data on each student's progress in completing college milestones allowing school teams to shift toward a more data-informed counseling model. Towards this goal, we provided several standard views in each school's Pathways tracker to make it easy for teams to view their students' participation in episode completion, episode responses, FAFSA completion, and ultimately identify and support students who need more help completing a milestone. These views make it

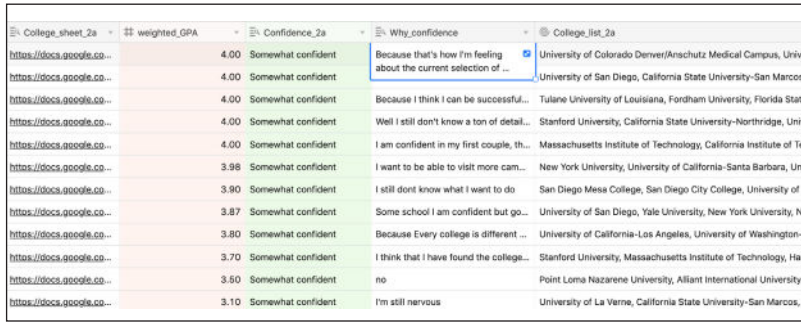
Episode 2: Building My Balanced List	
Episode 2A	
Episode 2B	

easy for school teams to generate and provide support to specific segments of students needing additional support with a particular college milestone.

For example, one school modified a view of juniors in their Airtable tracker who indicated that they were not confident that they had created a balanced college list. This segment of students was then sorted by GPA making it easy to identify students with higher GPAs who may need more help selecting the right mix of four-year colleges. See figure 2 where the Pathways tracker is filtered to show students who were only somewhat confident in their college lists. One thing to note is the inclusion of student qualitative responses (why_confidence field) where students explained why they selected "somewhat confident" on the Typeform survey.

Iterative Design Process

Another advantage to building using this no code approach is that it supports an iterative development process informed by data on how people are using the application. For example, we quickly realized that the original version of episode two had the lowest completion rate and longest average completion time. That pushed us to take immediate action and revise the episode. Using the no code software stack, the design team quickly and fairly easily redesigned episode two to better meet the needs of students: we decided to divide this episode into two parts to make each part more digestible and to better guide students through the process of using the customized spreadsheet described earlier. In the revised version of the episode 2A (embedded above), students are first guided through a self driven college



College_sheet_2a	weighted_GPA	Confidence_2a	Why_confidence	College_list_2a
https://docs.google.co...	4.00	Somewhat confident	Because that's how I'm feeling about the current selection of ...	University of Colorado Denver/Anschutz Medical Campus, Univer
https://docs.google.co...	4.00	Somewhat confident		University of San Diego, California State University-San Marcos, U
https://docs.google.co...	4.00	Somewhat confident	Because I think I can be successful...	Tulane University of Louisiana, Fordham University, Florida State
https://docs.google.co...	4.00	Somewhat confident	Well I still don't know a ton of detail...	Stanford University, California State University-Northridge, Univer
https://docs.google.co...	4.00	Somewhat confident	I am confident in my first couple, th...	Massachusetts Institute of Technology, California Institute of Tech
https://docs.google.co...	3.98	Somewhat confident	I want to be able to visit more cam...	New York University, University of California-Santa Barbara, Unive
https://docs.google.co...	3.90	Somewhat confident	I still dont know what I want to do	San Diego Mesa College, San Diego City College, University of Sc
https://docs.google.co...	3.87	Somewhat confident	Some school I am confident but go...	University of San Diego, Yale University, New York University, Nor
https://docs.google.co...	3.80	Somewhat confident	Because Every college is different ...	University of California-Los Angeles, University of Washington-Se
https://docs.google.co...	3.70	Somewhat confident	I think that I have found the college...	Stanford University, Massachusetts Institute of Technology, Harv
https://docs.google.co...	3.50	Somewhat confident	no	Point Loma Nazarene University, Alliant International University-S
https://docs.google.co...	3.10	Somewhat confident	I'm still nervous	University of La Verne, California State University-San Marcos, Sa

Figure 2: Airtable filtered to show students who are only somewhat confident in their college lists.

research process where they match colleges with their values and preferences. In the second phase—episode 2B—the guidance becomes more directive by recommending specific colleges that students should add to their list. This redesigned episode 2A increased the completion rate from 37% to 60% and students reported it was more helpful than the original.

Impact of the Pathways Course and Tracker

Over the course of the year, 4,000 students across 19 high schools completed more than 11,000 Pathways episodes. In addition, both the Pathways course and tracker received positive feedback from school staff using the application.

Students reported that the episodes demystified the process of completing college milestones and lowered their stress levels. One student wrote: "Getting help to guide on something new and scary in life is always comforting. This navigation provides such a thing by guiding students who will feel lost in the process of applying to colleges. In my case, I really don't have anyone to guide me, this program is a helpful tool to help me further understand the steps it takes to apply to college." Another student explained how the episodes put her at ease: "It made it super easy and relaxing. It made everything so clear on what I might want to do in life! :)". Echoing the same themes of making the complex college process more transparent and putting students at ease, a third student wrote: "I'm excited to get a lot of information because I'm about to be a senior and I was nervous because I've been sort of lost and confused in the whole college process." A teacher who had students complete the episodes explained how the episodes answer the sorts of questions that students may not ask: "It was very insightful and I really felt that it asked questions and provided answers to some questions that many students don't ask counselors or teachers. I also like the way it was organized and the progression made it very easy to follow if you were a student going through the process."

One particular opportunity that we have sought to scaffold within the College

Pathways Course episodes is putting students and their self-identified support network in dialogue about their evolving college plans. After each episode we automated a follow-up email to the student and their self-identified support network with an explicit prompt to provoke productive dialogue. To gauge whether this dialogue was happening in episode 2B (embedded above) we asked students whether they had a conversation with their support network about the initial college list they created in episode 2A and if so, what did they talk about? Several students wrote about the productive conversation they had with their support network: "I discussed my 2 favorite options, both of which are fairly close to home. I also explained why I was interested in those schools. The discussion was very helpful. They felt that they liked my top 2 choices and some of my backups as well. I'm feeling much more confident in the process now." Another student wrote about how it created space for their support network to share their own college experience: "We discussed the colleges I chose and which one would be a good choice based on my interests. It was helpful because I was also able to hear their personal experiences from the colleges they chose and how it helped them with what they wanted to do."

In our follow-up email to episode 2A we shared data on the initial colleges of interest that students had selected. For each college that students identified we shared data on graduation rate, persistence rate, net cost, and admission rate. One student explained how this prompted a productive conversation with their support network: "What we discussed is looking for schools with higher grad rates." Figure 3 is a screenshot of the customized Google sheet that this student ended up sorting by graduation rate.

Case Study Two: Tracking Longitudinal Student Growth and Student Supports at High Tech Elementary Chula Vista

Starting in the 2019-20 school year, members of the CREI team collaborated with elementary school directors, Student Study Team (SST) Coordinators, and elementary school deans in the High Tech High network of schools to design a more systematic way to understand student growth. Elementary directors pointed out that teachers were inputting student assessment data from the Fountas and Pinnell (F&P) reading assessments into Google Sheets each year without having access to a view where they could see each student's reading growth over previous years. This meant that it was very difficult to view the longitudinal reading growth of a particular student over their time in elementary school.

These conversations led to the development of the High Tech Elementary Chula Vista (HTeCV) Airtable Growth Tracker. Teachers access a view of their current students to easily input assessment data including student-uploaded samples. In addition, they have access to longitudinal data about each of their current students where they can access information about reading

College	Net Cost	Median Earnings	Grad Rate	Retention Rate	Admit rate	Interest Level
Southwestern College	3919	23400	0.2242	0.7233	1	Medium
California State University-Bakersfield	5687	36400	0.4212	0.778	0.2302	Medium
California State University-Channel Islands	$16,226	35300	0.55	0.78	0.78	
California State University-San Marcos	$12,872	37800	0.55	0.77	0.58	
California State University-Long Beach	8982	36500	0.6937	0.8717	0.3121	Medium
San Diego State University	15287	37700	0.7409	0.8889	0.3458	Medium
University of California-Irvine	$14,604	41100	0.83	0.93	0.29	
University of California-Berkeley	14846	48700	0.914	0.9685	0.1484	Medium
Southern California University of Health Sciences	16082					Low

Figure 3: A student's customized Google sheet that sorts colleges by graduation rate.

growth over previous years, teachers from prior years, student demographics, participation in an SST process, and family contact information.

After conversations with the HTeCV director and dean we built an easy-to-complete form for teachers and staff where they could log behavioral incidents within their Airtable tracker. A key feature we built allowed the dean and director to document their response to each incident so teachers and staff knew what actions administrators had taken. We heard from the dean and director that it was important that they be contacted immediately in particularly severe situations so we used Zapier to send a text message when an incident was logged that met the criteria they identified.

In addition, we built a simple form in the Airtable tracker where teachers could identify students for the SST process to ensure they were receiving additional academic or emotional supports. The SST process entails a series of monthly meetings between the teacher, student, and family to collaboratively implement the right intervention so that the student can experience more academic success. We heard from SST coordinators about struggles to schedule follow-up meetings every three weeks, so we used Zapier to automate a follow-up email to the coordinator and teacher two weeks after a SST meeting as a reminder to schedule the next meeting.

Judy Asiong, an educational specialist and SST coordinator at HTeCV shared her experience working with this toolset to continuously improve her SST process. "I feel that every year, I've been able to build a more streamlined SST system due to having all of our information in one place. The system allowed the following: teams can keep track of interventions and steps moving forward so when we did meet for a second meeting (6-8 weeks), we would know what was successful, what needed to change, and who else needed to get involved. It allowed our team to re-evaluate the existing SST process and what training needed to happen."

Lessons learned & considerations before building your own software

As the case studies exemplify, teams of educators have the opportunity to collaboratively build custom software that meet their specific needs. One advantage of building your own software is that you are embedded in the context, know the potential users, and can thus design your tool to

be responsive to the needs of your users. Despite this advantage, in our experience the biggest challenge is actually getting people in schools to use your software. Over the course of these projects we have learned that the best way to get staff members to use the software is to give them a role in creating it. Specifically, when you launch your tool, talk to users to find out what is not working for them and then make changes to address these pain points immediately. By empowering your users to engage in the process of improving the application you build trust and buy-in amongst early adopters.

In addition, remember to frame the purpose of your application as improving people's jobs, not replacing them. In our case we emphasized to counselors that the Pathways application allowed them to focus on high-value conversations with students in need of support and not administrative tasks. Connecting to practitioners why and emphasizing how your application frees them up to spend more time on that work can be a powerful tool to spur adoption.

To conclude, we leave the reader with three particularly interesting application development opportunities that could be built using these low code tools.

Opportunities for using low-code tools

Scaffold a culture of critique and the participation of an authentic audience.
Within your classroom you could automate the process of student work receiving peer, teacher, and community feedback.

- Possible useful tools: Zapier, Gmail, Google Docs, or Google Sheets.

Close the Loop on Student Goal Setting.
Within your school you could track longitudinal student growth and then have students engage in a reflective progress to identify opportunities for growth. Over time you could close the loop and have students reflect on whether they are actually making progress on the opportunities for growth they identified.

- Possible useful tools: Zapier, Airtable, or Google Sheets.

Support a Successful Student Transition.
Across your organization you could build opportunities for students transitioning to middle or high school to learn about what to expect from current students and teachers (similar to the Pathways episodes). Students could reflect on their fears about making the transition and be connected with current students to discuss these fears and how to make a successful transition.

- Possible useful tools: Zapier, Typeform, Airtable, or Google Sheets.

The "Planned Experiment" as a Tool For Disciplined Inquiry

Ben Daley
High Tech High Graduate School of Education

A signature practice in improvement science is the Plan-Do-Study-Act (PDSA) cycle. Often credited to Dr. Edwards Deming, the PDSA cycle is intended to be a practitioner-friendly version of the scientific method: plan a test of change, do it, study what happened, and then act to test further changes or try this change at a larger scale. The PDSA cycle is a structure for disciplined inquiry— that is, a tool for answering the question "How do we know if the change led to an improvement (Langley et al., 2009)?"

While the PDSA cycle is a conceptually powerful tool, in my experience participating in and leading a number of school improvement networks, I have become wary of a widespread assumption that doing improvement science is synonymous with doing PDSA cycles. To be clear, the idea that practitioners will test small changes and see whether the changes led to an improvement is unobjectionable. My concerns are both practical and philosophical. First, a PDSA is, literally, more paperwork: a document educators need to fill in and "turn in" to someone else, and this kind of task will always tend towards "box-ticking." At its worst, this turns improvement coaches into the "improvement police," chasing down harried educators to fill out PDSA paperwork. As noted by one prominent supporter of improvement science in education, "the dirty little secret in healthcare is that nobody fills out the PDSA forms." More substantively, while the idea of every individual practitioner acting as

a scientist studying their craft is intuitively appealing, in practice I observe busy practitioners being asked to design experiments on their own, often without a ready source of data to answer the question "How will we know if the intervention is a success?"

But though I've seen PDSA cycles devolve into box-ticking exercises (or not get done at all), I continue to believe that disciplined practitioner inquiry is a worthy endeavor. In pursuit of a more consistently achievable alternative to the classic "PDSA cycle," some of my colleagues recently conducted what is known in improvement science as a "planned experiment." Based on what I've seen, I believe that the planned experiment (Moen et al., 2012) leverages the strengths of the PDSA and side-steps some of its design flaws.

Our planned experiment was conducted as part of the CARE network, a collection of middle schools in Southern California working on helping more eighth grade students who are African American, Latinx, Indigenous, and/or experiencing poverty to be on track for successful college and career life outcomes. An element of that work is helping more middle school students feel a sense of belonging in their classes. The teachers from four CARE network schools engaged in a three-week planned experiment to test if particular practices were more successful at increasing student belonging as measured by a survey given to students before and after the intervention. The questions, modified from the PERTS (Project for Education Research that Scales) Elevate survey, asked students to rate the degree to which they agreed with the following statements, using a Likert scale:

1. This week in class, I had the opportunity to get to know my classmates better.
2. I feel like my teacher accepts me for who I am as a person.
3. This week I felt comfortable sharing my thoughts and opinions in class.

Before they began the planned experiment, the CARE team had identified two promising practices for increasing student belonging in middle school math classrooms: establishing a consistent welcoming routine at the start of class and conducting a systematic one-on-one check-in with every student. While these two practices had initial evidence of impact, the team had three specific questions about them:

1. Was it necessary to do both of these practices?
2. Was one more effective than the other?
3. Would using the two practices together lead to negative outcomes (e.g. perhaps together they were annoying to students)?

The goal here was to work smarter, not harder. If one of these two practices was more effective, the team wanted to figure that out quickly so they could focus on that practice. And so, the CARE team approached school teams

and asked if at least four teachers at each site were willing to participate. Four teams agreed. School teams learned about the two practices, which the CARE team had documented in detail. The school teams then thought about how they would like to implement these practices in their context, which required both pedagogical and logistical adaptations. After developing how the two practices would be conducted at their school, every teacher was randomly assigned to one of four conditions in a 2×2 matrix:

Teacher 1: Systematic student check-in	Teacher 2: Daily welcoming routine
Teacher 3: Both check-in and welcoming routine	Teacher 4: Control (1 welcoming routine per week)

Now it was time to take the pre-intervention measure: students answered the three survey questions. Next, the teachers implemented the practices as outlined above, and three weeks later, it was time for the post-intervention measure: students answered these questions a second time.

So that was the process. The obvious question is, "what made this easier to implement than a PDSA cycle?" There are three specific elements of the process that I want to examine in turn:

1. Paradoxically, the planned experiment is likely to have a more rigorous design while also being a more realistic ask for practitioners

The planned experiment is more likely to be designed in a way that increases confidence in the efficacy of the change ideas being tested, both because the experiment is tested across multiple contexts and because the measures are more likely to be robust. At the same time, because the individual practitioner does not need to design all aspects of the test of change, it is more feasible for busy practitioners to help design and execute the test rather than designing it from scratch by themselves.

2. The planned experiment puts educators at the heart of implementation conversations

Contrary to more traditional forms of educational research, the planned experiment is not research being "done to" practitioners, but rather is a practice that includes educators in important implementation conversations. At the same time, while the PDSA is intended to be a liberating structure ("you're in charge of your own learning"), being left to your own devices is not necessarily supportive of the busy practitioner.

Daisy Sharrock, Director of the CARE Network, shares her work in a session at the Deeper Learning Conference.

3. The planned experiment gives a clear role to those further from practice

In traditional education research, those further from practice can be guilty of doing research "to" practitioners. Meanwhile, traditional PDSA cycles can lead to those further from practice merely nagging practitioners or criticizing their work. In contrast, the planned experiment positions those further from classrooms (e.g. network hub leaders, school administrators, higher education faculty members) to help with experimental design and measure selection while also doing research with practitioners, not to them.

In some improvement circles, the PDSA cycle has been elevated as the only form of inquiry. This view is insufficient. For educators interested in the tools and thinking of improvement science, the planned experiment is an important tool to add to our toolbox. With more disciplined planned experiments in our schools, we can do more of what works and less of what doesn't.

Special thanks to Daisy Sharrock, Alicia Grunow and Sandra Park for their work on and insight into planned experiments.

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Brandi Hinnant-Crawford, Associate Professor of Educational Research at Western Carolina University and author of Improvement Science and Education: A Primer.

Improvement as a Tool for Our Collective Liberation

Brandi Hinnant-Crawford
Western Carolina University

Stacey Caillier
High Tech High Graduate School of Education

It is our pleasure to share this interview with Brandi Hinnant-Crawford, Associate Professor of Educational Research at Western Carolina University and author of Improvement Science and Education: A Primer. *The interview was conducted by Stacey Caillier, Director of the Center for Research on Equity and Innovation at the High Tech High Graduate School of Education. This interview first appeared on the High Tech High Unboxed podcast. It has been edited for length and clarity.*

STACEY CAILLIER:

Brandi Hinnant-Crawford, I am so excited to talk with you. Just to give folks a quick introduction, you're an associate professor of educational research at Western Carolina University. You have written a fantastic book called Improvement Science and Education: A Primer, which Gloria Ladson-Billings has given her stamp of approval, which is high praise indeed.

You are also a former English teacher and self-described data geek, who went on to become part of the Strategic Data Project at Harvard while you were writing your dissertation. You've been teaching master's and doctoral students how to use improvement science to tackle equity issues in education. And you've even applied it to your own personal life. Thank you so much for sharing your wisdom with us today.

Can you share your identity markers, how they inform how you show up in the world and your work?

BRANDI HINNANT-CRAWFORD:

Absolutely. We all have so many identities, and I'm going to probably name more than what you're used to hearing, but they are all core to who I am. So I guess, first off, I'm a Black cisgender woman. I am a Southerner, which matters, and you probably can hear the twang in my voice.

I'm a Christian, but I always like to clarify I believe in the liberatory Jesus and not the Jesus that's trying to bind people. I'm also a millennial, one of the elder millennials. I like '90s R&B and 2000s hip hop.

I'm a mom. I'm a twin mom. I'm an autism mom. And so those mom identities really frame how I see the world. And I move through the world as a plus-size woman, which has some things that come along with that.

All of these impact my knowledge and understanding of the world and particularly of the field of education. I was in school when white flight happened. I'm the daughter of an educator who was also an education activist. I grew up in an activist church. All of these things play a part in who I am and how I approach everything in my life.

SC

Thank you so much for sharing all of that with us. That's really helpful. So how did you come to improvement science? And what was the appeal for you, or what felt new or different?

BHC

I first encountered the ideas that would push me towards improvement science when I was in the Strategic Data Project. We read an article by Hess and Fullerton called "The Numbers We Need" that prompted an "aha moment" for me. They were talking about "balanced scorecards" and how by the time we are looking at achievement data it's really too late. What are the antecedents to those outcomes that we're looking at?

Then, when I was hired at Western Carolina University, they were a part of the Carnegie Project on the Education Doctorate. It was a newly redesigned program, and they wanted improvement science to be a signature methodology. I was hired as a methodologist, so I had to learn it.

I started immersing myself in spaces that were teaching me about improvement science. And we got into the Higher Education Network

(HEN) run by Louis Gomez and Paul LeMahieu, where they were trying to teach folks how to teach improvement science. So that's how I got into it.

Then my first "aha moment" where I realized this actually worked was when I did a personal improvement project as part of the HEN Network. I did it on academic productivity, because I was a brand new professor, and I needed to write. So I used the techniques of improvement science to identify what was hindering my writing, and I got to see that the problem wasn't that I was "lazy," the problem is all these meetings that I was having, that's what was detracting from my writing time! Then, as my students began to employ improvement science more and more, and I got to see the different things happening within their schools and organizations, I said, "You know what? This really does work."

Now, as I was putting myself in these spaces to learn more, I noticed in a lot of these spaces there weren't a lot of folks of color. And my chair always said that, in the academy, the literature was very much like a conversation.

This means that as a scholar, you have to figure out who you want to be in conversation with. And the people who I saw myself in conversation with were not the same folks doing the improvement work. So I had to ask myself, "Is this the space I belong in? Or can I bring what I know from those other spaces to this space?" That's what I've been trying to do ever since.

The other thing that really gripped me was that as people were defining problems and talking about root cause analysis, looking at the system, they were missing the elephants in the room: racism, classism, heterosexism. These are root causes to many of the outcomes we're dealing with.

So even as we were methodically naming problems, we weren't naming these oppressive structures within our society. I was like, "Well, come on y'all, we've got to call a spade a spade!" Those were things that I wrestled with. And before I became a proponent of improvement science, I was like, "This has to be a part of improvement work."

SC

Definitely. I loved in your book how you so clearly walk people through the tools of improvement. But you're very clear on how we use the "five whys" because we have to get to the roots. Any time you do the five whys deep enough, you're going to get into oppression of some kind. So you've got to keep digging and asking those whys until you get to the actual roots.

BHC

You really do. The way improvement is framed in the current discourse in education is that improvement comes from Deming. And so even in the epilogue of my book, I talk about how I overheard some colleagues saying, "This is a white man's way of thinking."

And I just want to say, Walter Shewhart and W. Edwards Deming and Gerald J. Langley and Anthony Bryk, I thank all of those men for the work they've done in making improvement science a kind of discipline. But these men don't own improvement. Improvement has been around forever.

And that's why in my primer, I really started with that idea of science and looking at those Islamic foundations. Like I said, I'm Black. So I'm the descendant of enslaved people in this country. And most of those folks came from West Africa. So I feel a connection to West Africa.

In Ghana, the Akan people use Adinkra symbols. And hwemudua is an Adinkra symbol that translates to "measuring stick", and it's about quality. Quality in life improvement, but also in production. So these things of course predate Shewhart and Deming.

These things belong to everybody. And I think, just because certain scholars have been elevated—and their work is good, I'm not tearing them down—but it makes other people think, "Oh, that's not for me." But they don't own it, even though they're writing about it. It's not just theirs.

SC

Brandi, thank you for saying that. I feel like your book is all the way through an argument for that. It's like, improvement science is for everyone. It's democratizing the whole process.

So I have to pivot a little bit and talk about your book, because I have to tell you that I discovered your book, because it was on a colleague's desk. And he had it actually opened to your epilogue, which is titled "Why Does a Black Girl Endorse Improvement Science?" And I read that epilogue, flipped to the first chapter, and immediately started texting faculty in our master's program that this is the book we've been waiting for.

I think I wrote to you, and I was like, "I'm doing cartwheels reading your book. It's so accessible, so full of concrete examples. And it makes such a compelling case for how folks can use improvement science for equity and educational justice!" And I just want to know, how did you come to write this, and who were you writing it for?

BHC

I guess I had three audiences in mind. The first is my students, people who are brand new to improvement science.

I told my colleagues, "Yo, I really want to do a primer." Because we have to start somewhere. And we need something that the students can pick up, that has definitions in it, so that someone who's never heard of it before can pick it up, read it, and be like, OK, I understand what's going on. Because some of the way we were piecemealing from other texts, students were still walking around, like, "So I don't understand what exactly I need to do." So that was my first audience.

The other audience really came to me from a conference at the University Council for Educational Administration, where several folks were presenting on improvement science. I was not a part of the presentation. I was just in the room. And someone asked the question, "Well, how does this work with equity work?"

To me, it was so very clear, but the nods and the questions of, "Yeah, how do we pair this with equity?" made it clear that it was not clear to everyone else in the room. So that's the second audience, I wanted to show, "OK, this is how these two things go together."

And then the third was for improvement "experts." And I'm not saying that my primer teaches them anything about the improvement process. But I think my primer challenges them to use a critical lens and to really think about the process of improvement.

We think about the outcomes of improvement and making sure we have an equity- or justice-centered outcome. But also, how do we make sure we have an equity- and justice-centered process? So those are the three groups I was trying to hit with what I was writing.

SC

That was one of the things that struck me about the book: how clear you are about how it's not just the outcome, the process itself has to be equitable. Can you say a bit more about the distinction between the two for you? What does an equitable improvement process look like for you?

BHC

Absolutely. First of all, it's those two questions I ask in the book. The first one is, who's involved? So when you think about who is involved, you're thinking about process, and involvement requires so much.

And it's not always easy, because those of us who are "learned" and know about improvement go in thinking, "Well, hey, I have the tools to fix X, Y, and Z." And a lot of times, the way it's presented is, we go and we get this information from the users, and then we go about and fix it. Uh-uh. No.

The users have more to give you than just to help to define the problem, and you need a significant amount of humility in the sharing of power for the improvement process to be equitable. You have to recognize that the people who may not have your training or your degrees may have the definition of the problem, as well as the ingenuity to develop the right solution. And giving that up is hard for folks.

The other piece is this real critical reflection, and this is also hard. Because it is a lot easier to look at data than it is to look in the mirror and see how you might be perpetuating injustices or oppressions within the process by dismissing certain voices. And so when you want to focus more on a data point than the voice of the person whose data point that is, that makes the whole process jaded. And in many ways, it invalidates it.

To really improve with equity, you've got to be focused on who's at the table, not just when you're defining the problem but throughout. How is this data being communicated, so that everybody around understands it? Don't just throw up a bunch of regression outputs or propensity score matching or whatever it is you're using, and then don't break it down so that other stakeholders around the table understand.

So that's what I'm really pushing at.

It is all about honoring all voices from the beginning to the end, from problem definition, from seeing the system. Because people from different perspectives see different parts of the system. You've got to have a multiplicity of voices throughout.

And you've got to be intentional about giving minoritized and marginalized voices space and power, especially when there is a perceived power differential. And if you don't do that, you can't have an equitable improvement process.

SC

Thank you so much for that. Is there a particular project you've been involved in or helped support that stands out as doing a really great job of attending to an equitable improvement process?

BHC

I would like to talk about one I'm involved with now. We've not used the term "improvement science" as a part of this project, but from inception, the voices of parents, students, faculty—and when I say, faculty, I mean, faculty at the pre K-12 schools—have been on an equal playing field with the principal investigator and the faculty from the universities.

I'm not the principal investigator, I'm just part of it. So I don't know if they were quite ready to talk about it. But the synergy and the magic that happens in that space is unlike anything I've ever seen.

And the way the folks in the K-12 schools are leading the rest of us and the way we listen and attend to what they're saying is really beautiful. And it's so eye-opening.

I guess it shouldn't be eye-opening and groundbreaking. It should be common sense, but the way they know their schools and their communities and their knowledge about context so supersedes my knowledge about methods and someone else's knowledge about curriculum. And so while we're there as supporters, that support comes secondary.

And I think it's all about what you believe about the people that you're serving. If you really think they have the gifts and the talents and the assets within them to address these things, then you can release some control. But, do we always believe that? I'm not sure.

I know that's very nebulous and not a lot of specifics. But I will say, this project is about implementing a new curriculum in a really large place. And the curriculum, in some aspects, it's still being designed.

And it's all about children in the margins. But those children, those parents, those teachers and principals, are at the table: they are the ones leading this work. And the faculty, the experts, so to speak, we're just there to support. It's beautiful.

SC

Thank you for sharing that. Something that you write beautifully about in your book also is the need for anybody who's engaged in improvement to be very user-centered and asset-based. And you talk beautifully about how we can fall into this trap of deficit ideologies. Can you say a bit about this trap and how you support folks, or even your students, in avoiding it as they're engaging in this work?

First of all, it's hard. Because we have grown up being taught certain things about certain groups. Whether we want to believe it or not, the way we've been socialized has conditioned us to think certain things about certain groups of people.

Let's say you are trying to facilitate an improvement project. Even if you are cognizant of deficit perspectives, that doesn't mean that everyone on your team is. Elsewhere in the book, I wrote a chapter with two of my doctoral students called "Teaching Improvement Science for Educational Justice." We lay out a four part framework for teaching folks improvement science in a way that helps them deal with this.

The first part is called explicit instruction. Explicit instruction is used to teach people things they wouldn't learn on their own. And you have to recognize that people are not going to learn about deficit ideology unless they are oriented to or being pushed towards things that talk about it. So there has to be some grounding in critical scholarship before you even begin the improvement process.

The next step is anticipation. So what we have people do is come up with their ishikawa diagrams and anticipate, as they would do this with the group, what other things people might put up there. And then highlight and point out everything that is deficit oriented.

And then comes the homework. If you know you are about to do something about first generation college students, and you know someone's going to say they were underprepared in high school, then the homework is to go find the literature that combats that. Then when that comes up, you have the information already to speak back to those deficit notions. That's the preparation piece.

Then the last piece is to go on out and do it. You still got to do it. And as you do it, don't expect yourself to be perfect.

It's also important to reflect on the process. What happened? What came up that you didn't anticipate? How could you do it differently next time?

But it gets you in that process of thinking about whatever it is you are wanting to do, whether you're wanting to help Black boys, or you want to help deal with discipline or whatever it is, you need to know what those ideas are to begin with.

And then you need to be prepared to speak back to people if you want to prevent the process from going down a rabbit hole of, "Well, it's their fault,

because they don't do X, and they're not motivated, and their mamas don't care." If you don't want all that to come up, you've got to be prepared to speak back to it, and not just from your gut and your feelings. You need to have some hard facts and data.

SC

I love that. I want to read that article now. It reminds me so much of what we know about good teaching too. You introduce a concept, you spotlight and anticipate common misconceptions, you then have a plan for addressing those misconceptions. As they arrive, you're on the lookout for them. So you can catch them. That's just good teaching. I love it.

BHC

It is. And improvement science is all about learning together, so you have to consider that problem-definition point, where deficit ideology can be so rampant, as a teaching moment, and to be prepared.

SC

Yeah. I have to quote just a little snippet from your book. Because this is also why I think the questions that you brought up earlier are so important. You write in the first chapter of your book, "Throughout this text, I will ask you to keep in mind two parties who are necessary for improving for equity: who is involved with the improvement process, and who will be impacted?"

And you say, "Can you use improvement science to make a process more efficient while maintaining the status quo? Absolutely, but that's not how I hope you will use it." It's really hard to stick to your deficit ideologies, when you have the folks that you're serving in the room doing the work alongside you.

BHC

It is. I use this fake example of a couple doing the five whys about what was wrong with their relationship. And if one goes and does it all by themselves, everything is the other person's fault. But if both of them are there, the outcomes and the answers become very different.

Now, there are examples when that's not always the case, because people, like we talked about with socialization, have internalized different oppressions. And you can go to a marginalized group and find individuals in that group who blame the group for their own marginalization. It happens.

But if you've got multiple perspectives from that group, you will have some

internal checks and balances. So it's all about who is involved. That is so, so very critical.

SC

Yeah. I love it. You also write that you have often seen two extremes of unfruitful activities in schools: the adding on of interventions that lead to initiative fatigue or the premature abandonment of interventions that could produce improvement.

And you talk about a particular administrator who says, "we tend to do this 'adopt, attack, abandon' approach," which when I read, I was like, "Oh my gosh. That's so true." I've seen that in so many places." Can you say just a little bit about why these extremes happen?

BHC

First of all, there's a lot of reasons why these things happen. One, practitioners are human, and when every week it's something new, folks begin to roll their eyes. My dissertation was about how teachers saw their place in policymaking. And I remember one of the teachers saying, "You know, I figure out whatever the buzz word is this week. I throw it in there, and then I close my door and do my thing, because I don't have time to keep up with X, Y, and Z."

And it is a humanness, and I get it. The thing is, we are always looking for the next silver bullet, especially when it comes to teaching kids. And this might not be popular, but we know how to teach kids. We do. We do.

SC

Say it, Brandi!

BHC

Gloria Ladson-Billings told us how to teach kids. Then it's been remixed and reformatted. Gholdy Muhammed has told us how to teach kids in simple, clear, accessible terms. So we know what we need to do.

And so there's that piece. We also know what needs to happen in schools to make them good places for kids. It's known. It's not a secret. But as we churn out something new, oh, here's the new shiny package. Go do this.

And there's the other shiny package we've only been working with for a little bit. It doesn't mean that the old one didn't work. And the shiny package might work differently at Hennant Elementary than it does at Crawford Elementary. And so we need to take the shiny package, if that's what we're

using, and we need to say, "OK, this didn't work well. Let's figure out what the problem was with it. Now let's massage it and try it again. So now I know this. And you know what? Little Johnny, who's in my class, is telling me what worked for him and what didn't."

So the reason we have this adopt, attack, abandon situation, is impatience. And of course, there is genuine urgency here: we can't wait for folks to figure out how to teach kids to read 10 years from now. Because what does that mean for the kids right now?

So with that urgency, I get why you want to attack, and then abandon something that isn't working like you'd hoped it would. But maybe instead, we should be adapting it and making whatever it is responsive to the context that we're working in. And so it happens because people are human and urgency is real. And it also happens because there is money to be made in making a new shiny thing. Let's be real.

And also because of external pressure, people feel like they don't have time to be innovative, or to tweak anything, or to change it and see if it works. Because trying something is risky in a society that is really driven by accountability and outcomes.

SC

I'm with you. I feel like so much of our collective journey at High Tech High has been, how do we create a context where adults can actually take risks in service of better education for students? It's really hard to create that kind of risk-taking culture, where people feel like they have permission to try things, fail sometimes, learn from that, adapt it to make it better, and really listen to kids along the way, and not get distracted by all the other stuff.

BHC

Right. Also in my dissertation, I had a teacher who told me, "Yeah, I learned all of this good stuff, things to try in my classroom. Then when I got employed at this particular school, this was the culture. My scores weren't looking like other people's scores. I abandoned it and moved to test prep, because people are human. And job security and things matter."

And so we've made it such that we don't really trust teachers as professionals to be able to take this thing and make it work for them.

SC

I'm not sure that this question directly follows, but I really want to ask it. And then I'm going to come back to something that you just said.

In an earlier conversation, you mentioned that there had been some valid critiques of improvement science and that you'd like to see the field respond to those critiques, not just argue about them, but actually do things differently. Can you share a little bit about what are some of the critiques that you've come across? And what would that actually look like to you, to do differently, not just debate?

BHC

Yeah. As I said earlier about who you want to be in conversation with, I'm still reading those people that I want to be in conversation with. And a lot of times, those are the folks who really see improvement science as more of a problem than a tool for equity.

And every time I read it, part of me feels like, "Oh no." But then I also have to read it with, "Yeah, well, you're right." And so how does improvement science maybe need, I don't want to say a makeover, but maybe to really think more about that equitable piece in the process?

I'll just tell you a couple of the critiques that I've heard. And these are all paraphrased, but these are all scholars that I really admire. First, Colleen Capper, in her book on organizational theory for equity and justice, talks about improvement science being part of the structural, functional epistemology, where it's all concerned about effectiveness and regulation and maintaining the status quo.

And depending on which improvement text you're reading and how you read it, there is this idea of understanding what your baseline is, paying attention to variation, and figuring out whether you're trying to get back to your baseline, or are you trying to move everything up? This can sound like a status quo argument. So I get it. I can't argue back against that.

Similarly, Sonya Horsford, Janelle Scott, and Gary Anderson talked about improvement science leading to a culture of quantification and contrived collegiality. And so, they say, at best, it might be leading to some learning culture, but that's at best. Because often, it doesn't, and that's when people put more emphasis on the data than on the voices. That can easily happen.

And then Megan Bang talks more about design-based research and research-practice partnerships. But she talks a lot about the power dynamics in the process. And she says, despite wanting to be user-centered and whatnot, what tends to happen is the experts do the designing. And the other people are in the room just so that they feel okay about it.

And then recently, Shane Safir and Jamila Dugan, in Street Data, begin chapter four talking about how improvement science is trash. And I'm

actually going to quote them. They say, "The tendency to oversimplify improvement and seek incremental change instead of deep transformation makes it a mismatch for equity work." And one of the first things they talk about is the PDSA cycle and how planning comes two steps before studying. And nobody has asked the people who it impacts anything.

And so when I read it, I said, "See, for a lot of folks, that's the impression of improvement science." It's this thing where we're coming in, we're going to quantify everything, we're going to run some tests, and then based on what the tests tell us, we're going to do the next thing.

And they miss the process of letting the folks closest to the problem come in and be an integral part of the work. The folks closest to the problem who have the most intimate knowledge are the ones who should be leading the improvement work. You might be an improvement science expert, but you are serving as a facilitator and letting other folks who know about the problem and who you trust have the ingenuity to come up with the solution take the lead.

And I think the way improvement science is often packaged, it seems like that's not what it's about at all. So what I would like the field to do, one, is to be a lot more clear about what we mean when we say, "plan," and be a lot more clear about what it means to be user-centered. And user-centered doesn't mean just interviewing these folks, it means these folks are a part of the team. They have agency and power and voice in everything we do from what types of data we look at to what decisions we make after we look at that data. And sometimes, I wonder, "Am I describing something different than improvement science?" Because other people clearly don't see improvement science the way I do.

And then I get this idea—Audre Lorde said that you can't tear down the master's house with the master's tools—and so I get the idea that a lot of people look at improvement science as the master's tools. Right? But my question is, "Is it the master's tools if they're in my hands? Or are they now my tools?"

And so I struggle with the way improvement science is often read so narrowly. And that is, in a lot of the literature, the way it's elevated. You do this. You do this. You do this. You do this.

But in those steps, I think especially if we are trying to be equitable in our process, it's a lot more complicated and more complex than that. And if we're, like I said, humble enough to let the folks who know the most lead us, improvement science can be transformative.

The college access team from Firebaugh High School in Lynwood, CA use the chain of "five whys" while discussing their problem statement.

SC

Brandi, you are singing to my heart right now, because I also, for the record, was a hard sell on improvement. And I think sometimes the hard sells are the most passionate folks, in part because when I was introduced to improvement, I was introduced to it in a way that I see a lot of people enacting now where you just go straight to the PDSA cycle. It felt like improvement was just doing a bunch of PDSAs.

And what I loved about your book was that it made it so clear that that is one piece of the process that is very far along the road. You need to do all of the figuring out what is even the problem that you're trying to impact. What is at the root of that problem? What is the system that's creating that problem?

Learning from everybody and collaborating with everybody in that system. So that when you get to the place of identifying ideas you want to try and learn about, they're grounded in that understanding of the system and the problem. And it can be transformative if you do all of that stuff, because you're literally rethinking the system and deconstructing it purposefully. But if you go straight to the PDSA, then it can be just tinkering at the edges.

BHC

That's it. I give credit to Anthony Bryk, Paul LeMahieu, Louis Gomez, and Alicia Grunow, for their book, Learning to Improve. If you really look at all those principles that they lay out, they're not stealth. When you learn something else about the system, you have to change what that system map looks like. Your theory of improvement should reflect the knowledge at that moment. But when it's packaged as, "Hey, run through these cycles," that's not accurate. The PDSA doesn't show up until chapter eight.

There's so much you have to do before you get there. And I think the way it has been introduced to people, they're missing that. And as they go out there, and they're like, "OK, we're going to do this cycle."

Cultural quantification and contrived collegiality, especially when you have people at the table, but you don't really want to hear what they say. They're just in the room, so you can check it off. That's what happens all the time on school improvement teams. You have a parent there, but you're not really interested in what the parent has to say. I'm trying to do something different here.

And I hope I get other people on board to do something different with me. My children's middle names are Elizabeth Freedom and Elijah Justice. Everything about me is rooted in justice.

I wouldn't touch improvement science if I didn't think it could lead to justice. Because I don't have time for nothing else. I'm clear about what my purpose on this earth is. And I don't have time to just be playing around with stuff, but people don't see it that way. And I'm trying to change what it means or to reconceptualize improvement to center justice.

SC

Brandi, that's the perfect segue to my last question for you which was, in your epilogue, you write about the need to push for systemic changes while identifying immediate changes we can make right now. And that's not an either-or.

You also call on the words of Ella Baker, who said, "We who believe in freedom cannot rest until it comes." And you write, "The fight for justice is iterative and continuous, but iterative does not mean slow or stalling. It means constantly renewing the strategy to get to the goal faster." And I know that in our previous conversation you said, you've been thinking a lot about critical pragmatism. Can you share what that means to you and why you're thinking about it right now?

BHC

Absolutely. First of all, I would like to say, when I think about my North Stars in improvement, they are folks like Septima Clark, Bayard Rustin, Ella Baker. They're strategists. And strategists aren't always the people whose name is in lights.

This week, we're celebrating Martin Luther King, Jr. Wouldn't be no King without Ella, Septima, and Bayard. It just wouldn't happen. But the strategists are constantly re-evaluating the strategy to move closer to that aim or objective.

Now, when I say systemic change and what we can do right now, and I don't know if I use this in the epilogue or not, but the thing that comes to mind is state sanctioned violence against Black people. Yes, I want some criminal justice reform. I want accountability for policing. I want these things, and I'm going to vote based on those interests.

I'm going to organize based on those interests. I'm going to march based on those interests, because I want that systemic change. At the same time, I'm going to tell my son and my daughter, when you encounter the police, this is how you behave. When you encounter the police, you can't get an attitude, 'cause Black people, our skin makes us dangerous.

I've told my baby, "You're cute right now. But when you hit puberty, you're going to be scary to people, and it's not fair. It's effed up, but it is what it is. And my job as your mother and someone who's trying to protect you is to give you some tools to deal with that situation when it comes, while I'm also over here marching and voting and organizing and doing whatever with the police." Or in some cases, those folks who are doing research on how Black children and children of color are seen as less innocent. So it's a both-and.

I want all of this systemic change. But if my kid is pulled over before that happens, I want them to have something they can do and hold onto to try to stay safe in that moment. And it's like what teachers say in classrooms, "Yeah, I want the curriculum to be different. Yeah, I want X, Y, and Z to happen, and I'm going to do things, I'm not going to just say I want them. I'm going to conscientiously work towards those things. But at the same time, when I close my door in my classroom, I'm going to do what I think all the children deserve. But I'm going to do it for the 30 that I have control over." And that's what improvement science is to me.

I am all for people who are like, "burn down the establishment. Let's start over." Okay. But while we are starting over, these kids right here who can't read, what are we going to do with them? I'm sorry. It's really that practicality piece.

And maybe I'm shortsighted. Maybe I am not courageous enough to just focus on the system. And then maybe that's not my assignment. Like I said, I'm a Christian. I believe we all got an assignment. Maybe my assignment is to focus on what we can do right now while it's other folks' assignment to focus on the big stuff and for me to back them up when I can.

But critical pragmatism is this idea I've been wrestling with. I've used it. I use it in the book. I used it in the chapter about teaching improvement science for educational justice. And I'm trying to write a piece just delineating what it means to be a critical pragmatist. Because that's how I'm describing myself.

I don't want anybody to be like, "Oh, she's an improvement scientist, and so she's with the structural functional epistemology." That's not who I am. Don't put me in the box with that.

And so I'm trying to define in some ways a new space for myself and how I see myself. So I'm going to read to you my working definition of critical pragmatism.

A critical pragmatist, i.e. me, is someone who seeks practical or context specific and applicable knowledge to disrupt unjust systems. So it's all about disruption. They extend the pragmatic question of what works by also asking what is just. They evaluate the merit of practical knowledge by its ability to

ameliorate the plight of the marginalized.

Their critical lens constantly reminds them that they possess knowledge only in community. I don't have the answers. Only in community do I possess any knowledge. And that they only create improvement through authentic and reciprocal collaboration.

And then I've got some ideas about what it takes to be a critical pragmatist. One of them is seeing the world through a critical lens. And that takes being grounded in critical scholarship. And I was telling a group of doctoral students that, just like Michael Apple said, as a scholar, you can't throw out elite knowledge.

If you're going to be a scholar activist, you got to use what you have been exposed to to bring about change. And you should figure out how to make that kind of elite knowledge accessible to the communities and the constituencies that you serve. So it's about seeing.

It's also about critical reflection and recognizing no matter how you're oriented, or no matter where you think your heart is, we all got work to do. And you've got to look in the mirror and say, "You know what? That meeting or that team I was facilitating today, so-and-so was trying to speak and I spoke over them. Or I moved to the next agenda item before their point was made. How can I be different? How can I stand in solidarity with and in service to different groups who might have oppressions that are different than my own?"

So I think there's a lot that goes into what it means to be a critical pragmatist. And like I said, I'm fleshing these thoughts out in my own brain, but it's what I'm aspiring to be. I tell people all the time, I'm a liberation slash womanist theologian. I'm a scholar activist.

I'm a critical pragmatist. All these things are aspirational. All of these things I'm trying to constantly be good enough to live up to those titles. And I feel the same way about being a critical pragmatist, but I'm trying.

SC

Brandi, this was such a gift. Thank you so much for sharing your thoughts and passion with us. Are there any final thoughts that you want to share?

BHC

Yes. As I said, I'm a Christian. And so sometimes I feel like you need to end with a benediction or a call to action or something. And so I just talked about this whole critical pragmatism piece and how it's aspirational. And I

would challenge everyone to aspire to it as well.

There is so much work to be done, and we've all been given gifts. And we need to put what we've been given to good use. So if that is being a critical pragmatist and you think that's part of how you can employ your gifts, I would urge you to join me in this fight and help me to reconceptualize improvement as really being about the work of justice.

And then the other thing I would say is about all my 1,000 identities I shared with earlier. Bring who you are to the work of improvement. Who you are matters. Where you situate in the world, where you sit, your perspective has a unique view of the system.

Don't crush down this identity or that one. We need everybody at the table to undo and disrupt and dismantle some of these structures that keep so many of us down. And so I would ask anybody listening to link arms with me and join the fight.

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