



UNBoxed

A Journal of Adult Learning in Schools

**A SPECIAL ISSUE ON
DEEPER LEARNING**

**ARTFUL THINKING
CLASSROOM**

jessica ross

**SCAFFOLDING
CREATIVITY
THROUGH DESIGN
THINKING**

mindy ahrens

**MINDSETS AND
STUDENT AGENCY**

eduardo briceno

**OPEN SOURCE
SOFTWARE**

tim mcnamara

**CHANGE LEADERSHIP
FOR LEARNING**

tony wagner

**DEEPER LEARNING
FOR PROFESSIONALS**

karen fasimpaur

**GUIDING STUDENT
REFLECTION**

tara della roca



Graduate School of
EDUCATION

*UN*Boxed

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The PolyMEDron Project; image courtesy of Sarah Strong

Welcome

The Editors



In April 2013 High Tech High hosted a conference sponsored by the Hewlett Foundation, bringing together educators interested in “deeper learning,” wherein students master core academic content along with the skills of critical thinking, problem solving, collaboration, communication, and learning how to learn. For this issue of UnBoxed, we invited participants to share their ideas, approaches and reflections about deeper learning. What is it? Under what conditions does it flourish? How do we get there? Why should we care?

Several contributors offer concrete approaches to deeper learning based in dialogue. Mary Hendra encourages students to take a stand in a “human barometer” activity; Tara Della Roca coaches students to achieve a balanced perspective in reflecting on their own work; Liza Eaton and Cyndi Gueswel integrate student agency with academics by fostering relational skills and habits of scholarship. Beth DeLuca offers her students a variety of ways to share their reflections on literature; Cara Littlefield consults with her students about how she might best give directions; Jessica Ross and her students go deeper into humanities

content by looking closely at art. Meanwhile, Tim McNamara urges educators to step outside school and take advantage of the resources and personal assistance offered by the online learning community.

In our UnBoxed interview, Tony Wagner, who delivered the keynote address at Deeper Learning 2013, describes a “going deep” moment in his own learning. He goes on to argue that schools must change if they are to become places of deeper learning, and calls for educators and other stakeholders to join in a national conversation about purpose and accountability. Wagner, Sarah Strong, Eduardo Briceño, and Karen Fasimpaur all point out that deeper learning in schools starts with the adults, and offer practical suggestions for how to begin. In the end, deeper learning is not about what we know, but rather about how we engage with what we don’t know. It is a matter, not of prescription and predictability, but of reflection, dialogue, and the willingness to venture together into uncharted territory.

UnBoxed readers may use their smartphones to link to related content while reading. To get started, simply download a free QR reader on your phone. Then, wherever you see a “tag” or icon, open the application and scan it with your phone’s camera. A website, video, or document will appear, offering further information and context.

The UnBoxed cards in this issue offer glimpses of projects and practices that we find inspiring. These cards are freely available on our UnBoxed website in a printer-ready format. Simply print, fold, share and discuss. Each card refers the reader to a web address for further information.

We wish to thank the K-12 and university educators who have reviewed our submissions for this issue and offered invaluable counsel. We invite all of our readers to join us in conversations about purpose, policy and practice in education by submitting your thoughts for publication or serving as a peer reviewer. To learn more, visit www.hightechhigh.org/unboxed

Read, enjoy, and participate!



The Triumph of Death by Pieter Bruegel the Elder.

An Artful Thinking Classroom

Jessica Ross
*Harvard Graduate School of Education and
The Global Learning Charter Public School*

I projected the image onto the screen and gave my eighth grade students several quiet minutes to take notes in their journals before I began asking questions.

“What do you *see*?” I asked. They answered in rapid fire: “Dark colors, tornadoes, guitar, casket, horse skeleton, dusty red skies, corner of holy people, skeleton pit, naked guy, angry mob, knights, mountain of fire...”

“So, what do you *think* this might be about?” This time, they took a minute to look back at their journals before sharing responses.

“It’s scary. It’s Renaissance era. Genocide. Done in the Dark Ages. A metaphor for the apocalyptic march of death. Poisoning with food and drink. Christians being raptured. The armored man looks like Jesus.”

After I captured some of their responses on chart paper, I concluded with, “And what does this image make you *wonder*?” These answers came quickly and didn’t require aid of their journals, “I wonder why

this was created, what was the motivation? What does triumph mean? I wonder if they are in a war. I wonder if this ties into what we are studying next. I wonder what the time period is.”

My students and I spent over thirty minutes that day analyzing *The Triumph of Death* by Pieter Bruegel the Elder. First they observed and described what they saw, and then they compared and connected their observations to previous knowledge. And finally, they questioned and explored viewpoints through their wonderings. We all looked at that image many times that day, going back to it whenever someone in the class noticed something that someone hadn’t seen before or made a new connection.

The Triumph of Death

The students’ thoughts were captured and documented both individually (in their journals) and collectively (on chart paper). Once they started to share their thoughts out loud, I scribed new connections and extensions that were made as the discussion moved beyond the initial observations that were noted in journals.

The work of art, along with the *See/Think/Wonder* routine, and the documentation of their thinking was used to launch a unit about medieval history. For my eighth grade humanities class, I designed the unit based on both World History I and English Language Arts curriculum frameworks and then used the *Artful Thinking* approach to shape an arc of instruction with specific thinking goals in mind.

Shari Tishman, the *Artful Thinking* project’s Principal Investigator, has described the goals of the program as follows:

Artful Thinking was developed to explicitly bring out the connection between art and thinking. There are two reasons for this. The first has to do with how works of art make us think, and the second has to do with what works of art make us think about. By both design and default, art invites deep and extended thought.

The five components of the *Artful Thinking* program include:

- Thinking Routines
- Thinking Dispostions

- Art & Curricular Connections
- Visible Thinking/Documentation
- Study Groups: reflective professional practice

What Happens in an *Artful Thinking* Classroom?

Thinking Routines

It all starts with thinking routines. There is a wealth of these available, and many teachers already employ them in their classrooms. I decided to introduce the unit with the *See/Think/Wonder* routine, which first asks students to make careful observations and then interpretations based on those observations. These are accessible entry points even for a student who doesn't have specific background knowledge. Once observations are reported, students then begin to consider what the information reveals; finally, they are asked what they wonder—which opens the door for further inquiry.

Thinking Dispositions

As the students progressed through the unit and gained knowledge about Europe during the medieval period, I made choices about subsequent thinking routines based on the thinking dispositions I was aiming for. Thinking dispositions are an inclination towards certain modes of intellectual behavior. The six thinking dispositions that are instrumental in considering art and subject area content include:

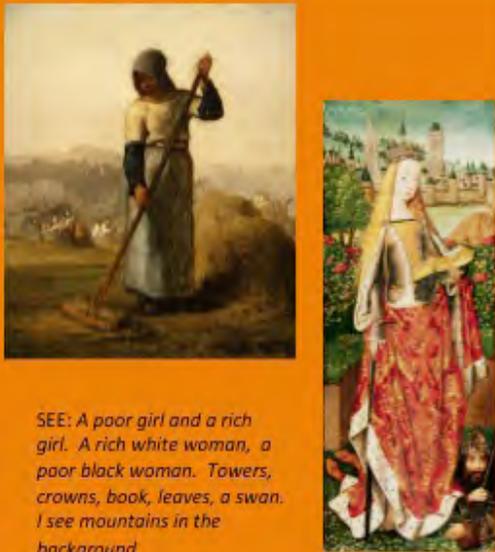
- Reasoning
- Finding Complexity
- Exploring Viewpoints
- Questioning & Investigating
- Observing & Describing
- Comparing & Connecting

The introductory routine I used, *See/Think/Wonder*, is a means to get at the disposition of questioning and investigating. As the students began to learn about the Middle Ages, I used another routine, *Connect/Extend/Challenge* to have them synthesize information from their readings by *connecting* the new information to what they've learned before, to notice what information *extended* their thinking, and to make note of ideas that were puzzling or that *challenged* their thinking.

The *Connect/Extend/Challenge* routine does reinforce the disposition of questioning and investigating, but is more heavily grounded in the disposition of comparing and connecting, which is why I chose to use that routine once the students had a stronger foundation of content knowledge.

Art (among other things) and Curricular Connections

Throughout the unit we examined text, images, and primary source documents using a variety of thinking routines in order to both learn about the time period and develop thinking dispositions. For example, as we added to our knowledge base, I pushed the notion of exploring viewpoints by having the students compare two paintings depicting women from different social classes.



SEE: A poor girl and a rich girl. A rich white woman, a poor black woman. Towers, crowns, book, leaves, a swan. I see mountains in the background.

THINK: The rich girls owns that kingdom behind her. The poor girl might be owned by the people behind her. Different social classes. St. Catherine's painting has more detail. I think they are two different seasons

WONDER: Who is the dude under the lady, is she a queen? Why is the poor lady raking? Is she a slave? How come there are not a lot of people in the picture? They look the same age, how old are they? What is St. Catherine reading? Does this have anything to do with the Bible?

Visible Thinking/Documentation

The next step was to decide how to document the process of our learning by making our thinking visible at various stages. We did this through journals, wall charts, discussions, and presentations of learning. This documentation served as both formative and summative assessment during the unit. I had a wide range of data gathered from each learning experience to determine the levels of individual and group

understanding about the content and about dispositional skill building. The student work also highlighted misconceptions, lack of historical perspective, and confusion on the part of students. For example, the students were more familiar with the class and social distinctions of early American history than with medieval European history, and while they could use their knowledge to make some connections to the plight of peasants and serfs during the Middle Ages, it was necessary to use a variety of sources for them to appreciate the women's sphere or the role of the church during that time period.

Study Groups: Reflective Professional Practice

So that I could appropriately challenge all of my students, address their misconceptions, and get feedback on the next steps of my plan, I brought examples of student work to my study group. Reflective teacher practice is a vital component of the Artful Thinking approach. Study group members use the “Looking at Student Thinking,” (L.A.S.T.) protocol devised to carefully examine student thinking in order to support teachers as they consider the next steps of the learning process (see Appendix). According to Tishman (2007), “This loop—from making student thinking visible, through thinking centered activities, to shaping instruction so that it further enhances student performance—is assessment in the most authentic sense.”

When my colleagues and I looked at documentation, we noticed that some students struggled to consider the content using a historical perspective. With this insight, I returned to primary sources that the students had examined already, like the Hereford Mappa Mundi, the largest known medieval map. We took another look, using a different thinking routine, and revisited the concept of worldview from a medieval European perspective.

Finally, toward the end of the unit, we used the Headlines routine to capture some of the big ideas we had learned that could have been newspaper headlines from the time period. Students suggested: “Foreign Invaders Attack. While One Rules, the Rest Suffer. The Epidemic Continues. Death Fights Back. Serfs and Slaves Survive...” The Headlines routine also helps to develop the disposition of comparing and connecting. The students are asked to capture core ideas and sum things up. We used these headlines as a transition point

to ‘follow the stories’ as we left the Middle Ages and moved towards the Renaissance.

Reflection

Adopting Artful Thinking involves weaving together many of the successful practices that teachers already use: thinking routines, assessing with documentation, setting dispositional goals, making learning visible and engaging in reflective teacher practice through study groups. The most daunting and rewarding challenge for the teacher is a new view on the role of art in the classroom. It becomes a matter of trust, not in picking the perfect piece of art to illustrate a content standard, but rather trusting the ability of art to surface thought-provoking questions, connections, and areas of inquiry. It also requires trust to learn from the process with your colleagues and from your students.

I have been using thinking routines with art, objects, poems, nonfiction text, charts, graphs, cartoons, film, you name it, for the past seven years. Sometimes when I look at the student thinking that I collect, I realize I could have picked a different thinking routine to get at the disposition I was trying to develop and so I adjust the next time. I encourage teachers to just dive in and play; don’t fret over picking the perfect art image, or text example, or thinking routine. Have fun, invite the students to share their thinking about a piece of work and you will be on your way towards creating an Artful Thinking classroom.

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The Artful Thinking program was developed at Project Zero (PZ), a research group at the Harvard Graduate School of Education (HGSE). For more information, visit:

Project Zero Website: <http://www.pz.harvard.edu/>

or

Artful Thinking Website: <http://www.old-pz.gse.harvard.edu/tc/index.cfm>

Appendix

Study Group protocol

1. Greetings and housekeeping matters. (3 minutes)
2. Briefly review Puzzles and Insights from last week (3minutes)
3. Sharing Documentation. Work in pairs. Each person shares a piece of documentation of students' thinking. Talk about it using the See/Think/Wonder routine. (20 minutes total, 10 minutes for each teacher to share work)

What do you see in the work?

Describe the work. Withhold judgment for the time being. What do you notice?

What do you think about that?

Speculate about students' thinking: What kinds of thinking do you see? What's going on?

What does it make you wonder about students' thinking?

Ask questions about the work.

Reflect

What are implications for future teaching?

4. Headlines. Each person identifies two headlines from their paired discussion: One key insight, and one key question or puzzle. Write these ideas on paper or post it notes that can be posted on the board. (5 minutes)

Make the groups the ideas visible in step 4. Save the documentation and use it in the following study group.

5. Insight and Puzzles discussion Come together as a whole group. Each person shares their puzzle and insight with the group. Make the groups' thinking visible – you may choose to write the headlines on chart paper, or stick their post-it notes on the board. Try to categorize the puzzles and insights and pick one or two of them for discussion. (20 minutes)
6. Creating opportunities for Thinking Brainstorm opportunities to use an idea or thinking routine that was discussed today. Choose one and plan a time to use it in the near future. (5 minutes)
7. Reflect on the study group and protocol How was this process? What was positive, what could be improved? Are there any questions about the protocol? (5 minutes)
8. Closing. Thank one another for support and plan to meet next time.

Solving Real-World Problems With Open Source Software

*Tim McNamara
High Tech High Chula Vista*

Open source software (OSS) is generally defined as computer software that you or I can download, use, modify, and distribute. Although some OSS projects do receive support from corporations, any given product, in order to thrive, must nurture and grow a community of contributors and followers—people who write the source code, fix bugs, train users, argue about next steps, and spread the word.

This necessity of survival has at least two important consequences for high school teachers like me (and perhaps you): 1) OSS communities organize and host open, ongoing, and frequently free or low-cost interactive events and trainings; and 2) existing community members tend to be kind, generous, and welcoming to newcomers of all ages.

In what follows, I will explain how a recent project of mine benefitted from working with OSS and OSS professionals in the hope that other teachers can use the project as a springboard or framework for helping students develop professional connections and tackle complex problems.

Let me summarize the project as quickly as I can: in January 2012, my team of 17 high school seniors at High Tech High Chula Vista (HTHCV) set out to address the parking and congestion problem on their campus. Three months later, after investigating the scope and source of the problem, attending an OSS training camp, learning Drupal (open source website building software), and spending many hours designing, building, refining, testing, and marketing, the team launched a community rideshare website at the school's Festival del Sol Exhibition. With over 100 current users, the site has helped reduce congestion and facilitate ridesharing.

Free Technical Training & Networking Practice

The expertise and generosity of Drupal community professionals played a large role in helping the students succeed. Our first intersection with this community occurred at Sand Camp, an annual multi-day festival at which Drupal aficionados gather in San Diego to learn, train, network, and socialize. My entire team of high school students attended the camp for free, and they attended beginner track classes on working with the software.

At camp, they also gained exposure to the Drupal community and completed an assignment to make three personal contacts and reflect on their camp experience. Most students walked away surprised at how open the community is to helping and welcoming newcomers. Here's a representative excerpt from a student reflection:

One thing that struck me was the people. They were good people who all shared a common interest that was not only positive, but also something they could make a living off of.

Expert Guidance from Professionals

Soon after Sand Camp, three members of local Drupal community, eager to share their excitement about OSS, visited our school to provide guidance and feedback on our project. All three professionals worked for Achieve Internet, a San Diego-based company that provides enterprise website consulting services.

Achieve President Ron Huber's visit helped students understand, in a

more profound way than a teacher could hope to communicate, that the limitation of our project’s scope came from real world contingencies as opposed to arbitrary teacher-imposed limits.

It happened like this: the student team presented their dreams for the carpool website—which included a mobile app, real-time rideshares, carpool driver rankings, and carpool contests. Ron’s diplomatic response to the presentation was that the team should narrow their focus—select one key piece of functionality and make it work great. Ron also pointed the team to a TED talk by Simon Sinek that echoed the message of laser focus and also explained the importance of knowing why you are doing things. This video, and Huber’s visit, inspired the project leaders to craft a succinct “why” statement:

We think every student deserves a safe and reliable ride to school and we believe that our community can work together to make this a reality.

With this new rallying cry and a dedication to delivering a simple and high-quality solution, the team crafted a new and simpler vision for the site, which would allow parents to input their address, view other potential carpoolers on a map, and use private messaging to contact other carpoolers. Ultimately, such a site turned out to be achievable in our timeframe.

Technical Guidance from Professionals

On the same day Ron visited, developers Dagoberto Aceves and German Licon provided technical guidance and shared their passion for computer science and OSS. With the students, Dago and German discussed the the ins and outs of Drupal, as well as issues related to the site’s look-and-feel, multi-lingual capabilities (many HTHCV parents are Spanish speakers), and user experience. The students also worked with Dago and German to develop plans for software development, as well as a timeline for testing and launching the site.

A week prior to launch, Dago returned to school to help upgrade the Drupal version, move the site onto the production server, and address several other small issues. While working with Dago that day, the students observed first-hand how a professional addresses a problem

by reading documentation, browsing issue queues, and debugging. It became evident to the students that the ability to be productive with Drupal requires a knowledge of available resources, and Dago showed students how to look, how to borrow, and how to ask for help.

The wider Drupal community also contributed to the students' project in several ways. Students regularly posted and answered questions on drupal.org, a site where thousands of developers exchange ideas every day around the clock. If you're unfamiliar with OSS, it may seem incredible that professionals respond to questions from people they don't know for free, but trust me, it's true. By participating in these online discussions, students not only received answers to their technical questions about their carpool site, but they also learned the ins and outs of a discourse community, gaining confidence in their ability to ask for help and manage their online rhetorical posture.

When the time came for beta testing, students posted a note to the San Diego Drupal User Group forum, asking the group to test the carpool site. Again, local professionals stepped up to offer critique through the forum, sharing ideas and expertise.

The Benefits of Student Involvement with OSS

In the end, Drupal the software worked well for our site, and the Drupal community helped students get a peek at the world outside school, work with professionals, and participate in a shared-interest community. What excites me, after reflecting on the project, is the great potential for student involvement in OSS. There are hundreds of OSS projects across the world and they host countless camps, user groups, and meetups that students can attend, typically for free or close to free. OSS professionals have both the interest and obligation to welcome and help newcomers, and these live-person connections help students address immediate project tasks and also discover their own passions, strengths, weaknesses, and interests.

If you believe, as I do, that students deserve to tackle complex, real-world problems, you also probably understand that addressing such problems requires vision, planning, contacts, expertise, and risk-taking. During our project, working within an OSS community provided a way for students to engage in all those aspects of problem solving.

Drupal enabled our high school project team to pursue the guiding vision that every student deserves a safe and reliable ride to school.

One final note: joining the Drupal community, even if some never return to it, will have influenced students beyond their work in the carpool project. High school students, including the seniors I teach, approach their coming adulthood with some trepidation. But because the “open” ethos of the OSS community removes age restrictions and encourages participation by all those who are capable and willing, OSS provides a vision for a welcoming world, as evidenced by this student reflection, written the day after she attended Sand Camp with our team:

What struck me most about the camp was the diversity of people that were in attendance. I honestly thought I was going to be walking into a lecture hall full of computer nerds. When I first walked in, the first thing that I noticed was that there were people of all different ages. Our class was the youngest group of people here, but there were a good number of people who looked like they were in their early 20's. I think the age group that surprised me the most were the people who looks like they were older than sixty. I thought this was really awesome because my grandparents barely know how to call someone on their cellphones, imagine if they could create websites!

Change Leadership for Learning

*Tony Wagner
Harvard University*

In this UnBoxed interview, Tony Wagner, first Innovation Education Fellow at the Technology & Entrepreneurship Center at Harvard, describes his entry into the profession, his abiding engagement with questions of leadership and change, and his hopes and concerns for the future of American education.

INTERVIEWER

How did you get started in education, and what were some of your early influences?

TW

Actually, my passion for education started with my own schooling. I hated school—was bored out of my mind, every step of the way. I left the boarding school that I was attending in the middle of my senior year, and finally managed to graduate from another school. I dropped in and out of colleges, first to write the great American novel, and then because I got very active in the civil rights and anti-war movements, to the point that the Dean of Men called me in, sat me in front of

this massive desk, and said, “Son, I just want you to know we know all about your communistic, homosexual, drug activities.” That was Richmond, Virginia, 1965.

I was radicalized by my education experiences. I started reading about education—A.S. Neill’s *Summerhill*, and Paul Goodman’s *Growing Up Absurd*. I read *The Port Huron Statement* and started one of the first SDS chapters in Virginia, back when D stood for Democratic. Having thought there was something wrong with me through all of those years of schooling, I began to realize, maybe it wasn’t me—maybe there was something wrong with the schooling. I ended up at a small experimental Quaker college, called the Friends World Program, where I studied for a year in Mexico, became passionate about the Mexican muralists, and actually met David Alfaro Siqueiros while he was working on the March of Humanity. It was an incredibly formative time.

I graduated from college feeling like I knew absolutely nothing, but knowing that I wanted to teach, so I came to Harvard for the M.A.T. program. I hated the education courses, but in one anthropology course the professor required us to take one historian’s theory of history and write a paper on it. I picked Karl Marx, because I’d never read him. It was the most thrilling intellectual experience of my life, to really try to deeply understand Marx’s theory of history. When I had written the ten-page paper, the professor said, “OK, now distill it to two pages.” I tore up my ten-page paper and started over, trying to really get every word right, and it was just thrilling.

After Harvard I taught for five years in a small school-within-a-school in Montgomery County MD Public Schools—basically an alternative high school for at risk students. Then I taught for four years at Sidwell Friends School with the absolute opposite kinds of kids. I have always tried to do educational R & D in my own teaching, trying to figure out a better way, but at Sidwell Friends I got bored, because once I figured out an architecture that enabled the kids to run the class, there was almost nothing for me to do. For me, all the creative work was in figuring out the design, and then it was on autopilot. Figuring it would be exciting to do R & D with an entire school, I took a job as head of a tiny K-8 school. That turned out to be a bad fit, as I had spent ten years teaching only high school, with no K-8 experience. I left there in my second year by mutual agreement.

Meanwhile I'd gotten concerned about all the saber rattling with the nuclear buildup at the time. A few of us started meeting regularly, calling ourselves Educators for Social Responsibility, and that spring, before the June '82 march, we began getting inquiries from people around the country wanting to affiliate with us. At that time we had about 300 people calling themselves members, and about \$300 in the bank. Somebody said, "Hey, we should think about starting a national organization." Four years later we had 125 chapters, 10,000 members and a national office staff of 16, going from nothing to something. These were heady times.

After four years I went to work with Dan Yankelovich in the Public Agenda Foundation on a fascinating adult public engagement project, but I felt I had gotten too far from my first passion, which was reinventing high schools. So I went back for my doctorate at Harvard. I hung out in three very different schools for a year and wrote a dissertation that became my first book, *How Schools Change*. My central finding has been what's driven me since: that leaders were stunningly unable to help teachers understand the changing world, and explain why practice might need to change. So that became a guiding passion for me, to be a simultaneous translator between this larger changing world and the world of classroom practice.

Teaching in the teacher education program at the University of New Hampshire, I assigned a book called *Winning the Brain Race*, by the then head of Xerox, David Kearns, making the business case for a very different skill set and a dramatically better education. I saw a clear parallel between the skills developed in the Dewey/humanist progressive tradition and the skills that are needed in the new economy. I've continued to be intrigued by that parallel, along with the whole question of the process of change, which I later pursued as Founding Director of the Change Leadership Group at Harvard under a Gates Foundation grant.

To fast forward a bit, with my continuing interest in the rapid evolution of the economy, I decided to undertake the research project that led to The Global Achievement Gap. Then I became very interested in the whole idea of innovation, and how, increasingly, young people with no skills are going to be displaced in this economy, with jobs being off-shored or automated at a growing rate. I became convinced that every young person was going to need to learn the basics of the innovation

economy. So that led to *Creating Innovators*.

INTERVIEWER

Many innovators develop despite or in opposition to systems, so how do you systematize innovation? It seems like an oxymoron.

TW

Exactly, but I think there are some clear answers to that question. You encourage risk-taking, you don't penalize mistakes, and you encourage people to take initiative to pursue their passions. Intrinsic motivation is absolutely critical.

INTERVIEWER

A lot of folks are optimistic that the Common Core standards may drive a new look at teaching and learning, while others think they may lead toward standardization and away from risk-taking and the pursuit of passions. What do you think?

TW

It's obvious that Massachusetts and Mississippi should have the same approximate academics. You've got to start with "Yes, it's solving a problem." But I have several concerns about the Common Core. First, it is a curriculum entirely designed to existing college admission requirements. Those are unquestioned, and, I think, highly problematic, with advanced math being Exhibit A. Why are we not putting more emphasis on statistics, probability, computation, estimation, and financial literacy? Why do we assume every kid needs to know algebra, and then calculus? It's lunacy.

Related to that issue, where is career-ready? Where is vocational, technical training? I was talking with a group of 50 high school seniors in Colorado recently, in one of the highest performing districts in the state. They'd seen my documentary on Finland, where 45% of the kids choose career-technical tracks that have been developed very closely with businesses. I asked them, "How many of you are planning to go to college?" Every hand went up. Then I said, "How many of you would have chosen a career-technical track had it been available in this high school?" Half the hands went up, because they know college may not be a good bet for them. They may know that college will lead to lots of debt but maybe no jobs. And besides that, they might have

preferred to learn with their hands. Common Core does nothing for those kids. Nothing.

The third and final nail in the coffin is that what's on the test will determine what happens in the classroom. As long as we insist on testing every kid, every year, we'll never be able to afford the quality of assessments we need. And so I think the tests won't change much by way of teaching and learning. What do you think?

INTERVIEWER

I side with those who say that assessment rightly belongs with those who are closest to the learner. If we're talking about deeper learning, or Learning 2.0, then the question is, what is Assessment 2.0? If Learning 2.0 is essentially dialogical, and aimed at developing self-directed learners, then Assessment 2.0 needs to work in parallel with that. It needs to be dialogical, and it needs to develop one's capacity to self-assess. Efforts to bring portfolio assessment to scale represent a step in that direction.

TW

For political reasons, accountability isn't going away in this country, and to simply say all accountability has to be local is not politically viable. And that's why I build in this idea—and Deborah Meier was the first one to do this—of having employers and college teachers selectively audit random portfolios to help establish performance standards so that it's not just us asking self-referentially, “Do we think this is good enough work?” We've got to bring outsiders into that dialogue sitting at the table with us, not passing judgment on us.

I would also advocate for selective use, in an auditing way, of high-quality assessments like the College and Work Readiness Assessment and the school-based PISA test. It has to be done through sampling—it's the only way we can afford it. And it can't be high stakes; it's informational, not punitive. Finally, assessment reform will not in itself change classroom practice. We need to fundamentally reinvent the preparation of teachers.

INTERVIEWER

Regarding your desire to be a “simultaneous translator,” are you now thinking that the best medium for that is film?

TW

You can't ask people to believe in a school that's like none that they ever taught in or attended. So the first step is to fund many more existing proofs of better schools. Next, the question is, how do we show those to people? You can't do it in a book. I think people have to see them, feel them, touch them and taste them.

In the film we're working on now, we're trying to do two big things. First, we're trying to help viewers understand this new economy, and the demands it's going to place on kids, and how radically different these new demands are. Second, we want to show people what really high quality education that responds to this new set of challenges looks like. We'll show start-ups and existing systems that are in the process of transformation.

INTERVIEWER

What are you thinking about now in your work, more than anything else?

TW

There are tensions in all of this work. One of the core tensions is, are we only preparing people for work, or is it about citizenship? I made a mistake in *The Global Achievement Gap* by not referencing the whole moral foundation that I think is essential. My own view is that the skills needed for active, informed citizenship and the 21st century skills needed for work are the same, but I think that needs to be better articulated.

The other tension is between liberal arts and vocational education. Are the liberal arts still important? Of course they are—but taught in a completely different way—liberal arts, not as the transmission of content alone, or even primarily, but as a way of thinking more critically.

INTERVIEWER

At High Tech High we wanted to build a school where, when you walked into it, you couldn't tell if it was a technical school or a college prep school. In this country, we've been living for too long with this separation between the technical and academic sides of the house when in fact each is richer when integrated with the other.

TW

This is why I've attended so much to the business voice. Most people don't realize that Accountability 1.0 was entirely business-driven. A Nation at Risk came out in 1983. Then nothing happened for years until Lou Gerstner from IBM and David Kearns from Xerox called for a national summit on education. All the governors and CEOs came, and the educators weren't invited, because they weren't trusted. You don't trust somebody who appears to have a job for life with no accountability. I get that. So we got Accountability 1.0 done by business leaders to educators.

I deeply believe we need a new national summit that calls for Accountability 2.0 with educators. To do that we need a different dialogue between those two worlds, and they're going to have to give up their historical antipathy to one another. If you look at why Finland has been so successful in transforming both its economy and its education system, one reason is that those two worlds have worked very closely together for forty years.

INTERVIEWER

On a study tour in Denmark in 1991, I sat in a conference room with representatives of labor, management, and education. One of our group remarked to them, "Every time you speak, you say 'we.' That doesn't happen back in the States." One of the Danes replied, "If we don't say 'we,' we don't survive."

TW

We have no sense of urgency in this country. We think it's just those few poor kids here or there that are struggling, and if only we can get those poor schools up to the level of our good suburban schools, we're going to be fine as a country. That's very different from Denmark, or Finland, where they realized their future was at stake. They had no choice but to work collaboratively to save the country, and create a viable economy. We don't see that yet. That's an important element of the film we're making, that we have to mobilize around a sense of urgency.

INTERVIEWER

What gives you hope for the future?

TW

There is a lot more innovation happening in education now. The fact that the Hewlett Foundation has brought a consortium of schools together in the Deeper Learning network is huge. These aren't just schools that have signed up for a bunch of principles. They are schools that are doing things differently. EdLeader21 is an organization of education leaders that is developing in-district capabilities for change. So you've got these two parallel efforts. And thirdly, we finally have better assessments that are reliable, valid, and scalable. The College and Work Readiness Assessment, for example, is a skills test focusing on analytical reasoning, critical thinking, problem solving, and writing. It's a test worth taking and worth teaching to.

The pressures are enormous. The stakes are enormous. The budget challenges are huge. Still, there's more innovation happening. But it's a race against time. It's really a race against time.

*To learn more about Tony Wagner's work, visit his website at:
www.tonywagner.com*



Deeper Learning in Common Core Math Projects

*Sarah Strong
High Tech High*

This year at High Tech High we decided to “give the Common Core a try” in our 6th and 9th grade math classes. Our hope was that the new Common Core standards (emphasizing coherence, rigor, and depth) would provide a good match for our project-based environment. Of course, we had questions. Would a common scope and sequence stifle the teacher autonomy that is so precious to our organization? Would teachers continue to be able to personalize and bring in adult world connections through math projects? Would the standards squelch the deeper learning we are striving for? Or would they finally put an end to our endless discussions about “what” to teach in the absence of good standards and help us move forward with defining our “how”?

Given the opportunity to step out of the classroom for a year and support this shift, I have engaged with many teachers and experienced firsthand how the project planning process has shifted with the entry of the Common Core. The approaches to planning can be broadly categorized in two ways. In the first, the “backward” method, teachers start with an idea or passion of theirs or of their students.

Through brainstorming and research, the mathematics in the idea is explored, highlighted, and included in the project design. The second approach has been “forward planning,” whereby the teacher has sat down with a list of standards in a given unit or units of study and worked to brainstorm possible real-world connections. Through the use of a sample open-ended problem the project is birthed out of the standards themselves. In the two case studies that follow, I will describe projects planned in the backward and forward directions. In the implementation of these projects, there have been the usual snags along the way. Nevertheless, glimmers of hope shine through for deeper, richer math projects and a more coherent math program.

“Backward” Project Planning: Fermi Math

Enrico Fermi is best known for his work as a physicist. What is lesser known is that Fermi really enjoyed tackling the estimation of “big problems,” problems so big that the quantities seem impossible to compute. For example, a classic problem of his was, “How many piano tuners are there in Chicago?” Using some educated guessing and some basic mathematics, Fermi would make estimations on these large problems.

As our sixth grade teachers took on the common core, Fermi math problems surfaced as an interest of ours that might spark a project linked to the ratios unit in our common core framework. The focus of ratios in sixth grade is modeling equivalent ratios using tools like the ratio table and double number line. After an initial brainstorm session with teachers, I created a sample poster outlining the stages of a potential math project and how the math fit into each step. I also created a sample Fermi problem and product, “How many donuts fit into a swimming pool?” The teachers who agreed to take on this project sat down and “tuned” the project. Throughout the tuning process, we brainstormed possible products and ways that we could make sure that math was present, finally arriving at a concrete project description and phases of action for implementation.

The project entailed students creating their own Fermi questions based on their own personal interests and measuring or researching the necessary information before modeling the scaling of the ratio through tables or double number lines. Three teachers implemented the project,

each putting their own twist on the final product and presentation for the work (two made stop-motion videos and one made posters in Photoshop). Allie, one of the co-designers and implementers, found that the project was engaging and the math work was rich. She went on to say, “Differentiation was really inherent in this project because students were able to come up with their own questions. I challenged my higher achieving students to come up with problems dealing with volume, while struggling students created problems looking at area or even just length or height.” She further reflected that another few days to implement critique and more drafts would have made their products even more excellent.

Ben, another teacher who helped design and implement the Fermi project, noted that one particular student who is often off task and unfocused was enabled to thrive in the project. “Even though he struggled with the math,” Ben stated, “he focused on the creation of the video in which he was implicitly outlining the math steps along the way.” Ben observed that because the problem was open-ended and kids could pick topics based on interest, there was deeper learning happening through the project. He further reflected that one challenge of the project was the tedium of the stop-motion video—some students got lazy and left the math out of their video even though they had clearly used the right tools in researching, setting up, and solving the problem initially.

In starting with a topic that interested us—Fermi’s estimation work—and in following a structured design and critique process, we teachers were able to work together to design a rich math project that engaged the students in deeper learning at all levels.

“Forward” Project Planning: PolyMEDron Project

Geometry presents the largest shift in the Common Core standards. As a result, it has been challenging for our 9th grade teachers to find a wealth of resources that properly convey the sought-after content and skills. In thinking about how to approach geometry this year, my colleague Amy Callahan and I sat down with two High Tech High Chula Vista Teachers. Our goal: take the Constructions and Rigid Motions geometry standards and create a project that highlights the core content in a rich and meaningful way to the students. When I first

met with Gavin and Paul, project co-designers and implementers, they had already looked through the standards and had a vague idea of where they felt the standards leading them: something along the lines of constructed polyhedra that could be displayed in mobile form or be hung in some way. In our planning time together, the four of us dove into the math standards and the mobile idea to see how they matched up. Two of us worked on physically constructing nets while the other two focused on technology, tinkering around with Geogebra until we learned the program well enough to use rigid motions to create nets. As Gavin and Paul put the project design into final form, they dubbed it “PolyMEDron” because after students constructed the net, they would export the image into Photoshop, where they would put images that represented themselves on each side of the polyhedral before printing, folding, and displaying the project for their school-wide exhibition.

The content of the project focused on constructions and basic definitions of rigid motions. As Gavin reflected, “Students were able to utilize their knowledge about constructions while learning about computer programs such as Geogebra and Photoshop.” Through the use of these programs, students became engaged in Common Core standards of practice: modeling with mathematics and using tools appropriately.

The PolyMEDron Project was not without flaw or hiccup. Technology problems such as freezing computers seemed to make the project take much longer than intended, and it lost steam in the process. Gavin further reflected, “The outcomes of the project were that students had a better understanding of how nets can be constructed to become polyhedrons, and students became very familiar with Photoshop. I do not think students were able to deepen their understanding of geometric constructions through this project which was the initial unit that we designed this project around.”

Though the content learning outcomes were not directly in line with what we set out to address, there was deeper learning as defined by Mehta (see below), in that students faced the task of doing most of the mental work themselves and that they were “playing” with the mathematics with the goal of making something artistic and representative of themselves. In terms of next steps, the teachers now have a launching point for how to address these standards next year. Whether the decision is to modify and implement a similar project or to take the standards and head in another direction with them, there

was a definite learning experience for both students and teachers in this process, as always in project based learning.

The Common Core and Deeper Learning

No doubt some combination of forward and backward project planning is the reality for most teachers planning projects. Nevertheless, the basic process of starting with either content or passions and then developing the rich math content through co-planning, brainstorm, questioning, and critique is one way that HTH teachers have combined our passion for projects with our desire to “give the common core a shot.” For teachers familiar with projects, it has brought an extra dimension to our math project planning time, leading to richer math projects. For teachers new to our organization, like Gavin and Allie above, it has provided a framework to structure and tune the project for next year. Jal Mehta (2012) defines deeper learning as both challenging and open-ended. He further says that it matters to students because it is linked to questions. From the students’ perspective, there is a regular grappling with uncertainty, the real possibility of failure, and the knowledge that they are doing most of the mental work. Using our High Tech High philosophies and structures as a guide, the teachers and I have gone about the year planning math projects, this time with the Common Core in mind. In co-planning projects and then observing as the projects are put into motion, I have seen evidence of both reflective teaching and deeper learning.

The Common Core has helped to structure our conversation and guide the rich mathematics in the projects. All of our questions around teacher autonomy and deeper learning have not been answered, but our ability to infuse and even feature Common Core math within our project based learning environment is exciting. We hope the Common Core will broadly impact others as they see that the new standards really do call for deeper learning like that in project based learning.

Visit www.hightechhigh.org/math for resources that High Tech High has been using to support teachers’ transition to common core this year.

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photo courtesy of Lindsey Ott

Design Thinking and the Shift from Refrigerator Projects

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Do you remember as a child the sheer thrill that came with having your work displayed on the family refrigerator? We do. Vividly. “Fridge-worthiness” was granted for only the best and did not come easily, especially for those of us with competing siblings. It often served as an exhibit for the artistically inclined and a trophy case for the non-athlete. Growing up, it was the height of affirmation in our households. When we became teachers, we strived to transform the walls of our school into our very own refrigerator—a showcase for supreme student work.

As we initiated this effort, the results were almost immediate. Our projects focused on compelling products, and critique was embedded throughout the process to ensure beautiful work. We were not just teachers anymore; we had become curators of excellence. Educators throughout our district and beyond came to see our gallery of artifacts. We must admit, the notoriety was flattering and drove us to further improve with each installation. It wasn’t long before we started separating student work into two categories: those worthy of our walls and those worthy of the trashcan. The end product was increasingly

trumping the learning process, and this was not lost on our students.

A turning point came one day after school as we were admiring a recent installment. One of our students—let’s name her Destiny—approached the wall hoping to find that her project had been displayed. Disappointment sank in as she realized her work had not been chosen among the elite of her class. In an effort to alleviate the uneasiness of the situation, we started in with some conciliatory compliments about her efforts. We were about to kick in the “maybe next time” speech, but she stopped us with one simple question: “Do you think we can do a project that isn’t just for our walls?” We were a bit surprised by her question. We told her we would “look into that” and sent her on her way. We wanted to dismiss her as a jealous student, but her question was relevant and worthy of a better answer.

Destiny’s question struck a nerve and, for the next few weeks, we struggled with how to proceed. On one hand, we were proud of the work we designed for our students. Not only were they creating incredible products, but they were doing it while learning significant content and developing a 21st century skill set. Every project included opportunities to collaborate, gain feedback, and communicate their results. On the other hand, we were not challenging students to solve complex problems—especially those that extended beyond our school. It was also evident that we had not created a culture of self-directed learners. We gave all the marching orders about what would be learned and how it would be defended. Most troubling, our students seemed all too happy to fall in line and play the “teacher pleaser” game. After reflection, we made it our mission to find schools, businesses, and organizations that were routinely seeking and solving authentic problems. It didn’t take long until we discovered the design thinking method.

Design Thinking

Design thinking is an iterative process that facilitates problem identification and solution generation. It is an approach to learning that is product focused, uses empathy to identify problems, promotes a bias towards action, encourages ideation, and fosters active problem solving (Kwek, 2011). Design thinking is used to solve design challenges, or units of study structured around real world problems linked with

interdisciplinary academic studies. Design challenges begin with an authentic and open-ended question that launches the design thinking process (Carroll et.al., 2010). Most practitioners of design thinking have adapted the components of the method to meet the needs of their students. The components of design thinking as adapted by The G School (2012) are:

- Gather
- Glean
- Generate
- Gauge
- Go

Gather: What do we need to know?

The first phase of design thinking is focused on understanding, empathy, observation, and research. During this phase, students consider the challenge they have been issued and determine what information they need to gain empathy for their users. In the Gather phase students participate in a variety of activities such as primary and secondary research, anthropological observation, interviews, surveys, listening and conversation. The goals of these activities are for students to uncover needs, identify users, and discover emotions and motivations that guide behaviors (Stanford, 2010).

Glean: What is our focus?

The Glean phase is all about developing a focus. Students must synthesize the information obtained during the Gather phase and identify a clear and actionable problem statement. The Glean phase should reveal the point of view of the user as well as provide a platform for further innovation.

Generate: What are the possible solutions?

The Generate phase is concerned with moving from convergent to divergent thinking. During the Glean phase, students have developed a tight focus. In the Generate phase, however, students produce as many ideas as possible. The most common method used during this phase is brainstorming, which may occur in a variety of formats. Students adopt a brainstorming mindset by adhering to a few rules: one conversation at a time, build on the ideas of others, go for quantity, encourage wild ideas, be visual, and defer judgment (Stanford, 2010). Brainstorming encourages students to uncover unexpected ideas and insights. During

the Generate phase, students collaborate to leverage the power of the group and build on the ideas of others (Carroll et. al., 2011).

Gauge: How do we build and test our ideas?

We often begin the Gauge phase with a reality check. Students have documented all of their ideas while deferring judgment in the Generate phase, but now they must find a solution that will work for their users. Adding constraints and then building and testing ideas encourage this. Students begin by prototyping their possible solutions. A prototype can be any type of artifact that can test a solution: a blueprint, sketch, model, storyboard, or even a skit. As prototypes are built, they are also tested to ensure that they are feasible, desirable, and viable (Brown, 2009). During the Gauge phase, a strong feedback loop is constructed to empower students to create, test and repeat the process until a final design is achieved.

Go: No more questions. Time to GO!

Once prototypes have been tested and final designs have been refined, students then create and implement their final solutions for their intended users. This phase is critical, because students are performing work for an authentic audience. The solutions are no longer mere ideas or prototypes; they are now real. Students present their findings, reflect on their progress, and assess the impact of their work.

The International Corridor: A Case Study in Design Thinking

The achievement gap and cycle of poverty have been well documented in the community served by our high school. Both of these factors have resulted in a low graduation rate, failing test scores, and a defeatist attitude shared by a large portion of the student body. The majority of students served by our high school are minority and face significant socioeconomic challenges. Generational and situational poverty are common. The high school is set in an urban environment surrounded by the “International Corridor.” The name “International Corridor” was bestowed on the neighborhood to reflect the diverse businesses and cultural centers that line the streets. This neighborhood stands in stark contrast to the upper middle class neighborhood directly adjacent to the International Corridor. Our neighborhood is a reminder of the results of suburban sprawl with its aging infrastructure and vacant buildings. While the diversity in our neighborhood makes it arguably

the liveliest and most fascinating in our city, it also creates a unique set of challenges for our students. In our newly adopted quest for authentic learning and solving relevant challenges, there was no more immediate problem to be addressed than the needs of our students and community.

As we sat down to consider how to best meet the needs of our learners, we decided that the most important characteristics of this challenge would be: identifying and solving a real and meaningful problem, increasing student engagement and commitment to the educational process, self-directed learning, and mastery of core content. Now that's a tall order! We issued our students a simple, yet complex design challenge: "Identify an existing community problem and implement a solution or intervention." Each group would be responsible for writing their own driving question, designing a solution, and presenting it to a relevant audience.

The academic subjects addressed in this Design Challenge were World Geography, English, and Foundations of Innovation and Design (a language arts elective course focused on research, empathy, and writing). As an entry event, the students went out into the community and created scaled maps of the neighborhood, paying close attention to the local businesses, residential areas, and services available. As they returned to school and embarked on the *Gather* phase, they created scaled maps of the area and learned relevant concepts relating to community and social justice. They defined terms such as community, social justice, spatial justice, and cyclical poverty. We conducted whole group discussions about the potential needs and barriers to success in our area. Each team of students learned interview techniques and practiced writing effective interview questions. Once armed with interview questions and a plan of action, the students revisited their community and interviewed business owners, patrons, pedestrians, workers, and the occasional loiterer.

As students moved into the *Glean* phase, they thought critically to synthesize the information they had gathered. They coded their interview transcriptions and observations to identify possible themes and define potential users. "Composite Character Profiles" (Stanford, 2010) were created to define and generalize the population of the International Corridor. Students generated "Empathy Maps"

(Stanford, 2010) that demonstrated a deep understanding of their users as well as exposed deficient areas that needed to be further investigated. Taking a large amount of data and reducing it to one user was a challenge for groups of four to six students. They had to stretch themselves to collaborate in a way they had not done previously by making concessions, compromising, and offering real insights. From a wealth of information, the students identified community issues and crafted a driving question that would be the catalyst for their self-directed learning as the challenge continued.

Perhaps the most challenging part of this process occurred when each design team wrote a “Point-of-View Madlib” (Stanford, 2010) for their user, which we referred to as the driving question. Students created a variety of user-centered driving questions:

- How might we help cashiers in our community feel safer while at work?
- How might we help Asian shop owners better connect with store patrons?
- How might we help improve the image of Hispanic-American youths in our neighborhood?
- How might we make our school food and clothing pantry more appealing to community members in need?

While by no means an exhaustive list, this represents the variety of users and needs identified by ninth grade students using the design process. Equipped with a unique user and challenge, each group moved to the *Generate* phase, which pushed them to brainstorm multiple possible solutions for their community issues. After several rounds of brainstorming, clear front-runners emerged. Students created proposals that highlighted their most feasible, desirable, and viable ideas.

The *Gauge* phase of this design challenge was where self-directed student work became critical. Each team was responsible for prototyping their best ideas. The prototypes were unique to each group based on the desired end product or service. Teams created storyboards, cardboard models, blueprint drawings, sketches, among other low-resolution prototypes. From a classroom management perspective, we had to trust students to carefully plan their daily activities. This was done through a weekly calendar that contained a daily list of activities and

materials needed. Each team maintained a daily journal that compared each day's projected activities with the actual activities completed for the day. These documents were shared with the instructors using Google Apps, allowing us real-time management.

After careful planning, testing, feedback, critique and revision, each team decided on a final product to address their driving question. The class instructors conducted team meetings where each team presented their prototypes and a detailed proposal of their product that included a rationale for how it would address the needs of the chosen users. Finally, it was time to GO! We secured the necessary supplies for each team and they began working to make an impact on the International Corridor. The products ranged from a self-defense DVD to be distributed to local workers to a full size display case to make our food and clothing pantry aesthetically pleasing. The design challenge culminated with each team presenting their solutions to community stakeholders.

Reflection

Discovering design thinking became our watershed moment. It removed our “product tunnel vision” and reminded us to value the process of learning. And it was precisely the process that empowered our students to learn with autonomy and solve complex problems. The products and experiences were real and impactful—and now breathe life into the community. Our students made us realize just how trivial some of our previous “refrigerator projects” really were. It makes us wonder what else they're capable of teaching us.

Our journey began with a student who asked a clear, concise, and uncomfortable question. Thank you Destiny for speaking up when we needed to hear you most. You did more than start a revolution; you caused a revelation.

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For more examples of design thinking visit: <http://www.thegschool.com>

Deeper Learning for Professionals

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Many of the professional development experiences we have as K-12 educators are lackluster. At their worst, they can be uninspiring, inauthentic, and ineffective. A waste of everyone's valuable time.

On the other hand, professional learning can be stimulating, inquiry-driven, and powerful. It can ignite our lives as both teachers and learners. How can we spend more time in these rich experiences? What is it that sets these experiences apart?

The impetus behind deeper professional learning is to apply the ideas of inquiry, self-direction, critical thinking, and collaboration to our own professional learning as educators in order to have experiences that enrich our learning and that of our students. When teachers come up with their own questions about their practice, such as “How does openness afford new kinds of learning?” and explore them together, powerful learning results. And by participating in this kind of learning as educators, we are able to understand and apply it in our classrooms.

A couple years ago, I began to take a closer look at my own experiences in professional development, both as a participant and as a facilitator, and found them to be lacking. Too often I found myself standing on a literal stage suggesting that “sit and get” methods were less than optimal in participants’ own learning environments. Too often the workshop agendas were set by the district administration with little or no input from participants. Too often there was not enough time for meaningful group discussion, collaboration, and hands-on work, and too little follow-up afterward.

P2PU School of Ed

This led me to explore other learning models, in particular peer learning in open spaces. Through Peer 2 Peer University (P2PU), I discovered a model of learning that was participant-driven, community-based, and open (in all senses of the word). While my first experiences with this model were not related to K-12 education, I soon saw the obvious application to deeper professional learning for teachers.

And so began the P2PU School of Education (www.p2pu.org/school-of-ed). While I was the founder of this school, like everyone in peer learning, I am both a facilitator and a participating learner. I started this school to experiment with providing authentic, peer learning experiences for K-12 teachers.

In the fall of 2011, we launched our first seven courses, which were well received. Some of our initial premises were proven out. The learning was extremely social with the conversations among participants being active and vibrant. High quality facilitation was critical. One facilitator said, “It is clear to me that my participation, encouragement, cajoling, and also complimenting, has an influence in the quality and quantity of participation.” Among our richest experiences were the asynchronous online discussion threads and the synchronous gatherings via web-based tools like G+. Groups of teachers spent time together, exploring and negotiating the meaning of topics like student engagement, writing across the curriculum, and content curation.

Other suppositions we had were not supported. Surprisingly, the high quality content we had invested in developing was not the most valued part of these groups. In fact, it was sometimes discouraging

that participants did not even seem to be reading the course content we had worked hard to assemble. My own course on open educational resources was an example of this with participants sometimes veering off into discussions of free, but not open, resources, which was to me a counter-example of what the course attempted to convey. It was a strong lesson to me in “less is more” and in what kind of content best lends itself to peer learning.

We also found that the most important instructor/facilitator skills were not necessarily content expertise, but rather community building and group facilitation ability. Contrary to what we originally supposed, a high level of content expertise on the part of facilitators may even dampen the peer learning experience, as participants are more prone to want to be “taught” by the experts, rather than fully engaging in the peer experience.

One challenge we ran into, not uncommon for online learning, was sustaining participation levels. One facilitator found that comments could sometimes draw people back in: “I think people want to participate but get busy in their lives, so if a comment makes them feel like they can jump back in without too much effort, they will.” We also found that some people came back to the courses even after they had formally concluded, which has been gratifying.

Participation seemed at times to be sporadic or declining; however, when we probed deeper, we found that there were a significant number of “lurkers” who were gaining value from the course, despite their apparent lack of participation. One evening I facilitated a web-based discussion with course participants and was surprised to see a participant who had not been active in the course previously. I’d assumed she’d dropped out of the group. She didn’t participate much in the web conversation, but afterward she asked me if I could stay on for a few minutes. She then told me that this course had changed her classroom. She said, “This has totally opened up a whole new world for me. This is absolutely fantastic. I’m just enthralled with all the goodies that I can now use for my students. Thank you, thank you so much for hosting such a fabulous class for us. I really appreciate it.” This comment brought tears to my eyes and made all the frustration worthwhile. It taught me that you can’t make assumptions and, as one participant said, “Lurking is a ‘stage of development’ in the online space.”

One epiphany for me was when a participant said, “I was hoping to be taught something but instead we are doing the teaching. I really don’t have time right now to collaborate on someone else’s project.” I had assumed that when participants signed up for a peer learning experience, they would be expecting collaboration.

I came to realize that deeper professional learning is a new experience for many people. Self-direction in learning is often not a natural or comfortable task for those who are not practiced in it.

Upon discussing this with others, we decided to put together a course called Empowering Your Personal Learning. This was the first instance where a core group of co-facilitators/participants brainstormed the course outline together. This kind of participant-inspired, inquiry-driven group has been very successful.

What We’ve Learned

Almost two years and 30 or so courses later, there are many things that we have learned in this grand experiment.

First, in our experience, the formation of community has been critical. The social nature of peer learning relies on trust and relationships. This is not something that can be fostered over a few weeks. While this kind of community-building takes time, we are beginning to see some evidence of it at P2PU. In large part this has been due to the ongoing, generous participation of many individuals, as well as organizations such as the National Writing Project. We have benefitted greatly from the participation of their already-existing community of passionate and deep thinking educators who share our values and goals. I personally feel a great friendship with many of the people I’ve met through this experience. When I have a challenging question or an inspiring victory to share, they are the people I turn to, whether through P2PU, Twitter, G+, email, or phone.

I have also learned that peer learning experiences work best when they are designed by the group, not instituted from the top down. Going through a collaborative design process as a group also seems to free up participants to suggest their own course-related activities mid-stream. In one course on curation, several participants added course activities

that were far more useful than the ones we had originally planned. This felt to me like a turning point in our process and a real victory for peer learning.

We've found that diverse groups of learners add to the conversation. At P2PU, we have significant international participation, as well as that from various disciplines and professions. Even for groups that deal with what appear to be U.S.-centric topics, like the Common Core, having this diversity of participants has made the conversations richer.

In terms of logistics, shorter courses (three to four weeks) seem better able to maintain momentum, while still giving enough time for in-depth exploration. These shorter courses can then spin off into more in-depth, follow-up explorations. Courses with defined start and end times have had more sustained participation, as opposed to those with open, rolling enrollment.

One of the pleasant surprises at the School of Ed has been the advent of peer learning groups with students and teachers involved together. Harry Brake from the American School Foundation in Mexico City started a project on P2PU in which students write grants to fund community service projects that they design. This was inspired by a face-to-face project that Mr. Brake had started in Delaware. Now, with this project being online, teachers and students from other parts of the world, as well as a variety of non-profit organizations, have connected and participated. Students are working on grants to improve educational access in Mexico, to build homes for the less fortunate, to support the arts, and to build wells in developing countries.

Another ground-breaking educator, Paul Allison, from the Bronx Academy Senior High, has extended his curriculum through the P2PU community as well. Mr. Allison is a co-founder of Youth Voices (www.youthvoices.net), a school-based social network that encourages students to write about their passions, connect with other students, comment on each other's work, and create multimedia about topics that are important to them. This is deeper learning in action.

The Youth Voices project has recently been expanded to be a full, Common Core-aligned curriculum. Through this, students are

completing projects on subjects of their own choosing at their own pace and direction. Mr. Allison has designed and incorporated badges into this through the P2PU community. For their work, students are awarded badges that count for credit toward graduation. While some call this a gamification of education, one of Mr. Allison's students, Anthony, aptly pointed out in a web meeting with other teachers and students that "this is no game." These students are doing in-depth projects that not only develop core academic skills, but hone important deeper learning skills of collaboration, communication, critical thinking, self-direction, and persistence.

As in other courses, while students have clearly benefitted from Mr. Allison's approach, teachers around the world have also gained from seeing how an innovative approach like this can work. Together, by interacting with this class in the Bronx, we're thinking through complex issues like how deeper learning can be aligned to the Common Core, how student self-direction can be prompted and tracked, and how assessment and credit can be tied to these projects.

I have been involved in doing some peer evaluations with these students and was even able to visit them in the Bronx. Having this face-to-face contact deepened our online contacts. I feel a real connection to these students and often wonder how specific individuals are progressing in their work. Being able to check in on them online helps to maintain the connection.

Through this important work, I've experienced the power of online collaborations with teachers and students. And as in my face-to-face experiences, I've seen that students often drive the innovation in formal educational environments.

On-Going Challenges and Puzzles

As much as we've learned over the course of this experiment, we still have even more to figure out.

One issue that we've wrestled with is the open nature of our learning community. Openness can mean many things, and at P2PU it includes having open-licensed (Creative Commons) content that can be freely shared, remixed, and redistributed; having enrollment that is free and

open to anyone in the world; and having group activities be freely viewable on the Internet and not behind firewalls. I believe that this openness and transparency encourages a kind of participation that is uniquely beneficial.

However, I also recognize that for those who are new to peer and online learning, this openness can be unnerving. In fact, other communities have reported that openness like this can actually discourage participation by some. I'm not sure how to resolve this conundrum.

Another question that plagues many online communities including ours is how to sustain momentum. I feel a sense of loss for all the participants who sign up for a course and then don't participate, as well as every time a participant drops out. Still, I know that teachers are under unprecedented time pressures and that finding the time to participate in extra professional learning opportunities like these is difficult. I have gotten countless emails with stories of personal travails that prevent people from participating despite their best intentions.

At the present, participation at the P2PU School of Ed, for both participants and facilitators (including me), is an opt-in, volunteer activity. Currently, P2PU offers neither formal university continuing education credits, nor stipends, for participation. Are the intrinsic rewards of this participation enough?

In my experiences with more formal professional development, I have seen the detrimental effects of professional development that is offered on a pay-for-attendance basis – participants who are only there to get their check can end up being roadblocks to others' learning. Offering stipends in some ways seems to run counter to the intrinsic motivation inherent in this kind of learning. On the other hand, teachers certainly should be adequately compensated for the important work they do, and most district pay schedules do not provide this.

In our pilot phase, we pursued university credit for P2PU courses. The process involved many long and sometimes agonizing conversations. This highlighted for me the many differences between informal and formal learning, such as participation measures (seat time vs. a competency measure), the role of a syllabus (predetermined and unchanging vs. “hack the syllabus” and make it up as you go),

assessment measures (traditional vs. authentic), and even facilitator qualifications (traditionally certified vs. peer facilitators). At the time, we decided that the compromises we would have to make to be certified to grant formal credit weren't worth the trade-offs. And still, we recognize that teachers need this formal credit to be recertified and to advance on the salary scale.

We have also pondered the potential intersections between informal learning, such as that happening at P2PU, and formal learning, including the many district-provided professional development in-services. I would love to see more districts experiment with deeper professional learning within their institutions. I believe that this could change the nature of professional development and re-energize teachers in their practice. I have seen teachers staying up late in the night to post comments or have conversations with others about topics they feel passionately about. I know that if more teachers had these deep experiences of inquiry, reflection, and collaboration, they would benefit, as would their students.

An Invitation

In doing this work, my sincerest hope is that other teachers, schools, districts, and ministries of education will consider incorporating deeper learning into their professional development plans.

Whether it is through the P2PU School of Ed or other communities, I hope that rich and vibrant communities take hold with more and more people participating. And as those communities experiment, as we have done, I hope that they will share their experiences with us. As with all forms of deeper learning, there will be successes and failures, and it is only through experimenting and sharing that we all improve our practice.

I believe that deeper professional learning has the potential to change not only how we learn as adults, but also to affect how we facilitate learning with students. My hope for the future is together as a community we can make this happen, not just for a few teachers and a few students, but on a large scale.

Project Gallery

*Teachers and Students
High Tech High Schools
and other Innovative Schools*



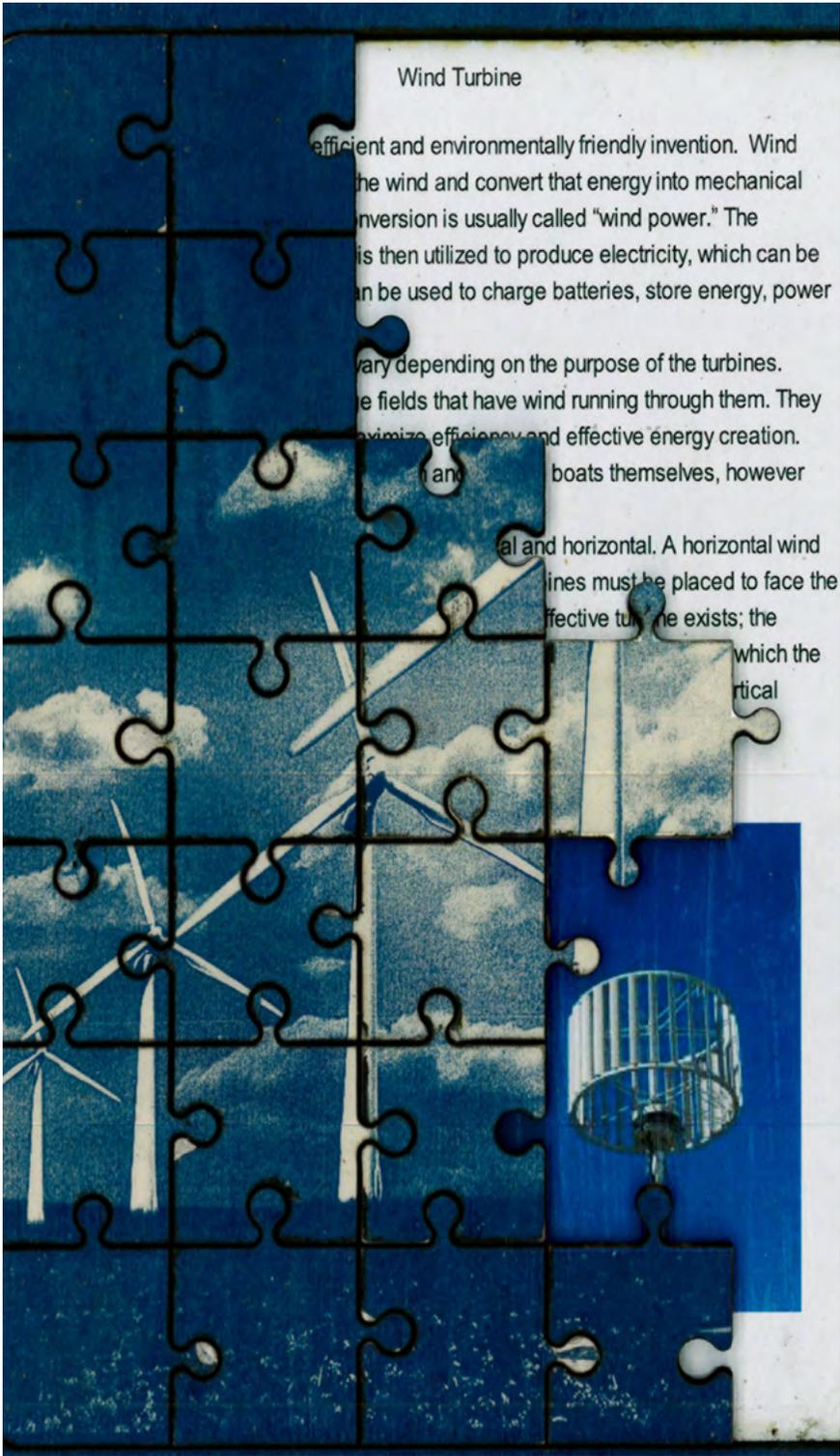
In this gallery, we offer a set of *UnBoxed* “cards” that provide quick, concrete glimpses of projects we find inspiring and practices that support teaching and learning. These cards are now freely available on our *UnBoxed* website with additional teacher and student reflections, in a printer-ready format: <http://www.hightechhigh.org/unboxed/cards/>. Simply print, fold, share and discuss. As always, each card on the website refers the reader to a web address where further information is available.

Wind Turbine

efficient and environmentally friendly invention. Wind turbines capture the wind and convert that energy into mechanical energy. This conversion is usually called "wind power." The mechanical energy is then utilized to produce electricity, which can be used to charge batteries, store energy, power

various devices, and so on. Wind turbines vary depending on the purpose of the turbines. They are often found in open fields that have wind running through them. They are designed to maximize efficiency and effective energy creation. Wind turbines are also used on boats themselves, however

they can be vertical or horizontal. A horizontal wind turbine's blades must be placed to face the direction in which the effective turbine exists; the vertical axis turbine, which the blades are placed vertically



Energy Puzzles

*Don Mackay, 12th Grade Science
High Tech High International*



Our senior engineering students created jigsaw puzzles to introduce energy concepts to elementary age children. Each puzzle picture depicted a source or application of energy and included an age appropriate explanation laminated beneath the puzzle. The students printed their pictures using a cyanotype process and photosensitive paper prepared in class by mixing iron salts that react to form a deep blue dye (Prussian blue) when exposed to sunlight. The developed pictures were decouped to hardboard and cut into puzzle pieces with a laser cutter. A one page description of the energy represented by the picture was decouped to the puzzle frame under the pieces. During this project, students used their knowledge of how light interacts with matter to both create (with sunlight) and cut (with a laser) their puzzle pictures. They also learned to reframe a complex energy concept into a narrative engaging to a 5th grader. Students chose one of four roles: a researcher, an artist, a carpenter, and a chemist. Students assessed each other's product for quality of workmanship, technical accuracy, and adherence to the theme. The ultimate assessment however was the level of engagement on the part of the elementary school students to whom the puzzles were presented.

Teacher reflection

I was most surprised by how much more seriously the students took the project once they realized the final product would actually get used by 5th graders. There were many glitches that could have derailed the project but they repeatedly came up with creative solutions to make sure their puzzle would get delivered. The authenticity of the deliverable was the key. I also appreciated how this project integrated so many ideas and skills, from light to energy to chemistry to writing to carpentry.

Student Reflections:

It was interesting to try and explain wind turbines to a fifth grader. It made me think about exactly how a turbine works, and how to explain it in a simple way.
—Daniel

What I found most interesting was the way that light transfers energy based on the frequency of the light. I now think of this when I think of sun burns, plants, and photos. I enjoy learning things I can use to explain things in my life.
—Madison



Food For Thought

Ali Hernandez, 6th Grade Math/Science

Deirdre Kehoe, 6th Grade Math/Science

High Tech Middle Chula Vista



The Food for Thought project focused on why and how to make healthy food choices. Students researched the food industry in America and the deceptive nature of fast-food advertisements. They learned how to read food labels and discovered the many benefits of vitamins and minerals. Students selected a vegetable to grow and research, designed a kid-friendly recipe that included their vegetable, calculated the nutritional content of their recipe, cooked their recipe many times, and took professional photos of the results. Ultimately, the students compiled a professional cookbook of healthy vegetable recipes for kids. During exhibition, students in chef's hats stood by their cookbook pages and educated visitors about the benefits of their vegetable, how they calculated the nutritional value of one serving of their recipe, and the importance of making healthy food choices.

Teacher Reflection

This project stretched beyond the classroom to connect school and home. I was struck by how powerful it was to involve parents in the critique process. Many parents told me that their child had never cooked before, or was now more appreciative of the food on their table. When you hold the cookbook in your hands, and flip through its beautiful pages, it is clear that 56 children cared deeply about their work.

Student Reflections

We made our recipe at home with the help of our family and then they tried it and gave some critique. They gave some celebrations and suggestions. We took the suggestions into consideration and changed our recipes. This was a very unique form of critique because it allowed for our families to get very involved with our project and truly get an inside look at what we were learning in class. —Sarina

Eating fresh and balanced meals make a big difference in one's well-being. When you eat what you choose, ask yourself, "This tastes good, but how does this affect my health?" —Izadora & Aleia

Find our cookbook on Blurb: <http://www.blurb.com/b/4063342-food-for-thought>

HISTORIC RAP THROWDOWN



Historic Rap Throwdown

Ross Roemer, 10th Grade Humanities

Chris Mutter, Multimedia

High Tech High International



In pairs, students chose and then researched a controversial historical figure that had both a positive and negative impact on history. Students created a fact sheet and eventually wrote a persuasive essay. Next, the names of the historical figures were randomly selected out of a hat to create the rap battle pairings. Teams of four students now worked together to create lyrics for a rap battle. While the majority of the research and writing was being done in Humanities class, students worked on creating a beat suitable for a rap battle in their Multimedia class. Students then recorded their written lyrics over their beat, created costumes, and filmed a music video in front of a green screen and then edited to create an entertaining video that was exhibited on YouTube.

Teacher Reflection:

We both share an affinity for the YouTube channel Epic Rap Battles and, while the original content may not be appropriate for school, we thought it would be a great place to start for a project idea. Our goal was to support our students in creating rap battles that were not only school appropriate, but that were more historically accurate than our inspiration on YouTube. It was a great opportunity to have students demystify historical figures, seeing that even heroes have flaws and villains aren't complete monsters.

Student Reflection:

The most useful aspect that I learned from this project was something that wasn't intended. I did learn a lot of history and multimedia, but the biggest thing I got out of this project was how to not care about looking silly. At first I held back and was afraid of making facial expressions and doing funny dances. As I got more comfortable, not only did the clips become better but I felt better and had more fun while being filmed. After completing this project I feel extremely proud and satisfied about my final YouTube video. —Hana

To view videos go to <http://www.youtube.com/multimediahthi>



Depiction of Woodstock

Turning Points, Toy Theatre

Margaret Noble, Multimedia
Rachel Nichols, 12th Grade English
High Tech High Media Arts



The goal of this project was to recreate and interpret critical historical turning points from the last 150 years in the hopes that these creative stories would stimulate new dialogue about old stories. In order to tell the story with puppets, each student group picked their own topic to investigate, and each member of the group wrote a research paper investigating a unique aspect/angle of their turning point topic. Building on each individual student's knowledge, groups were able to create interpretive toy theatre shows with hand-crafted originally designed paper puppets. With help from the professional puppeteer company, Animal Cracker Conspiracy, students learned to manipulate their puppets in relationship to custom animations, sound, and video works (all produced by the students).

Teachers' Reflection

Experimental projects are the toughest to facilitate. It's impossible to predict what the outcomes will look like as different students create work in their own unique styles. Consequently, the work is very exciting because the students and teachers wander into unknown territories. During this project, students became more and more comfortable with the steady process of critique and revision over a period of eight weeks. By the end of the project, students asked for more rehearsal time and more critiques because they knew these processes strengthened their work. The greatest lesson seemed to be that students learned to trust in the process of experimentation and believe in their capacity to produce beautiful work.

Student Reflection

The take away message of our piece, based off the life of Harvey Milk was that anyone has the power to make or inspire social change. I've learned that while it's important to make change so that people's lives can be lived honestly, it's also important to make change in one's perspective so that new knowledge and ideas can be shared and appreciated.

—Spencer

To learn more go to:

<http://margaretnoble.net/educator/turning-points-toy-theater/>

'THE END OF THE WORLD UNCOVERED



THE MAYAN MYSTERY: SOLVED

By Naomi, Stella & Carlos

The Mayan civilization disappeared in 1517. For centuries, people have tried to figure out why. Some think it was a drought, some think it was a disease, and some think it was a combination of all three. But now, a new theory has been proposed. It says that the Mayans were actually a mix of different cultures, and that they were not as advanced as we thought they were. This new theory could change the way we think about the Mayan civilization.



EXTINCTION IS FOREVER

by Naomi, Stella & Carlos

Out in the cold waters of the North Pole, you spot a polar bear family trying to swim to a nearby ice cap floating in the water. You see the cub waddly waddling, no longer holding onto its own weight. They start to paddle slower and you see them slide under the icy cold water, sinking while water fills their lungs. They drown. This doesn't happen to only one polar bear family, this happens to more than 100,000.

After researching extinction, Stella said, "Until one has loved an animal as part of one's soul, that part remains unawakened to notice how much it matters to the world until one has lost it."

Animal Extinction and Endangered Animals
It's important to understand the difference between endangered animals and extinct animals. Habitat loss, hunting, and the introduction of a new predator or prey are the ways animals may become endangered. Habitat loss occurs when an animal's home is polluted or destroyed. Endangered animals are close to becoming extinct, basically on the road to extinction. Some animals today who are endangered include the polar bear, elephant, panda, leopard, koala, cheetah, wolf, gorilla, and the jaguar.

Extinction is the end of an organism or a group of organisms, normally a species. Some animals become extinct due to the climate changing or natural disasters. Early in history extensive hunting of animals was still being done by people. For example the Tasmanian wolf ate the farms animals of people. It ate the loss of these animals, people shot and trapped the animal. This caused the Tasmanian wolf to become extinct. Some other extinct animals are the dinosaur, mammoth, saber tooth cat, dodo, mammoth, mammoth wolf, and the megafodon shark.

Speciation occurs when a species is separated from one another. They start growing in different places, not different foods, and reproduce differently. For example, red squirrels living in the woods are separated by a river. Some squirrels are stuck on the opposite side of the river. After a few years there will be two species of squirrels. The original red squirrels will exist, but because of the river there will be another squirrel species. This is because in those few years the squirrels ate different foods lived differently, and began to reproduce with each other. They grew in different habitats. The new traits of the new species cause a noticeable difference between the two squirrel species.



Horizon of Doom

by John Boyce, Langston Brown & Hayden Sutalo

Imagine: You're floating in the ocean. Suddenly, you feel a tug. You don't think it's much. Then BAM! You get sucked down to the depths of a whirlpool. Think of that pull. Then think 10,000 times that pull. That's what black holes are like. Black holes are the strongest force in the universe in which nothing can escape. How is a black hole made? Black holes form all galaxies have black holes with masses 100,000 times the mass of the sun," says assistant professor Bruce Osofski of Astronomy at San Diego State University. There is nothing to be done about black holes since nothing can escape them. That lucky for us, our sun is too small to become a black hole.

If you got sucked into a black hole you would be stretched and heated until you were a sliver of matter. Scientists call this process "spaghettification" because you would look like a strand of spaghetti. Originally, Nigel Calder used the term, but later Stephen Hawking expanded on the expression. Other people believe you would be transported by another universe, but many scientists have turned that idea down because in principle, the mathematics of black holes shows they might be able to transport you to another region of space or possibly another universe. However, the mathematics also shows that the connection only lasts for a fraction of a second at a time, and that the link to other universes depends on a specific set of conditions, which may not even exist. In order for something to be sucked into a black hole, it has to be inside its event horizon. A black hole's event horizon is a point beyond no return. If you go there, you won't come back.

There is no gravity in space, but black holes have such a great force of gravity. Does a black hole take all the gravity from space? Maybe that is how black holes are so strong. Since there is no gravity in space, not many people understand how black holes have so much of it. Since black holes are made

When a black hole gets close to a red giant, it sucks the gasses from it and produces a ring. by Alan Diego



To learn more (or to buy a magazine) visit: www.bobbyshaddox.com or mswongsdp.weebly.com

The End of the World Uncovered

Bobby Shaddox, Allie Wong, and Mike Vasquez
6th Grade Integrated Project
High TechMiddle



Students and teachers built this project from scratch. We started with students' questions about the world and themselves. From those questions, an overarching theme for a semester project emerged: The end of the world. After brainstorming and selecting doomsday topics, students conducted authentic research on a wide variety of topics, stretching across academic disciplines. Each group arranged field trips and interviews with local organizations and experts in order to get answers to their essential questions. Finally, they wrote, illustrated and designed a magazine to reveal their findings. The published piece was accompanied by Flash animations. Our magazine launch party (exhibition) took place the day before the supposed Mayan apocalypse (December 21, 2012). We sold 65 copies in just two hours!

Teacher Reflections

The democratic design of this project has shifted my mindset about project design and learning. I watched my class tackle complex issues in their research, interview college professors and take the lead on scheduling field trips. Together we found natural connections between science, mathematics, English, technology and social studies. The project proved to me that a democratic approach to learning is definitely a way to deepen learning.

—Bobby Shaddox

Throughout both the design and execution of this project, I was continually blown away by students' ideas, effort, and collaboration. Students stressed over how important it was for them to make their own choices and work with others. In this project, I definitely felt more like a facilitator or even a participant than a teacher. One of the best parts was watching students make decisions about how to design a project that were similar to decisions I would have made.

—Allie Wong

Student Reflection

I remember the satisfaction that I felt when I was presenting my work at exhibition. They were amazed that a group of 6th graders could do this type of work. When we actually have a say in the project, it makes it more fun for all of us. We had design input which made it more interesting. I would definitely want to try this again.

—Langston



Matter All Around

Meaghan Leahy and Trisha Magoon, 1st Grade

High Tech Elementary, Chula Vista

First Grade Scientists explored the world of matter all around them! They wondered...

- What is matter?
- How can we change matter?
- How can we use this knowledge to help others?

Investigating solids, liquids, and gases led to several fun creations such as play dough, chalk, goo, and bubbles. Our scientists had so much fun exploring and learning about matter that they decided to share their creations with others; they each prepared a Matter Activity Box to donate to children at San Diego's Ronald McDonald House.

Teacher Reflections

Going into this project we wanted to tap into first graders' natural curiosity and excitement, so we built the learning around hands-on, messy explorations. Our instincts were right. First grade scientists couldn't wait to see what each day had in store for them! Their enthusiasm became a natural bridge linking their initial curiosity to authentic learning. As scientists, they wondered, tested ideas, discovered new ways of thinking, and made connections between matter and the world around them. Our students understood the importance of helping families at The Ronald McDonald House and empathized with what it would be like to be away from the comforts (and toys!) of home. Our scientists knew they weren't making bubbles, play dough, and chalk just for themselves—they were excited to give their Matter Activity Boxes away. As teachers who work with the littlest of learners, we were proud this project included so much excitement and learning, and benefitted the community.

Student Reflections

This project was awesome because I learned what matter is, how it works, and how it changes to other kinds of matter. —Zuri

I feel happy because the Ronald McDonald House kids have something to play with so they won't be bored. —Khalel

Now that I donated my activity box I'm so proud of myself. I feel like a party is in my heart! —Carlo



The Learning Landscape

Lindsey Ott, Language Arts;

Eric White, Social Studies;

Ben Williams, Science

The G School, South Carolina



Students often complain about their learning environments, whether it's comfort, mobility, or the aesthetics. They often describe their schools as feeling like a warehouse or even a jail. These oppressive and sterile surroundings are just not conducive to learning. In response to this need, we issued our students a challenge: design a piece of furniture better suited for the 21st century learning environment.

Throughout the project, our students learned how to empathize, synthesize data, brainstorm ideas, and prototype solutions that met engineering, humanities, and design specifications. The project culminated with students designing and building eight innovative pieces of classroom furniture to meet the needs of their clients: a class of fifth grade students that were dissatisfied by their learning environment.

Teacher Reflection

This ambitious project was led by STEM and supported by humanities. As an anthropologist, my favorite part was when our students gathered data to understand and empathize with their fifth grade users, because students are not often provided with enough opportunities to think outside themselves. The most challenging portion was engineering the students' ambitious designs. We empowered them to pursue wild ideas, but we still had to engineer them to meet safety and durability specifications. The most satisfying part of the challenge was delivering the newly constructed furniture to our unsuspecting users. The looks on the fifth graders' faces made every moment of this challenge worth it.

—Lindsey Ott

Student Reflection

We learned core concepts in math, science, and humanities while producing new and innovative designs for furniture. My team designed a Ferris wheel bookshelf that not only stored materials on the shelves, but also had rotating bins where the students could place their belongings. That idea allowed us to tackle a key science concept, rotational mass, in an engaging way that provided us with a great education and the elementary school with a great bookshelf.

—Jon

To learn more visit: <http://vimeo.com/35233751> or www.thegschool.com



Are You Fitter Than a 5th Grader?

*Tara Della Roca, 5th Grade
High Tech Elementary, Chula Vista*

Over the course of 11 weeks, 5th grade students studied the human body, learned about types of exercise that support healthy growth in kids, and worked diligently to improve their own fitness levels. Most importantly, the class developed a solution for motivating their schoolmates to exercise more frequently. They designed and built a parcourse for the school—a permanent fitness circuit consisting of 13 exercise stations including a climbing traverse, tire run, balance beam and log jump.

Teacher Reflection

In addition to giving students a chance to study the body and explore children's health, this project provided opportunities for students to develop their decision-making capabilities as they made the many choices required in designing and constructing the parcourse. The class also learned to manage hurdles that arose at various times related to the installation of their work and additionally, challenged themselves to pursue and surpass their own fitness goals throughout the project.

Student Reflections

It was challenging deciding among a lot of ideas from the class. It was hard to come up with one thing for how the signs should be designed to how the climbing traverse should be painted. But after making all those choices we ended up with a parcourse we're really proud of.

—Raymond

In this project I learned that if you make a mistake then learn from it because when I painted the signs for the parcourse I made some mistakes and figured out how to fix them. It was challenging to make them look just right!

—Alex

The measurements for the frames was challenging because you have to be exact. If you're not, then pieces won't fit together!

—Jaddin

Kids need to get fit and if they're not it might not seem bad now, but it can lead to diseases in the future. I learned to not only stay healthy, but help others stay healthy.

—Jessica



The Great 9th Grade Odyssey

Marra Smith, Math/Physics
High Tech High International



Students worked in groups of three or four to create boats made solely out of cardboard and packing tape. These boats were 6 feet by 4 feet (or larger) and two or more people from each group would set sail in them in the bay. For six weeks students explored the concepts of buoyancy, density, volume, and mass, and how engineering design and scaled drawings could be applied to further their understanding. They built one-eighth scaled models of their designs, tested their models, and then revised their designs on paper before embarking on a week of building their full-scale boats. The project concluded with a daylong exhibition where students showcased their learning of the concepts through demonstrations and displays, and then put their boats to the ultimate test as they sailed away in the bay.

Teacher Reflection:

For two weeks during building, my students continually told me that there was no way that this would work. They didn't even believe me when I showed them pictures of people in cardboard boats. They especially didn't believe me when I told them to check their calculations—they just figured that they did something wrong. They weren't convinced until race day was upon us, and they pushed their boats out into the water for the first time. There was this magical moment and transformation that happened when they truly understood what those calculations and drawings represented. Figuring out the required volume for their boat was meaningless unless they could take those calculations and build a boat they could actually sail. What was even better was that these boats seemed to defy all odds, proving to the students that even when it doesn't seem possible, there is always a way.

Student Reflection:

This was my favorite physics project I've ever done. I really enjoyed learning about density and buoyancy and all of the factors that go into things that float because it gave me a better understanding of how things around me work. It was awesome that we got to design and build our own boats using the information we learned. Testing and racing our boats in the bay was a really fun way to celebrate the end of the project.

—Agustin

Gaining Perspective: Guiding Student Reflection

*Tara Della Roca
High Tech Elementary*

We've all had those days when a couple of minor things go wrong and suddenly the whole day seems a failure. I've spilled coffee on myself getting into the car and then gotten to school only to realize I left something important at home. Next thing I know, I'm claiming to have a "horrible day" when really just a couple of things have gone awry.

Many of our students have this experience daily. They struggle with something or make mistakes that weigh so heavily on them that these things distort their view of the whole day. These children don't have the perspective to recognize that these moments are just small pieces of a much greater experience. They allow these negative events to color their whole day—or sometimes, alter their whole perception of themselves.

Connor is an example of one of these students. He began fifth grade at High Tech Elementary with a lack of flexibility and problem solving skills that caused him to 'explode' in the classroom with disruptive,

inappropriate and sometimes destructive behavior. These moments were so outrageous that they captured the attention of every child in the class, and caused us all to start thinking of Connor as only a collection of these events. Connor frequently called himself “an idiot” or “stupid” and claimed to not be able to control himself—which was an understandable belief after a lifetime of experiences like these.

By October, I had witnessed many of Connor’s “explosions” followed by his belligerent defenses of “I can’t help it, I’m just an idiot.” When I sat down and carefully reviewed a typical day, I realized Connor had positively contributed to several activities when he was not having outbursts. If I could help Connor gain perspective on his behavior, he might realize that he is not defined by his explosions and see that he has the ability to do good things in school (and actually does, at times, too).

I developed a rudimentary tabulation of Connor’s day for several days to help him more objectively review his behavior (see graphic). It was basically a schedule for the events of the day—every minor activity in which we participated. As we progressed through the schedule, Connor and I reported on his behavior and participation in each task. The simple purpose was to have a clear, quantifiable representation of his day. The record was not a behavioral chart aimed at getting compliance, but rather a reflective exercise that allowed Connor to honestly view his own experiences intending to help him feel ownership of his behavior (both good and bad).

After three typical days (days in which Connor’s “explosions” were still dramatic and frequent) the records showed that there were many times during each day in which he was behaving as a contributing student in our class. This surprised Connor so greatly that he actually commented with a proud smile, “I’m not an idiot, am I?” One week of this approach helped to change Connor’s perception of himself; the reports allowed him to see that he was more than just his poor behavior. Even more noteworthy is that this shift in thinking opened up Connor to the idea that he has the ability to contribute in a positive way and it has made him willing to address his problems to help him reduce his explosions in class.

TRACK MY DAY: [REDACTED]

Thursday, Oct. 4th

	Acted as expected ☺	Listening without speaking ☺	Participating ☺	Showing interest ☺	Putting forth effort ☺	Shouting out ☺	Interrupting others ☺	Refusing to do class activity ☺
Morning Mtg. Greeting	mostly ☺	☺	☺	☺	☺			
Morning Mtg. Sharing	☺	☺	☺	☺	☺	some ☺		
Intro to Fitness Test	mostly drawing ☺	☺	☺	☺	☺	some ☺		
Project: Planning body system lesson with small group			some ☺		some ☺			☺
Reflection		☺	☺	☺	☺			
Keess	☺	☺	☺	☺	☺			
Engineering	☺	☺	☺	☺	☺			
Lunch	☺	☺	☺	☺	☺			
Read-aloud: Cricklowing	some writing in tub ☺	☺	☺	☺	☺		☺	
Read-aloud discussion	some ☺		☺	☺	☺	☺	☺	
Written reflection on story	☺	☺	☺	☺	☺			
Math problem-solving			some ☺		some ☺			☺
Zumba	☺	☺	☺	☺	☺			☺

thoughtful writing!

excellent participation led the class!

needed a lot of encouragement for this activity!

difficult getting started

The design of this record is adaptable. For Connor, smile and frown face symbols were appropriate; they made it easy for him to quickly discern between his positive and negative actions. I also divided activities into parts so that Connor could report success during one time even if he didn't behave well throughout the whole event.

In addition to helping Connor gain perspective on his experience, these reports, when shared with the class, helped alter Connor's classmates' opinions of him. His loud and frequent negative behaviors had molded their perceptions of him such that they had trouble seeing around them. The class anticipated poor behavior with every interaction with Connor. A couple of these records, shared by Connor with the class, helped revise their view of Connor and recall and appreciate moments in which Connor contributed to the class rather than took away from it.

I have used this system with other students, as well. Kristine is a high achiever who is incredibly tough on herself. On a day with several successes, Kristine only remembers her mistakes and however minor, feels discouraged by them. I created a chart for Kristine to record her personal successes and failures in a typical day. Following each activity, she gave herself a grade for her perceived experience during the activity. By the end of the day, Kristine concluded positively about her school day even though there were occasional hiccups. The overwhelming presence of ‘high grades’ helped her look past the lower times—times she normally dwelt on extensively. This experience was pivotal in helping Kristine recognize that her misperception of events was causing her distress. Since this experience, Kristine occasionally reverts back to getting greatly discouraged by events in her day; the chart she completed is a powerful visual to look back on reminding her to put things in perspective.

Helping students develop the capacity to view things objectively—to obtain honest perspectives of their experiences—is important for developing reflective students. This simple approach can help students with very different experiences better recall and candidly view their actions and behavior.

A Differentiated Math Lesson, A to Z

Cara Littlefield
High Tech Middle Media Arts

“Ok, get into your groups and start working.” I was sitting in one of my grad school classes and twice in one night I realized I had absolutely no idea what to do when I found my group. This was the second time in one night that I had missed the teacher’s directions. It wasn’t that I was doing something else, it wasn’t that I was intentionally ignoring the teacher, I just don’t process information well orally. Thankfully after years of school, I’ve developed coping skills. I moved into my group, received clarification on the assignment, and started to work. I realized, though, that many of my sixth grade students haven’t developed these skills yet. When they miss directions, I sometimes grow frustrated with them making comments like, “I just said that.” It made me think about how I give directions. I offer different forms of differentiation in assignments, and wondered if there was a way to differentiate the directions as well. I decided it was worth a try.

I have made it a goal to have a class meeting at least once a month to bring up and discuss class issues. Both the students and I are able to bring issues to the table. We happened to have a class meeting scheduled, so I brought up the idea of differentiated directions with

the class. I told students what had happened to me that week in class and they found it humorous. I asked them what we could do to make the direction giving process more effective for their individual learning styles. They agreed that they would like to have more choice in how they receive directions. Some kids requested a specific checklist for the day of what they were supposed to do. Some kids wanted to work with friends to clarify directions. Others wanted to get more one-on-one directions from me. We came up with a plan. Each time I presented a new assignment, I would have clear directions written out and would have five minutes to give a brief overview of the assignment for the day. Then students would have a choice:

1. Get right to work.
2. Clarify directions with a friend.
3. Work in a small group with me.

I was excited to try it out. I decided to start with a concrete math assignment on integers and to embed varying types of differentiation throughout the assignment, not just in the directions.

Forms of Differentiation

Differentiating the content knowledge

My students have a wide range of background knowledge in mathematics. They also process new information at varying speeds. In order to accommodate for this, I usually create three levels of assignments and title them “mild, medium, and spicy.” The assignments all provide access to the same concepts, but at different levels. The mild level is the background knowledge necessary to achieve grade level standards. It usually includes content knowledge from previous grades and builds to grade level content. Medium is considered at grade level. Spicy applies the concept in a more advanced way. Students understand that, although the levels increase in difficulty, they all address the same general content and help them achieve an understanding of grade level content. They are able to choose which level they feel most comfortable with, and usually choose assignments that are appropriately challenging. In this assignment on absolute value and integers, I was only able to develop two “levels.” All students were asked to write integers from real life situations. For example, they translated the phrase “20 degrees below zero” to the integer -20. Mild students then worked on the computer to compare and order integers and to identify absolute value. Medium/Spicy students

compared and ordered positive and negative fractions and compared absolute values.

Differentiating the environment

Within this assignment, I also provided students with choices about the setting in which they wanted to work. Students who needed background noise could use their iPods, students who needed quiet space could work in the commons, and students who liked to work in groups could stay in the classroom. Throughout the assignment, students were scattered around the room and in the common area working on their math.

Differentiating directions

As I mentioned earlier, I wanted to incorporate differentiating directions into this assignment. The day of the assignment I briefly went over the expectations for the day and let the students get started. Surprisingly, no students asked to work in a small group. They all expressed that they had a good grasp of the directions. As they began to work, students began to ask questions. I felt this was a good time to work on their resourcefulness skills. I asked them to re-read directions. Most of the time, the directions answered their potential questions. If reading the directions didn't help I asked them to talk with a neighbor. With only a few exceptions, students were all able to complete the assignment successfully.

At the end of class, we debriefed the concepts from the day and the new direction giving process. In the debrief, students demonstrated that they had a good understanding of the concepts from the lesson. They commented that they appreciated the choice to get right to work instead of having to listen to long, drawn out directions. One student said, "I just don't enjoy listening to instructions because I can figure it out on my own." Another commented, "We can finish our work faster and if people know what they're doing they won't have to sit and listen to what they already know. If they don't know what they're doing they can just go to the teacher and ask for help." Another student who chose to work in a small group mentioned, "I understand the math better when I can work with the teacher." Students also stated that they liked being able to work with friends.

Reflection

After teaching this lesson, I came away with a few insights:

- Students processed the directions as well, as if not better, with the new method. In the past, I was just wasting valuable learning time trying to convey directions whole class.
- Students appreciate choice. Whether it's in how they receive direction, being able to choose their learning space, or even choose what level of understanding they want to pursue, they put forth more effort if they have a voice.
- In the future I would like to use this strategy with a variety of assignment types, including larger scale projects.

One addition I plan on making to the direction giving process is to change up how I use my five minutes of reviewing the instructions. I will start by having the students read the directions on their own, then give a brief overview, then ask them to share their understanding with a neighbor, finally ask for clarifying questions. I think this will provide students with an even more solid understanding of the assignment from the start. And as students work, I will circulate around the room to make it a safe space to ask for more one-on-one clarification.



Taking a Stand on Controversial Issues

Mary Hendra
Facing History and Ourselves, CA



Never doubt that a small group of thoughtful, committed citizens can change the world. Indeed, it is the only thing that ever has.

—Margaret Mead

Agree? Disagree? How passionately do you agree or disagree? What evidence supports your stance?

What language is important as you decide where you stand on this statement? “Never” or “only”? Is it significant that it is “citizens” or a “small” group? What about an individual? What about a large social-networked movement coordinated through the Internet or through cell phones?

These are questions and statements I pose to students—and adult learners—after studying the Civil Rights Movement, most particularly a case study of the integration of Central High School in Little Rock, Arkansas. At this point, they know the history and the players involved. They can talk about the telegrams to President Dwight D. Eisenhower, the battle between Eisenhower and Arkansas Governor

Orval Faubus, and the role of the NAACP. They know each member of the Little Rock Nine by name and have read narratives of student actions and perspectives from several of them as well as other students at Central.

Literally taking a stand on a statement like this helps them take their understanding to a deeper level. This is called a “human barometer.” It is similar to the “four corners” strategy where students choose whether they agree, disagree, strongly agree or strongly disagree. However, the barometer recognizes that there is complexity in the question; that a stance may include some agreement and some disagreement at the same time. When students take a stand, they also listen to other students’ interpretation and evidence and regularly reconsider their stance. “Is my position truly this far over to one side or the other?” “Did my colleague convince me?” I find this willingness to continue to take in new information an important part of students’ development of thought and application of the evidence they have been studying.

Why and When To Do a Barometer

Engaging in a barometer activity can be an effective pre-writing exercise before an essay assignment because it gets many arguments out on the table. The barometer teaching strategy helps students share their opinions by lining up along a continuum to represent their point of view. It is especially useful when trying to discuss an issue about which students have a wide range of opinions. It helps students refine their use of language, line up the historical evidence they can use to support or refute a statement such as Margaret Mead’s, and clarify opinion from fact—both in their own thinking and in that they hear from their peers.

How To Do a Barometer

Step one: Preparation

Identify a space in the classroom where students can create a line or a U-shape. Depending on the space, you can also do this outside or in a hallway if it won’t disturb other classes. Place “Strongly Agree” and “Strongly Disagree” signs at opposite ends of a continuum in your room. Or, you can post any statement and then at the other end of the line post its opposite. I like to use statements that have some

ambiguity so that there is no one clear answer, and students will be able to wrestle with definitions as well as evidence.

Step two: Contracting

Set a contract for this activity. Since it deals with students literally putting themselves and their opinions on the line, it has potential for outbursts which result from some students not understanding how classmates can hold whatever opinion they hold. Reiterate your class rules about respect for the opinions and voices of others, and call for them to be honest, but not insulting. Re-address ways to constructively disagree with one another, and require that when offering their opinion or defense of their stance, that they speak from the “I,” rather than from an accusatory “You.”

Step three: Formulating an opinion

Give students a few minutes to reflect on a prompt or prompts which call for agreement or disagreement with a particular statement. For this particular barometer statement, students prepare by using Facing History’s “Choices in Little Rock” curriculum. This is a rich curriculum which explores the legacies of segregation, the impact of Brown v. Board, and the specific case of integration of Central High School. Students have the opportunity to explore the choices made by leaders, students, the media, and the community, and to identify the consequences of those choices. As they prepare for the barometer activity, they can review the work they’ve done with this unit and/or the documents themselves. It is also nice to let students journal personally about the prompt before taking a stand since they will have to explain their stance to others.

Step four: “Take a Stand”

Ask students to stand on the spot of the line that represents their opinion—telling them that if they stand on either extreme they are absolute in their agreement or disagreement. They may also stand anywhere in between the two extremes, depending on how much they do or do not agree with the statement.

Step five: Explain positions

Once students have lined themselves up, ask the students to explain why they have chosen to stand where they are standing. Ask students to take two steps out and face their peers as they talk about their

stand. This is an opportunity to share with each other, rather than defending their position to me, their teacher. As they do this, only the person who has taken two steps out and turned to face the line should talk. It is not a question and answer time with their peers—they should not be interrogated. After they have shared, another student can step out of the line to share why they are standing where they are. Encourage students to keep an open mind as they listen to their peers; they are allowed to move if someone presents an argument or highlights evidence that alters where they want to stand on the line.

Encourage students to refer to evidence and examples when defending their stance. It is probably best to alternate from one end to the middle to the other end, rather than allowing too many voices from one stance to dominate. Run the activity until you feel most or all voices have been heard, making sure that no one person dominates.

Step six: Debriefing

There are many ways you can debrief this exercise. You can have students reflect in their journals about how the activity changed or reinforced their original opinion. Or, you can chart the main for and against arguments on the board as a whole-class activity.

With Common Core reinforcing the importance of writing, I like to think of this as a strategy that front ends the deep thinking that will create better essays, better thesis statements. After doing a human barometer, if I immediately set students to writing a thesis statement, their position is more nuanced, their thinking more complex, their evidence more grounded.

A Fun Variation

“The international community has a moral duty to intervene when human rights are being violated.”

This is a statement I pose after we’ve spent a bit of time studying the Armenian genocide. It is another statement rich for debate and discussion! I introduce this after studying the Armenian Genocide with a resource book from *Facing History and Ourselves*. Students understand the genocide by this point. They know what happened, when, and who was involved. They know that some individuals chose to rescue their Armenian neighbors while others stood by or even

participated in the violence directed towards them. I have also seen that at whatever time I ask, they recognize this pattern of intervention and non-intervention in other countries and situations at the current time. When I posed this statement in the early 2000s—a time when there was much discussion and disagreement about the US invasion of Iraq—a high concentration stood on the side of DISAGREE! Students’ and teachers’ stances reflected a concern that “humanitarian intervention” was “an excuse for military invasion.” A few years later, as Darfur took center stage in newspapers, many went to the AGREE end of the spectrum.

After giving an opportunity to discuss their personal stance, we take a whirlwind tour of individuals at the historical time period of the genocide itself to go deeper in understanding their choices and the impact of those choices. We look at the words of Ambassador Morgenthau at different points in his progression of thinking. Where would he be on this barometer? We look at Clara Barton, organizing relief efforts in response to massacres of Armenians in the 1890s. Where would we place her on the spectrum in comparison to the Congressional leaders at that same time who advocated the United States make a political statement against the massacres? Does it matter what our capability for action is, how effective we are, or just what we believe? We put their names on big post-its on the wall to show where they might be on the spectrum. We move them around as we get additional people to put up on the wall. We consider larger groups such as “American government,” and then rip those post-its apart as we find we need to understand the multiplicity of actors involved in a category like that.

There is no right answer. It is the process of thinking which is so important.

This type of thinking and discussion is why I teach. It is how we challenge and push our students to nuance and complexity.

All of the resources mentioned in this article can be downloaded for free at www.facinghistory.org



Supplies for prototyping. Photo courtesy of Mindy Ahrens

Scaffolding Creativity Through Design Thinking

*Mindy Ahrens
High Tech Middle*

As I read the students' reflections on our latest project, building hovercrafts, I wondered what I could have done differently. Many students commented that they struggled with their design and working with their group. I noticed these challenges as well. I couldn't help but compare their creativity on this project to another design project we did in the beginning of the year. In September, students were asked to "redesign the classroom" to make it more functional and flexible. When I compare these two projects, I realize there was one big difference about our process. When students redesigned the classroom we used Stanford d.school's Design Thinking process to guide our work. We did not use this during the hovercraft project. I wondered how using this process might have affected student's levels of creativity so I sat down with one of my students, Ethan, to get a student's point of view. Through our conversation, it became clear that he felt the structure of the Design Thinking process helped his group become more creative and cohesive.

The Design Thinking Process

According to the d.school web site, Design Thinking is a process for producing creative solutions to nearly every challenge. Students learn by doing, with a bias toward action in the real-world:

We don't just ask our students to solve a problem, we ask them to define what the problem is. Students start in the field, where they develop empathy for people they design for, uncovering real human needs they want to address. They then iterate to develop an unexpected range of possible solutions, and create rough prototypes to take back out into the field and test with real people. (2012)

This process has become popular in the business and education community because of its focus on innovation, a skill highly valued in the 21st century marketplace. The structures built into each phase allow for high levels of creativity and collaboration, therefore, leading to innovative outcomes.

Design Thinking Phases

	Goal	Why
Empathy	To truly understand the people you are designing for through interviews and observations.	To discover design opportunities within the gaps between what people do and what they say they do.
Define	To craft a Point of View statement: "(Name of user) needs a way to (do something) because/but (statement of issue)." Ex. "Sheila needs a way to have privacy in the classroom because she needs quiet to concentrate."	To synthesize and distill the empathy findings into one specific user and his or her need.
Ideate	To generate as many ideas as possible to potentially solve the user's need.	To focus on the quantity of ideas. Push for "new" and "crazy" ideas to open the mind to different solution possibilities.
Prototype	To build rapid, physical representations of an idea.	To bring an idea out of the brain in order to show it in any physical way.
Test	To allow the user to interact with prototypes, watching for moments where the user is confused, stuck or unhappy.	To learn even more about the user and to refine solutions.

Structured vs. Unstructured Creativity

During the redesign the classroom project, specific structures were set up for small groups to collaborate. Our teaching team decided when

and how students would brainstorm, prototype, and test with the user as I will describe in more detail below. We would eventually build some of the ideas generated, but the focus of this project was to practice the skills needed for design thinking: collaboration, creative thinking, and problem solving. During the hovercraft project, however, students received instructions on how to build the actual hovercraft but had no structure for how to design the top or how to collaborate with their group. Groups had the freedom to design and build in whatever fashion they saw fit. The focus was now on learning physics and craftsmanship skills. I watched as all groups immediately got to work building. They spent very little time formally planning their design and most discussions happened while multitasking. It was rare to see a whole group of four together for more than a few minutes. In our conversation, Ethan reflected on the experience saying that his group had trouble collaborating. They each had separate ideas for the hovercraft design and had to compromise on the final product. He felt that this made the end result less creative than the various original ideas. Some teachers might think that the huge amount of freedom would allow creativity to flourish but it actually did the opposite. Students exhibited their hovercrafts in a “Freedom Fighters” parade for multiple schools to view. Although the learning goals of this project were more focused on science, the real-world audience created the need for a beautiful final product. Many students did not consider the final designs to be their most creative, best work.

Teaching Creativity through the Design Thinking Structure

In *Out of Our Minds*, Ken Robinson, defines creativity as, “the process of developing original ideas that have value” (2011, p 2). He believes that everyone has creative capacities but not everyone develops those capacities. In her book, *inGenius* (2012), Tina Seelig agrees and argues that the skill of creativity can and should be taught. It is not a fixed ability that people either have or don’t have. She also claims that creativity is better taught with a set of formal tools or processes, which may seem counterintuitive to some but actually enhances creativity. Thinking about the importance of formally teaching creativity made me reflect back on our redesign the classroom project. What exact tools and processes helped students reach a higher level of creativity? How did the design thinking process allow us to meet each student where they were creatively but ultimately push them to reach higher

levels of creativity? In each phase of the process, how can I use the Design Thinking process to scaffold creativity?

Empathize and Define

First, I can give students a starting point. The first step in the design process, empathy, was an important scaffold because it gave students a specific user or a starting point in which to design for. As two students, Megan and Nayeli told me later, they actually feel more creative when they have a starting point. Too much freedom and no constraints makes it harder for them to think creatively when it comes to design. During the redesign the classroom challenge students chose one specific user to interview. By asking many questions and then synthesizing all of the information gathered, groups were able to identify their user's specific need or problem when it came to working in a classroom. Some users needed a quiet place to work while others needed music. One student wanted to bring nature into the classroom. Others needed places to put their various supplies. By now designing for the one person they interviewed, students had a narrow, more manageable focus for the rest of the design process.



Ideate

Clarifying the user's need also gave a starting point for the next stage, ideating. Ideating, or brainstorming, is a structured way to record the numerous ideas for meeting the user's needs. There are two ways to push student's creative thinking during this stage. The first is to model a technique called "yes, and." Instead of all four members of a team listing out their own ideas only, students are also encouraged

to build off of other's ideas by saying "yes, and..." For example, one member might suggest a chair that has pocket to store supplies. Another member might say, "Yes, and the chair has an ipod dock." Third member: "Yes, and the chair can be raised to the roof so the student can have privacy." In this way, members work together to build a collaborative list of ideas and all students feel attached to the list. They are not competing for ownership of the best idea. A second way to push creativity during ideation is to periodically call out additional parameters for the ideas such as: what if you had a million dollars, what if you had no money, what if your invention was made in the future, what if it was made for aliens. These suggestions push students past the practical solutions to more innovative ideas. During this step of the process, Ethan remembers his group members building off of each other's ideas to make an even more innovative list than they would have working alone. This "group-think" style made for a longer, and more creative final list of ideas. He felt that this step was also important for building group buy-in for all members. Members had created the list together and were therefore invested in all ideas.

Prototype and Test

Once a group had chosen their favorite ideas, they moved on to the prototyping stage. Students rapidly built example models with various cheap supplies such as paper clips, post it notes, buttons, and tape. Prototyping should be fast and crude for the sole purpose of showing an idea to the user in order to solicit feedback. After testing with the user, groups should make revisions and repeat the process until they have a final design that meets the users original need. This prototype, test, revise cycle leads to creative problem solving in two ways. One, students have to find a way to represent their often wild idea with common supplies such as those mentioned above. Second, they have to respond



to the feedback given by the user to adapt their product. Students may feel compelled to stick to their ideas no matter what. In the Design Thinking process, however, you are responding to someone else's need and are designing for them, not yourself. This helps to separate the designer from the product so that they are not emotionally attached and may result in a more creative end product.

When Ethan's group prototyped for the redesign the classroom project, they designed a table with a privacy shield made of Velcro that also holds personal supplies. He expressed pride in his group's product and felt that it was very creative. When talking about his group's hovercraft design, on the other hand, he felt that his group did not reach their creative potential. Ethan's group did experience many opportunities to creatively problem solve as they built and tested their hovercraft or when elements of their design failed. Ethan was unhappy with the final look of the hovercraft though, and believes that if they would have prototyped first, that would have led to more group buy-in and a more creative final design.

Next Steps

The basic Design Thinking process, and the strategies within each step, are all ways to scaffold the skill of creative thinking. Some students may not need these structures and are able to create amazingly innovative products within complete freedom. That student is rare, however. Teaching through projects has allowed me to see that most students actually need structures to allow their personal and collaborative creativity to come out.

Listening to Ethan's assessment of the two projects made me wonder why students hadn't used elements of the Design Thinking process on their own. I asked him if he would use parts of the process on his own during a project. Couldn't he suggest a brainstorm session or rapid prototyping to his group? He agreed that he could suggest it but thought that a group of four might not agree to do it. He thought a partnership of two would work better. As we talked about the transfer of responsibility from teacher as facilitator to student as leader, I could see that this was the next step in scaffolding creativity. The design thinking process had been carefully structured in the first challenge but now I needed to help students internalize the steps and implement them independently. I can help them make the transfer by reminding

them of the steps involved before starting a project but also allow the group to have autonomy in implementing those steps.

Just as in scaffolding math or language acquisition, teachers should provide structures and supports when needed in order to support all learners. We also need to build independence by gradually removing this scaffold. Creative thinking skills are no different. The Design Thinking Process is just one way to meet students where they are creatively and build their skills from there.

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photo courtesy of Cyndi Gueswel

Don't Just Talk About Character: Teach Habits

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When was the last time you were involved in completing a project for work that didn't require collaboration? Probably a long time ago, if ever. Chances are that most of your important projects require you to collaborate in significant ways with your colleagues. Even though collaboration is essential to your work, it is unlikely that you are operating from agreed-upon best practices for working and talking together. The real world demands that employees enter the workforce with the skills they need related to teamwork, problem-solving, interpersonal relationships, and oral communication. In fact, over the course of the last 30 years, these four skills have moved to the very top of Fortune 500's list of most valued characteristics. (Richards, n.d.). Given this demand, we as educators must ensure that our students develop and use skills like collaboration effectively when they enter the workforce.

The good news is that the education field is currently buzzing with research and discussion about the importance of explicitly teaching these kinds of skills. The Common Core standards and other related initiatives are re-energizing the conversation and raising the bar, not just

in terms of rigorous academic content, but also in how students come to master that content through what is widely referred to as “student agency”—a set of character-related academic mindsets and learning strategies that contribute to students’ academic success. In fact, the groundbreaking report from Consortium on Chicago School Research (CCSR), “Teaching Adolescents to Become Learners—The Role of Noncognitive Factors in Shaping School Performance,” provides a comprehensive literature review showing definitively that student agency has a significant, positive impact on academic achievement (2012). The research makes sense. Consider the significant role collaboration skills play in a vibrant classroom characterized by deep learning: when students follow routines and norms that allow them to navigate discussion and work, they spend significantly more time thinking critically.

What is not yet being discussed, researched, and documented widely is how schools and teachers can intentionally integrate student agency with academics in ways that help students develop the skills they need. (Farrington et al., 2012). In Paul Tough’s recent book *How Children Succeed*, he quotes Angela Duckworth—Psychology Professor and respected researcher in the field of student agency—as she notes, “thinking and talking about character isn’t enough, specifically for adolescents. It’s one thing to know abstractly that you need to improve your grit or your zest or your self-control. It’s another thing to actually have the tools to do so” (2012, p. 92). Though many schools embrace teaching character or social skills, most approach character as a separate set of skills or list of values, often loosely defined and supported by “canned” curriculum with external positive reward systems. Increasingly, however, educators are seeking ways to instruct specifically to these skills and weave them in with academics in authentic ways that mirror healthy professional interactions—like collaboration.

Confused about Terminology?

At this time, there is lack of agreement in the field about terminology, which can cause confusion. In addition to the phrase “**student agency**,” other widespread terms include “**noncognitive skills**” and “**21st century skills**.” The Expeditionary Learning Schools framework breaks character down into two types: *relational* and *performance*. **Relational character** skills are essential for positive and ethical interactions (e.g. kindness, honesty, integrity). **Performance character** skills (or “**habits of scholarship**” are needed to obtain a standard of excellence in academic or real-world endeavors (e.g. organization, perseverance, craftsmanship).

The research of Duckworth and others shows us that performance character in particular can be taught and learned, just as academic content and skills are. Tough quotes Duckworth discussing an idea brought forth by American philosopher and psychologist William James: “Habit and character are essentially the same thing. It’s not like some kids are good and some are bad. Some kids have good habits and some have bad habits. Kids understand it when you put it that way, because they know that habits might be hard to change, but they’re not impossible to change” (2012, p. 94). The term “habit” is powerful. It emphasizes the concept of agency—the ability humans have to make choices about their behaviors—and the notion of practice.

A Promising Solution

In Expeditionary Learning schools—a non-profit organization that partners with schools, districts, and states to continuously improve education for all students—performance character skills, called “habits of scholarship,” are taught at the classroom and whole-school level. Lasting habits will not flourish at the “I” level unless they live at the “we” level first, so the journey begins by establishing school culture, structures, and systems that emphasize the integration of the habits with academics. Habits of scholarship are agreed upon school-wide and taught through every course rather than approached as a separate, stand-alone program or curriculum. Also essential is that all adults in the building deeply understand, practice, and hold themselves and one another accountable to the same set of habits while modeling a growth mindset. It is the adults in the building who establish and uphold the essential “ecology” of agency and habits at a school.

Odyssey’s Habits of Scholarship	
Habit	Targets for all Students in Grades K-8
Responsibility	<ul style="list-style-type: none"> • I can use strategies to engage in my learning. • I can use strategies to complete quality work on time.
Revision	<ul style="list-style-type: none"> • I can use revision strategies to improve my work and actions
Inquiry	<ul style="list-style-type: none"> • I can use the inquiry process to investigate a topic or problem.
Perspective Taking	<ul style="list-style-type: none"> • I can use multiple perspectives to help me understand events and issues.
Collaboration & Leadership	<ul style="list-style-type: none"> • I can contribute to a common goal through my words and actions. • I can effectively implement leadership strategies.
Service & Stewardship	<ul style="list-style-type: none"> • I can make choices that have a positive impact on the environment and community.

What follows is one case study from an Expeditionary Learning school that helps address some of the burning questions framed above; specifically, it shows how one teacher supported students in the development of the habit of collaboration.

A Curriculum that Provides Opportunity for the Development of Habits of Scholarship

At the Odyssey School, a K-8 Expeditionary Learning school in Denver, Colorado, 6th graders engage in an in-depth study of the impact of humans on the health of their local river as way to meet standards in science and language arts. In teams, students develop and implement a scientific study of the river. You can probably imagine what it could look like for a group for 6th graders to go off to the river to implement a scientific study. At best: the team works together to collect data with precision, paying attention to the variables that must be controlled to collect accurate data; at worst: the team tromps around in the river, collects some data (not managing to control any of the variables), disagrees about who will do which job, and loses expensive lab equipment.

Any veteran teacher knows that a plan is needed to support students' fieldwork success. The mistake that many teachers make is that they try to control every facet of the experience for kids by outlining a list of scientific procedures, assigning students specific roles, and managing any disagreements that arise. You may be thinking, why is this a mistake? These strategies will certainly help the day run smoothly. However, the missed opportunity is that when the teacher tightly designs the experience, students miss out on learning opportunities. Specifically, students miss opportunities to practice negotiating who will do what, sharing their ideas, and actively listening to others' ideas. Each skill is an important aspect of strong collaboration. What is lost when there is too much teacher control is that students have less opportunity to practice and learn about the habits of collaboration and self-directed learning—two skills considered necessary to support students in mastering core academic content (EPIC, 2010).

Habit Instruction that Promotes Student Ownership

What if instead, the teacher supports students to develop the skills necessary to not only collaborate effectively, but also develop their skills in self-directed learning through careful choices about curriculum,

instruction, and assessment? What if the river day is a culmination of their work toward developing these skills, and instead of the teacher micro-managing fieldwork, he is watching see how well his instruction and support worked? What if students were in charge of their learning, both about the scientific content and habits of scholarship?

Let's take a look at how Jon Exall, a 6th grade teacher at Odyssey, did just this. First, because he knew that students would need to develop crucial collaboration skills, he crafted a learning target linked to both the school-wide habit of "Collaboration and Leadership" as well as to Common Core ELA Speaking and Listening standard 1 ("[Students] engage effectively in a range of collaborative discussions with diverse partners"): I can coordinate my actions and efforts with the actions and efforts of my research team to ensure quality data collection. This learning target was shared with students at the outset of instruction and was in front of them throughout the study; it was just as important as the science content targets addressed concurrently.

Simply having a learning target wasn't enough, however. Jon knew that he needed to build a vision with the students about what it would look like to hit that target. To do this, students watched video of themselves and others working together both in the classroom and in the field. Through video observation and reflection, they developed descriptors for "accomplished" collaboration. They revised the descriptors until they felt they had them right, resulting in a rubric that provided the class with a commonly held vision of what it looked like to hit the target.





Students used a rubric (see Appendix A) to set goals, give each other feedback, and practice items on the rubric that were tricky for them. Because of Jon’s curriculum design, students had plenty of opportunities to practice their collaboration; they practiced as they learned how to control variables, made a plan for their work on the next river day, and learned the scientific skills necessary to measure biotic and abiotic factors in a river. As a result, the river day went off without a hitch. Jon reports, “Students rose to the occasion in terms of collaboration on fieldwork. They really had to. It was the ‘high stakes’ opportunity to demonstrate the habit.”

Amir, a student new to the school, reflected on his experience learning to collaborate with his group: “Some of my work [shows] that I am developing.... I am good at sharing ideas with my crew..., but I was also distracting to my crew, so I should work on that.” While this may seem far from proving that Jon’s technique helped Amir, let’s look back at the first days of the project. While sorting macroinvertebrates, Amir’s table group unanimously gave him the feedback that while he was good at “getting his voice into the crew,” he also interrupted people. Over time, his peers began to give him more feedback about “listening thoughtfully” to what others were saying, and “being flexible.” One month later, Francesca wrote to Amir: “I think you were really flexible and you advocated for yourself and me. You gave gentle reminders to Alex, but then you apologized for being a little harsh.” While the change may seem subtle, the focused feedback from his peers about what he did well as well as what he could change, along with a lot of

opportunity to reflect and practice, helped Amir begin to see success (see critique example below)

Collaboration Critique		
Learning Targets: - I can coordinate my actions and efforts with the actions efforts of my research team to ensure quality data collection		
Collaboration Critique		
Name of Group Member	Collaboration Successes	Collaboration Challenges
Yourself	• Involved in my job and I was flexible because I didn't want to switch off, but I did.	• got distracted because I went to see other groups bugs.
Francesca	You were flexible with jobs and volunteered to trade when other people had the not-so fun jobs.	when one of the other groups caught something interesting, he went away when we were in the middle of identifying one.
Camille	he was really being flexible to the new idea of having him switch off he was really open to the idea.	Amir was not letting us ask questions and he was trying to continue he kept walking away to other groups.
Alex	You are staying in one place and you were really staying involved helping you to correctly and easily identify your bugs.	You were getting distracted by other group bugs. You were missing the identification sheet you are moving around the room.
Karen	You were involved in the work and identifying the macros.	You got distracted by another group. You just said what you saw and not off of the key.

Camille * you also did not

Lasting Learning

This example shows the synergistic nature of improving both habits of scholarship and academic achievement. In order to successfully collect authentic data at a local river (as well as engage in other science lessons held in school), students needed to develop both character and academic skills. They were driven to develop their skills of collaboration because of the meaningful academic content. They cared about the quality of their data because they cared about the health of their local river. They knew it was important to work together, and having a clear target, common language, and several opportunities for self-directed learning allowed them to succeed and help one another improve.

Amir knows that he has to keep working on the habit of collaboration. He reports, “My next step for the future is to not distract my crew. If I have a question, just ask, but don’t get off topic with it. And I would love to keep sharing ideas. I love getting my voice out and heard.” Amir may not have reached “Accomplished” on every criterion on the

rubric yet, but the power of this example is that Amir has grown his own vision about what it means to work well with a group; perhaps more importantly, he has specific goals about what he can improve the next time that he encounters opportunities to collaborate. In fact, this is exactly what Jon intended. He explains that this collaboration study will help students in the future because, “it gives them vocabulary to begin with and will give them a reference point to grow from. They’ll know what is tricky for them as a collaborator and what they are generally successful with. As a result, they can both improve from that point and offer their strengths and experience to future group members.”

Thankfully, Jon will provide Amir, and his entire crew, with plenty more opportunities to practice. He’ll continue to engage students with meaningful science content. He will keep using explicit learning targets derived from standards. The class will continue to use their rubric to drive reflection and feedback. And, though students have room for growth, Jon knows he won’t need to control fieldwork days with canned roles and rules, because students have taken ownership about the work they have yet to do—both in science and collaboration. This type of teaching and learning results in lasting change—learning that students will be able to transfer beyond a single situation to a diffused set of situations, precisely what is necessary when helping students develop true habits of scholarship that will prepare them for college and beyond.

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Appendix: Collaboration Rubric

Your Name _____

Collaboration and Leadership Rubric

Habit Target: - I can coordinate my actions and efforts with the actions and efforts of my research team to ensure quality data collection				
	Beginning	Developing	Accomplished	
Ideas	<p>-Student rarely can be seen collaborating as described in the Accomplished column</p> <p>-Student often needs reminders about his or her collaboration</p>	<p>-Student usually can be seen collaborating as described in the Accomplished column</p> <p>-Student occasionally needs reminders about his or her collaboration</p>	<p>Student consistently can be seen collaborating as described below:</p> <ul style="list-style-type: none"> - Stays on topic in conversation and with attention - Shares their ideas to their group members - Listens actively to group members - Includes others into the conversation – shares the air - Includes others in group work - Advocates for others and themselves - Stays involved through active participation - Shows flexibility with group members - Shows patience with group members <p>Student never needs reminders about their collaboration</p>	<p>Exemplary</p> <p>Student meets description for Accomplished and...</p> <ul style="list-style-type: none"> -Student consistently demonstrates respectful and effective leadership

Comments:

Teachable Moments: A Lesson in Listening to Students

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Many teachers will tell you about a “teachable moment”—that magical moment of learning that propels teacher and student forward: an epiphany. I refer to them as “ah-ha” moments, a Zen-like rush of clarity. These can be times when students have a breakthrough in understanding content, or connect the dots by thinking critically. Sometimes as teachers, we forget that we learn alongside our students. Not long ago, I had my own epiphany. Here is the journey of how it happened.

After many unsuccessful attempts in my first two years of teaching of trying to read the same book with students at varying reading levels, I vowed never to read a “class book” in my 8th grade Humanities class again. They were messy! Students were either disengaged or confused. During my third year of teaching, I resolved to only use the tried and true scaffolded literature circles based on student readiness. I admit, the first time I tried them I wasn’t necessarily sold on the idea for a myriad of reasons. They felt forced. More importantly, the students wouldn’t follow the protocol of sharing their findings. Moreover, if students did not read their book, other group members would suffer.

Students also struggled sharing their views on the novel during their meetings. When I envisioned these student meetings, I hoped to find rich discussions beyond the context of plot, setting and characters. Yet, all students did was read their answers from the question sheet and have flat, forced conversations. Nonetheless, the benefits of literature circles outweighed the negatives, and I stuck with them, even though they lived stagnant in my classroom for several years. I knew something needed to change.

This is when three separate, albeit, almost magical, occurrences happened. I felt as if the stars were aligned and were pointing me in an obvious direction. First, I had been planning my project on immigration. Secondly, it was the week of student-led conferences. Lastly, I had just started my differentiation class for the High Tech High Graduate School of Education.

For the Immigration project, my literacy goal for students was to learn about different immigrant stories through fiction. The novels were intentionally chosen to depict various historical and modern day immigrant struggles. There was a mix of reading levels represented. Some of the titles were *La Linea* by Ann Jaramillo, *Enrique's Journey* by Sonia Nozario, *Uprising* by Margret Peterson, *Breaking Through* by Francisco Jimenez, *Ashes of Roses* by Mary Jane Auch, *Farewell to Manzanar* by Jeanne Wakatsuki Houston, and *Alligator Bayou* by Donna Jo Napoli. When I had done this project in the previous year, I found that my students liked reading their novels, yet did not efficiently complete the dry literature circle assignment sheet.

During each of our student-led conferences, I realized that each student had different talents. Most of them enjoyed the books they had been reading; yet the general feedback was that they did not want to be forced to fill out a sheet. My assumptions were accurate; I knew the sheets were stale. They agreed with me that they were too constricting.

And then it hit me! It is such an obvious idea! I could differentiate the product they need to create to bring with them to their literature circles. I came up with heterogeneous options that gave students the choice of which one they could accomplish. My thinking was that giving students choice on the assignment based on their interests, could help with the struggles with comprehension of the text and could elicit

more student engagement.

Here are the ideas I came up with:

Option 1: QOC	QOC: This stands for quote, commentary, and question. You will be required to find a quote from your week's reading and type 2 Paragraphs answering at least 2 of the following: <ol style="list-style-type: none">1. Why did this quote stand out to you?2. Where does this take place in the novel?3. How does this quote relate to your character's struggles with identity? You must then at the end write a question that you have to bring to your lit circle.
Option 2: Visual reflection:	You will have to draw a scene that takes place from the novel. This image should be in color and best quality of work. You will then explain in one paragraph its significance to the plot, character and cultural identification. You will have to bring this to your lit circle and present in to your group.
Option 3	Write a letter to a character. Choose a character in the story that you feel connected to. Write a letter expressing the emotions, connection, or questions that you have regarding that specific character or elements of the story. This should be at least 1 page that should show your true understanding of that character's life and journey through the novel.
Option 4	Write a poem or song.
Option 5	Write a journal entry from the perspective of character in the novel. Make sure to include as many details as possible.
Option 6	Photo story: Take or Photoshop a picture that represents an element in the story that you feel particularly connected to. Along with the photo, write 1-2 paragraphs explaining the connection and why you chose the photo you did.

My students and I discussed other possible options for the assignments.

As a class, they came up with some amazing ideas:

- Tell a summary with food
- Character symbol pages
- Quote grab book
- Dance
- Comic
- Video blog

After the initial groan my students offer whenever I give them any assignment, the further I explained the options, the more I began to overhear students discussing which ones they were going to do. They liked the freedom to choose whichever option they preferred. They also were very surprised that they were “allowed” to choose the same option for each literature circle meeting. Another change was how often they meet. In previous literature circle assignments, students met twice per week; now they only meet once. This was done intentionally because I wanted more quality and attention to details put into their assignments. It was time to see the results!

Teacher Feedback

The following week, I noticed a number of changes in student engagement. First, I witnessed somewhat stronger conversations regarding the text. Ultimately, however, I feel that I should put more structure into place for the literature circle meetings. Each student shared their work, but did not connect it to the text as much as I had anticipated. Second, students were held accountable for the reading and completed their options. Options one and two were the most popular choices, with options three and six trailing close behind. No student chose to create option five.

There are a few lingering concerns I have about these assignment. The major one is quality of work. While I gave them a full week, I still feel as though they are waiting until the last minute to get it done, and therefore, the work is not their best quality. I also worry that they will get too caught up in the product and not focus as thoroughly on the reading itself.

While it is important for me to reflect on my initial thoughts, I thought it would be most prudent to get feedback from my students. Here are some of their responses:

“I like the new lit circles because they are very open ended. In the old lit circles, we did not have much choice as to what we could write/create because it was more structured. I like the new ones better because we can do almost whatever we want with the assignment because it is formed around our own opinions and choices. Also, the new-lit circles let us choose our favorite option

and elaborate on just one thing. With this set up, we can be very reflective and thorough with that instead of having to worry about 4 different requirements and having to elaborate on something we weren't as passionate about. One thing I don't like about our new lit circles is that for some people, it is not structured enough and they can get away with little to no effort at all. Also, I don't think some people are as motivated to complete the assignment and they may or may not do their part as well as other group members who put more effort into it. I like the way we are doing the lit circles now, though, and for me they are perfect.” —Bonnie

“I think that the options are ok. I liked the other lit circles better because I feel like having to pick an option makes it stressful. I did not know which option to do so I ended up doing my lit circle the day before it was due. I like how we had a structure on the other lit circle.” —Zoe

Judging from the feedback from both students, I believe that these assignments have great potential. I'm excited to see how the project will evolve. I feel as though as I continue to modify and pay attention to student engagement, the literature circle assignments can become even more valuable and accessible for all types of learners at different readiness levels and interests. I have realized a tremendous amount from gaining student feedback through out this project. More importantly, I have learned that it is often not what systems and structures we put forth as teachers, but by just listening to our students, we can have our own “ah-ha” moments.

Mindsets and Student Agency

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Deeper learning requires students to think, question, pursue, and create—to take agency and ownership of their learning. When they do, they acquire deeper understanding and skills, and most important, they become more competent learners in and out of school. They become better prepared to succeed in academics, but also in 21st century careers and in life.

We can't force students to develop agency and drive their own learning. It must come from within. Deeper learning instructional practices, such as using student-centered and self-directed learning methods, encouraging collaboration, and incorporating real-world projects, interviews, case studies and explorations, result in prolific learning when students are ready to drive their own learning. But using these practices is not always sufficient for students to truly take the reins. So what else do they need in order to get in the driver's seat, take agency, and dive deep? And how do we help them do so?

Hierarchy of Learner Needs

A large body of research in psychology and education, focused on areas such as motivation, mindset, college & career readiness, grit,

non-cognitive factors, and 21st century competencies, is uncovering the critical elements needed for students to drive their own learning. It points to two essential focus areas that hold the most promise: Learning Mindsets and Learning Strategies & Habits, highlighted in Figure 1 and discussed in the sections that follow.

Before diving in, let's acknowledge that just like any other human being, students need to meet their physiological needs such as food, safety (physical and emotional), and connection with others. The vast majority of children in the U.S.

meet enough of their physiological needs that these are not a material hindrance on learning. For those who don't, we have a responsibility to provide these needs, at least while they're at school. We can feed students, foster a safe and bully-free environment, and cultivate a learning community in which all children value learning, feel acknowledged and are accepted.



Figure 1: Hierarchy of Learner Needs

Essential Opportunity #1: The Four Learning Mindsets

Aside from physiological needs, students' motivations and efforts are driven by their mindsets—a set of key beliefs they hold. The greatest untapped opportunity to improve learning in our schools is to deliberately work on developing the four Learning Mindsets that stand out in the research as deeply influencing student behavior, outcomes, and overall drive to learn, as documented by the University of Chicago CCSR's literature review *Teaching Adolescents to Become Learners* (Farrington, et al., 2012):

Mindset #1: A Growth Mindset: *"I can change my intelligence and abilities through effort."* Among these beliefs, the most foundational and critical for us to focus on is the growth mindset, first identified and studied by Stanford professor Carol Dweck, Ph.D. Students with a growth mindset realize that their abilities to think and do are a result of their past behaviors. They see effort as what makes people smart, they are motivated to focus on continued growth, and they persist in

the face of setbacks. On the other hand, when students see intelligence or abilities as fixed, they see effort as something only incapable people need, they shy away from challenge, and they disengage when things get hard (Mueller & Dweck, 1998).

A growth mindset can be learned. When we teach a growth mindset, students work harder because they want to do so, they use more effective strategies, and they reach higher levels of achievement (Blackwell, et. al., 2007). While this benefits all students, it also breaks down negative stereotypes and thereby contributes to closing the achievement gap (Good, Aronson, & Inzlicht, 2003).

The growth mindset is the most powerful lever to improve learning because it is the driver of student behavior that we're least aware of and least deliberate about building, and because it has the greatest impact on student behaviors required both to learn knowledge and skills and to build the other critical Learning Mindsets and Learning Strategies & Habits that improve students' ability to grow.

Mindset #2: Self-Efficacy: *"I can succeed."* Related to the growth mindset is the belief that one can succeed (Bandura, 1986). Students must believe that they can achieve their goals, however they define those goals. If students think they need help or resources, they must see a path they can take in order to obtain the required help or resources. The stronger their growth mindset, the more students will seek ways to overcome adversities and search for alternate strategies to achieve their goals.

Mindset #3: Sense of Belonging: *"I belong in this learning community."* When students feel they belong to a learning community, they become engaged in learning (Harvey & Schroder, 1963; Oyserman, Bybee, & Terry, 2006). When they feel they belong to a community of peers that values going beyond one's comfort zone and learning about the world, students connect learning activities and objectives with social rewards they value.

Mindset #4: Relevance: *"This work has value and purpose for me."* As many deeper learning educators know, students engage in learning much more energetically and deeply when they value the knowledge and skills that they're working to acquire, or find them relevant or interesting (Eccles et al., 1983). That leads them to think deeply,

question, pursue, and put their full selves into their work. Project-based learning and real-world connections are ways to foster relevance and help students explore passions, goals, and applications of learning. We can also have students reflect on and write about the relevance of their work, or about a learning experience they're about to embark on.

Essential Opportunity #2: Learning Strategies & Habits

Students with Learning Mindsets are energized, seek challenges and hold high expectations for themselves. But if they don't know what to do in order to meet those ambitious goals, they may develop a sense of helplessness. Or if they have misconceptions about what strategies are effective, they may try, fail, try again, fail again, and eventually question the Learning Mindsets. For example, if a student has the false impression that putting in effort is simply about the amount of time one spends on a task and not about *deliberate practice*, she may not achieve the progress she expects, which in turn may lead her to conclude that her abilities are fixed.

We have the opportunity to teach not only knowledge and skills, but also the self-management and learning-to-learn skills needed in school and life (as well as the Learning Mindsets). We may think that students implicitly learn these skills as they do their work, but without explicit instruction and reflection, this understanding is not as solidly consolidated in the mind and understood (Schwartz, 1998). Research shows that we need experiences to deeply understand knowledge, but we also need explicit discussion and reflection to truly make sense of our experiences and apply our new understanding in different contexts.

We must teach kids how to learn. We must teach them know-how such as:

- how the brain works and how we can increase its capabilities,
- how to manage our learning, including how to set learning goals, self-assess, approach new subjects, manage homework, dive deeper, learn from mistakes and know what to do when things get hard,
- how to engage in *deliberate practice* to develop expertise,
- how to foster innovation and creativity,
- how to work in teams,

- how to manage emotions,
- how to develop willpower,
- how to develop desirable habits through cues, routines and rewards, and
- how to combine habits with tools to manage one's self and one's learning.

Learning Strategies & Habits include a host of self-management and learning-to-learn approaches and behaviors. Some strategies are more universal while others work better for different people or in different situations, but we must teach students how they can better manage themselves, approach learning and pursue their goals. These skills should be part of a basic educational foundation for all children.

The Role of Instruction

The Learning Mindsets and Learning Strategies & Habits enable students to seek and dive into learning opportunities. Of course, students also need quality instruction, guidance and learning activities. Learners need someone or something guiding them toward their zone of proximal development and pointing them to resources and experiences that will enable them to maximize personal growth.

Deeper learning instructional practices are powerful, especially when our goal is to develop critical thinking and performance skills required by the Common Core and 21st century life. However, we must recognize that instructional practices, while critical, are not enough, at least as traditionally defined (that is, when not encompassing instruction on mindsets and learning strategies). Learning mindsets, strategies and subject matter instruction are layers that we need to work on largely concurrently, not just one after the other. They reinforce one another and learning on all three layers is ongoing.

The transition to the Common Core appropriately demands more of students to better prepare them for success. In order to succeed in that transition we must also shift the learners' mind from passive detachment to active engagement and challenge-seeking. We need to develop in students the mindsets, strategies, and habits that cultivate student agency so that students can thrive not only in school but beyond. As we rethink teaching and learning in our transition to Common Core instruction, let's take the opportunity to also incorporate student agency practices.

Realizing Learning Mindsets and Learning Strategies & Habits in Schools

This work can happen in today's schools. At Mindset Works we serve hundreds of schools that are increasing student agency and achievement through deliberate focus on Learning Mindsets and Learning Strategies & Habits.

Here's how they do it:

Start with the adults: Research shows that students' mindsets are heavily influenced by the interactions they have with people around them. For example, studies show that when we praise kids for being smart when they perform well, we inadvertently put them in a fixed mindset. They start focusing on trying to look smart, avoid challenge, see effort as a sign of weakness, and fall apart when things get hard (Mueller & Dweck, 1998). Psychology research clearly shows that language that praises students' intelligence or abilities backfires and leads to students' self-doubt and avoidance of challenge.

In order to create school and community environments in which students value effort and growth, we must educate teachers and parents on relevant research, work to foster a growth mindset in adults, and align around school practices that create and deepen student agency, including ensuring adults serve as role model lifelong learners. Expanding this alignment to include parents is also helpful. Whether schools use resources from organizations like Mindset Works to guide this alignment or develop their own, this explicit work on school culture and practices is an important foundation.

Explicitly cultivate students' Mindsets and Learning Strategies: Just like anything else we teach students, we must explicitly teach Learning Mindsets and Learning Strategies & Habits for students to take on the beliefs and incorporate strategies into daily living. It is helpful to teach students how their brains work and how to strengthen them, as well as effective learning strategies, tools and habits that best enable them to manage themselves. This is best done as a whole school effort so that one result of this explicit instruction is common understanding and language that all students, educators and parents in a school share, so that everyone can refer to that common understanding in everyday

teaching and learning. Doing this work not only shifts students' mindsets but also teachers' mindsets. Our blended learning program, Brainology®, is one way hundreds of schools accomplish this. This work is possible today.



Embed strategies in everyday teaching &

learning: Once teachers, students, and families share common foundational beliefs and practices, the work continues to embed practices that foster student agency in everyday life. Teachers continue to work on language, instructional practices, and their own beliefs, while students work on their mindsets, learning strategies and habits. This does not take additional time. It is about the way we do our daily work, interact with one another and manage ourselves, and it leads to deep beliefs and habits that drive all of students' behaviors.

For example, teachers can explicitly frame lessons or projects as opportunities to work on what we don't know and go beyond our comfort zone to build capabilities. We can make better use of student mistakes and confusion as opportunities to learn, clarify and study the learning process. We can give feedback to students focused on their behavior, their choices, their strategies, rather than on being smart or talented. We can teach performance skills, such as those in common core standards, using content that furthers Learning Mindsets and Learning Strategies & Habits, such as info texts on how people who struggled reached success, or on scientific research about what makes for effective self-management and learning, or about the relevance of our school work to our communities and life. We can have students chart their growth so they can view their improvement over time, and we can have them build growth mindset portfolios exemplifying times in which they took risks and achieved doing something they couldn't do before. We can encourage student goal-setting and reflection on what is working and not working in their learning strategies. And we can serve as role models so students can see that everyone

in our community is a lifelong learner, seeks feedback and takes on opportunities to grow.

Transition to student independence: Once we develop these mindsets, strategies, and habits, we also need to help students own them after they graduate. We can help them transition habits from being driven by teachers and the school environment to being self-driven. Older students can mentor younger students around mindsets and learning strategies, and we can gradually remove the school-dependent cues so that students develop self-driven cues needed to maintain effective habits after they graduate.

We Can Do It

How can we best prepare students for a world that will require more of them? The most important resource in education reform is the learner's mind. We need to re-ignite the hunger for learning that many students lose along the way. Explicit and embedded work on Learning Mindsets and Learning Strategies & Habits puts students in the driver seat of learning and gives them direction and tenacity to chart their paths to success.

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To learn more about the growth mindset or expose it to others, see Eduardo's TEDx talk:

<http://www.youtube.com/watch?v=pN34FNbOKXc>

For resources to build Learning Mindsets and Learning Strategies & Habits see:

<http://www.mindsetworks.com/free-resources/>



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