Ferris Wheel Physics
Morgan Malone & Grace Allen
Our ferris wheel is affected by a centripetal force. The wheel must always have a force traveling towards the center or the wheel would stop spinning in a circular motion.

Primary Blend
Emily Dykheng & Peter Pham
By switching on or off colored lights the viewer can explore additive color—the process of combining wavelengths of light to create different colors.

String Vibrations
Derek Hubbard & Lemuel Calpito
By plucking the various strings and adjusting the tension lever at the top, the viewer can explore how mass, length and tension affect pitch.

Pullies—The Teachers’ Example
Jeff Robin, Andrew Gloag & David Berggren
Students use pully systems to experience mechanical advantage, applying different forces to lift the same weight. The equations show how to find the forces involved.

Analog Flash for Windows
Jeff Robin, Art, High Tech High
David Berggren, Engineering, High Tech High
Andrew Gloag, Math/Physics, High Tech High

The assignment for this senior project was to create an interactive, museum-quality exhibit that fit in a window frame and illustrated a principle of math or physics. Analog: most of the projects were mechanical. Flash: like products created with the Adobe Flash software, the products were interactive. For Windows: the products were made not for PCs, but for the actual 24” x 24” x 5” interior windows in High Tech High.

Timelines and Check-ins
The project took a whole semester, and the students worked on it nearly every day. We used an online calendar and weekly check-ins to make sure that no one was falling behind. We were very strict because we wanted all of the groups finished by the deadline.

Books
Students taught each other the content behind their projects, while creating their own books that included images and explanations of the physics and math for all the windows.

Exam
The students took a final exam on the math and physics represented in all the projects. They were allowed to bring the books they had made to the exam, and the exam comprised one fourth of their final grade.

Teacher Reflections
At first I was a little skeptical of exactly how an art teacher, a math/physics teacher, and an engineering teacher were going to come together to create a meaningful and high quality senior project. In the end, this project turned out to be one of the best I have done in my five years of teaching since coming out of industry, and one that I am very proud of.

—David Berggren

The project worked because the three teachers on the team were interested in learning each other’s perspectives. I wanted to learn the physics and engineering involved, and my colleagues wanted the displays to be artful.

—Jeff Robin

To learn more about this project and others visit http://staff.hightechhigh.org/~jrobin and http://www.hightechhigh.org/pbl
High Tech High Design Principles

**Personalization**—High Tech High schools foster student engagement by knowing students well, tapping into students’ experiences and interests, and building a strong sense of community.
- small learning community (maximum 125 students per grade)
- advisory program for all students
- projects reflect students’ interests and passions
- integrated support services for students with needs

**Adult World Connection**—All students engage in community-based learning, collaborating with adults on meaningful work that extends beyond the school walls.
- students participate in internships, field studies, and other community-based learning
- student projects contribute to the workplace or community
- students regularly exhibit their work to authentic adult audiences
- students have one-on-one relationships with adults in field placements

**Common Intellectual Mission**—All students graduate ready for post-secondary education, work, and citizenship.
- non-selective student admissions; student population is representative of the local school district population
- students are not tracked into classes by race, class, or perceived academic ability
- technical and academic learning are integrated across the curriculum
- school has a full-time college counselor/placement officer

**Teacher as Designer**—Teachers work in interdisciplinary teams to develop curricula and programs for 50-70 students per team.
- teaching staff includes experienced master teachers, recent university graduates, and professionals from the world of work
- curriculum is designed by teachers and reflects their passions
- teachers meet in teams at least one hour daily for planning and staff development
- teachers participate in hiring and orientation of new staff

**Questions for Reflection and Discussion**
How does the school ensure that each student is known well by at least one adult?
How does the school make the adult world of work visible and accessible to all students?
What are the common expectations for all students, across all subject areas?
How is this a place where teachers can and do learn?

To learn more about High Tech High design principles visit [http://www.hightechhigh.org](http://www.hightechhigh.org)
Seniors from High Tech High Media Arts brought the invisible to light during a multimedia exhibition exposing hidden paradigms, underground cultures and unresolved issues. Through documentaries, photo/sound essays, and video installations, students critically explored topics such as graffiti, rave culture, youth activism, self-mutilation, and the media. Students developed their projects in HTHMA’s sound lab, using technology to showcase information they gathered from expert interviews and in-depth investigations of local professional, cultural, and institutional communities. The exhibition took place at the Museum of Contemporary Art (MCA) in downtown San Diego.

Teacher Reflection

Playfulness, curiosity, adventure, fun—must a vast abyss always divide these vital states of mind from academic achievement? Hopefully not! I re-learned a precious lesson from my students this year. Exploring intrinsic passion inspires success and cultivates joy! It is the art of effortless effort, a state of steady flow.

Behind every piece in this exhibition was a story of a student who undertook a personal, artistic, and intellectual exploration, and in doing faced many challenges. For John, a struggling student whose graduation hung in the balance, completing a successful project was of paramount importance. And yet, he could not find a topic to research. My colleague knew John well enough to tap into one of his passions with this question: Is graffiti art or vandalism? Thus, a successful documentary project was born, one that included interviews with police officers, tours of legal graffiti venues, and the creation of several art pieces.

An important element of any project is that student work be displayed for an authentic audience. To that end, my teaching partner and I wrote a proposal “pitching” our project to the MCA’s Educational Curator. The result was one night and ample space to exhibit our students’ work. After the magical exhibition evening, the museum staff were so impressed with the professionalism of the work, they invited our students back. Three months later, the MCA hosted our “Freedom” exhibition, extending its hours to display its permanent collection alongside our students’ work.

—Lacey Segal

For more on this project and others visit http://www.hightechhigh.org/schools/HTHMA and http://www.hightechhigh.org/pbl
Options for Reflection

Choose one of the options below. The goal is for you to reflect on at least one aspect of your practice and, for me, to connect with you about your work and explore ways to provide additional support.

**Video reflection**

Video your class, watch the footage and choose an 8-10 minute clip that you find particularly striking, troubling or interesting. Frame a question to discuss. We will watch the clip together and explore solutions to your question. Try to capture footage not only of your instruction, but also of students at work (building, doing, discussing, solving, writing, presenting).

**Project design brainstorm**

Choose a project that is still in the design stage. Bring relevant documents that you have created. We will discuss design issues: how to develop an essential question, incorporate inquiry, apply the 6 A’s (authenticity, academic rigor, applied learning, active exploration, adult relationships, and assessment), integrate across disciplines, scaffold/chunk deadlines, facilitate critique sessions, develop useful rubrics, etc.

**Looking at student work**

Choose a completed project or assignment that you think could be improved for future use. Bring three samples of student work, ranging in quality, along with relevant project sheets or rubrics. We will discuss your vision for the project compared to what students actually produced and consider how to improve the quality of work next time.

**Action research project**

Choose a dilemma that you are having in class, and develop a methodical approach to gaining deeper insight into that dilemma. You may want to survey students, parents, or other staff members first to gain a broader perspective. For our discussion, bring in your plan for addressing the dilemma based on what you have learned so far. What strategies will you try, and how will you assess their effectiveness in meeting your goals for student understanding?

Building a Faculty Culture of Reflection and Conversation

Kelly Wilson, Director, High Tech High International

Too often in schools, teachers work in isolation with little opportunity to engage in adult conversation about their practice. As a school director, I work with teachers to develop a culture that is collaborative rather than evaluative, where teachers have the time and space to talk about challenges they are facing without feeling like they are exposing themselves to scrutiny or judgment. Our faculty has developed group norms and protocols whereby teachers can discuss and reflect on their work during our regular morning staff meetings. Teachers bring in student work for critique, share dilemmas with critical friends, reflect on student feedback, model and discuss best teaching practices, and observe classrooms using a collegial coaching model. The goal of these conversations is to share our work and make it public, just as we do with exhibitions of student work.

**Supporting Teachers**

Even within our collaborative culture, I have found it challenging to define my role in working one-on-one with teachers. The very nature of my role is in part evaluative, yet I want to support teachers and to stay connected to issues they are grappling with in their work. To that end, I offer teachers four options for reflection and conversation: video reflection, project design brainstorm, looking at student work, or action research. The goal is for teachers to reflect on issues of practice and for us to explore possible solutions together.

**Using Video for Reflection**

In this work I have been particularly struck by the power of video for reflection. With video, the teacher can literally play back the lesson and observe classroom dynamics through fresh eyes, often catching student interactions and conversations they may have missed. This allows for deeper reflection than when I simply share my observations. Our conversations feel more authentic because our discussion is guided by the teacher’s perceptions and questions rather than my agenda. Teachers still receive critical feedback on their work, but video helps us focus our conversations on where they would like to grow in their practice.

To learn more about Professional Development at HTH visit our Digital Commons at [http://www.hightechhigh.org/dc](http://www.hightechhigh.org/dc)
Then print this out and make a painting, like Jewelyn Buduan, senior at High Tech High (front image). To see more student art visit http://staff.hightechhigh.org/~jrobin
Power Lunch engages students in informal conversations with local professionals and serves as an entry point for potential business/community partners. Students choose to attend during regular lunchtimes. After introductions, the floor is opened to student questions, conversation ensues, and the event concludes with students sharing something they have learned.

**Schedule**
To maximize student participation, set a regular time and place to hold these conversations. HTH Media Arts hosts Power Lunch every Friday from 11:45 am to 12:15 pm.

**Marketing**
Post the Power Lunch speaker schedule where students will see it. Involve student leaders to get the word out about the event. Send notices to parents, teachers and students through e-mail. Make announcements at staff meetings so teachers can encourage students to attend.

**Speakers**
Power Lunch participants have included professionals from healthcare, law, graphic arts, film production, biotechnology, university admissions, catering and journalism.

**Testimony**
The value of these conversations is that they open up possibilities for students. Students who want to be small business owners, for instance, can talk about their ideas with me. I can make a suggestion or frame an idea. Sometimes, they need to hear from sources outside their parents or teachers. In my experience, it doesn’t matter who is sending the message. It’s more important that the lesson is learned.

—Adrienne Hunter, Owner, Skyy Limousines

Power Lunch is a great opportunity to experience different professions without going too far down that path. I ask questions about the workday, salary, required education. I feel empowered to make better decisions about my future.

—KJ Edwards, 10th grade, HTH Media Arts

Through Power Lunch, students gain insight into the many, often unanticipated, life pathways professionals have taken. They also learn to appreciate the well-roundedness, flexibility, and collaboration necessary to be successful and happy with future careers.

—Robert Kuhl, Director, HTH Media Arts

To learn more about Adult World Connections at HTH visit [http://www.hightechhigh.org](http://www.hightechhigh.org)
Superhero in the Making
Diana Cornejo-Sanchez, Humanities, HTH Media Arts
Chris Wakefield, Math/Science, HTH Media Arts

This project integrates language arts and physics standards while tapping into students' interests in comics and anime. Student pairs researched physics concepts such as magnetism, entropy, waves, thermodynamics, gravitation, and momentum to create superheroes or supervillains whose special powers embodied these concepts. They then developed short stories—and ultimately, colorful bound comic books—starring their characters.

Teacher Reflection
This project really gave students creative freedom. As a teacher, I got to see students' imaginations at work as they developed a story and translated it into comic book form. Their stories had to include the superhero's discovery of his/her power and how he/she ultimately decided to use that power. This presented an interesting challenge for students, since they had to really build a story line, develop their characters and set a tone. The results were great stories and amazing comic books. Through multiple drafts, critiques and revisions, the students also realized how much work is put into the comics and anime they love.

—Diana Cornejo-Sanchez

Embodying Ohm’s Law
The science concept my partner and I were given was Ohm’s Law. For this, we made a comic called “Strike.” It was about a man named Walter Bithers, who felt that all mechanical objects were against him, from his electric toaster that shuts off while he is making his precious breakfast to his car that suddenly has a dead battery. It isn’t until he is fired from his job and mugged by an unfortunate young kid—who is struck by lightning and dies instantly, with the voltage going through his body and affecting Walter too—that Walter realizes he has the power to put electrical charge back into objects. He uses this new power to his advantage, recharging the toaster and the car, and soon finds out that he can do illegal things like stealing from ATMs. He steals for months, becoming so rich he doesn’t even notice the cops chasing him. But that’s not where our story ends. What do you think will happen?

—Shanna McCue, 9th grade, HTHMA

To find out Walter Bithers’ fate and to learn more about this project and others visit http://www.hightechhigh.org/schools/HTHMA and http://www.hightechhigh.org/pbl
Essential Questions
How do you think Odysseus feels during his journey?
Is Odysseus a hero by modern standards?

The Rhapsodist’s Task
In a “freaky Friday” body swap, you have become the epic hero, Odysseus! As you journey across the Aegean Sea, you will catalog your trials, tribulations, and feelings about each episode in a postcard home to your wife, Penelope. Create your postcards just like the two-sided postcards we send to our friends and family. On the front, provide a colorful illustration of what occurred in the episode (colorful drawings or photo shop are preferred, but clip-art is acceptable). On the backside, type your letter to Penelope, where you include:
• A detailed, vivid account of what occurred
• Your reflections about how the event affected you and your crew
• At least one quote from the Odyssey, followed by a professional citation

The Final Touch
Type your postcards. Make sure each episode has a title and a picture. Create an eye-catching cover for your postcard collection. Then, number your postcards and create a table of contents. Presentation is important for this project, so make sure you allow ample time to type and display it.

Teacher Reflection
Students were asked to create a collection of postcards from the perspective of Odysseus to his beloved wife Penelope documenting his trip through the Aegean Sea. The assignment helped students become more involved in the story because it asked them to express, in writing, the range of emotions Odysseus may have felt while battling one eyed giants, traveling to the frightening underworld, and witnessing the deaths of his men. Not only did students develop a deep appreciation for the Odyssey, but they also came to understand tone and perspective in their writing.

—Angela Guerrero

For more on this project and others visit
http://staff.hthcv.hightechhigh.org/~aguerrero/ and http://www.hightechhigh.org/pbl