“Everyone deserves to feel the power of crossing a finish line,” says the Challenged Athletes Foundation. Our driving question was: What do athletes need to do to compete at their optimum level? This interdisciplinary project examined the physics behind athletic training through the lens of challenged-athlete Kyle Maynard’s book “No Excuses.” We looked at how athletic clothes affect heat transfer, the interplay of torque and prosthetic limbs, designing a better athletic shoe, and products that allow completion of simple tasks without the use of a limb. Students also interviewed classmates, teachers, parents and community members about overcoming struggles, recognizing that adversity does not discriminate and can always be faced with bravery and courage. In addition, the class visited the Olympic Training center and met with challenged athletes. Finally, students volunteered at the San Diego Triathlon Challenge, hosted by the Challenged Athletes Foundation, and created an exhibition at Road Runner sports.

Teacher Reflection
This project created an opportunity for students to really integrate physics and humanities in an authentic way. Students learned about the way the human body functions and how those functions can be augmented by technology in the form of prostheses. They were also able to explore the ethical and emotional considerations of challenged athletes through Kyle Maynard’s book and by interacting directly with challenged athletes.

Student Reflections
Challenged athletes want to be treated like everyone else. They don’t mind if anyone asks them about their “obstacle.” They want to prove that they can do what anyone else can do. —Frida D

This project has changed my perspective of those with physical differences by seeing how they are not really disabled at all. They may have lost a limb or have autism but they go to the Olympics. These people are not disabled in my opinion. They show to millions that they can do regular things that people think would be impossible for them. —John D

To learn more visit: hightechhigh.org/mr-gallagher-s-dp/
Airwaves of Identity
Ashley DeGrano, 8th Grade Humanities
High Tech Middle North County

Airwaves of Identity focused on the media’s effect on cultural thinking and action. Students wrote and produced live radio shows on topics that were deemed important by them (music, pop culture, politics, etc). Students reached out to businesses in our local community for donations, advice, and participation in the event. We partnered with local radio station 102.1, KPRi in order to learn from working professionals in the business. To document the process, students kept weekly blogs that allowed them to post pictures of each week and reflect along the way. Students had a job that was developed and carried out by them for the entirety of the project, including host, script writer, director, DJ, and social networking guru.

Teacher Reflection
Airwaves of Identity built in a tremendous amount of student voice and choice. The students were motivated throughout this project, reaching out to members of the community and pushing each other to meet deadlines and perfect their live shows. The design, process, and products were completely student driven. The final products reflected the students’ dedication and pride for the project.

Student Reflections
I had many doubts going into the project about how we were going to pull it off, but after our first meeting with our group I gained a lot of excitement towards our exhibition. I felt comfortable being able to choose what role I wanted to be in. There was no point where we weren’t using communication in order to complete our jobs and end the project as a collaborating radio show team.

—Ashley S

The project taught me more than I realized. We didn’t just learn history and literature, we learned to appreciate one another and look past everyone’s flaws. Unexpectedly, the whole project brought life to the classroom culture. No student was outcasted, and we became a family.

—Leni A

To learn more visit: msdegrano.weebly.com
Students examined the role of the media in their lives and how they can use the media to positively influence others. They learned the process of creating a film: writing a script, creating a storyboard, conducting interviews, filming scenes, and editing footage. Students who created public service announcements partnered with local organizations and featured them in their films. Those who created mythbusters-like videos researched specific scientific questions that interested them. All students completed weekly blogs reflecting on their learning, successes, and challenges. At exhibition they showcased their films in a student-designed movie theater and shared reflections on the process in our “behind the scenes” room.

Teacher Reflections
Earlier this year we had been struggling with student engagement and motivation. We wanted students to have more voice and choice in this spring exhibition project. Allowed to choose their own topics and video formats, students showed more enthusiasm and ownership of their work. Students were all over the map when it came to choosing a project democratically. We didn’t want to force any specific topic, and they ended up coming up with genuine inquiries that really mattered to them. I believe they were impressed with what they were capable of doing as a team.

Student Reflections
Anyone can make a difference, no matter how young or old. As long as one person takes a stand, others will follow. —Hanna

Self-harm is a big issue that affects teens and young adults. The video was a way to let others know that there are people who care about them and are willing to support them. —Elizabeth

I learned how to become more professional in working in a group, and I learned how to investigate and test my ideas in a scientific way —Micah

To learn more visit: sites.google.com/a/hightechhigh.org/cochran/
Second graders investigated the question, “How do Members of Our Community Show Care and Perseverance?”

Throughout this project, students engaged in fieldwork to show care and perseverance within their community. To begin, we brainstormed people who showed our Habits of Heart and Mind: care and perseverance. Next, we asked various experts to visit us to teach us about these traits and how they show this in their personal life and in their job. During the process of speaking with experts, students generated interview questions, took notes, and debriefed about what they learned.

Finally, the students selected one member of their community who inspired them and taught them about our Habits of Heart and Mind. Students wrote creative biographies and created Norman Rockwell style artwork, developed through multiple drafts. These pieces of work were exhibited at a local non-profit art center in San Marcos called Charity Wings.

Teacher Reflection
I was inspired and amazed at the efforts the students made to help their community. It was tremendously rewarding to see the outcome of our fieldwork as well as how accomplished the students felt. I hope that this project will be an inspiration for students to continue to help others outside of their school and persevere to make a difference in their community.”

Student Reflections
My highlight of the project was going to the beach because we got to pick up trash. —Grant

My highlight of the project was getting to help the community. —Matteo

To learn more visit: mskimtsai.wix.com/htesecondgrade
Plato once wrote, “Music is the movement of sound to reach the soul for the education of its virtue.” Through music, we express who we are. It is an almost universal experience that connects us all. To explore how music can bring us together, students designed and constructed a MIDI (musical instrument digital interface) controlled Jambox. A Jambox is a social music creation device with which people of all musical abilities can come together, manipulate sound, and create music naturally. Our goal was to design an intuitive MIDI device that people of all musical abilities can use. Our essential questions were 1) How can a social music creation device encourage people with a range of musical abilities to create musical art? 2) How can the engineering design process be used to coordinate the efforts of many individuals? Concepts and skills covered included Electricity and circuitry, computer-aided design (CAD), Pugh chart analysis, and soldering/wiring.

Teacher Reflection
Music is a passion of mine and it was great to be able to share that passion with my students through a music-based product. I planned this project to start with a lot of individual designs that came together to create a single product and it required a lot of structures to support collaboration. Once the building phase came, it was amazing to see students supporting each other and independently distributing work. This project most definitely allowed individual strengths to flourish. I also used digital fabrication in this project. This meant that the build phase was optimized and allowed for more time to be dedicated to the design phase, which I consider to be where the meat of this project lies.

Student Reflection
Not only was I able to learn new skills like soldering and computer-aided design, but I was able to get into the user’s mind and determine what would be best for them. During exhibition, it was very obvious that the visitors were having a great time and enjoying their interaction with the Jambox. Overall, this was one of the most rewarding projects I have done at High Tech High.

—Austin

To learn more visit: markpoolesdp.weebly.com
Everyone loves a good carnival, especially the rides! In addition to adrenaline, fun, and excitement, carnival rides provide us a perfect example of simple machines in action. In this project, students combined their understanding of simple machines, motorized mechanisms, LEGO construction, 3D modeling, and engineering design thinking to create their own LEGO Carnival. In groups of four, students designed and constructed “Carnival LEGO” rides, each including a motor and a mechanism using gears or pulleys. Each team also designed and built a unique, scaled LEGO piece to improve the functionality of their ride, as well as an architectural feature scaled to minifigure size to be placed in our carnival. Students designed the LEGO piece and architectural feature on Google SketchUp, and printed them on our 3D printer.

Teacher Reflection
It is important to me that the students make connections between engineering design and real-life applications, such as the use of simple machines in amusement rides, and the ability to create unique, useable parts on a 3D printer. I enjoy presenting open-ended design challenges so the students can witness the creativity and variety of final designs. The excitement and enchantment of the final carnival exceeded my expectations as guests entered the room, hearing carousel music mixed with the whirring of LEGO motors and exploring the colorful LEGO rides, the beautiful architectural features, and computers displaying the students’ SketchUp designs.

Student Reflections
I am proud of my architectural feature because I put a lot of hard work into my Churro Stand. I am also proud of our ride engineer for making our ride happen. The best part was watching it function in our exhibition.

—Rosy

Before the start of this project I didn’t even know what SketchUp was! I also learned a lot about gears, pulleys, and levers. It was also very interesting learning about how the 3-D printer worked.

—Paula

To learn more visit: sites.google.com/a/hightechhigh.org/acrump
What's the Story – an Art Project
Lucy Williams, Year 1 Students
School 21, Stratford, London

This project was designed to develop children’s painting and drawing skills as well as critiquing and redrafting skills. We started with a visit to the National Gallery in London and looking at a variety of artworks. We then explored how to use colours and textures when painting. The children read a story called Beegu and created an artwork using different colours and textures to represent the feelings in the story.

Teacher Reflection
As a new school and new in my role as Project-Based Learning leader this project was a chance to really develop the children’s core skills of critiquing and redrafting. We felt it was important to begin our project with discussions and questions about various artworks so children could explore what they liked about art and how to talk about a work of art. This was a crucial stage as it allowed them to develop reasons for their own choices in their work. Our main dilemma was how to get children so young to produce something beautiful and thoughtful and we hoped this would come through critiquing and redrafting. We taught the children the three rules of critique, which they found easy to recall and put into practise. It was great watching the children feedback their ideas to each other and improve their work from that feedback with each draft. The final products were beautiful and each child could explain their choices and reasoning behind their artwork.

Student Reflection
I enjoyed going to the art gallery because when I looked at the paintings they were better than mine. The feelings I chose from Beegu was when she was tired with the puppies—I liked that part. I used green and blue splats in my first draft because they were confused colours. On my second draft I didn’t do the same. I filled all of the gaps—that’s what my partner wrote. I agreed with my partner and was interested in what she said. She helped me do it neater on my third draft because my second draft is not as neat. I didn’t mind the critiquing. I’ve learnt how to paint more carefully.

—Noah (age five)
We were literally seeing mice run across our floors during our morning meetings. Custodians were spending valuable time trying to trap and remove the endless stream of field mice besieging our school from the open landscape surrounding the building. This was one of those projects that had an “in the moment” purpose which set up the kind of authentic product that we project based teachers are always seeking. After researching the local predators of rodents and carefully considering the impact each might have on the school environment, students decided that owls would be the safest and most effective choice for natural reduction of the rodent population. The students researched, designed, and built their own unique owl nesting boxes. Each team of students created three separate prototypes before building their final products. They also created power-point presentations and wrote persuasive letters that successfully raised more than half of the funding necessary for materials.

Post Script: The owl boxes did indeed attract nesting owls and the school’s rodent population was substantially decreased.

Teacher Reflection
I was thrilled and surprised at the variety of skills this project touched. In math—measurement, conversion, fractions, mixed numbers, area, perimeter, 2-dimensional nets into 3 dimensional products. In writing, research-based persuasive letters to raise funds revealed the deep knowledge students had gained about local predators as well as the owl boxes themselves.

Student Reflections
My favorite part was the actual exhibition because it was fun to show everyone our work. The most challenging step for me was the building because it was hard to get all the measurement right and I had never done anything like it before. —Yasmin

My favorite part was making the prototypes because we made a miniature owl box. —Heriberto

To learn more visit: sites.google.com/a/hightechhigh.org/mr-govoni-s-dp/projects-2012-2013
Re-inventing Romeo and Juliet
Carol Cabrera, 9th Grade Humanities
High Tech High North County

Students created theatrical design elements—lights, sounds, costumes, set—for Romeo & Juliet... but set in a completely different time and place. What if Romeo & Juliet were Israeli and Palestinian? Cro-magnon and Neanderthal? Irish and North Irish? How would these design elements look different? What does it take to create a design pitch that would be funded by a producer?

Teacher Reflection
The idea for this project came from a thesis I wrote for theatre school that set Romeo & Juliet inside the French-Vietnamese Conflict. I realized then that the story could be applicable to any world conflict, and I decided to bring that to my students in this project. Working with Kurt Schwartz on the Physics aspect of this project was one of the easiest integrations in my co-teaching career. When I mentioned “War,” Kurt began talking about the money spent on war machines and the physics of different weapons. The idea of re-inventing these weapons of war into tools for good paired well with re-inventing Romeo & Juliet into this new time and place.

Student Reflections
I learned that a problem between two people can create a war of politics and later, when it is declared “over,” people will find another reason for hate. I will take away with me from this project to be tolerant and do my best to cause change. —Johanna

Researching the conflict was the best part of it. I got to learn so much about the culture of Israel and Palestine when drawing the costumes or sketches. I was fascinated by the war and how long it has been going on. One thing I will take away from this project is that if you let conflict and hatred go on, it spirals into a rivalry that lasts for generations and cannot be stopped. —Bonnie

I’ve learned about the meanings of evil, the mistakes of the past and the possibilities for the future during this project. Learning about these conflicts and finding connections between them allowed us to see why conflicts are often started. —Gabriela

To learn more visit: carolcabrera.weebly.com
In Sickness and In Health
Shani Leader, Matt Leader, Alec Patton and Danjuma Quarless
High Tech High North County

This 11th-grade interdisciplinary project used art, biology, and humanities to pursue the essential question “How can I take control of my health destiny?” All classes and curriculum centered around the theme of personalized medicine and personal empowerment in a modern world. Our commitment to real world application and introduction to experts was a central piece of the project. Through a National Science Foundation funded program we were allowed the opportunity to partner with a researcher for the duration of this project as well as working with other researchers from Scripps Translational Science Institute and UCSD. Project tangibles included art, oral history videos, life maps, research and interviews with scientists.

Teacher Reflection
For two months students were engaged in an in depth learning experience about health and well being. Students created multiple drafts of projects in all classes. They were also engaged in critique sessions that were cross discipline. Across the board, students were excited and proud of their final products.

Student Reflection
The moment that summed up this exhibition project for me, was when I got to talk to another student’s father for a long time about our project work. He was extremely excited to be talking about cardiovascular disease. I think the reason why this moment summed it all up is because the point of exhibition is to exhibit our work to the public and teach them something. But at the same time I think it is an equal opportunity for us to learn more. We can never have too much information or know everything about a topic. In addition, showcasing my art was one of my biggest accomplishments. I have never felt that I am good at painting or art, so for my piece to be put up on the wall, I was really proud.

—Daniel

To learn more about this project and others, visit sleader.weebly.com/ or alecpatton.weebly.com/ or steamprojectleaders.com/
Tenth graders stepped into the shoes of scientists and became stewards of our environment by implementing solutions to local water issues. Students learned about the history of the world through water, collaborated with local and regional organizations, and engaged in scientific research to test solutions to issues such as water pollution, lack of clean water access, overuse or waste of water supplies, and endangered marine life. Students submitted their action plans to the Siemens We Can Change the World Challenge, a national K-12 environmental sustainability competition, and created a documentation panel and interactive exhibit to showcase their work.

Teacher Reflection
The Siemens competition challenged our students to think like scientists and tackle real problems that affect real people. By providing a rigid but broad framework, we were able to incorporate student voice and choice in the design and execution of each group’s action plan. Solutions included a solar-heated water bag, a three-step filtration for our school’s reclaimed water supply, and a quantitative study of the impact of hand sanitizer on water usage and bathroom resources.

Student Reflections
The research and hours of time that we spent working have changed me. Every day brought me closer to my group and my planet, giving me a strong understanding of why I should care and what I can do to help.

—Aine P

This project helped us construct an idea of our issue based on the expertise of professionals in the field. The Siemens challenge made us realize that the work we were doing would have an impact on the community that would transcend HTHCV.

—Rafael R

The level of learning was incomparable to anything I’ve ever done. Giving back to a community and knowing that your hard work is currently serving a purpose and benefiting a family might just be the best feeling in the world.

—Erika A

To learn more visit: zurcazila.weebly.com/projects
Creating Ripples with Underwater Robots
Kara Quinlan, 9th Grade Physics
High Tech High Chula Vista

This project took students from robotic ideas, engineering designs, structural, electrical and mechanical systems, to a final assembly of their Underwater Remotely Operated Vehicle (ROV) robot. Students used their ROV to understand buoyancy forces and density acting on a submerged object. Once the ROVs were complete and tested, the students entered the SeaPerch Tournament and competed against other Southern California schools in two separate missions: an underwater obstacle course challenge and a heist mission. In the heist mission their ROV slid an underwater gate open, went through the gate and recovered a block of wood on the pool floor at depth of six feet. Throughout the project, professionals from the United States Navy, SeaPerch, Exploring STEM Careers Initiative (ESCI) and SeaBotix served as resources for the students in their ROV assembly and troubleshooting. The project lived on after the competition at Living Coast Discovery Center (LCDC) to complete research for the coastal region, and add sensors to the ROVs.

Teacher Reflection
This project encouraged students to think outside the box in how they viewed physics and robotics. My students could not believe they built their own controller from breadboard electronics. I saw my students’ attitudes change and become excited as their robots took shape and came alive. I stood back and saw 54 excited, engaged students flagging down their friends to show and teach them about their ROV. I overheard students saying they never knew they could “do” robotics and now they want to study robotics and engineering.

Student Reflections
The most memorable moment was when all the pieces of the robot came together. I am more excited to be an engineer.
—Jacob

I am more interested in robotics now than before and realize I can build a working robot! Imagine what you can do when you have more parts than just what was in the high school. —Rosy

To learn more visit: quinlank.weebly.com
A Picture is Worth 1000 Words
Jeremy Farson, 12th grade Art
Pam Baker, 12th grade English
Chris Trompas, English Student Teacher
High Tech High International

This was a collaborative project between 12th grade Art and English classes where students chose a piece of art to reproduce and then wrote the 1000 word story that emerged from the painting as they studied it. Although the story didn’t have to be biographical, students (and teachers) researched their artist, asking the following essential question: How does an artist’s life show up in his/her art, and what kinds of stories might emerge from a close reading of the artist’s art, life, and environment? After multiple workshops and revisions, the finished products were collected in a book that is available for purchase through Amazon.

Teacher Reflection
By linking a creative writing assignment to an introductory painting exercise, we noticed the students’ efforts become deeper and more purposeful, giving greater significance to the experience and effectiveness of reproducing a work of art. The writing informed the reproduction of the painting and vice versa. Researching the artist, the time, the history behind the work and the era, helped students to become more familiar with the context in which the artist worked, thus allowing students to make use of the stories that naturally emerge after spending a significant amount of time with an image. Very few students had trouble coming up with an original story based on their painting.

Student Reflections
It was hard to get 1000 words but it challenged us to develop a story within those limits and tested our writing skills. —Teta C

I enjoyed the freedom to write about and create my own world around a piece of art that I found interesting. —Vincent S

The fact that I had to keep my story at a thousand words challenged me to figure out what was actually crucial to my story. —Jon B

To buy the book on Amazon visit: http://goo.gl/koYNoU