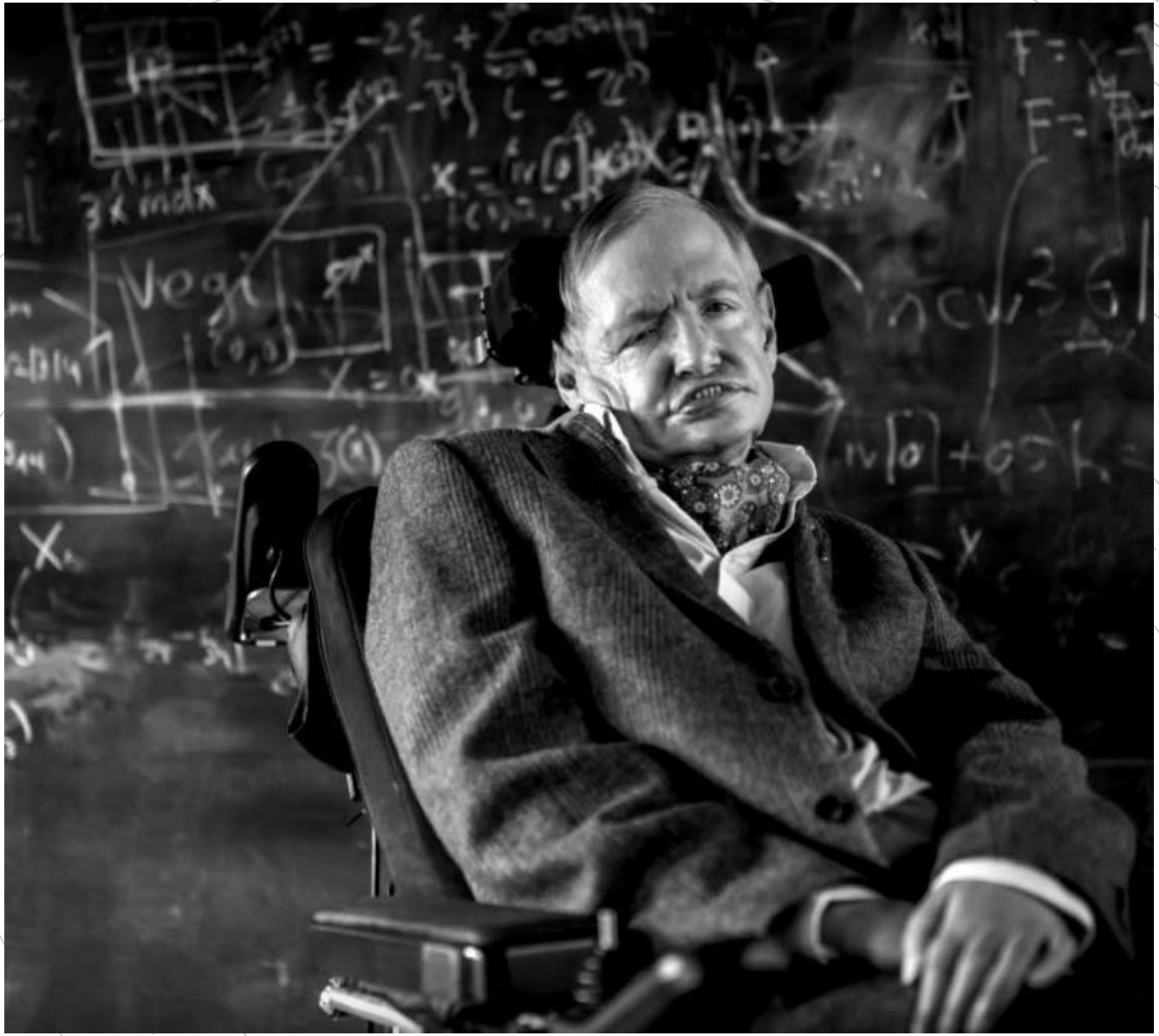


- We are all temporarily abled - *Anonymous*

Finding Strengths in Differences—The Power of a STEM Education

Dr. Ellis Crasnow

Director of Special Education

The Help Group

Outcomes of those with special needs are poor:

Published by the United Nations Department of Public Information — DPI/2486 — November 2007

- Global In developing countries, 80% to 90% of persons with disabilities of working age are unemployed, whereas in industrialized countries the figure is between 50% and 70%
- Asia and the Pacific There are 370 million persons with disabilities, 238 millions of them of working age. Their unemployment rate is usually double that of the general population and often as high as 80% or more
- United States A 2004 survey found that only 35% of working-age persons with disabilities are in fact employed, compared to an employment rate of 78% in the rest of the population. Two-thirds of unemployed respondents with disabilities said they would like to work but could not find jobs

The number of individuals with special needs world-wide is larger than the data suggest

- Cultural shame results in cases being unreported
- The assessments for various disabilities differ by region and country, so the same individual may or may not qualify as having a particular disability depending on the assessment used
- Definitions used might not be consistent across assessments—'disabled' itself is not used consistently, nor are 'mild', 'severe', etc. when used in these contexts
- The consequence is that there is a huge drain on the economy in terms of lost human resources, and a serious impact on the financial and emotional resources of the family

The problem of poor outcomes for those with special needs requires a new approach

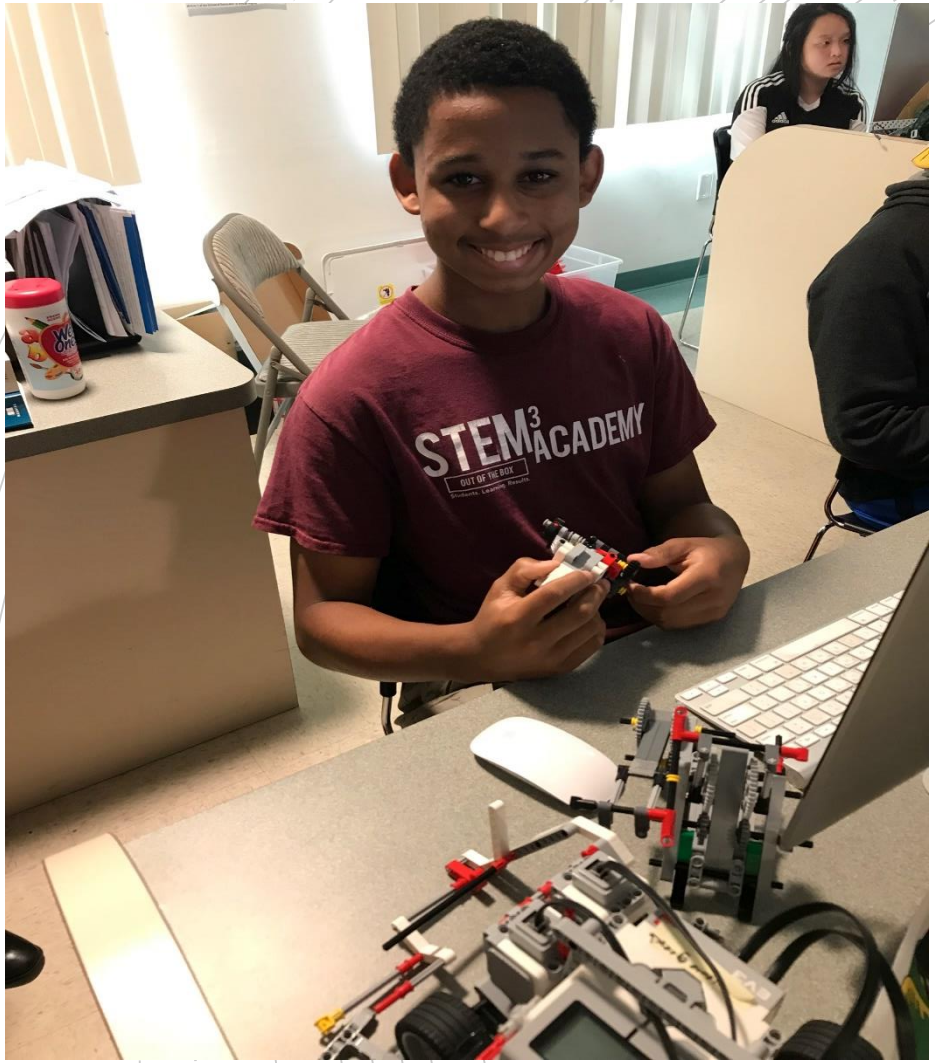
What follows is a new understanding of what a STEM education is and how it benefits students with special needs

- STEM is not exclusive to science, technology, engineering and math—it is an educational model that encourages students to think critically, work collaboratively, engage in projects in a wide variety of subjects in order to develop a better understanding of the world
- We live in a technology driven world and not having the necessary skills to navigate the future is a big disadvantage for students with special needs. These skills can enhance their lives.
- There is a body of evidence which supports the claim that early intervention is key—the earlier the intervention, the better the prognosis

The 4 benefits of a STEM Education for students with special needs

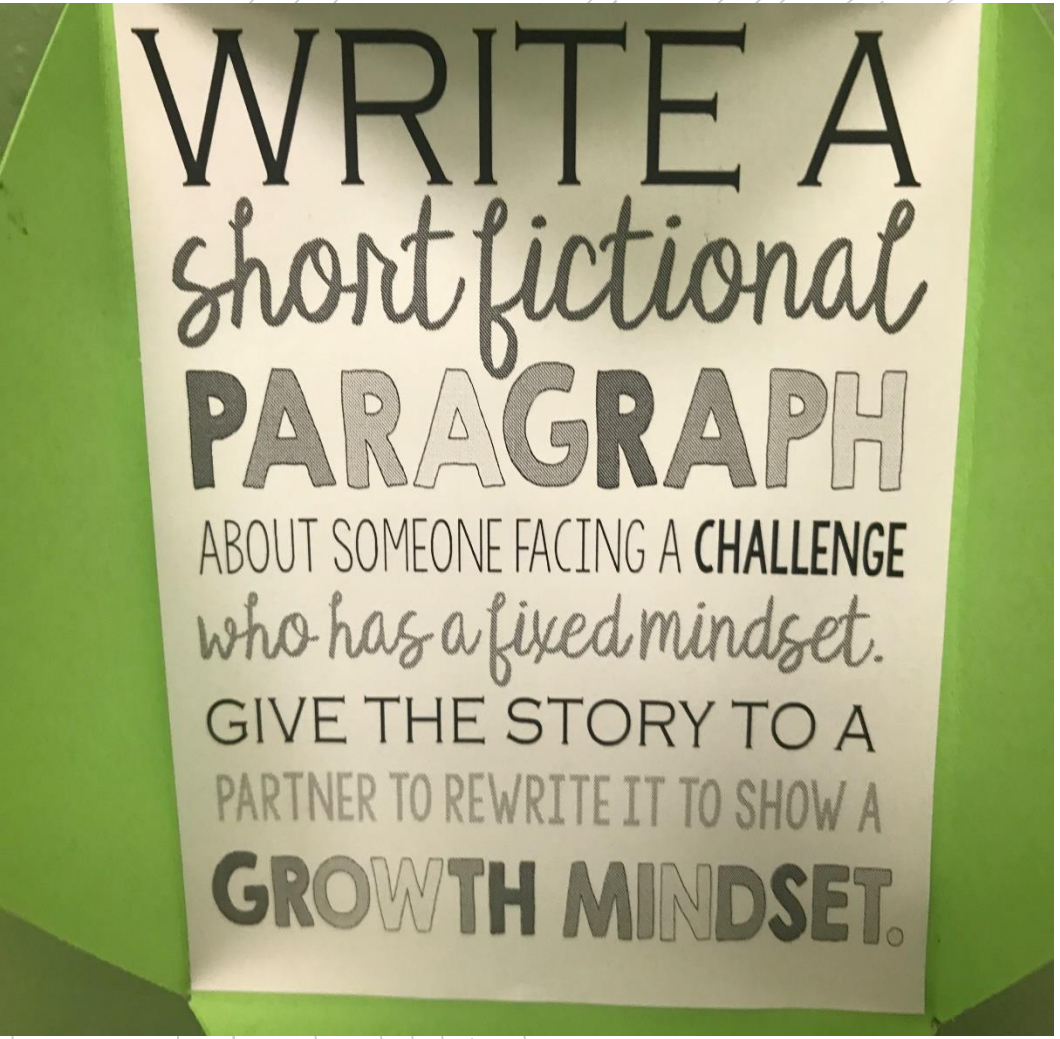
1. Develop Social Emotional Skills

- Many activities in STEM are team based. The settings are collaborative—think of a robotics build, scientific research, or a team project
- Collaborative projects support 21st century skills like: cooperation, communication, critical thinking
- At best 50% of success is dependent on what you know—the other 50% or more depends on how well you can interact and communicate with others
- So, social emotional skills and training are embedded into the model



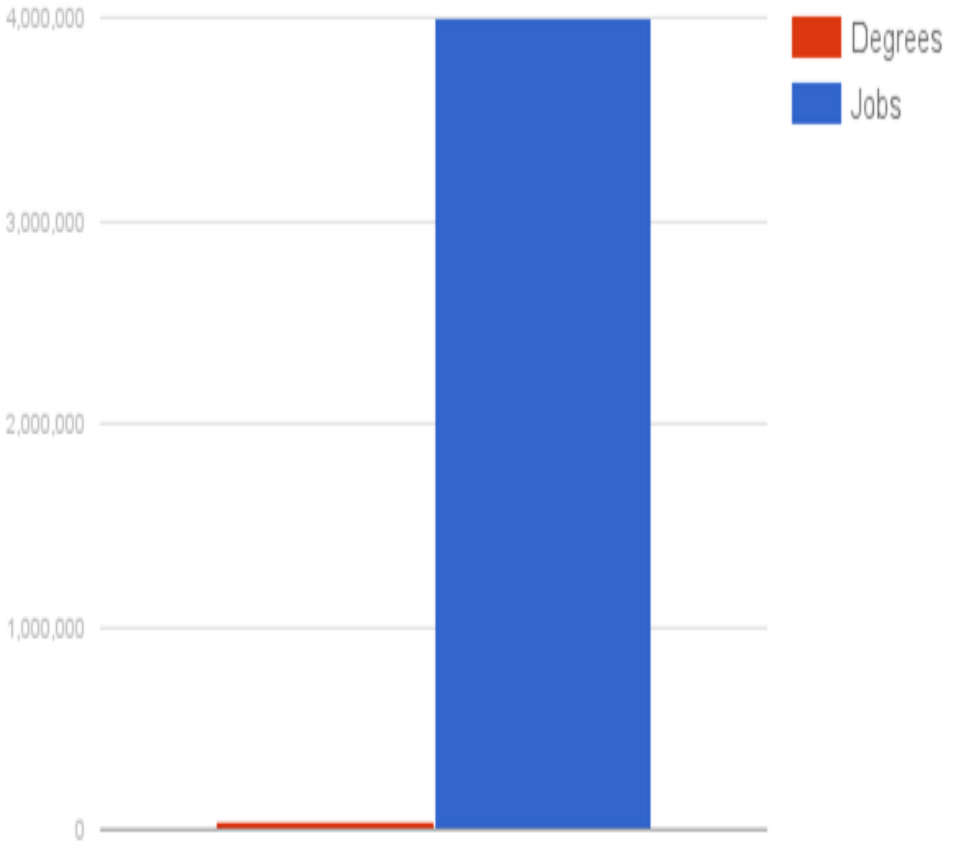
2. Better Able to Produce and Consume Technology

- Technology has so changed what we do and how we do it that students who lack familiarity with modern technology and its uses are at a disadvantage
- Basic living skills and the quality of life for those with disabilities are enhanced by technology if they have the foundation to be able to use them



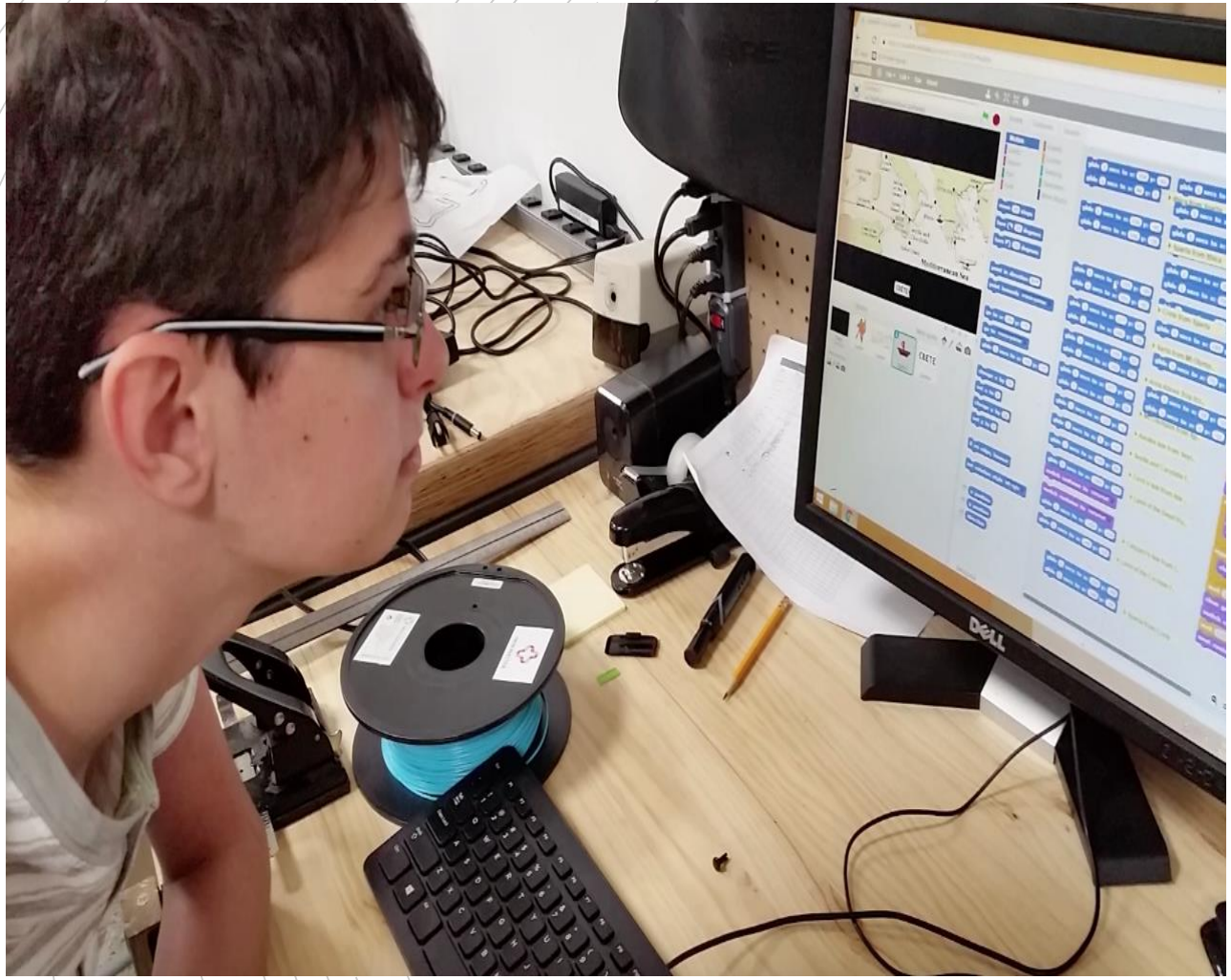
3. Develop Student Interests and Passions

- 21st Century STEM model is more effective way of student learning than the more traditional approach
- Traditionally, the classroom is led by a teacher to transfer information – the bucket theory of knowledge
- The new approach matches student interest, passions and goals with opportunities in the marketplace and seeks to engage them in a way that develops their abilities to be competitive



4. Better Prepare for Future Employment

- For some students this model can lead to employment in a STEM related position. The impetus for the development of the educational approach was the poor outcome statistics that are still with us
- In developing countries, 80% to 90% of persons with disabilities of working age are unemployed, whereas in industrialized countries the figure is between 50% and 70%
- The growth of STEM jobs in the US and worldwide is far greater than the number of jobs in other fields, which favors students with this educational background



What are the ingredients for effective STEM learning for students with special needs?

The classroom environment is an important contributor to learning

Lab-based instruction


Test 1 is Fri 9/18!!!
-Ch 1+2
Fall
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$\sqrt{\frac{2\Delta x}{a}} = \sqrt{t^2}$
$\sqrt{\frac{2\Delta x}{a}} = time$


NIKE
SB

STEM Classrooms by contrast are interactive and collaborative


Ohm/Elect
Need Help
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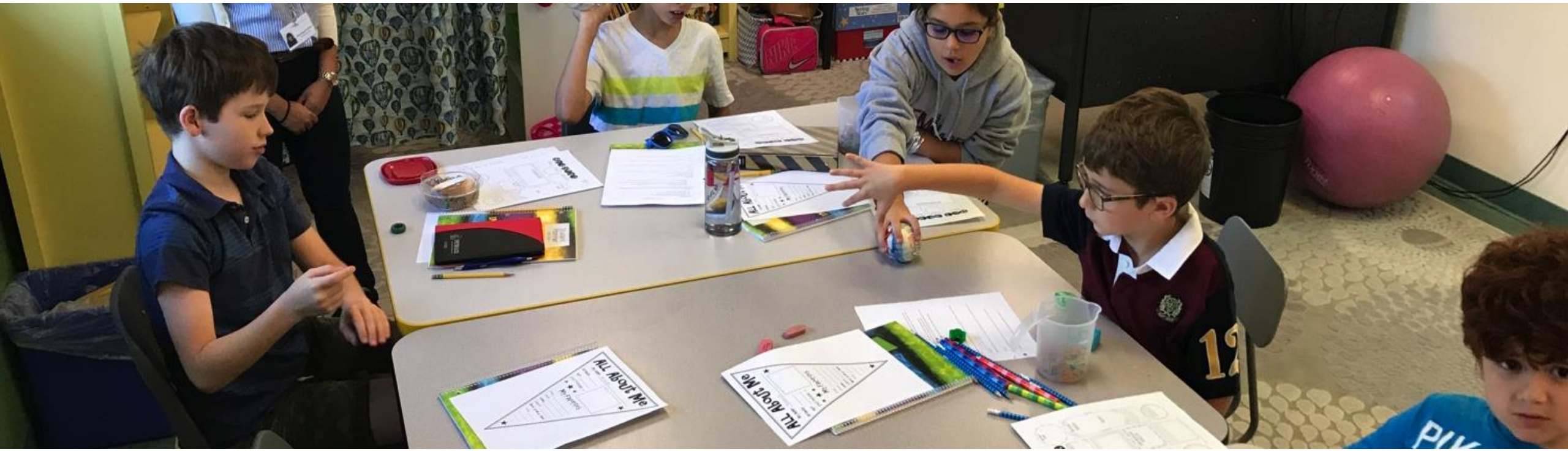
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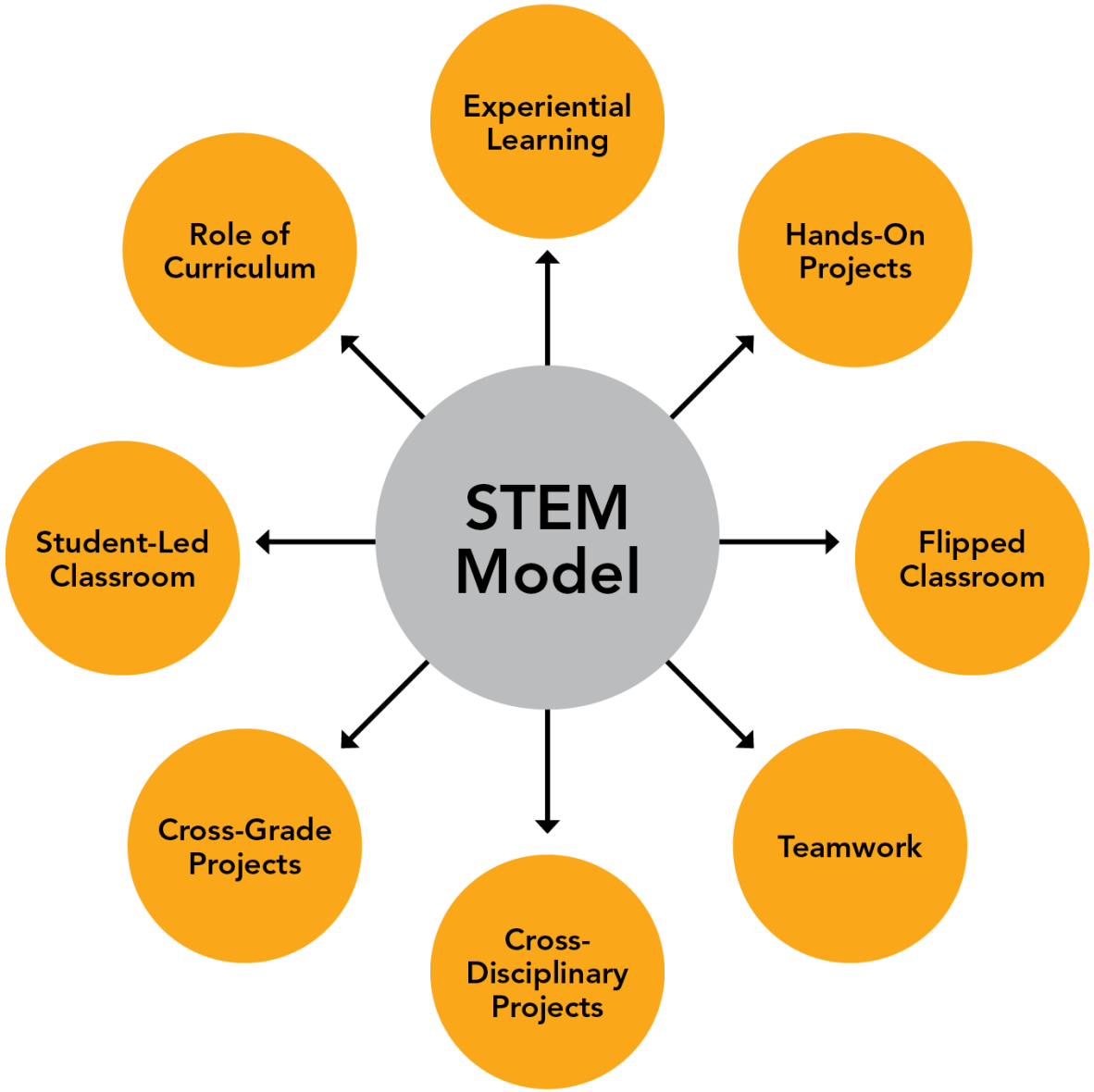


The STEM^3 Model and its Parts

Experiential Learning

Experiential Learning

- In the tradition of Montessori, Rudolph Steiner, Dewey, Piaget and Papert
- Engage students in authentic experiences where they confront real-world problems and apply what they know to solve them


FRÜ
FREE
DOM


I always liked painting.

Hands-on projects

Hands on projects

- Students actively seek a solution to a contemporary problem by researching, developing, making or building


STEM3 ACADEMY
OUT OF THE BOX
Students. Learning. Results.
NASA Robotics Alliance Project
STEM3 Academy
Team 5678
Valley Glen, CA
SPIDER 1622
BOSCH
FIRST


NORWOOD

Flipped Classrooms

Flipped Classrooms

- Traditionally, passive work is done during class time, and active work is done at home
- A flipped classrooms reverses that—active work is done in class when teachers and staff can support the student, and passive work (watching a video clip or reading) is done at home
- Many students with disabilities are unable to work on their own at home—their family circumstances might prevent it, they might have a heavy after-school commitment to other activities, they might need academic support

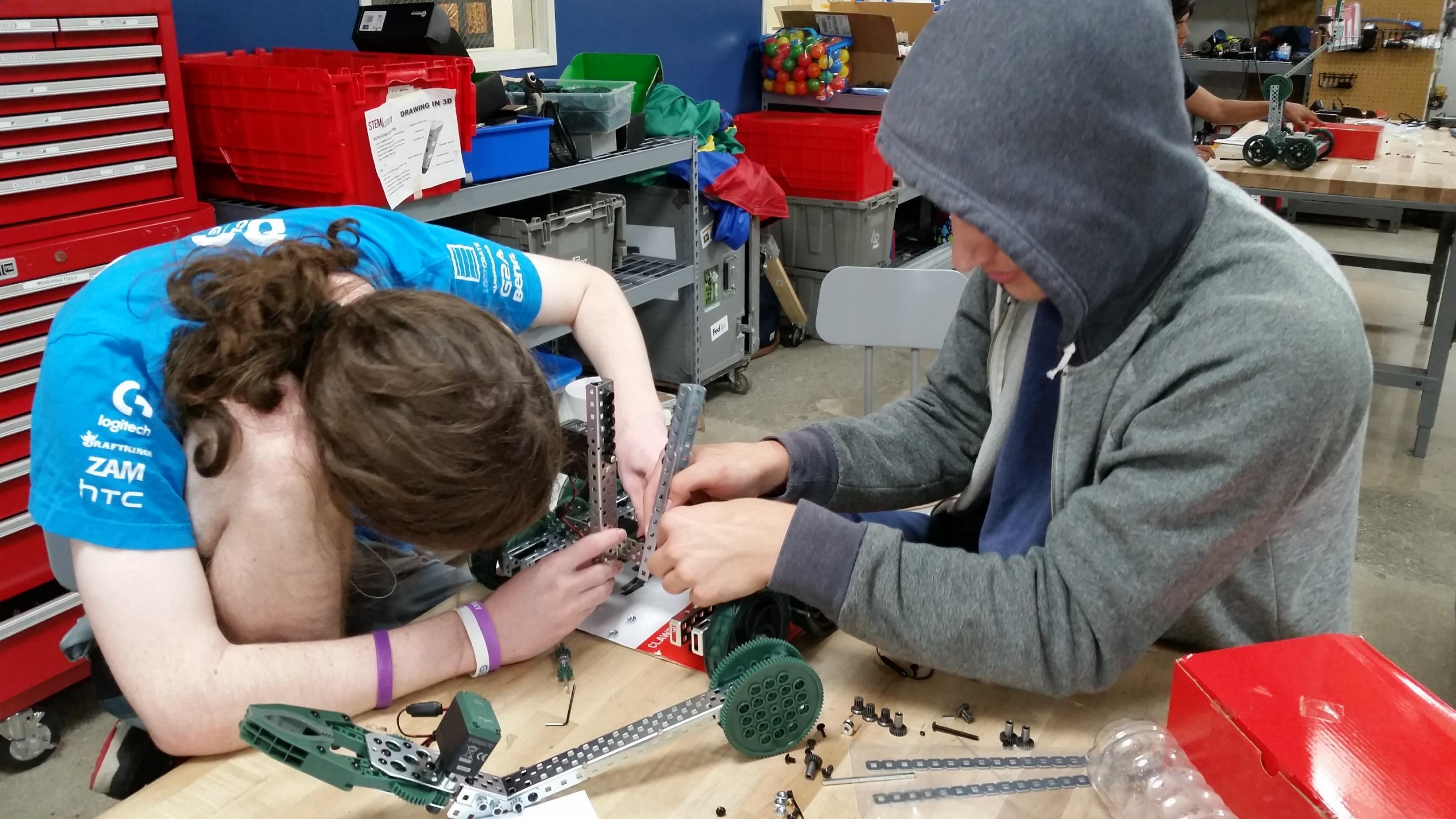

56
78
Research Express


STAR WARS

Teamwork

Teamwork

- Teamwork teaches collaboration, and the importance of empathy, taking others and their ideas seriously
- It makes us aware of our strengths and weaknesses in relation to each other
- It teaches conflict resolution, and students learn to negotiate with each other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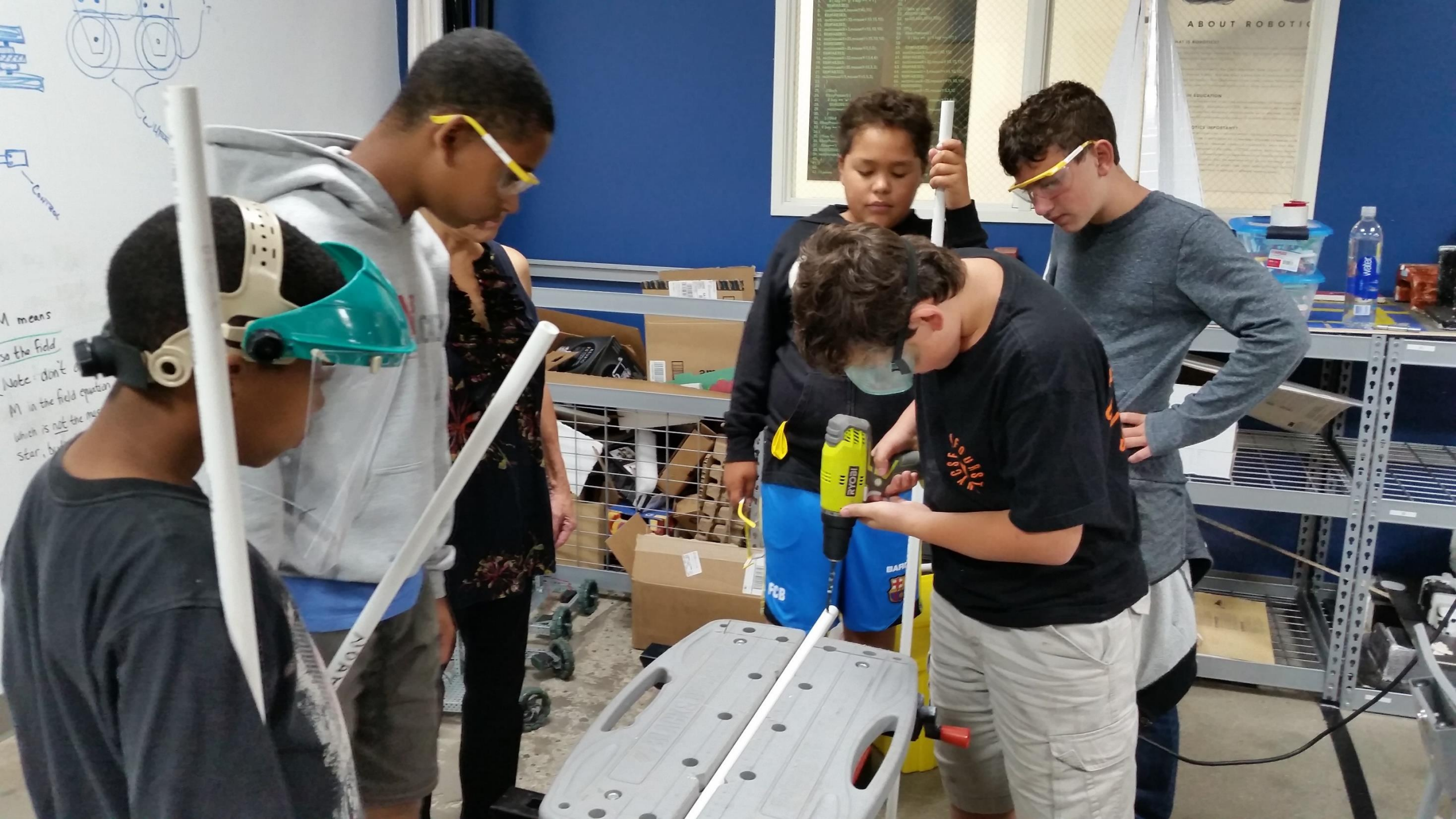
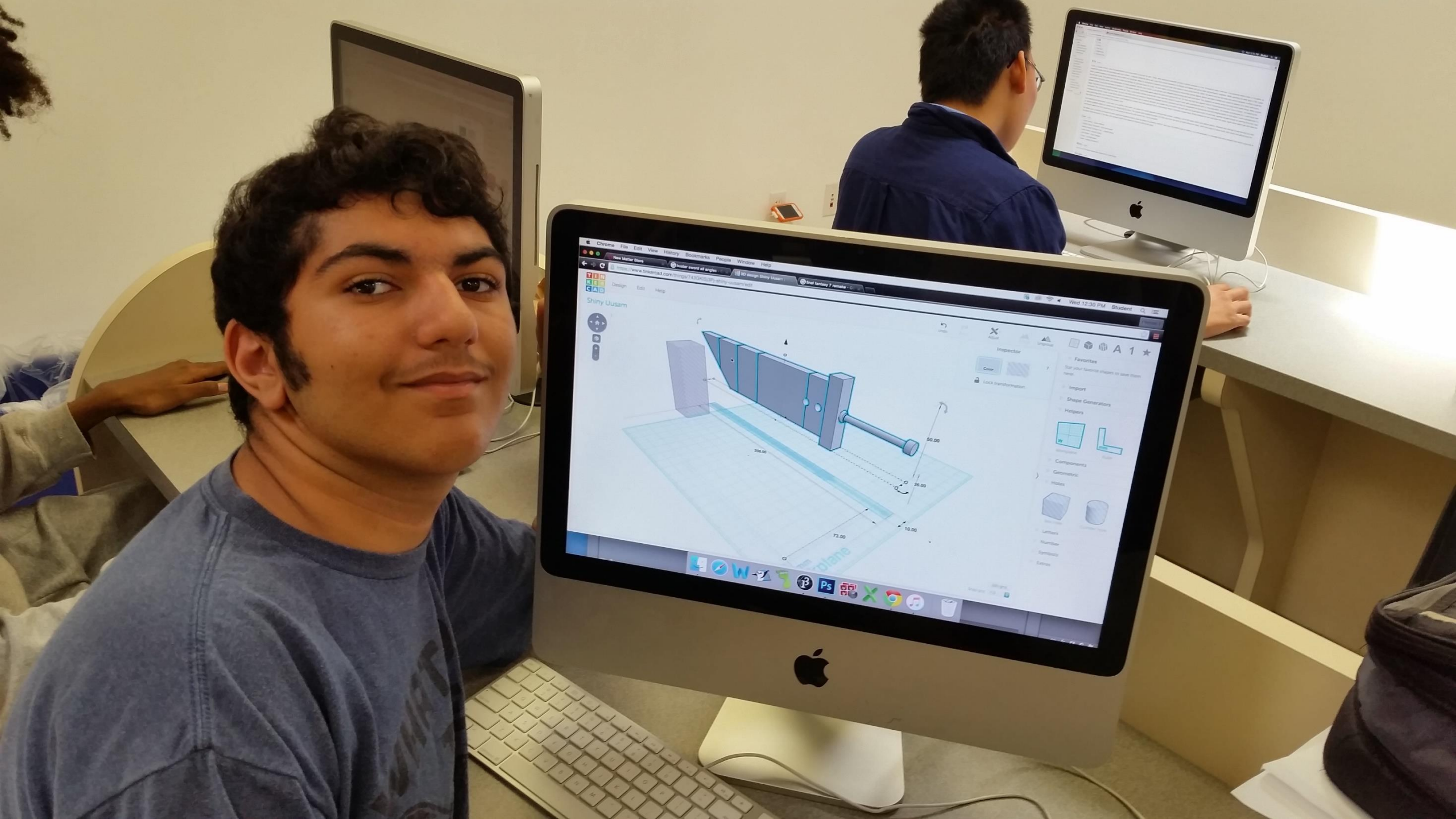

ABOUT ROBOTIC
water
RYOBI
FCB

Cross-disciplinary projects

Cross disciplinary projects

- Students use the skills they're learning in other academic classes towards one cross-curricular project
- Increases creativity and collaboration among team members which are critical skills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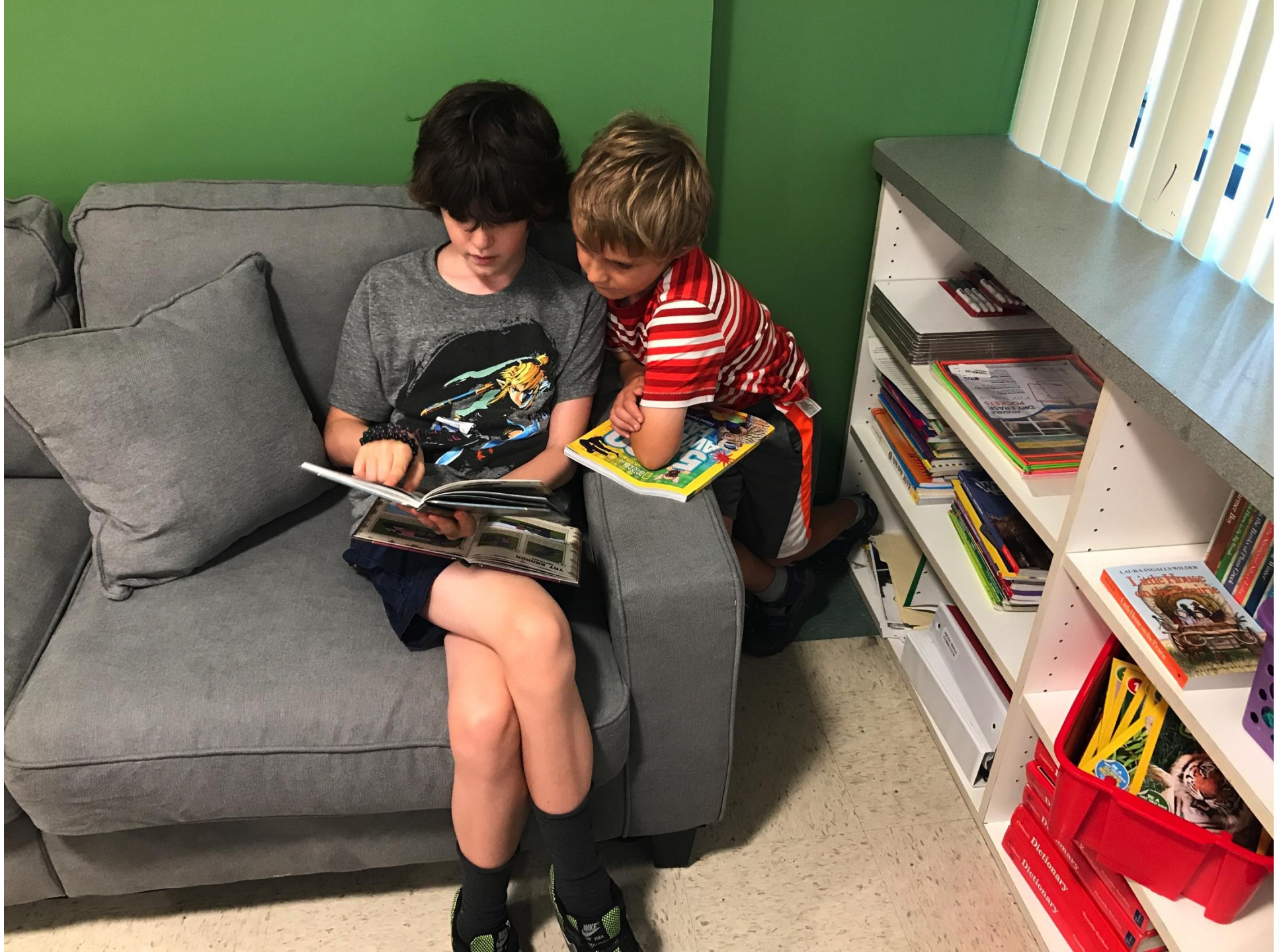
Cross grade projects

Cross grade projects

- Starts a mentoring relationships across the grades
- Provides for coherence and a shared purpose among those in the school

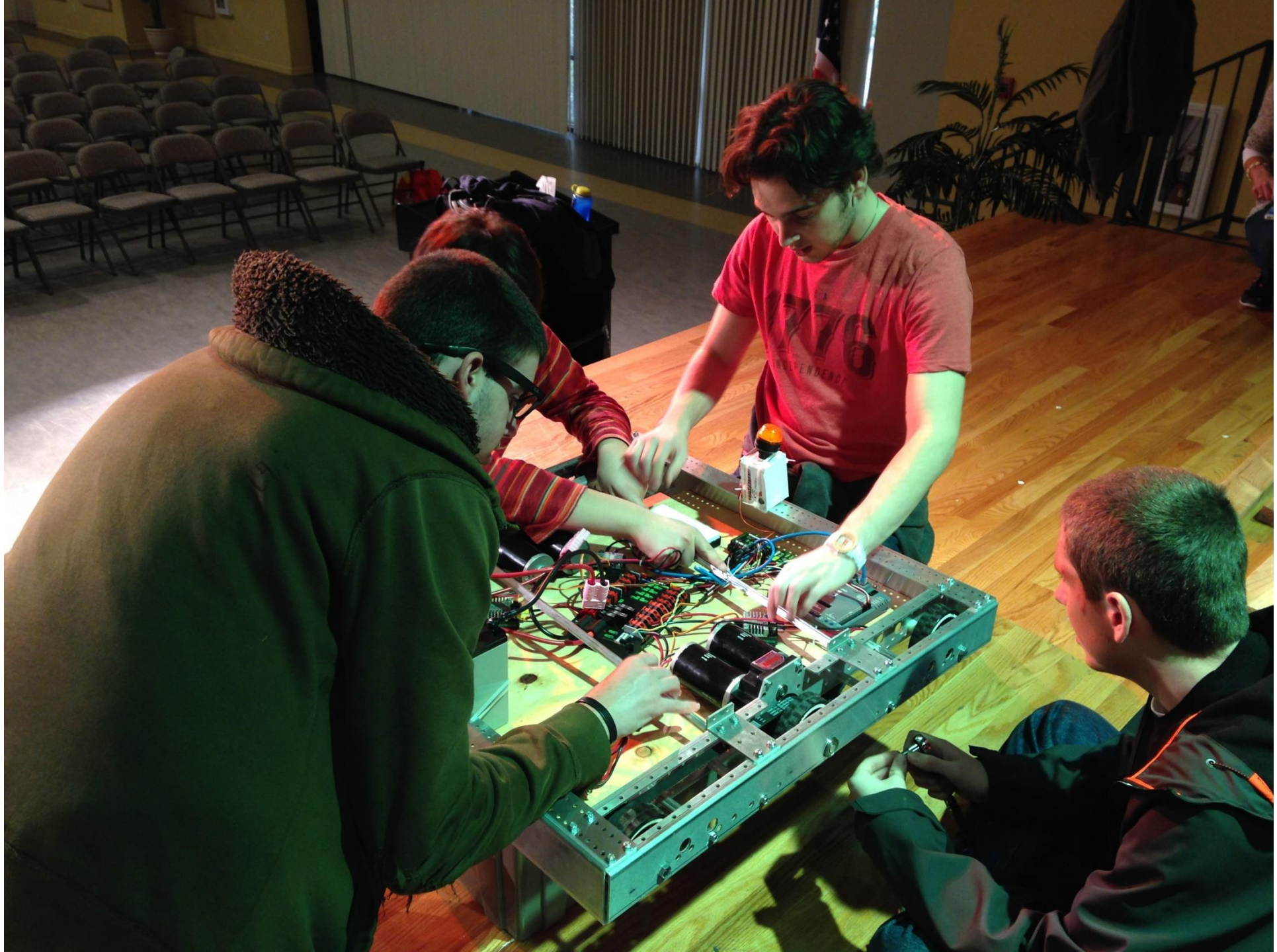

LAURA INGALLS WILDER
Dictionary
Dictionary


TORMACH
2015
VENTURA
REGIONAL

Student led classrooms

A STEM classroom is student led

- Traditionally, students ask questions and teachers provide the answers. In a STEM classroom teachers ask the questions, and students research, explore, plan and prototype in order to provide the answer
- Projects should reflect student interests, passions, and motivations



Role of Curriculum

- Just in time learning
- Content versus activity—why is latter important without former?
- Do lower cognitively demanding activities for lower cognitively able students

Conclusion

- We’ve looked at the most important of the STEM ingredients to a strong education for those with special needs
- Conclude with a review of a number of people and events that embody those ingredients


2008-Leuzinger High School
Lawndale
2009-Best in Class
North High School Torrance
2010-Louisville High School
Wooland Hills
2011-Hawthorne Math and Science Academy
Hawthorne
2012-California Academy of Math & Science
Dominguez Hills Carson
2013-North High School
Torrance
2014-Milken Community High School
Los Angeles
2015-Westchester High School
Los Angeles
2016-Westchester Enriched Sciences Magnet High School
Los Angeles
2017-Stem> Academy
Los Angeles
Raytheon
Engineering Games
CHAMPION

Wanda Diaz
Astronomer

Temple Grandin
Professor of Animal Science

Kevin Cheng Kai-Man
Photographer

Daniel Inouye
US Senator

John Nash
Mathematician

Mona Minkara
Computational Chemist

Frida Kahlo
Artist

Morocco Restaurant staffed with chefs who are mild and moderately intellectually disabled

Commerce and Industry are specifically interested in hiring and training those with special needs who have the aptitude and motivation

What can *you* do?

- See your students for who they are
- Find out what their passions and interests are
- Find out what their strengths and abilities are
- Plan projects that encompass a variety of strengths, interests, and abilities
- Guide and support them in their explorations—be a mentor and a guide
- Have them engage in projects which are authentic, which have real-world implications
- Have their projects viewed by the community and make an impact on the community
- Have them adopt the mindset of an engineer, a problem-solver
- Have them include technology in their explorations
- Teach them what they need to know when they need to know it so they use it at that moment

谢谢