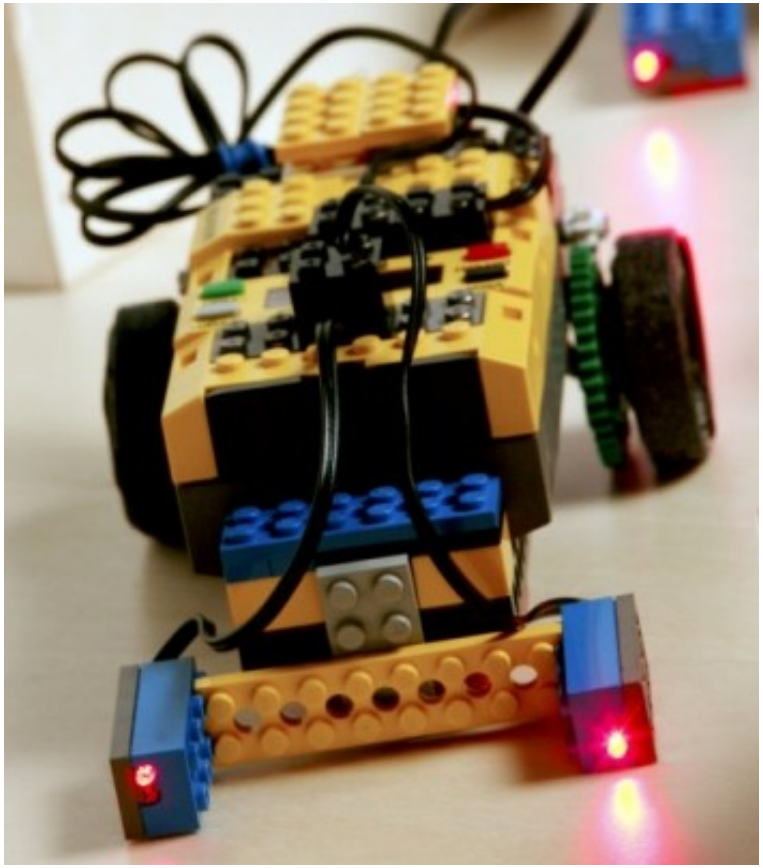
Learning with Lego Robotics – NXT Style



Lego Robots. [Photography]. Retrieved from Encyclopædia Britannica Image Quest.
http://quest.eb.com/images/132_1301124

By

Tim and Barbara Boyer

(Take-Aways)

A. Desire all classes (or disciplines) to obtain and integrate some form of Lego Build/Robotics into their curriculum

B. Make Room for Girls in the process

C. Provide real life engineering, collaborative applications for all students with a medium that is user-friendly

Introduction

- **(2-3 Min) Introduction - Opening with Student Videos using FLL Lego Robots**
- SAS 2012-13 Videos and images runs
- FLLSCIS and SASFLL

- Legos in Space (http://www.legospace.com/en-us/Default.aspx)
- NASA Video Link NASA (http://www.legospace.com/en-us/Videos/Default.aspx#492746)

Why Legos in the Classroom?

The 4 C's of Lego Education

- The LEGO Education curricula provide students a unique combination of challenges and hands-on experiences designed to their particular skill level. Students are given the chance to build meaningful artifacts with their own hands both individually and in group settings. By using the LEGO Education materials, students become motivated and excited to learn.
  - From (Solomon Menashi, 2013) http://lessonplanspage.com/teaching-stem-with-lego-education/

Why Legos in the Classroom?

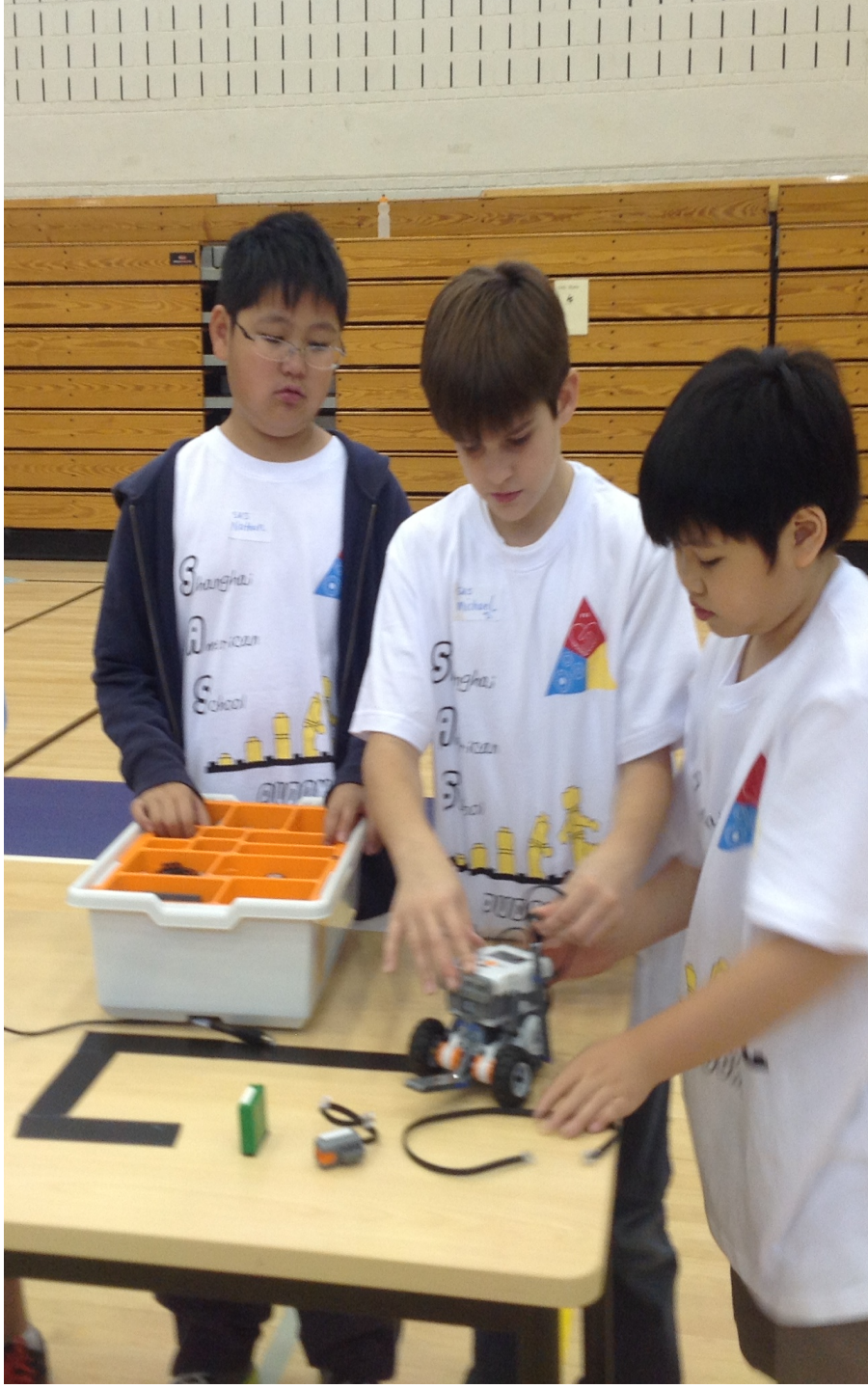
C1 - Connect.

- Learners are given an open-ended task that allows them to find their own solution to the challenges placed before them. The active engagement of students in problem solving encourages them to connect to their own interests and motivations. Students are encouraged to ask questions and explore ideas to connect their newly acquired learning to their existing knowledge and areas of interest.

Why Legos in the Classroom?

C2 - Construct.

- The core of every LEGO task involves building. By actively learning through tactile experience, students construct knowledge in their minds. Students also construct knowledge with others in group settings, where collaboration extends their learning even further.



C3 - Contemplate

- Students are given the opportunity to consider what they have learned through the construction activities. Through contemplation, students ask reflective questions about both the content and process of their learning. These questions are designed to help learners gain awareness of the process in which they are engaged, and to encourage exploring new ways to go about finding solutions to the challenges set before them

Why Legos in the Classroom?

C4 - Continue

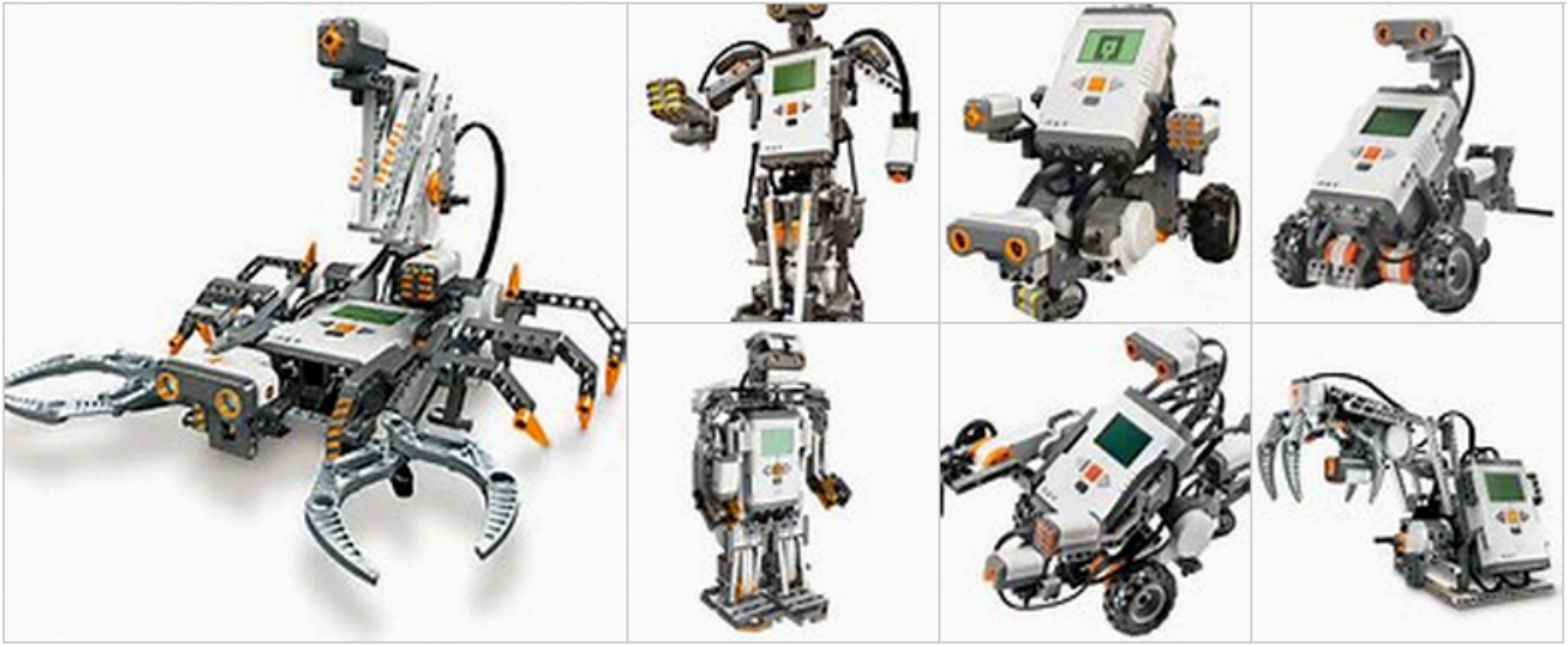
- Every LEGO task ends with a new task that builds on what has just been learned. Thus, students are encouraged to continue their exploration and extend the experience beyond the classroom.

Intro to Lego Robotics NXT

- What can an NXT do for you?.... Well Lots

Images of **nxt robot**

bing.com/images



From Bing Image Search http://www.bing.com/search?setmkt=en-US&q=images+of+nxt+robot

Intro to Lego Robotics NXT

The Lego NXT

- What is it? http://mindstorms.lego.com/en-us/whatisnxt/default.aspx

THE NXT

The NXT is the brain of a MINDSTORMS® robot. It's an intelligent, computer-controlled LEGO® brick that lets a MINDSTORMS robot come alive and perform different operations.

Motor ports
The NXT has three output ports for attaching motors - Ports A, B and C

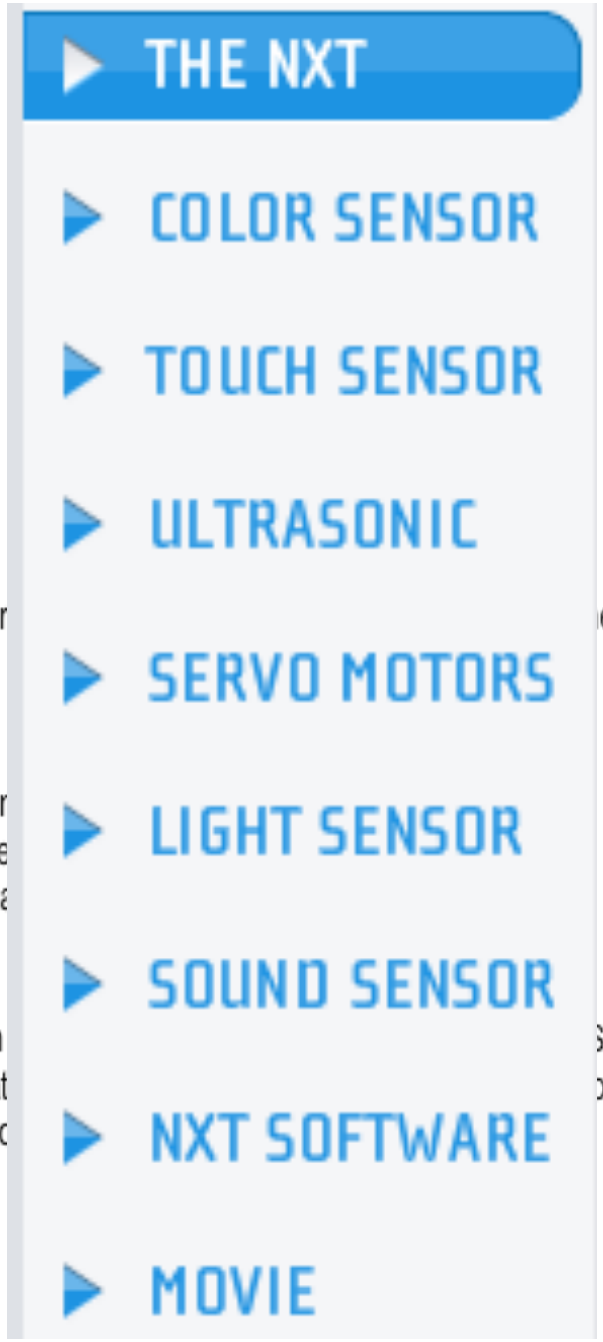
Sensor ports
The NXT has four input ports for attaching sensors - Ports 1, 2, 3 and 4.

USB port
Connect a USB cable to the USB port and download programs from your computer to the NXT (or upload data from the robot to your computer). You can also use the wireless Bluetooth connection for uploading and downloading.

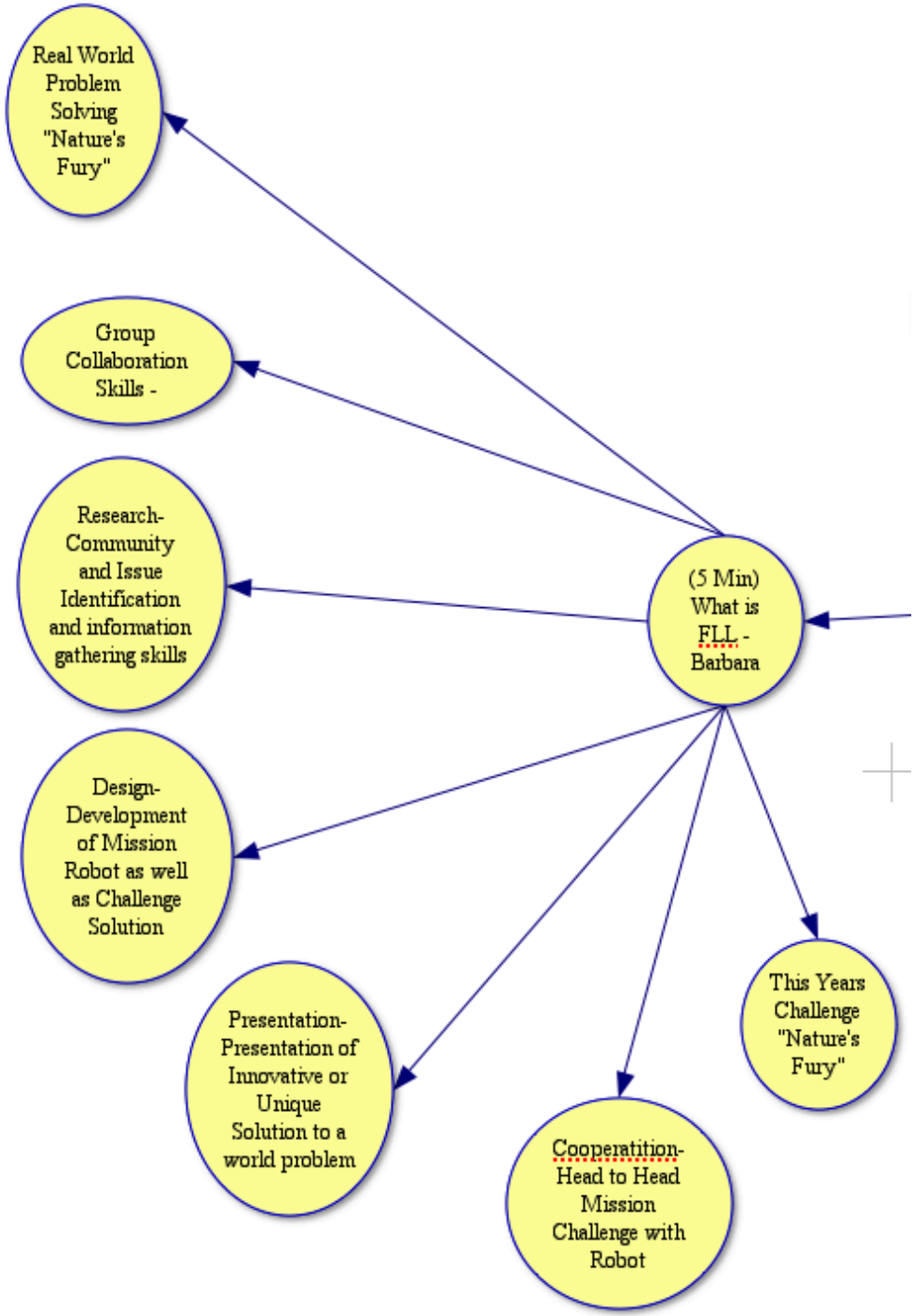
Loudspeaker
Make a program with r
program

NXT Buttons
Orange button : On/Er
Light grey arrows: Use
Dark grey button: Clea

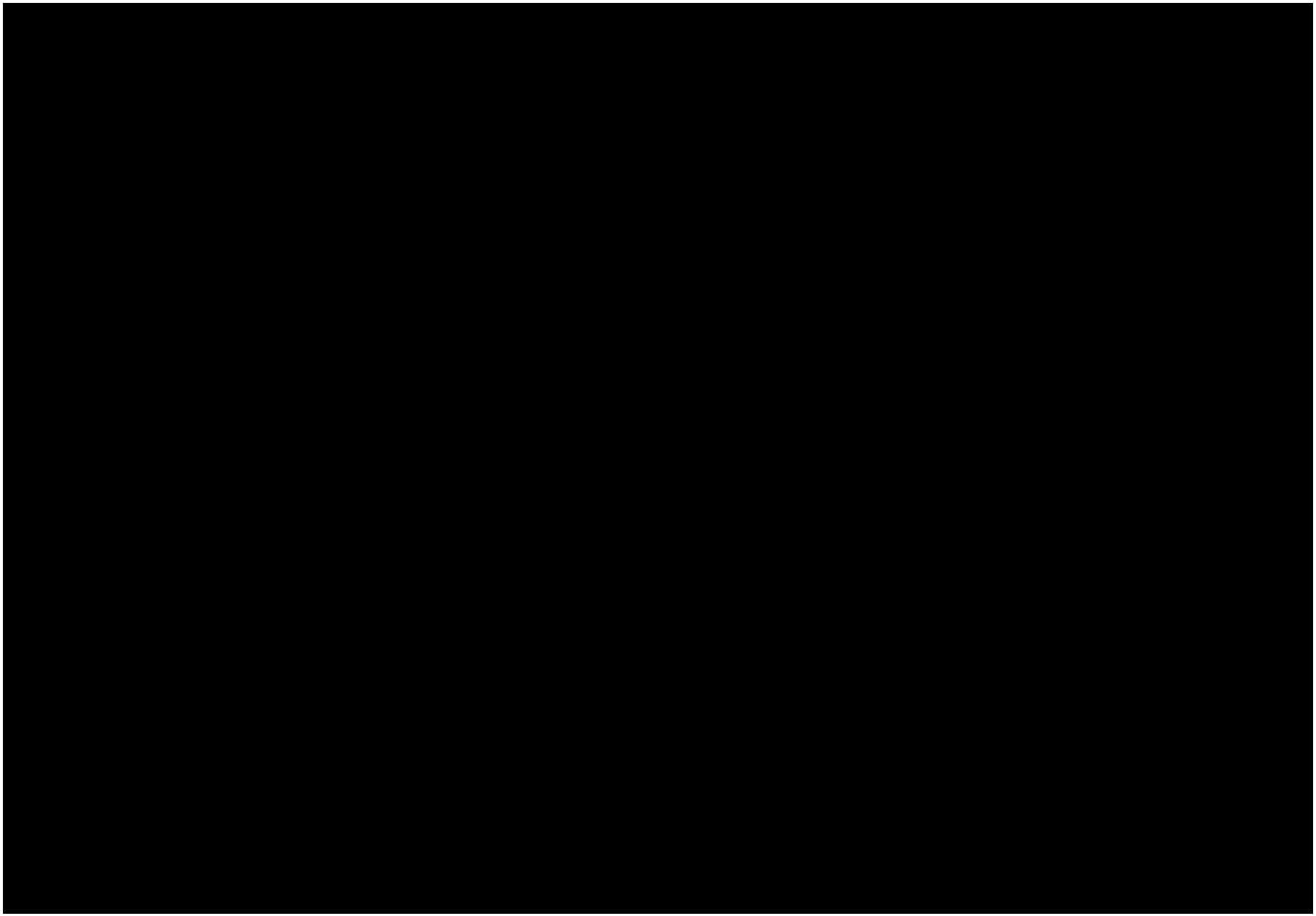
NXT Display
Your NXT comes with
NXT Users Guide that
on display icons and c



First Lego League



FLL a Trick?…. To get more Kids interested in Designing….. Building….. And Creating

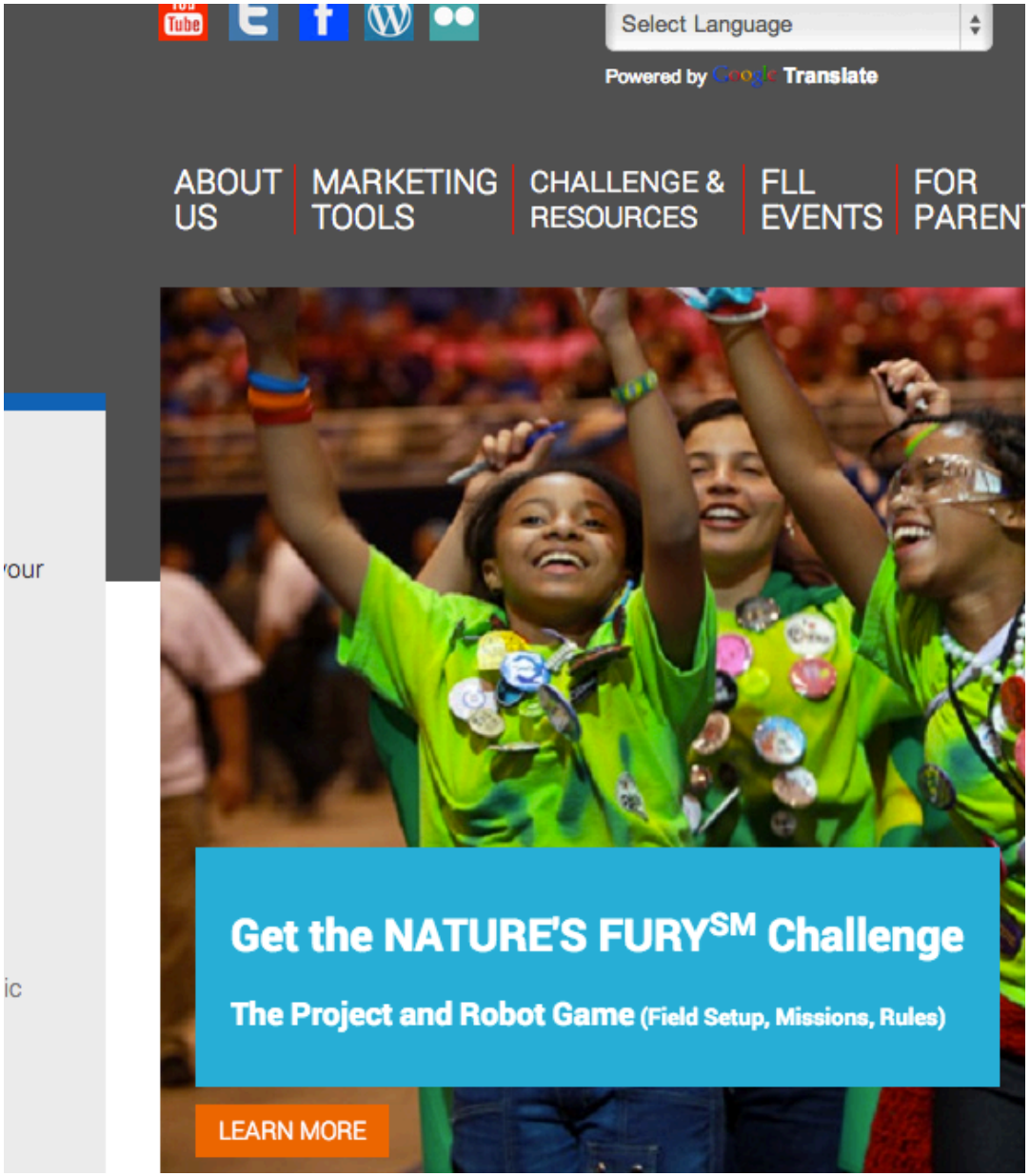


This Year's Challenge – Nature's Fury

Prepare

Stay Safe

Rebuild



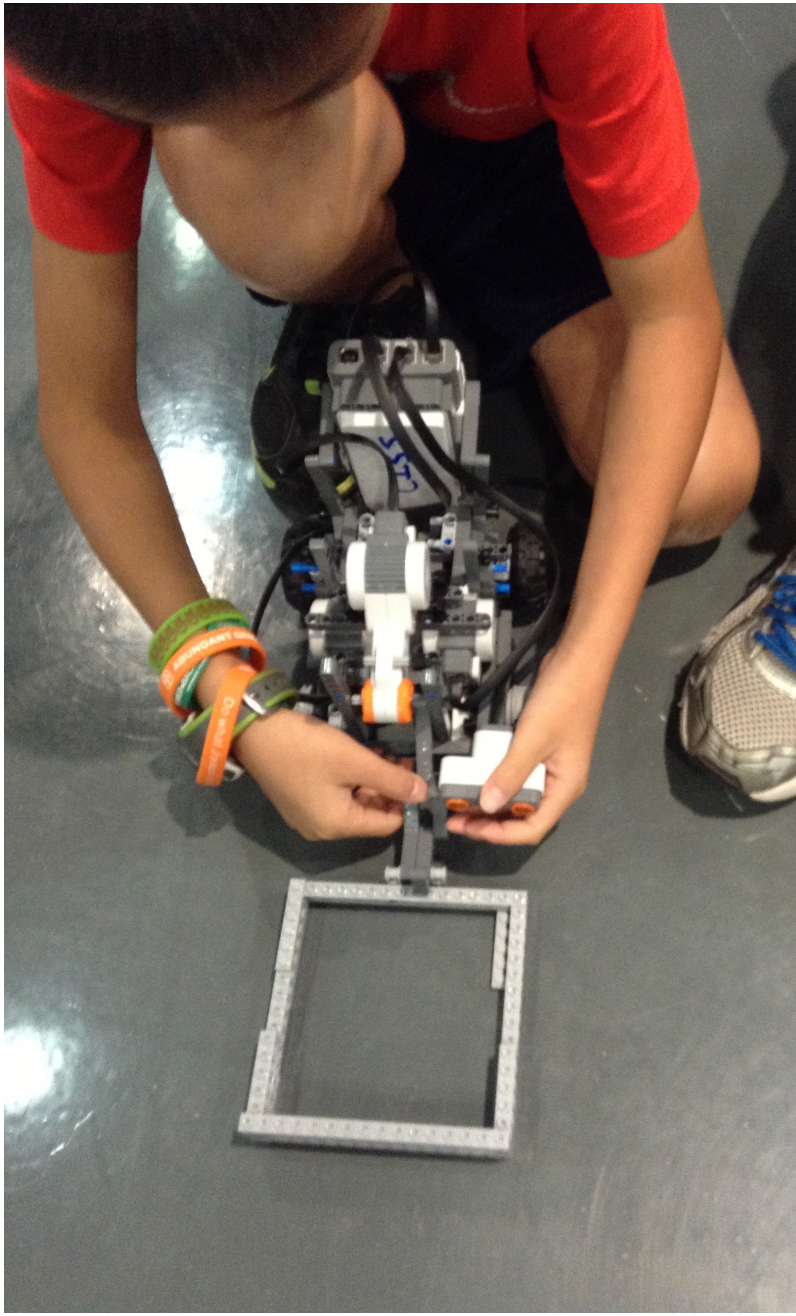
Primary Age Program

Similar Theme…

Students build a solution to their project that is movable using NXT Robot.

Build/Experiment/Play Time

- **(20 Min) Build/ Experiment/Play Time with Robots on the FLL Mission Board**
- **A. Robot Demo's From Afterschool Lego Teams**
- **B. Play and Program with Barbara's Bot**



ClassRoom Re-Connects

- **(5 min) ClassRoom Re-Connects "Screen Shots" for Learning**
- 20 Quick Teaching Examples - Slide Wrap
- http://www.edudemic.com/legos-in-class/
- Brain Storm Time
- **A. Math**
- **B. English**
- **C. Science**
- **D. Art,Design Tech**
- **E. Computer Programing**

20 Teaching Ways with Legos

20 Ways Teachers Are Using Legos in the Classroom

By Jeff Dunn on January 3, 2012 @edudemic

It doesn't matter if you're four or 40, when you see Legos they are nearly impossible to resist putting together, pulling apart, and building into something. This is the reason, among many others, that they've become such a valuable tool in classrooms across the nation.

From kindergarten all the way to grad school, Legos are being used to help students learn about science, math, engineering, and even social interactions. Read on to learn more about the many ways teachers and students are engaging with these timeless plastic blocks to learn, explore, and have fun.

Our partners over at Online College originally published this post and routinely share some terrific content. Be sure to check them out!

20. Fair Street International Baccalaureate World School:

Legos can help teach kids math, science, and … creative writing? That's just what they're being used for at this Gainesville school and others in the area. Teachers are making Legos a part of a wide range of lessons, from mathematics to language learning. The Legos have been a valuable addition to the curriculum, getting students engaged and even making it easier for non-native English speakers to get engaged and understand what's going on.

19. Pleasant View Elementary Lego Learning:

Given a problem, students at elementary schools in Pleasant View have to come up with a solution to solve it — using Legos, of course. Students build robots that have learned to do everything from rescue a prisoner of war to move an obstacle, with the help of parents and engineers from John Deere. Using computers and the Legos, students learn basic engineering and math skills that teachers and project organizers hope will boost their long-term interest in STEM fields.

18. Juneau FIRST Robotics:

Alaska may boast some of the most remote and wild places in the U.S., but that doesn't mean kids are missing out on opportunities to play with Legos in their schools. Students in Southeast Alaska schools will be taking part in the nationwide FIRST Lego League robotics competition, showing off their skills at building, designing, and programming. According to local organizers, each year about 1,500 Alaskan students participate in the program and many more would if their schools offered the program. Students who build the best robots have the chance to take their work all the way to the top, with the World Championship being held in St. Louis next year.

17. Block Kids:

There are few programs that reward creative thinking the way the Block Kids program does. Students are given a random assortment of objects (like a rock, string, tin foil, and a pile of Legos) and asked to create something. The results and creativity are often surprising, with many students showcasing thought well beyond their years. Kids also get a chance to interact with the scientists, engineers, architects and other professionals who judge their work, and winners from each region get a chance to go on to success at the national level.

16. ## Bricks 4 Kidz:

Lizz and Anthony Mele own and operate Bricks 4 Kidz, a service program that combines the fun of Legos with projects focused on science and physics. Students taking part in the program use special Lego blocks to build machines and illustrate basic scientific principles. The program is often held after school, but can also be set up to take place at parties, at home, or at local events and next year, they may even offer a summer camp. Kids love getting creative with the Legos and parents report great results from the hands-on learning process.

15. ## Lego My Library:

Who says libraries are just for books? At the Canfield Library, kids will find much more than great reads. They can also participate in the Lego My Library program, the brainchild of a local kid and Lego enthusiast. The program allows kids to meet at the library to socialize and complete projects with the Legos that require teamwork and problem solving. The program has been so successful that librarians think they'll need to get more Legos to make future meet-ups of the group possible.

14. WPHS Lego Rap:

While other kids are making Legos into robots, students at Woodland Park High School are using them to get creative by making a rap. Engineering students and their teacher put together a short video using Legos that demonstrated the basics of sentence and paragraph structure. Each student took on a particular role, some filming, others designing, and others writing the rap. Combining math, engineering, English, design, and new media, the project was very multi-faceted and shows what kind of amazing projects can be done with the deceptively simple blocks.

13. Teaching Math with Legos:

Kathryn Cramer isn't a teacher, but she does spend time working with her learning disabled son on learning topics he has difficulty understanding. One of those subjects happens to be math, and because her son isn't great with memorization, she decided to use Legos to give him something with which to associate the math he needed to learn without resorting to simple rote memorization, which wasn't working for him. Cramer used place memories to help with multiplication tables and built a Pyramid (complete with a Pharaoh) to help him understand perfect squares and prime numbers. While this took place outside of the classroom, it could be a valuable tool for any special education teacher to use.

12. Zoltan Sarda, Explorer Elementary:

Legos aren't just for learning structured lessons. They can also help teach children life lessons about responsibility, trust, and right and wrong. When a student tried to swipe a pile of Legos from Sarda's classroom, the educator didn't freak out. He told the student that he could take home the Legos for one night if he promised to bring them back. The student did. The experience spurred on a system in his classroom where students would borrow and bring back Legos throughout the year. Surprisingly, not a single Lego was lost, and students felt good that they were trusted enough to be allowed to take the blocks home.

11. Legos in ESL:

Legos transcend language and that's why teachers like Emma Herrod believe they can be such valuable teaching tools in the ESL or EFL classroom. Herrod used to work at Lego but now teaches English to a wide range of people at a school in the UK. She makes use of Legos in her classroom through a variety of activities, asking students to write, discuss, and work together to build Lego models. Students have so much fun working with the Legos, they forget to be self-conscious about their language skills.

10. ## WSU Mindstorms:

Students in the Wichita area can head over to WSU to learn more about science and play with Legos at the same time. The university participates in the Mindstorms program which asks students to design and build robots that solve specific problems. In past years, students have worked on a wide range of projects, including one that challenged them to design their own Mars Rovers. The summer program offered by WSU encourages kids to work together, get creative, and most of all, have fun while learning.

9. ## Adrian Bruce, Lego CAD:

You've probably heard of using CAD for architecture or engineering, but did you know it can also work for Legos? Lego offers a CAD program called Lego Digital Designer, which teacher Adrian Bruce has been using with great success in the classroom. Students in classes can use the software to design digital solutions to problems, ranging from creating a modern sculpture to modeling a character from a book. Bruce believes that Legos can be more than tools for science and math courses, and uses them to teach students lessons from a wide range of subjects.

8. River Ridge Middle School CATS Program:

The Communities Actively Teaching Students Program is a great way to bring experts in the local community into the classroom and have them work with students to teach them about a subject they might not otherwise get a chance to learn about. At River Ridge MS this fall, this meant Legos and lots of them. Students worked with each other and local engineers and scientists to build cars, cranes, and carousels out of Legos, examining how these constructions relate to real-life engineering projects. Teamwork, creativity, and problem-solving were all stressed in the activities, giving students a well-rounded introduction to fields they might find interesting.

7. ## Linton-Stockton Elementary School:

Few tools are as fun to work with when learning engineering principles as Legos. Students at LSES are getting a chance to do just that, researching social problems and learning how to solve them by using basic robots. The school has created a Lego robotics team that not only works on projects at the school but also competes in other area contests. Students at the school have taken their projects to the next level, however. When researching food safety, this year's nationwide robotics topic, the students not only read articles about the topic but they also traveled to a local farm, designed a logo, and learned about food laws, making Legos an amazing tool at their school for teaching not only about engineering but about government, science, and design as well.

6. North Star Academy:

Students at North Star Academy use Legos to build robots, but not just any robots. The students create robots to solve a particular problem. Those with the best designs can enter their work in a tournament held at the school, competing against students from several other area schools. Each year the projects are themed, and students do research not only into how to build their robots but also the larger issues that surround the problems (for instance, this year, students focused on food safety issues). Projects are judged based on their physical features, programming, and performance.

5. Effingham Lego Social Club:

Unlike many of the other educational uses of Legos on this list, the Lego Social Club isn't necessarily focused on teaching kids about math and science. It has a much bigger goal in mind. The club was started by Patty Hooper, whose son has autism and often struggled with social interactions. She came up with the idea for the club and got funding through a generous grant from Pepsi. Today, the group hosts kids from all over the area, some with learning disabilities and some without, all bonding over a shared love of Legos.

4. ## After-school program at Ritter Elementary School:

For the most focused of Lego enthusiasts, learning with Legos doesn't have to end when the school day is over. At Ritter Elementary School, many students stay behind to take part in a Lego building program that gets them designing and programming Lego robots that have done everything from spinning to dancing and kicking. Program officials believe it isn't just teaching kids computer skills, it's also boosting creative thinking and teamwork abilities. The program must be doing something right, as its set to expand to several other area schools in the coming years.

3. ## Joe Viera at BCC Kids College:

Kids who take part in Bristol Community College's Kids College program get a chance to play with a childhood favorite in a whole new way. Students can enroll in a variety of leveled Lego engineering courses, which allow them to boost math and science skills while creating structures and robots out of Legos. Students not only use the blocks but also connect them to laptop computers for programming and design, which Viera reports that many students love so much, they do it at home as well. Ultimately, Viera hopes that the class and the lessons it teaches will inspire students to pursue a career in engineering.

2. ## Tony Grift at UIUC:

Assistant professor of agricultural engineering Tony Grift loves Legos because they are the perfect blend of education and entertainment, keeping students engaged while teaching them valuable lessons. Grift uses the blocks in his Technical Systems Management class, asking students to build a robotic agricultural machine that solves a problem he gives each group to work on. While the students have responded very positively to the brick-based projects, Grift admits they're just as fun for him, too.

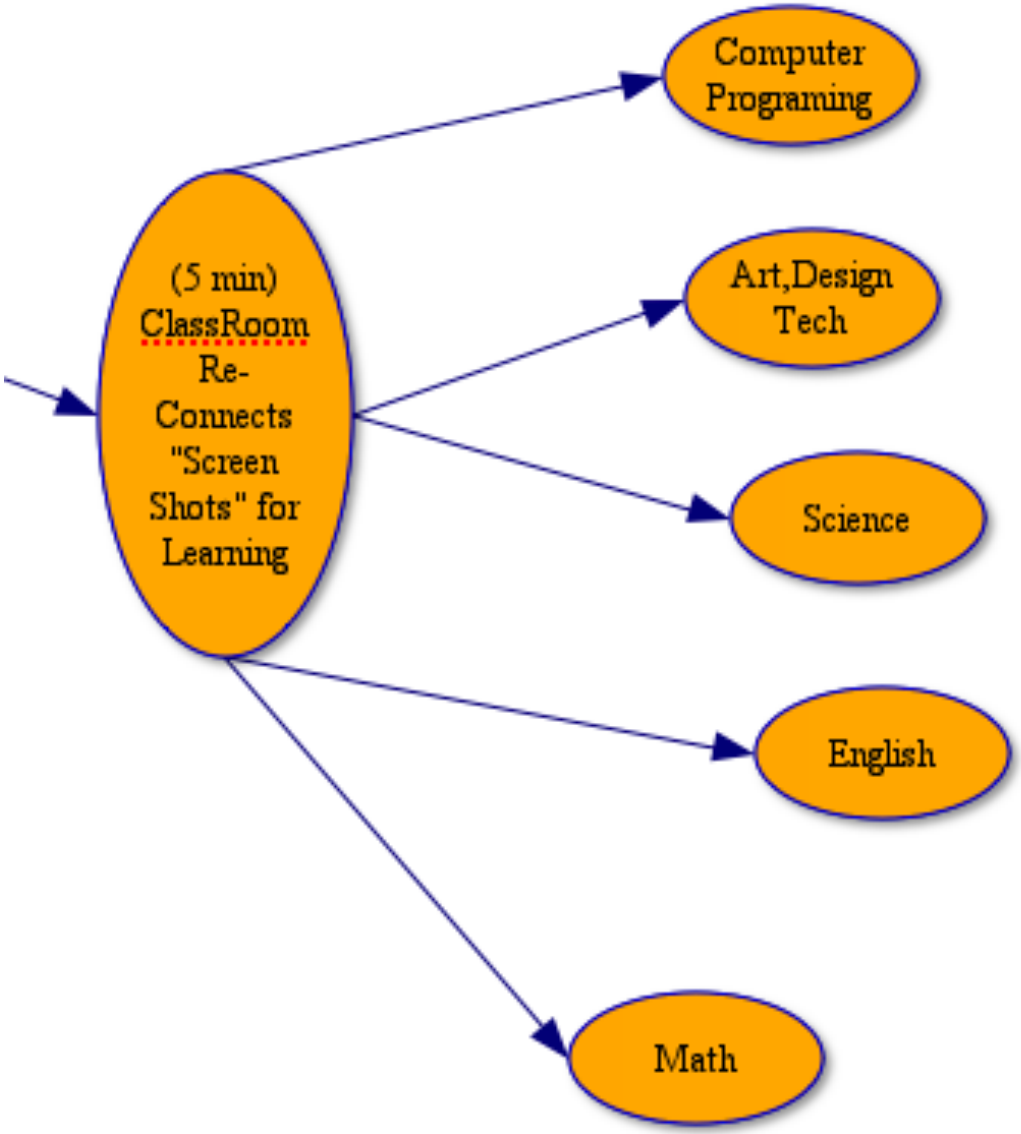
1. ## Tiffany Archer at Ozarks Community College:

Tiffany Archer, a teacher in the Computer Information Systems department at Ozarks Technical Community College, has brought her childhood love of Legos into her modern-day classroom. Archer works with college students to help them construct and program robots made out of Legos, skills she believes can later be applied directly to real-world work in manufacturing.

Class Connects

Brain Storm Time

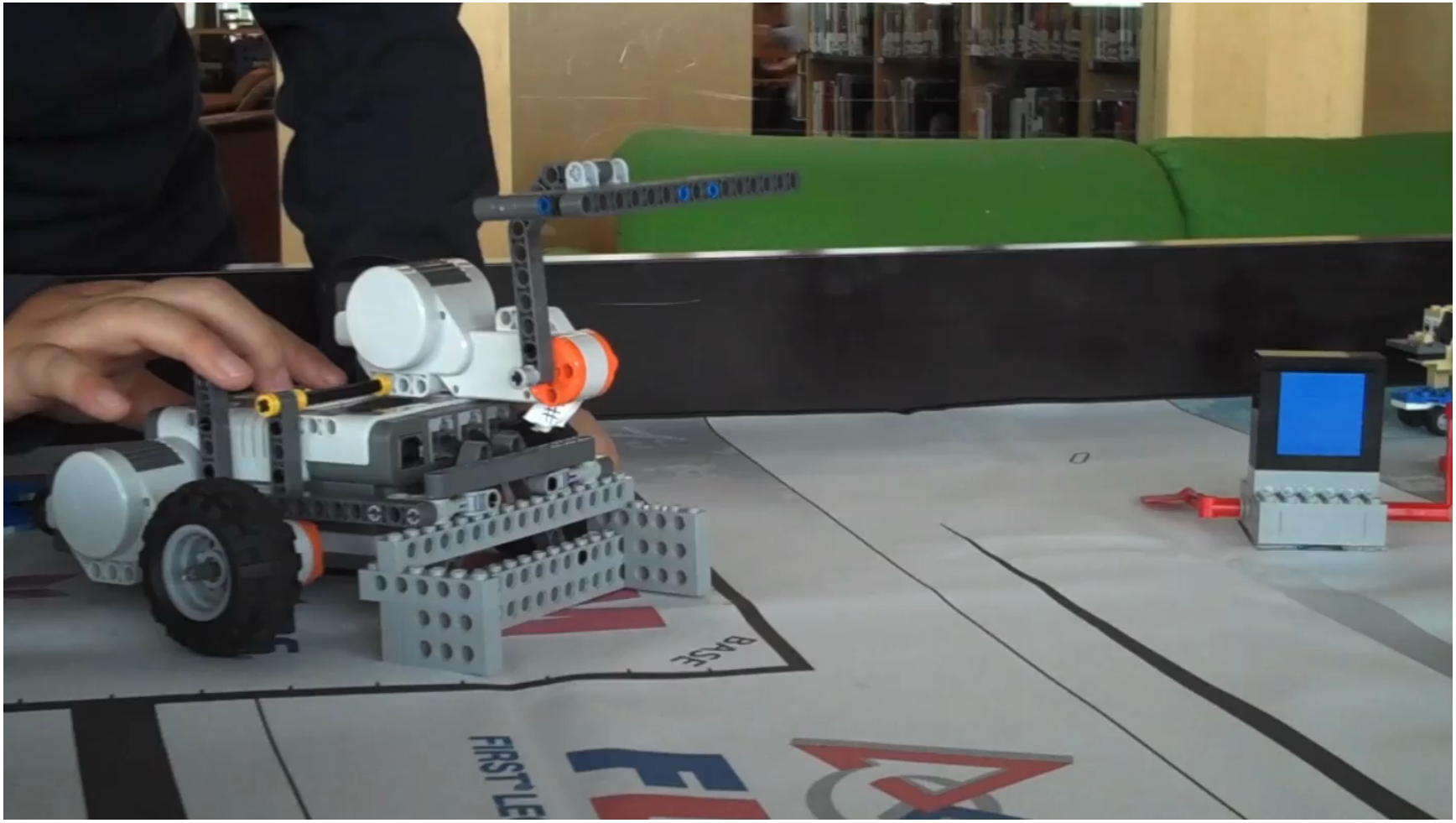
- If you had a kit(s) in your room…



Closing Take-Aways

- **(2-3 Min Tie-Ups and Take-Aways)**
- **A. Desire all classes (or disciplines) to obtain and integrate some form of Lego Build/Robotics into their curriculum**
- **B. Make Room for Girls in the process**
- **C. Provide real life engineering, collaborative applications for all students with a medium that is user-friendly**

Movie Links



Notes

- Changes and Modifications…

Movie Links

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