Introduction to Elementary and Middle School Robotics

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Introduction

- Elementary and Middle School Engineering Education with a focus on robotics
- Some background
- Activities
- Wrap-Up

Tap creative play

- Are we tapping into the so important creative play of children in school, especially the kind associated with building?
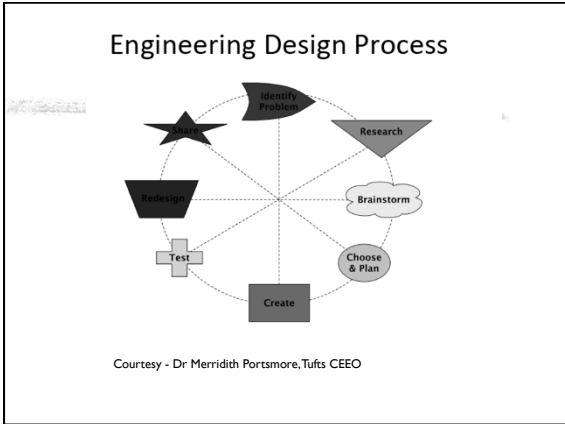
Tap creative play

- It's more fun to actually be building something. If you took a class in robots and just learned about things, if the teacher just drilled information into your head, it would not be as fun as building and experiencing it to learn.
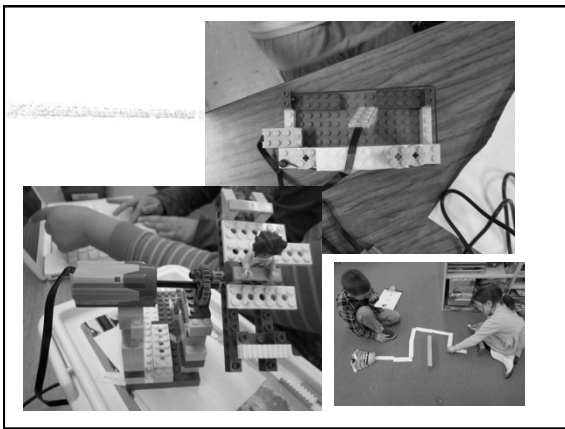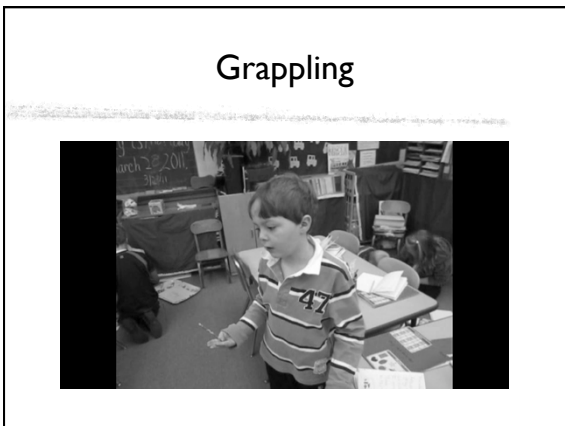
- Grade 6 Girl 2

Tap creative play

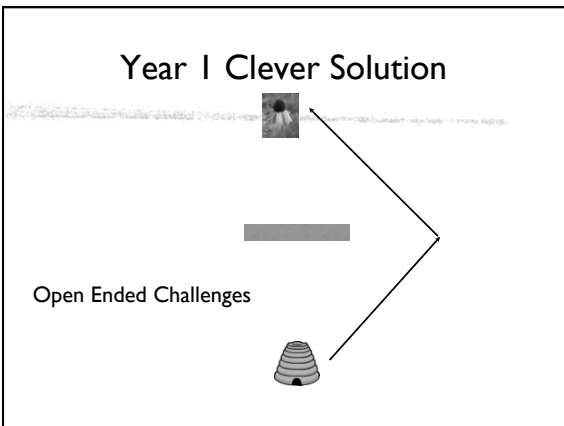- Who is tapping into creative play? Are we?

Lego Robots directly tap into the creative play urge of children in a healthy and educational way. A PK-6 robotics curriculum (such as Elementary Engineering Curriculum) is needed to support and sustain the natural engineering instincts of young children until formal engineering education starts.

WHY ROBOTS?

- Engineering can be taught in many ways, why Lego Robots?
- Familiar, fun, fantasy
- They can be programmed, adds "life"
- Tech component built in
- Math, science, ELA as well

Engineering Design Process

Courtesy - Dr Merridith Portsmore, Tufts CEEO

Grappling

Year 1 Clever Solution

Open Ended Challenges

Depth of Learning

Motivating

Fun

It was hard so it made us jump up and down when it finally worked. Grade 5 Girls Team 1

How is it different?

•[It's] Absolutely! [different from other schoolwork.] It's more interactive because mostly what we are doing in school is paperwork. With this you get to experiment, instead of just doing something, like math, you got a question, you figure it out. With this you can, change it up, experiment. Grade 6 Boy 1

•It's fun and different in a different way. I just think it is more fun. The way you think - easier is some ways, harder in some ways. The way you think is more fun to think that way than the other way. Grade 4 Boy Team 2

More Quotes

- I didn't think you would use all that math and science to build that robot. Grade 6 Girl 2

- It's more fun [than usual schoolwork.] It's a lot different – sometimes mathematical. You have to think in a different way. This would make this, would make this, happen. Each step is connected. Grade 4 Boy Team

What did you like about robotics?

- What did you like about robotics?
- 24 Mentioned the project as fun
- 15 Got to build/hands on
- 8 Different than other school work/special/exciting
- 7 Liked the programming even though it was hard
- 5 Cool
- 4 It was satisfying/exciting getting things to work
- 2 Liked the trial and error
- 2 Had to learn to compromise, work together
- 2 Got to move around, not stay in seat

RESEARCH - Interview results

- Student very aware of how they are being taught
- Prefer hands on activities and believe they learn better that way

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Grade 6 Robots – Pre-Survey

NAME _____ DATE _3-30-11_

What is a robot? a robot is a mechanical divice that you can program to do different thing.

What is engineering? Engineering is a type of work that involves mechanics

How much do you agree or disagree with these statements? Circle One.

I want to be an engineer or scientists when I am older.

Strongly Agree   Agree   (Neither Agree or Disagree)   Disagree   Strongly Disagree

I like using computers and other technology.

(Strongly Agree)   Agree   Neither Agree or Disagree   Disagree   Strongly Disagree

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Teacher Interview

Student Interview

Dancing bird activity

- Build Dancing Bird with partner according to the directions
- Create a simple program to make the birds move for 10 seconds
- Do the LEGO created experiment with the pulleys and belts
- Embellish your program or birds if time permits

Reflection

- What STEM learning did you experience? 21st Century Skills?

Drumming Monkey or Spinning Top

- Build the Drumming Monkey or Spinning Top
- Do experiment(s)

Open Ended Challenge

- Build an amusement park ride that is fun and safe
- Only use parts in your kit
- Use words and/or pictures to plan a ride
- 30-40 minutes
- "Mistakes" are progress

Reflection

- What STEM learning did you experience? 21st Century learning?
- How did this differ from the more structured activity?
- How did you experience the engineering design process?

Curriculum Sequence

- PK – BeeBot Introduction, Counting, Letters
- K – BeeBots – E&M, +/-, Letters, Challenge
- 1 – WeDo - Getting Started, Dancing Birds
- 2 – Drumming Monkey, Spinning Top, Ride Challenge
- 3 – Amazing Adventures (ELA), Car Challenge
- 4 – Soccer (Math), Burglar Alarm Challenge
- 5- NXT Introduction – programming movement
- 6- NXT Dragster Challenge – engineering

Sharing Out

Grade Specific Project

- Build project(s) specific to your grade level
- See lesson plan(s) and/or Teacher's Guide

Next Steps

- Logistics – kit sharing, laptop sharing, parts managment
- Support – software, hardware
- Curriculum – sequence, follow up session

Final Thoughts?

Resources

- jheffernan@hr-k12.org
- http://www.kidsengineer.com/

Materials list

- NXT robot (1) build - NXT session only
- My WeDo Kit
- Domabot directions (1) – NXT only
- Dancing Birds, Spinning Top, Drumming Monkey Handouts (20)
- Ride Challenge Handout (20)
- Sound handouts (20)
- Directions – address

- Post slides online
- Laptop, video adaptor, power cord, mouse
- Lesson Plans
- Slide handouts