

Elementary Robotics

John Heffernan





Tap creative play



✦ *Who is tapping into creative play? Are we?*





1	0	2	7	3	4	9						
A	B	C	D	E	F	G	H	I	J	K	L	
M	N	P	Z	Y	W	Q	S	V	U	T	X	

Bell

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*

Elementary Engineering - Sustaining the Natural Engineering Instincts of Children



Toddlers, preschoolers, and kindergarteners are natural engineers. They love sand castles, blocks, fairy houses, and other projects that support their creative, fantasy play. We support this natural engineering instinct in preschool and kindergarten classrooms with blocks, LEGOs, sand and water tables, and other activities.

As students reach first grade and beyond, we remove all these activities from school. Yet we still expect them be interested in engineering when they get to high school and college. The Elementary Engineering Curriculum supports students' natural engineering interests all through elementary school. The Elementary Engineering Curriculum creates and delivers a preschool to grade six engineering experience based on robotics. Each year, students have at least one robotics experience. In grades K, two, four, six, and eight students also have an open ended engineering challenge. I explicitly teach the engineering design process in an age appropriate way. Robotics provides very high interest, motivating, and deep learning experience for students.

Barcode Area

We will add the barcode for you.

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"If the teacher just drilled information into your head, it would not be as fun as building and experiencing it to learn." Grade 6 Robotics Student



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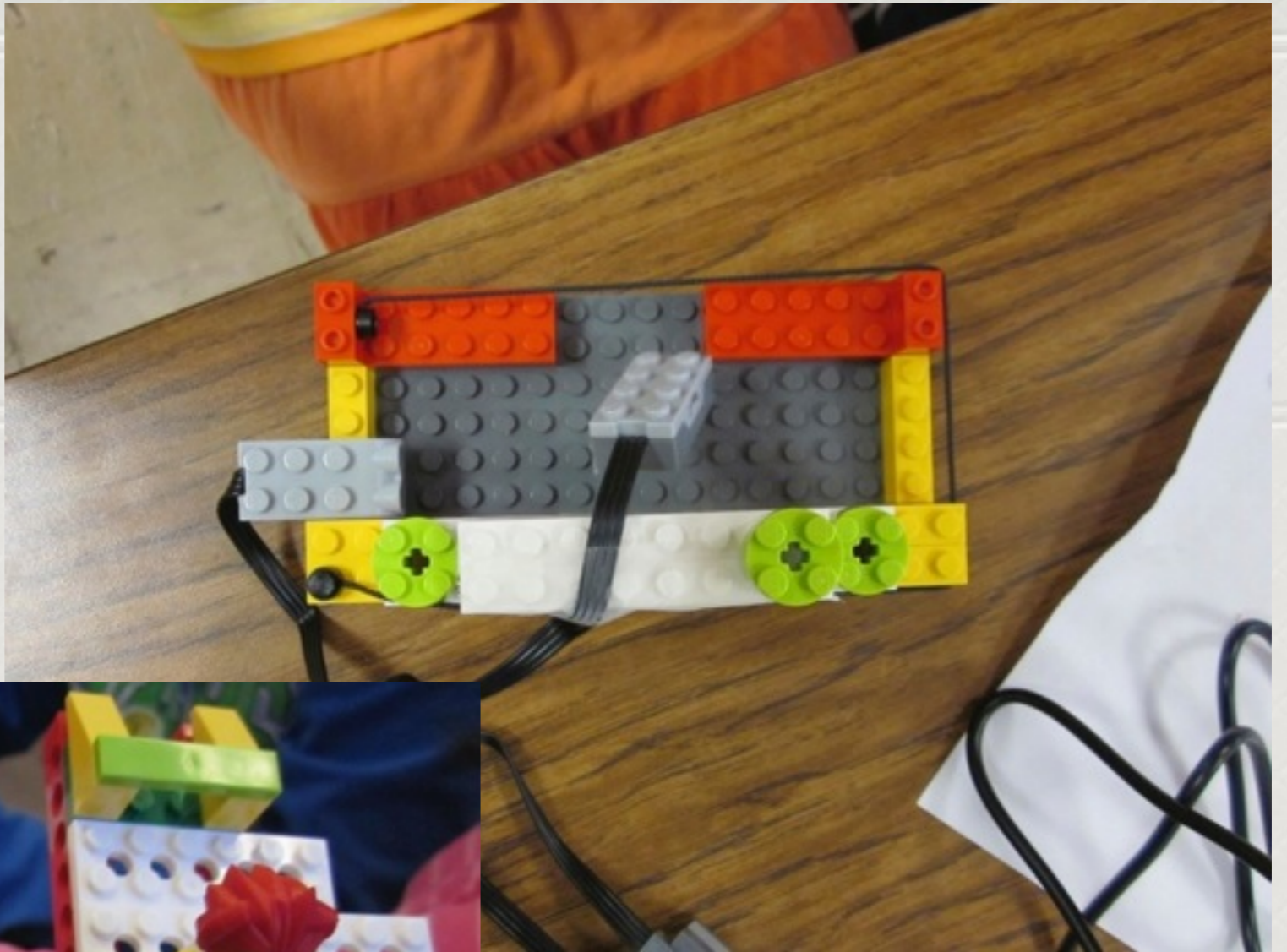
ELEMENTARY ROBOTICS

Sustaining the Natural Engineering Instincts of Children

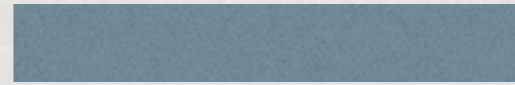
JOHN HEFFERNAN

Elementary Engineering Curriculum

- ✦ *PK - 6 Robotics Curriculum*
 - ✦ *Engineering primary focus*
 - ✦ *Collaborative, Communication, Creativity*
 - ✦ *Science, Math*
 - ✦ *ELA*
- ✦ *BeeBot, LEGO WeDo, LEGO NXT/EV3*
- ✦ *Mix of structured and open-ended engineering challenges*



Year 1 Clever Solution



Grappling 2



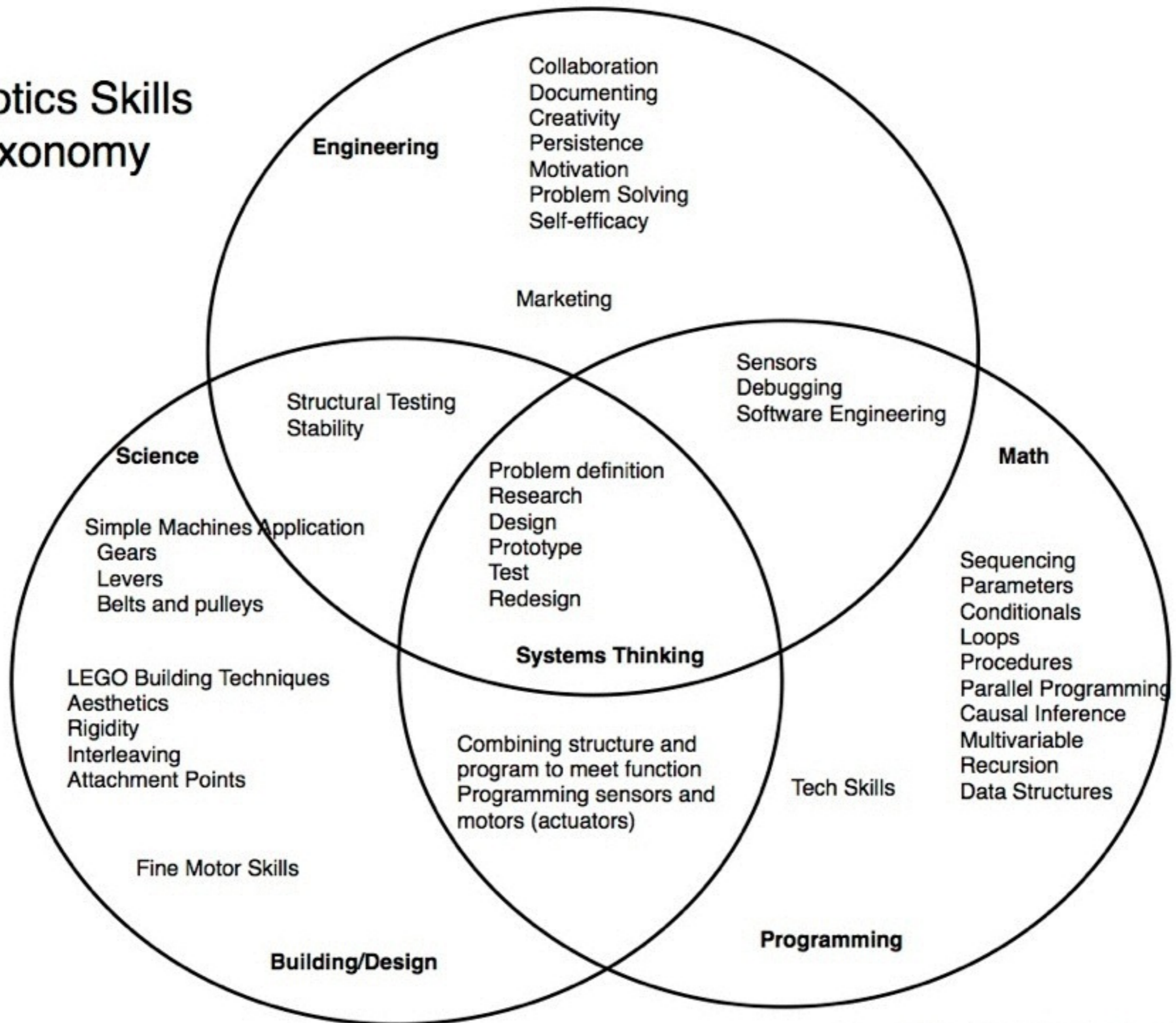
Research Questions

*How do grade K to 6 elementary students' robotics engineering skills and processes change over time in terms of construction and programming techniques?
Specifically, what changes in their techniques and processes can be seen over time that impact their ability to realize their design ideas?*

Research

- ✿ *Longitudinal Study - K - fine motor, 1 - building*
- ✿ *Pilot - Cross-sectional Study - projecting out effects of design decisions, cause and effect*

Robotics Skills Taxonomy



Resources

✦ *johnheffernan@verizon.net*

✦ *Kids Engineer* - *<http://www.kidsengineer.com/>*

✦ *Tufts CEEEO* - *<http://ceeo.tufts.edu/>*