Making and Makerspaces in Education: Resources for Innovative Learning

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Mission: provide educators and institutions with the training, resources, and community of support they need to create engaging, inclusive, & motivating learning experiences through maker education.
Making is the act of creating.
Background on the Maker Movement
Invent.
To learn more please visit
Extreme Marshmallow Cannons!
How the government and private sector can turn American kids on to science through “Making.”
By Thomas Kail | Posted Wednesday, June 13, 2012, at 7:50 AM ET

Read more from Slate’s special issue on science education and give us your best ideas for raising the next generation of scientists and engineers.

Earlier this year at the White House, President Obama met Joey, who developed the “extreme” cannon capable of projecting a marshmallow to the bank, which stated simply, “Don’t Be Something.”

Joey is a self-described “Maker,” a community of young people and adults designing and building things on their own initiative. The story of Joey and the marshmallow cannon is just one example of how makers are shaping the future of technology and society.
STEM Career Pipeline: Department of Education, CTE
Federal agency partnerships: Corporation for National and Community Service (CNCS) -- Maker Ed’s Maker VISTA program
Research: National Science Foundation (NSF) improving innovation and STEM workforce development
Research: Institute of Museum and Library Services (IMLS) to support competitive workforce and an engaged citizenry
Higher Education: MakeSchools.org and Fab Foundation (Fab Lab Network)
Every Place a Makerspace
“Give the pupils something to do, not something to learn; and the doing is of such nature as to demand thinking; learning naturally results.”

- John Dewey
Long & Rich History...

Arts and Crafts Movement: focus on craftsmanship

Progressive Educators: Montessori, Piaget, Vygotsky, Freire, Dewey

Vocational Education: metal, auto, wood, 4H, etc. (shop & ag classes)

Spaces for Making: Hall of Science, Exploratorium, Magic House, Legoland
Key Findings:
- there may be a trend towards incorporating making in K-12 settings
- respondents tended to be experienced, veteran educators & leaders
- varied reasons & interests in making

http://makered.org/community/research/#map
Four Sketches of Making in K12

“Educational leaders, particularly school administrators, need to be ‘the crazy ones, the misfits, the rebels, the troublemakers, the round pegs in the square holes…’ that create energizing experiences for all that walk into their schools.”

Meadow Elementary (CA): building shared ownership in K-5

Schaefer Charter (CA): infusing making in summer programming; eliminating summer school in K-5

Northfield Community Middle School (NJ): redefined school spaces through making and design

Albemarle County Public Schools (VA): tied making to lifelong learning and included in strategic plan
Meadow Elementary: Unused Portable & Ziplock Challenge
“My most remarkable take-away from our Maker Camp experience was watching the five teachers who worked in the camp begin the first day scared, nervous about not having a lesson plan to work from, and by the end of the camp, all of the teachers stepped back, allowed students to fail and learn from their failures, watched students persevere, guided students rather than showed them answers...Consequently, our Schaefer makerspace was created without a question as to why.”
Northfield Community Middle School: Hallways as Makerspaces
Seven Pathways of Educational Environments

The Albemarle County Public Schools District is a geographically large and socio-economically diverse district of almost 14,000 students and 1200 teachers in 26 schools surrounding Charlottesville, Virginia. It spans 726 square miles, from the Appalachian Trail to Virginia’s Piedmont plain, including an urban ring, suburban communities, and low density rural areas. Schools buses travel 14,000 miles daily. The percentage of elementary school students who receive free or reduced lunch ranges from 5% in one school to 79% in another. The distribution of students who are English as Second Language Learners (ESOL) ranges from less than 5% to more than 50% across schools. Each school has vastly different needs and available community resources. Teachers throughout the district also vary across background as well as in experience, skill levels and teacher education training. No broadband, cable or 4G commercial service is possible in 70% of this mountainous community.

The Challenge

These diverse geographic and demographic circumstances challenge district leaders to address opportunity gaps that exist among learners and to develop the capacity of educators to connect learning that is:

Seven Pathways: (1) choice and comfort; (2) instructional tolerance; (3) university design for learning/individualized learning; (4) maker-infused curriculum; (5) project/problem/passion-based learning; (6) interactive technology; and (7) connectivity.
Walton Middle School, Albemarle County Public Schools: Rolling Treehouses

Photo: Public Workshop
My Favorite Thing Has Been.....
All of it has been extraordinary.

My name is Henrik and I am a building hero!
Purpose, People, Parts & Pieces
Purpose
- What would be the goals of incorporating making into your space (e.g., classroom, school, library, museum, etc.)?
- What would success look like? How do you measure this success?
- Who is making in your space?
- What are the values that underlie making in your space?

People:
- What kinds of relationships will be fostered in your space?
- What kinds of approaches will you use to facilitate these relationships? To facilitate making and learning?
- Who supports your space? And what roles do they play?
- Who could, but can’t or doesn’t, support your space?
- What kinds of activities, events, and/or structures could be put in place so that they could?

Parts and Pieces
- What tools and materials support making in your space?
- How is the layout of your space conducive to making? How is it not?
- Along the spectrum from low-tech (analog) to high-tech (digital), where do the tools and materials in your space lie?
## MAKERSPACE PLANNING SHEET

<table>
<thead>
<tr>
<th>SPACE</th>
<th>What do I already have?</th>
<th>What do I still need? (Why do I need it?)</th>
<th>How do I get it? (From where or whom? When? At what cost?)</th>
</tr>
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<tbody>
<tr>
<td>Think of the physical space as well as the atmosphere or environment you are trying to create.</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>MATERIALS &amp; TOOLS</th>
<th>What do I already have?</th>
<th>What do I still need? (Why do I need it?)</th>
<th>How do I get it? (From where or whom? When? At what cost?)</th>
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<tbody>
<tr>
<td>Consider whether or not each item will need to be maintained or replenished.</td>
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<table>
<thead>
<tr>
<th>PEOPLE</th>
<th>What do I already have?</th>
<th>What do I still need? (Why do I need it?)</th>
<th>How do I get it? (From where or whom? When? At what cost?)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mentors, staff, volunteers, community partners, youth, etc.</td>
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Excerpted from Youth Makerspace Playbook
Key Insights for Education

Every child a maker

Top maker tools: glue, cardboard, tape, hand tools

Invest in community

Photo: Children’s Museum of Houston
Key Opportunities in Education

Ask the students/youth what they are currently making/doing

Appreciate and document learning process (not just product/outcome)

Connect making with established principles/practices (PBL, inquiry, depth of learning)

Opportunities for design, prototyping, and iteration
Key Challenges for Education

Lack of time:
schedule, curriculum, PD

Equity & access:
digital divide

Assessment:
(formative & summative)

Photo: DIY Girls
Q&A

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Thank You

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