Do Now

- Take out a piece of paper and a pen
- Draw a quick sketch or floor plan of a math class you remember from middle of high school
- 3 minutes
1843
How many of your math class sketches looked like one of these?
Investments in R&D

R&D Spending by Sector.
The education sector spends relatively little on research and development.

<table>
<thead>
<tr>
<th>Sector</th>
<th>Percent of revenue spent on R&amp;D</th>
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<tbody>
<tr>
<td>Pharmaceuticals and medicines</td>
<td></td>
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<tr>
<td>Semiconductor and other</td>
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<tr>
<td>electronic components</td>
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<tr>
<td>Computer and electronic products</td>
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<tr>
<td>Aerospace</td>
<td></td>
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<tr>
<td>Medical equipment and supplies</td>
<td></td>
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<tr>
<td>Machinery</td>
<td></td>
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<tr>
<td>Education</td>
<td></td>
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</tbody>
</table>

Source: Adapted from Chatterji and Jones (2012). See also: Bureau of Economic Analysis (BEA; 2012); National Science Foundation (NSF; 2011); President’s Council of Advisors on Science Technology (2010).
Note: Year is 2006. Education number represents R&D as share of total spending. Data on R&D outside of education excludes federal funding.
Only 9% of low-income students will graduate college with a four-year degree.
Doesn’t work for many kids at the top

37%  50%  76%
Doesn’t work for too many teachers

Teacher Satisfaction Levels

Disheartened: 40%
Contented: 37%
Idealist: 23%

Tackling the Classroom’s Design Flaw

- Shy. Hates to work in groups. Loves technology.
- Wants lots of attention. Hates to handwritten.
- Was out of the country for three years and not in school.
- Reads books that are three years ahead of grade level, but doesn’t want to be a nerd.
- Plays hours of video games each night instead of doing homework.
- Talented artist who needs to see visuals to understand.
- Is two years ahead in math and a year behind in reading.
- Loves to apply math concepts to sports.
Theory of Open Space

A conventional junior classroom

The same classroom re-arranged to make better provision for active learning

Source: http://www.tvcream.co.uk/?cat=5531
Open Classrooms In Practice: 1960s and 70s

Source: 1969 annual report of Western Australian Education Department
http://www.tvcream.co.uk/?cat=5531
What Was Missing

New Classroom Model

Open Space

Instructional Approach
Reconsidering the Open Classroom
New York City: School of One Pilot

Plan showing the library organized around a central learning space, the Omega, with smaller group learning spaces throughout.

Study showing various flexible and fixed configurations.
New York City: School of One Pilot

3D rendering of School of One pilot design
2011-12 TerraNova

6th grade School of One students posted scale score gains that were twice the national average.

GRADE 6
22 pt. gain vs 11 pt. gain

2011-12 TerraNova

7th grade School of One students posted scale score gains that were twice national average.

GRADE 7
12 pt. gain vs 6 pt. gain

Mean Scale Scores

625

Fall Spring
School of One

Fall Spring
National Mean

2011-12 TerraNova

8th grade School of One students posted scale score gains more nearly four times the national average.

School of One and Teach to One
Teach to One: Math
2012-13 Installations

Chicago PS
- Spencer Elem (230 stds)
- Gray Elementary (400 stds)

NYCDOE
- IS 228 (900 stds)
- MS 88 (330 stds)
- MS 381 (375 stds)
- IS 49 (280 stds)
- IS 2 (700 stds)

DCPS
Hart MS (445 stds)

2012-13 Total: 8 Schools, 3500 students
Teach to One: Math
2013-14 New Installations

Total New Schools 2013-14:
• 6 Schools, ~2,500 students

Chicago PS
• Marquette Elem (400 stds)

Northern New Jersey
Newark
• University Heights Charter School (150 stds)
• Speedway Elementary School (200 stds)
Elizabeth
• iPrep Academy (185 stds)
Perth Amboy, NJ
• McGinnis MS (1,000 stds)

Charlotte-Mecklenburg Schools
McClintock MS (700 stds)
Joseph Morris

Grade: 5th
Address: 5 Main Street
New York, NY 11234
Teacher of Record: Ms. Adams
Math Period: 4

Pace:
Quarterly: .85
Annual: 1.03

Performance vs.
Grade Level:
1 Week Behind

Motivation:
8.4

Current Skill: 5.NBT.2. Explain patterns in the number of zeros of the product when multiplying a number by powers of 10.

Average
3

Current
2

Upcoming Playlist

- 5.NBT.3. Read, write and compare decimals to thousandths.
- 5.NBT.4. Use place value understanding to round decimals to any place.
- 5.NBT.5. Fluently multiply multi-digit whole numbers using the standard algorithm.

Modalities

- Independent
  7.4
- Live Teacher
  5.6
- Collaborative
  6.5
- Virtual Live
  8.9

Interest

- Sports
- Music
- Performing Arts
TTO Space Design Principles

- Flexibility in instructional layout
- Increase student learning time
- Address the needs of all students simultaneously
- Reconfigure space without needing new construction
- Empower students to take ownership of learning
- Encourage increased teacher collaboration
TTO Space in Action
Easy to Reconfigure
Increased Efficiency
Student Ownership
Simultaneous Learning
Teacher Collaboration
Lessons Learned

Hart Middle School
Math Lab

Original layout
Lessons Learned

Hart
Middle School
Math Lab

Revised layout
Further Considerations

- Acoustics
- Lighting
- Furniture
- Data and Power
- Finishes and Graphics
Considerations for Future Design

- Functionality - Let the Program Model Dictate Design
- Site Selection
- Sustainability