Assessing the Cost-effectiveness of Online and Blended Learning

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Overview of Presentation

What do we mean by cost-effectiveness of online/blended learning?

Review of existing research on costs of online/blended learning

Cost considerations specific to online/blended learning

School of One, blended learning math program for middle school students, as an example to demonstrate “ingredients approach” to costing programs
A definition of cost-effectiveness

What do people mean when they claim that something is “cost-effective”?

• Given a target objective, e.g., increasing by 10% the # of students meeting state math standards:

  o What is the lowest cost alternative (educational program/intervention) to achieving the 10% objective?

  o OR

  o If the budget is already fixed, which affordable alternative is expected to get the highest percentage of students to meet the math standards?
For online/blended learning the two parts to the cost-effectiveness question are usually…

- Compared with traditional face-to-face (f2f) classroom teaching:
  - 1) Does online/blended learning cost less, the same or more?
  - 2) Is online/blended learning more, less or just as effective in promoting a specified outcome?
For online/blended learning interventions, costs can be separated into:

- Up-front development costs vs. running costs
- Replication costs experienced by sites adopting the intervention
  - Prerequisites, e.g., wireless connectivity
  - New costs, e.g., licensing fees
  - Fixed vs. variable costs
  - Gross vs. marginal costs
Research on costs of online/blended education

Bates (2005) estimated the cost of an online UBC course at around US$660 per student or $6,600 for an MA degree. No recent higher ed. cost studies or comparison with f2f.

Anderson *et al.* (2006) estimated costs of K-12 virtual schooling to be about the same as regular brick and mortar schools when similar services are being provided, excl. transportation and capital costs.
Research on costs of online/blended education

Cavanaugh - estimated average costs for full-time students at K-12 virtual schools in 2008 at $4,310 per student vs. average per pupil expenditure in 2006 of $9,138 (NCES).

Battaglini, Haldemann, & Laurans (2012)
  - K-12 Virtual schools costs: $5,500 - $7,100 vs. $10,000 traditional schools
  - Blended learning costs: $7,600 – $10,200.
Cost drivers for online/blended learning  Battaglino, Haldemann, & Laurans (2012)

- Labor
- Content development and/or acquisition
- Technology and Infrastructure
- School Operations
- Student Support Services
School of One (So1)

http://www.schoolofone.org/

- So1 is a blended learning math program for 6th - 8th graders developed by the NYC DoE

- Students spend 70 minutes a day learning math in a variety of modalities both virtual and live

- So1 computer program or “Learning Algorithm” tracks individual student progress, determines what skills (s)he has mastered and what still needs work, and creates a daily “playlist” of math activities for each individual student.
Development costs for So1 estimated at $8mm over 2 years

- Technology devpt. costs for Learning Algorithm and capacity to house 5,000 math lessons that can be completed and assessed online
  - *Estimated cost $5 mm over 2 years*

- Curriculum devpt: Panel of math experts to develop math skills map and review 25,000 lessons
  - *Estimated cost $150,000*

- Content: 5,000 math lessons purchased from 50 different vendors and adapted for So1 system.
  - *Estimated cost $0.5mm*

- Team of 12 educational technology professionals working with software developer to develop system and interface with schools
  - *Estimated cost $1.2mm/yr ($2.4mm total)*
Prerequisite resources at replication sites: estimated costs per annum

- Math teachers – 4 math sections (25-33 students each) operating at once with 4 certified teachers plus 2 student teachers
  - *Estimated cost $380,000 (expect to be lower outside of NYC)*

- Wireless connectivity: $50,000 for entire school amortized over 5 years
  - *Estimated cost $10,000*

- E-mail access for entire school
  - *Estimated cost $25,000*
# Estimated replication costs

 Assumes 6 teachers, pre-existing wireless connectivity, e-mail for all students

* cost amortized over 5 years  
** cost amortized over 3 years

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost per annum for school of 480</th>
<th>Cost per student</th>
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<tbody>
<tr>
<td>Construction*</td>
<td>$40,000</td>
<td>$83</td>
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<tr>
<td>Initial p.d.</td>
<td>$8,000</td>
<td>$17</td>
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<tr>
<td>Digital content manager/tech support</td>
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<td>$167</td>
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<tr>
<td>Hardware**</td>
<td>$36,667</td>
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<td>So1 licensing</td>
<td>$150,000</td>
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<tr>
<td>Ongoing p.d.</td>
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<tr>
<td>TOTAL</td>
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<tr>
<td>Virtual tutor option</td>
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<td>$675</td>
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<tr>
<td>TOTAL with virtual tutors</td>
<td>$648,667</td>
<td>$1,352</td>
</tr>
</tbody>
</table>

* cost amortized over 5 years  
** cost amortized over 3 years
Is So1 Cost-Effective?

• Several studies of effectiveness have been conducted. None have conclusively shown that academic achievement for students using So1 is better than for comparison students experiencing traditional f2f teaching.

  - [http://www.schoolofone.org/research.html](http://www.schoolofone.org/research.html)
  - 2012 study by Cole, Kemple & Segeritz

• Comparing So1 with traditional teaching, the extra cost of $1,352 per student above and beyond existing school costs, is not an efficient use of resources for improving academic achievement.
Are online college level courses cost-effective?

No published documentation on costs of a specific online/blended program/course compared directly with f2f.

Obom & Cummings (2007): Johns Hopkins online students learned content as well as f2f students. Courses not cheaper than f2f due to fixed costs such as buildings/faculty (Falk, 2012 pers. comm).

Costs per student can be lower if scale can be increased significantly (MOOCs)

But if effectiveness drops due to lower completion rates/less learning, may not be cost-effective

What is the desirable outcome: greater access or greater achievement?
Conclusions

• Significant cost savings are possible when online learning is used to replace f2f instruction, due to
  o increasing student/teacher ratios
  o elimination of non-instructional services
  o faster completion of same content/skills (e.g. online credit recovery)

• In some cases the costs are just being deferred elsewhere, e.g., families, colleges.

• Little documentation of effectiveness of K-12 online/blended learning wrt improving academic outcomes

• Little documentation of costs of specific interventions
Useful readings


Useful readings


