

# Assessing the Cost-effectiveness of Online and Blended Learning

**PACE Seminar**  
**December 6th, 2012**

Fiona Hollands, Ph.D.

Center for Benefit-Cost Studies of Education  
Center for Technology and School Change  
Teachers College, Columbia University

# 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:
  - What is the lowest cost alternative (educational program/intervention) to achieving the 10% objective?
  - OR
  - 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).

Battaglino, 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

	Cost per annum for school of 480	Cost per student
Construction*	\$40,000	\$83
Initial p.d.	\$8,000	\$17
Digital content manager/tech support	\$80,000	\$167
Hardware**	\$36,667	\$76
So1 licensing	\$150,000	\$313
Ongoing p.d.	\$10,000	\$21
<b>TOTAL</b>	<b>\$324,667</b>	<b>\$677</b>
Virtual tutor option	\$324,000	\$675
<b>TOTAL with virtual tutors</b>	<b>\$648,667</b>	<b>\$1,352</b>

\*

# 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>
  - 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
  - increasing student/teacher ratios
  - elimination of non-instructional services
  - 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

Anderson, A., Augenblick, J., DeCesare, D., & Conrad, J. (2006). *20/20 Costs and Funding of Virtual Schools*: Augenblick, Palaich & Associates. Retrieved from: <http://www.inacol.org/research/docs/Costs&Funding.pdf>

Bates, A.W. (2005). *Technology, E-learning and Distance Education* (2nd ed.). New York: Routledge.

Battaglino, T.B., Haldemann, M., & Laurans, E. (2012) *The Costs of Online Learning* Washington DC: Thomas B. Fordham Institute. Retrieved from: <http://www.edexcellencemedia.net/publications/2012/20120110-the-costs-of-online-learning/20120110-the-costs-of-online-learning.pdf>

Cavanaugh, C. (2009). *Getting Students More Learning Time Online: Distance Education in Support of Expanded Learning Time in K-12 Schools* Washington, DC. Center for American Progress. Retrieved from: <http://www.americanprogress.org/issues/2009/05/pdf/distancelearning.pdf>



# Useful readings

Cole, R., Kemple, J.J., & Segeritz, M.D. (2012) Assessing the Early Impact of School of One: Evidence from Three School-Wide Pilots. The Research Alliance for New York City Schools. Retrieved from: [http://steinhardt.nyu.edu/research\\_alliance/publications](http://steinhardt.nyu.edu/research_alliance/publications)

Levin , H.M., & McEwan, P. J (2001). Cost-effectiveness analysis: Methods and Applications. (2<sup>nd</sup> ed.) Thousand Oakes, Sage Publications.

Rice, J.K. (2012). Review of the Costs of Online learning. National Education Policy Center. Retrieved from: <http://nepc.colorado.edu/thinktank/review-cost-of-online>

U.S. Department of Education, Office of Educational Technology. (2012) *Understanding the Implications of Online Learning for Educational Productivity*, Washington, D.C. Retrieved from: <http://gsehd.gwu.edu/documents/users/juliestella/implications-online-learning.pdf>