

CD 173: Curriculum for Young Children: Math, Science and Technology

Tuesdays 4:10-7pm, Fall 2012

Eliot-Pearson Department of Child Development

Curriculum Lab

<http://ase.tufts.edu/devtech/courses.html>

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Office hours: By appointment

Course Description

This course explores how to create and implement curriculum for young children, with a focus in the use of technology to teach math and science, and the development of technological fluency. The underlying philosophy of this course is that people learn better when engaged in making and designing their own meaningful projects; therefore, we will become designers of curriculum and technological tools and we will test it out in a pilot project in an early childhood classroom. We will observe how children play and learn with technology and we will learn how to use on-line tools to document their learning experience. This course has three pillars: design of innovative curriculum and technological environments, observation and evaluation of technology-rich curriculum in the classroom, and documentation of the experience using new technologies.

Course Requirements

- **Readings.** All students are expected to do the readings, and to participate in discussions of the readings in class. Prof. Bers book, “**Blocks to Robots: learning with technology in the Early Childhood Classroom**” will be used. Most of the other readings are linked from the syllabus.
- **Class presentations.** Class time will be organized as discussions, not lectures. To help get discussions started, each session a student will be asked to summarize the readings and describe one question or issue that he or she found particularly provocative in that week's reading.
- **Design studio.** Students will work individually and in teams to experience different educational software, design interactive projects and test them out in the classroom. These experiences are aimed at connecting the readings and the theory with hands-on practice.
- **Empowering ideas paper (Due September 18):** Students will choose a "powerful idea" in the areas of math, science or technology, that empowered them to think in new ways when they were young. They will write a three page report describing what is the powerful idea, a personal recount of how they first encountered it, the struggles to grasp it and the tools, people and related ideas that helped them understand it. They will also specify if and how, it relates to the MA curriculum frameworks and the core curriculum.
- **Curriculum proposal with Scratch Jr. (Due October 16):** Students will choose a "powerful idea" in the areas of math, science or technology and design a ScratchJr based curriculum proposal and a set of Scratch Jr. activities that helps students to explore and understand it.
- **Robotics Display (Due December 4th)** Students will create a book, animation or movie to teach a concept related to robotics to young children. They will present it in class on the final day.

Tentative Schedule

Day 1 (Sept 4): Introduction and course overview

Papert, S. (1999). [Papert on Piaget](#). Time Magazine, special issue on "The Century's Greatest Minds," page105, March 29.

Videos

Design studio (5:30-7): WeDo robotics projects building a classroom garden

Day 2 (Sept 11): Powerful ideas; empowering ideas

Duckworth, E. (1972). [The Having of Wonderful Ideas](#). Harvard Educational Review, vol. 42, no. 2, pp. 217-231.

Papert, S. (1980). [The Gears of My Childhood](#), *Forward to Mindstorms: Children, Computers, and Powerful Ideas Basic Books* (pp. xviii-xxi).

Bers, M (2008) "Blocks to Robots: learning with technology in the Early Childhood Classroom" NY: Teacher's College Press (introduction & chapter 1)

Design studio lead by students: Working with the frameworks and standards

- [NCTM standards](#) (National Council of Teachers of Mathematics [website](#))
- [National Science Education Standards](#)
- [Benchmarks for Science Literacy](#) ([American Association for the Advancement of Science](#)'s website)
- [Kindergarten Core Curriculum math standards](#). Additional preschool standards in the [Massachusetts standards](#).
- [ITEA standards for Technological Literacy](#)

Day 3 (Sept 18): Learning by doing, learning by designing with Scratch

Peppler, K., & Kafai, Y. (2005). [Creative coding: The role of art and programming in the K-12 educational context.](#)

Resnick, M. (2007). [All I Really Need to Know \(About Creative Thinking\) I Learned \(By Studying How Children Learn\) in Kindergarten.](#) Proceedings of the SIGCHI Conference on Creativity and Cognition, Washington, D.C.

Resnick et al [Scratch: Programming for All](#) Communications of the ACM (CACM)

Scratch day

Scratch <http://scratch.mit.edu/>

Assignment due: “Empowering ideas” paper.

Day 4 (September 25): Young children and computer programming

NAEYC Policy Statement

<http://www.naeyc.org/content/technology-and-young-children>

(skim) Barron, et al. (2011). *Take a giant step: A blueprint for teaching young children in a digital age.* New York, NY: Joan Ganz Cooney Center.

http://www.joanganzcooneycenter.org/upload_kits/jgcc_takeagiantstep.pdf

Druin, A. (2002) The role of children in the design of new technology. *Behaviour and Information Technology (BIT)*, 21 (1), 1-25.

<http://hcil2.cs.umd.edu/trs/99-23/99-23.pdf>

ScratchJr Page

<http://ase.tufts.edu/DevTech/ScratchJr/ScratchJrHome.asp>

ScratchJr Poster

http://cadrek12.org/sites/default/files/Bers.%20SJ%20Poster%202012_0.jpg

Design studio (5:30-7): Scratch Jr.

Day 5 (October 2): Scratch Jr. day

Developing Scratch curricular modules and examples

Day 6 (October 9) No classes. Substitute Monday schedule

Day 7 (Oct 16): Sharing projects

Students will share with each other the Scratch Jr. curricular modules and proposals

Assignment due: Scratch Jr. curricular proposal and modules

Explaining next assignment at the robotics museum

Day 8 (October 23): Robotics in early childhood

Bers, M (2008) “Blocks to Robots: learning with technology in the Early Childhood Classroom” NY: Teacher’s College Press (chapters 3 and 4, as well as all four vignettes in the book and interview with Terry Green)

Bers, M. & Horn, M. (In Press). [Tangible programming in early childhood: Revisiting developmental assumptions through new technologies.](#) In I. R. Berson & M. J. Berson (Eds), *High-tech tots: Childhood in a digital world.* Greenwich, CT: Information Age Publishing.

Design studio 5:30-7: Kiwi robotics with Safoura

Day 9 (October 30): MIT Robotics museum (field trip)

Day 10 (November 6): Learning about math

Kafai, Y. B., Franke, M., Ching, C., & Shih, J. (1998). Game design as an interactive learning environment fostering students' and teachers' mathematical inquiry.

International Journal of Computers for Mathematical Learning, 3(2), 149–184. [PDF](#).

Murray, Megan, Mokros, Jan, & Rubin, Andee. (1998). [Where's the Math in Computer Games?](#) *Hands On!* Vol. 21, No. 2. Cambridge, MA: TERC.

Andee Rubin (2005) [Math that Matters](#). Threshold. Spring 2005.

Design studio 5-7: Scratch Jr., manipulatives and math

Day 11 (November 13): Math education

Papers provided by guest speaker:

[Algebra in the Early Grades](#)

[Arithmetic and Algebra in Early Mathematics Education](#)

Guest speaker: Barbara Brizuela (4:30-5:30)

6-7 Working on the robotics interactive materials (editing software, etc) with Elizabeth

Day 12 (November 20) Engineering is Elementary. Museum of Science

Guest speaker

Day 13 (November 27) Little scientists

SAM Animations

Guest speaker: Morgan Hynes

Day 14 (December 4): Presentation of final projects