EDUC 647M: Making & Makerspaces in Education

Fall 2022
University of Massachusetts, Amherst
Program in Learning, Media and Technology
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Office Hours: Upon Request
Location: Online,
asynchronous weekly
assignments
Credits: 3

Course Description

A makerspace revolution is here. K-12 schools and libraries are dedicating physical spaces as maker spaces and equipping them with 3D printers and other tools; administrators are urging those spaces and tools to be used for learning; students are wondering what they can create in these new settings. But what *is* a makerspace? And, how does Making (aka the design of physical or digital artifacts) fit into informal and formal educational settings? In this course, you will engage in a series of interactive, hands-on making activities with low-tech and high-tech tools as well as a final Maker Faire project to examine the theoretical, practical, and social justice issues related to Making and Makerspaces in education. An introduction to LED circuits, electronics, and programming using Arduino will be given and may be used for the Maker projects in this course.

Course Learning Objectives

By the end of this course, active participants will be able to:

- Identify at least 10 ways Making activities can be incorporated into formal and informal educational settings.
- Describe how Making activities provide new affordances for, and ways of thinking about, teaching and learning.
- Discuss the learning theories and models that underpin educational maker experiences.
- Identify how issues related to social justice are manifested in technologies, makerspaces and pedagogical practices.
- Design a Maker Project to showcase in a virtual Maker Faire.
- Discuss how to collaborate with peers, teachers, librarians, and experts across disciplines to design technology-rich making experiences for students.
- Be able to build simple programmable LED circuits using Arduino.

Course Materials

The following books and materials are required for this course:

- Blikstein, P., Martinez, S. L., & Pang, H. A. (2016). *Meaningful making: Projects and inspirations for fab labs + makerspaces.* Constructing Modern Knowledge Press.
- Martinez, S. L., & Stager, G. (2019). *Invent to learn: Making, tinkering, and engineering in the classroom*. Constructing Modern Knowledge Press.
- Tucker-Raymond, E., & Gravel, B. E. (2019). *STEM literacies in makerspaces: Implications for learning, teaching, and research*. New York, NY: Routledge.
- ELEGOO UNO Project Super Starter Kit with Tutorial and UNO R3 Compatible with Arduino IDE
- Alligator Clips

The first book is a free online e-book. Free copies of the remaining course books are available at the UMass Amherst Library. In addition to these books, you will be expected to read journal articles, websites, blogs, and other resources related to the course content. An Arduino kit - available for about $50 - is required for the course. Additionally, alligator clips (link provided) above) and some commonly found office supplies are needed.

Class Schedule

Week	Class Topic	Homework
1	Concepts: Pedagogy of Making Lab: Low-Tech Making Challenge	Read: ● Invent to Learn (ch. 1-2) ● Meaningful making: Projects and inspirations for fab labs + makerspaces (pp. 2-23) ● The Philosophy of Educational Makerspaces Do: ● Watch weekly podcast ● Complete your learning reflection ● Comment on 3 peers' learning reflections ● Lab
2	Concepts: Teaching and Learning by Making Lab: Intro to LED Circuits	Read: ● Invent to Learn (ch. 3-4) ● The Benefits of the Copy Stage of Making Do: ● Watch weekly podcast ● Complete your learning reflection ● Comment on 3 peers' learning reflections ● Lab
3	Concepts: Designing Good Projects Lab: Make Your Own Switch	Read: ● Invent to Learn (ch. 5-6) ● Design a Cardboard Chair Challenge ● Meaningful making: Projects and inspirations for fab labs + makerspaces (pp. 103-136) Pick one author. ● Dissecting the Un-Makerspace: Recycled Learning ● Crafting the Maker Mindset (EDUTOPIA blog post) Do: ● Watch weekly podcast ● Complete your learning reflection ● Comment on 3 peers' learning reflections ● Lab
4	Concepts: Fabrication Technologies and Programming Lab: Arduino LED Blink	Read: ● Invent to Learn (ch. 7-9) Do: ● Watch weekly podcast ● Complete your learning reflection ● Comment on 3 peers' learning reflections ● Lab

5	Concepts: Digital Media and Gaming Lab: Moderate-Tech Making Challenge (incorporate technology to enhance your design from week 1)	Read: ● Video Design & Analysis Framework ● Guide to Finding Media for Classroom Projects ● Memes: fun waste of time, or incredible literacy integration tool? ● Multimedia Design ● Video Games and the Future of Learning ● Creative Commons guide to Use + Remix Do: ● Watch weekly podcast ● Complete your learning reflection ● Comment on 3 peers' learning reflection ● Lab
6	Concepts: Assessing Making Lab: Blink 2	Read: ● Creating an authentic maker education rubric ● Invent to Learn (ch. 11) ● Meaningful making: Projects and inspirations for fab labs + makerspaces (pp. 26-47) Do: ● Watch weekly podcast ● Complete your learning reflection ● Comment on 3 peers' learning reflections ● Lab
7	Concepts: UDL, Design Thinking Lab: Final Project Brainstorming	Read: ● Making Makerspaces Accessible with UDL ● Design Thinking Process and UDL Planning Tool for STEM, STEAM, Maker Education ● Design Thinking for Educators - Designer's Workbook Do: ● Watch weekly podcast ● Complete your learning reflection ● Comment on 3 peers' learning reflections ● Lab
8	Concepts: Making a Makerspace Part I -Materials/Tools -Space -Teacher Role Lab: Final Project Research	Read: ● Learning in the Making: The Role of the Educator as a Maker Educator ● Learning in the Making: A Comparative Case Study of Three Makerspaces

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9	Concepts: Making a Makerspace Part II -Equipment Costs -Funding -Grant Writing Lab: Final Project Planning	Read: ● Edutopia: 6 Strategies for Funding a Makerspace ● Invent to Learn (ch. 10) ● ● STEM Literacies in Makerspaces: Implications for Learning, Teaching, and Research (ch. 1, 5). Do: ● Watch weekly podcast ● Complete your learning reflection ● Comment on 3 peers' learning reflections ● Lab
10	Concepts: Making, Makerspaces, & Social Justice Lab: Final Project Prototyping	Read: ● Designing Equity-Oriented Makerspaces Part I: Interrogating the Equity Challenges in the Maker Movement ● On Equity Issues in the Maker Movement, and Implications for Making and Learning ● STEM Literacies in Makerspaces: Implications for Learning, Teaching, and Research (ch. 6). Do: ● Watch weekly podcast ● Complete your learning reflection ● Comment on 3 peers' learning reflections ● Lab
11	Maker Project Do: ● Watch weekly podcast ● Work on final Maker project during class time and for homework	
12	Maker Project Do: ● Watch weekly podcast ● Finish final Maker project ● Document final project with Digital Portfolio	
13	Maker Faire	Showcase Maker Projects in a Virtual Maker Faire (open to the public)
	Digital portfolio due by 8 p.m. ET	

Assignments

Participation

You will be asked to complete a variety of tasks during class and for homework throughout the semester (e.g., Making challenges, design activities, peer feedback). Your active participation in activities, engagement with course readings, and contribution to the class are essential to your success as a learner and instructional designer.

Learning Reflection - Due Weekly
You will be expected to submit a weekly learning reflection (i.e., paper, video, podcast) in which you respond to the following prompts: What did you learn while making? Summarize and reflect on any readings. Your learning reflection will be an important tool as you study, reflect upon, and critically examine the relationship between making and learning. You will receive feedback and comments on your learning reflection from classmates and the instructor. You will be expected to reply to these comments in a timely manner (<7 days).

Maker Project - Due Week 12
For this project, you will engage in a Making project to showcase the skills, knowledge, and competencies you developed during this course. Potential project ideas include digital media products (e.g., video, podcast, series of visuals), a series of Making lesson plans or curriculum redesign, a business plan/proposal for incorporating a makerspace into a community in need, a prototype for new Making/makerspace tools, or redesign of a school makerspace to increase accessibility. This project should be substantive in scope and showcase your knowledge of makerspaces, Making activities, and how to enrich teaching and learning and address social justice issues with Making. You can collaborate with classmates for this project.

Digital Portfolio – Due Week 13
For the final project of the semester, you will design and develop a digital portfolio (or add to your portfolio from EDUC 593A) that showcases what you accomplished and learned this semester. The portfolio should be well organized, easy to navigate, and professional (i.e., something that you will show to a potential employer). The digital portfolio should include a page that features your Making projects as well as a Learning & Making philosophy statement in which you discuss the following:

- Why should makerspaces be incorporated into schools/classrooms?
- What are the aspects of effective makerspaces (or making activities)?
- How do makerspaces mediate student learning (hint: Think beyond academic standards)?
- How will you incorporate a makerspace or making activities into your practice?
- How can you create a makerspace that addresses issues of social justice?

Grading Policy

My expectation is that each student will complete the work for each week and be an active and prepared participant in online class discussions. Incompletes will be given for personal and family emergencies only. In addition, students whose work is found to be willfully plagiarized will be reported to the College of Education Administration for further disposition.

Grades will be weighted as follows:

- Participation (engagement in online class activities, peer support): 30%
- Learning Reflections: 30%
- Maker Project: 20%
- Digital Teaching Portfolio: 20%

Scoring Rubric

94-100 – A
89-93 – A-
85-88 – B+
80-84 – B
75-79 – B-
70-74 – C+
65-69 – C
Below 65 – Failing (Grades below a C are not passing per Graduate School rules)

Late Assignments

Late assignments will not only affect your grade, but also affect your ability to build a strong community with your classmates. If you fall behind on any of the assignments, you will need to setup an individual meeting with the instructor to discuss how you can get back on track in the course. You will lose 10% of the points for each day that an assignment is late.

Observance Of Religious Holidays

University policy and Massachusetts State law permit students to miss class in order to observe religious holidays. Students who need to miss a class must notify the instructor in advance.

Accommodation Statement

The University of Massachusetts Amherst is committed to providing an equal educational opportunity for all students. If you have a documented physical, psychological, or learning disability on file with Disability Services (DS), you may be eligible for reasonable academic accommodations to help you succeed in this course. If you have a documented disability that requires an accommodation, please notify me within the first two weeks of the semester so that we may make appropriate arrangements.

Academic Honesty

Since the integrity of the academic enterprise of any institution of higher education requires honesty in scholarship and research, academic honesty is required of all students at the University of

Massachusetts Amherst. Academic dishonesty is prohibited in all programs of the University. Academic dishonesty includes but is not limited to: cheating, fabrication, plagiarism, and facilitating dishonesty. Appropriate sanctions may be imposed on any student who has committed an act of academic dishonesty. Instructors should take reasonable steps to address academic misconduct. Any person who has reason to believe that a student has committed academic dishonesty should bring such information to the attention of the appropriate course instructor as soon as possible. Instances of academic dishonesty not related to a specific course should be brought to the attention of the appropriate department Head or Chair. Since students are expected to be familiar with this policy and the commonly accepted standards of academic integrity, ignorance of such standards is not normally sufficient evidence of lack of intent. Follow the link below for detailed information on the Academic Honesty Policy http://www.umass.edu/dean_students/codeofconduct/acadhonesty/