EDUC 626/SI 548

Principles of Software and New Media Design for Learning

Instructors:	Dr. Chris Quintana
Location:	School of Education, Room 4212
Time:	Wednesdays, 4:00-7:00pm
Website:	Course site on Canvas (http://umich.instructure.com)
Contact:	Email via Canvas message. We may also use a messaging system (e.g., Slack) to contact me and to facilitate communication for design groups (additional apps TBA)

Course Overview

This course is structured as a discussion-oriented seminar, involving design work and focused attention on assigned readings, group projects, and design-oriented presentations and critiques. Students will be introduced to the process of designing computer-based learning environments. Students will work in groups to design and prototype learning environments for a variety of learning contexts. Attention will be focused on ensuring designs are based on sound pedagogical theory and that learning environments are thoughtfully embedded into curriculum.

This course will look at two major areas:

- ***Key Issues in Designing Effective Learning Technologies:*** We will look at the design process in relation to designing learning technologies and the differences between learner-centered design and the more traditional usability-centered approach to software design.

- ***Learning Sciences and Design:*** We will look at current work in educational scaffolding and how scaffolding techniques can be designed in technology to mediate learning.

Design Work and Critiques

Design is difficult and submitting one's designs to the scrutiny and criticism of others can be intimidating. However, design critiques provide invaluable opportunities to learn for the designer and the audience. Lessons can come from both the failures and successes of any particular design, as well as the contrast between different designs. In order to achieve the benefits of these opportunities, we will prioritize the cultivation of a classroom culture of trust and sensitivity.

Learning Objectives

Students will:

- Gain practical experience in the design process for developing learning-oriented software
- Differentiate between the design of learning and usability-centered design
- Explore theories of learning and current work on educational scaffolding to see how they inform the learning technology design process
- Engage in "hands-on" software/new media design activity

Target Audience

This course is open to students who have varying levels of experience in teaching with technology and designing learning technologies: Teachers who have used some technology in their classrooms and are interested in trying their hand at technology design projects; software

designers interested in different approaches for designing learning technologies; and other students who might have little or no teaching experience, but who are comfortable with technology and are interested in applying their knowledge to educational projects.

Course Requirements

There is a range of assignments in this course, but the core work for the semester is a group project (3-4 students/group) to design a learning technology. There will be several products that groups will create and present for discussion and review. Part of your grade will be made up of individual work (40%) and part of your grade will be made up of group work (60%). Please note that within each group project, there is leeway for the instructor to tailor the grade to each individual student (e.g., by assessing individual writing skills and presentation skills). The overall course grades will be based upon the successful completion of each of the following components of course-related work.

Requirement	Details
Individual assignments	
Class Participation	Class attendance is mandatory, as is active participation in the course, including online and face to face discussion on each week's readings, in-class work, and group work. (**10%**)
Learning Technology Exploration Due: January 19	Individually, you will take a focused look at something you believe is a "learning technology/new media" project. Begin identifying different aspects. What are the learning goals? What is the context of use? What is the supported activity structure? Are there specific features in the technology that you feel support learning (or are such features lacking)? You will submit this assignment (probably on a discussion thread) and should comment on the assignments of at least three of your peers. (**5%**)
Learning Technology Critique Due: March 9	In this digital poster assignment, you will take a focused look at a learning technology or new media design that we have used in the course. As with the Learning Technology Exploration, you will ask: What are the learning goals? What is the context of use? What is the supported activity structure? Are there specific features in the technology that you feel support learning (or are such features lacking)? For this last question you will make explicit connections from learning theories and recent work on educational scaffolding that we have discussed in class. (**10%**)
Design Reflection Due: April 21	Throughout the semester, each student should maintain a "design diary" to document the specific roles and contributions made to the group project. The design portfolio should demonstrate individual progress over the semester. Design documents and artifacts can be kept in a folder, journal, or online source (e.g., blog). Students are encouraged to take notes on their thinking and their group's processes as the projects develop. Part of the design portfolio is a final short overview describing the personal progress made as a designer, including an assessment of the major successes and failures of the software design project and what was learned about the design of learning technology. (**15%**)

Group assignments	
Design Project Activities Due: January 26	**Design Proposal Summary: Briefly Summarize Your Project Idea** The design proposal summary (1-2 pages, double spaced) is a short written document that describes the goals of your proposed software/new media project, a description of the target audience, the content area of the software, learning goals, and other assumptions that will define the software being designed. (**5%**)
Due February 9	**Updated Design Project Report: Refine and Expand Your Proposal Summary** The updated design project report should expand on your design proposal summary (4-6 pages, double spaced). The updated report should provide more details about the content area, the learner audience, and the learner needs supported by the software. The learner needs should be discussed in sufficient detail to fully motivate and inform the learning-oriented software features that you will design in future stages. The report should also describe specific activities supported by the software and other aspects of the work that the target audience will engage in with your software. (**10%**)
Due: February 25 (information structure) and March 23 (rough screens)	**Design Outlines** The design outline should sketch out the functionality and rough screens for your software. **For February 25:** You should start to describe details such as information structure. **For March 16:** Then you should sketch out user interface screens and elements, scaffolding features and rationalization, etc. While some aspects of the design might change as the project evolves, a well-thought-out outline will help the design team develop a unified vision. You will present your design outline in class on March 18 using any medium or modality that you choose. (**5%** / **5%**)
Due: April 13 (Final presentation) and April 22 (Final submission)	**Final Design Prototype/Storyboards** The design outline should now be expanded into your final software prototype/storyboard for the class presentation. This could be a paper-based or computer-based artifact that is a "proof-of-concept" representation that could serve as a model for further development work and allows you to "demo" a typical user path to illustrate the software design and user interface elements. Your final artifact should be carefully planned and rendered as professionally as possible. Together with your team, you should plan a presentation (e.g., slides, poster, etc.) and an accompanying project report that showcases your final design, a summary of the design process involved in the particular project, and an identification and rationalization for the scaffolding and other learning-oriented features in the software. Your final artifact should be carefully planned and rendered as professionally as possible. After the presentation, you will also submit a final version of your presentation materials that you augment with some additional points throughout where you provide some notes that give the theoretical rational for your design decisions (including references to the course readings). You can submit your final presentation materials on April 22. (**35%**)

Course Schedule (subject to change depending on progress on projects)

January	**Overview and goals of learning technologies, user-centered and learner-centered design, learner needs, project selection, begin design work**
Session 1 • January 5 Course Overview and Introductory Discussion	Course overview, introductory business, preliminary discussion on learning technologies. Next deadline: Learning Technology Exploration assignment (due January 19) Work for next week: • Bring in possible design project ideas • View lecture video for next week • Read Soloway, Guzdial, and Hay (1994) • Read Quintana, Krajcik, and Soloway (2003)
Session 2 • January 12 Designing Software for Learning	Class discussion: • Learner-centered design • Compare and contrast designing for usability versus for learning • Discuss project ideas and start setting up project groups. Work for next week: • Prepare and submit your Learning Technology Exploration Assignment (in Canvas) by January 19 • View lecture video for next week • Read Metcalf, Krajcik, and Soloway (2000) • Optional: Read Goodwin (2009), chapters 11 and 12
Session 3 • January 19 Designing for Learning: Design Methods and Approaches	Class discussion: • Design methods • Learner and domain analysis • Thinking about learner support needs In-class group work: • Meet with your project group and discuss this week's topics with respect to your design project. Work with your team to prepare your **Design Proposal Summary**, due January 26th Work for next week: • Peruse the Learning Technology Exploration Assignments of your peers. Comment thoughtfully and comprehensively on at least three of your peers' explorations. • View lecture video for next week • Review Chapter 1 of Selwyn's (2011) Educational Technology: Key Issues and Debates plus choose an additional chapter

Session 4 • January 26 Key Issues and Debates in Educational Technology	Class discussion: • Issues arising from the Selwyn readings Work for next week: • Read Fosnot and Perry (2005) • Read Wilson (1996) • Read Honebein (1996) • Read Oliver (2000) View lecture video for next week

February	**Design issues, continued. Learning theories and perspectives, implications of theory for design, prepare design proposals and project reports**
Session 5 • February 2 Learning Theory: Social Constructivism	Class discussion: • Constructivism, overview of Piaget and Vygotsky • Consider how constructivist ideas can be implemented in technology Group work: • Work on projects and prepare **Updated Design Project Report**, due February 9 Work for next week: • Read Quintana et al. (2004) • View lecture video for next week
Session 6 • February 9 Learner Support and Scaffolding	Class discussion: • Scaffolding and the connections to Vygotsky • Think about scaffolding ideas in education and in technology • Discussion question and examples of scaffolding features Group work: • Group project meetings—discuss and continue refining project overviews (with focus on learner support needs) Work for next week: • Read Driscoll (2005) • Read Mayer (2005) • Read Koedinger and Corbett (2006) • View lecture video for next week • Optional: Read Anderson (1996)
Session 7 • February 16 Learning Theory: Cognitive Science and Information Processing Theory	Class discussion: • Information processing and design implications for technology • Multimedia design implications and examples that connect to information processing • Cognitive tutors

	Group work: • Work on project descriptions (with focus on learner needs and project outcomes) Work for next week: • Read Driscoll (2005) • View lecture video for next week • Optional: Read Burton, Moore, and Magliaro (2004) Prepare individual **Learning Technology Critiques**, due March 9
Session 8 • February 23 Learning Theory: Behaviorism	Class discussion: • Behaviorism and its impact on learning technologies Group work: • Continue work on updated project description and begin thinking about **Design Outline 1 (Information Structure)**, due February 25 Work for next meeting: • Finalizing readings and lecture…TBA shortly View lecture video for next week

March	**Learning theory continued. Theory recap, new directions for learning technologies, moving to project work on storyboarding and prototyping.**
March 2	**Spring Break: No class meeting. Rest and relax as much as you can!**
Session 9 • March 9 Designing for Everyone	Discuss: • Designing for broad sets of learners by taking a Universal Design for Learning approach • Thinking about issues of accessibility in design Group work: • Continue work on updated project description and begin thinking about **Design Outline 2 (Rough Screens)**, due March 23 Work for next meeting (these are subject to change due to some hot-off-the-presses related papers that were just released): • Read Gee (2004) • Read Price (2007) • Read Ainsworth (1999) • Additional paper TBA
Session 10 • March 16 "Emerging" Technology and New Media for Learning	Discuss: • New media and new technologies for learning • Issues in learning technology landscape: gaming, mobile computing, social networks, information visualization

	• How can we push forward on the design of learning technologies? How do we balance pushing forward while making sure these approaches can be implemented effectively? Work for next meeting: • Prepare/submit work on Design Outline 2 (Rough Screens) to submit March 23
Session 11 • March 23 Back to Design…Design Work and Project Development	Discuss: • Topics related to new horizons in learning technologies • Revisit Learning Technology Exploration Assignments in light of our recent discussions on learning theories and scaffolding Group work: Continue storyboarding to work on finalizing project materials
Session 12 • March 30 Design Work and Project Development	Group work: Continue storyboarding and design to move towards Final Design Prototype/Storyboard

April	**Continue with prototyping leading up to final design presentations and papers**
Session 13 • April 6 Finalize Designs and Final Q&A	In-class group work: Continue storyboarding and design to move towards Final Design Prototype/Storyboard
Session 14 • April 13 Project Presentations	Final meeting for the semester. Final group project presentations.
April 22	**Final prototypes/storyboards** are due (5:00 pm eastern)

The Fine Print: Given the dynamic nature of design and a design-oriented class, the instructor reserves the right to make changes in the syllabus as needed. Students will be notified of changes in advance.

Course readings

For Session 2

Quintana, C., Reiser, B. J., Davis, E. A., Krajcik, J., Fretz, E., Golan, R., et al. (2004). A scaffolding design framework for software to support science inquiry. *Journal of the Learning Sciences, 13*(3), 337-386.

Soloway, E., Guzdial, M., & Hay, K. E. (1994). Learner-centered design: The challenge for HCI in the 21st century. *Interactions*, 1, 36-48.

For Session 3

Metcalf, S. J., Krajcik, J., & Soloway, E. (2000). Model-It: A Design Retrospective. In M. J. Jacobson & R. B. Kozma (Eds.), *Innovations in Science and Mathematics Education* (pp. 77-115). Mahwah, NJ: Lawrence Erlbaum Associates.

(Optional) Goodwin, K. (2009). *Designing for the Digital Age: How to Create Human-Centered Products and Services*. Wiley Publishing Inc.

For Session 4

Selwyn, N. (2016). *Education and technology: Key issues and debates*. Bloomsbury Publishing.

For Session 5

Fosnot, C. T. & Perry, R. S. (2005). Constructivism: A psychological theory of learning. In C. T. Fosnot (Ed.) *Constructivism: Theory, Perspectives, and Practice*, Teachers College Press.

Honebein, P. C. (1996). Seven goals for the design of constructivist learning environments. In B. G. Wilson (Ed.) *Constructivist Learning Environments: Case Studies in Instructional Design*, Educational Technology Publications.

Oliver, K.M. (2000). Methods for developing constructivist learning on the web. *Educational Technology, 40*(6), 5-18.

Wilson, B. G. (1996). Introduction: What is a constructivist learning environment? In B. G. Wilson (Ed.) *Constructivist Learning Environments: Case Studies in Instructional Design*, Educational Technology Publications.

For Session 6

Quintana, C., Reiser, B. J., Davis, E. A., Krajcik, J., Fretz, E., Golan, R., et al. (2004). A scaffolding design framework for software to support science inquiry. *Journal of the Learning Sciences, 13*(3), 337-386.

For Session 7

Anderson, J. R. (1996). ACT: A simple theory of complex cognition. *American Psychologist, 51*(4), 355-365. (Optional)

Driscoll, M. P. (2005). Cognitive information processing. *Psychology of learning for instruction*, 71-152.

Koedinger, K. R., and Corbett, A. (2006). Cognitive tutors: Technology bringing learning sciences to the classroom. In R. K. Sawyer (Ed.) *The Cambridge Handbook of the Learning Sciences*, Cambridge University Press.

Mayer, R. E. (2005). Cognitive theory of multimedia learning. In R. E. Mayer (Ed.) *The Cambridge Handbook of Multimedia Learning*, Cambridge University Press.

For Session 8

Burton, J.K., Moore, D.M., Magliaro, S. G. (2004). Behaviorism and instructional technology. In D.H. Jonassen (Ed.), *Handbook of Research on Educational Communications and Technology*, Mahwah, NJ: Lawrence Erlbaum Associates. (Optional)

Driscoll, M. P. (2005). Radical behaviorism. *Psychology of learning for instruction*, 29-69.

For Session 9

TBA

For Session 10

Ainsworth, S. (1999). The functions of multiple representations. *Computers & Education*, 33, 131-152.

Gee, J. P. (2004). Learning by design: Games as learning machines. *Interactive Educational Multimedia, 8*(April 2004), 15-23.

Price, S. (2007). Ubiquitous computing: Digital augmentation and learning. In N. Pachler (ed.), *Mobile learning: Towards a research agenda*, London: WLE Center, IoE.

Additional Policies and Expectations

Policy on Original Work
Unless otherwise specified, all submitted work must be your own, original work. Any excerpts from the work of others must be clearly identified as a quotation, and a citation must be provided. It is also required that you produce original work for each assignment that you submit in this course. In other words, you should not reuse your own content from other assignments, either from other courses or from this course.

You may obtain copy editing assistance and you may discuss your ideas with others, but all substantive writing and ideas must be your own or be explicitly attributed to another. An exception is group work, which is assumed to be a collaboration by all group members.

See both the University policy on Academic Integrity and the LSA Office of the Assistant Dean (Student Academic Affairs) Standards of Academic Integrity for definitions of plagiarism, and associated consequences. Any violation of standards for academic integrity will result in severe penalties, which might range from failing an assignment to failing the course.

Accessibility and Universal Learning
I am committed to supporting all students regardless of ability, and regardless of whether or not you have a Verified Individual Services Accommodation (VISA) recognized by Services for Students with Disabilities (SSD).

As a student, you can contact SSD for a confidential and private determination of your eligibility for accommodations if you believe you qualify, at https://ssd.umich.edu/, or by phone at (734) 763-3000. If you already have a VISA, please provide me with that information as soon as possible so that I can plan for your accommodations.

If you do not have a documented disability, but believe that you need an accommodation, please make an appointment with me to discuss your options and ways I can assist your learning. All information you share with me is private and confidential.

Information about Mental Health and Well-Being
The University of Michigan is committed to advancing the mental health and wellbeing of its students, while acknowledging that a variety of issues, such as strained relationships, increased anxiety, alcohol/drug problems, and depression, directly impacts students' academic performance.

If you or someone you know is feeling overwhelmed, depressed, and/or in need of support, services are available. For help, contact Counseling and Psychological Services (CAPS) at (734) 764–8312 during and after hours, on weekends and holidays or through its counselors physically located in schools on both North and Central Campus. You may also consult University Health Service (UHS) at (732) 764–8320, or for alcohol or drug concerns, see this resource.

For a more comprehensive listing of the broad range of mental health services available on campus, please visit https://www.uhs.umich.edu/aodresources.

This course will be conducted fully online due to the COVID-19 pandemic. We are also witnessing a major sociopolitical uprising. This is an extraordinary moment in history, and we are all dealing with many challenges, fears, traumas and difficulties during this time.

I ask we work this semester to build a sense of care and community for our class. This includes extending kindness, being honest, caring for your own needs, and being aware that everyone is dealing with a wide variety of issues outside of coursework. Please think carefully about what you need each day in order to be in the best mental, emotional, physical and spiritual health that you can. Please be gentle and kind with yourselves, each other and with us. Please communicate things that you need as soon as you know that you need them, whether it's a deadline extension, extra help with coursework, or accommodations that will make your learning easier. **You never owe me an explanation for why you need help—simply saying what you need is enough.**

Gender Pronouns
All people have the right to be addressed in a way that aligns with their personal identity. In this course, we will share the name we preferred to be called, and if we choose, share the pronouns we wish to be addressed by. Also of note: there is an option to indicate your personal pronouns in Wolverine Access using the Gender Identity tab under Student Business.

Any student who faces challenges securing food, housing or other basic needs and believes this may affect their performance in the course is urged to contact the instructors or the Dean of Students Office (734-764-7420; deanofstudents@umich.edu; 609 Tappan Street) for resources and support.