**LS 625 – SPRING 2017**
**Designing Science Learning Environments**

INSTRUCTORS: Devrim Güven
devrim.guven@boun.edu.tr (Ext. 7790)

CLASS: Wednesday 13.00-16.00 at ETB 511

OFFICE HOURS: by appointment

TEXT: Weekly readings available on moodle

ONLINE COMPONENT: https://moodle.boun.edu.tr

## OVERVIEW AND OBJECTIVES

This course is designed to introduce theoretical positions science learning and science learning environment design concepts, considerations and processes. Through assigned readings, discussions, analysis and critique of curriculum documents, the research based science learning environments and design assignments, participant are expected to become competent in science learning environment design that focuses on supporting authentic science learning at a level appropriate to learners.

## ACADEMIC HONESTY

It is assumed that you will submit your own work for all assignments and only your own work will receive a grade. If you refer to the work of any other author (including the work of another student, Internet source, published or unpublished article) you must clearly indicate what is quoted or paraphrased or summarized, cite the source in APA format, and incorporate the cited material logically and coherently into an exposition of your own ideas. Incidents of deliberate academic dishonesty will result in failure for the course and liability to disciplinary action under the terms of the university.

## DISABILITY POLICY

Bogazici University is committed to provide equal educational opportunities for all BU students. If you have a disability-related need for modifications in this course, contact me for appropriate accommodations.

## COURSE ASSIGNMENTS AND GRADING

Professionalism / In-class and Online Participation (20 Points)

Discussion Facilitator (10 points)

LE Design Presentation (20 Points)

LE Design Paper (40 Points)

Design of Science Learning Environment: For this assignment, you will construct a learning environment in a group of two based on topics in the course or one that you are interested in.

- LE Design Presentation: For the last class, please prepare a presentation of your learning environment in the presentation format of your choice. The presentation should be around 20 mins.. (November 1)

- LE Design Paper: You will submit a 10 page double-spaced design paper (excluding references) that includes an introduction, brief literature review that describes the learning theories and instructional models used to design the learning environment. Furthermore paper needs to identify description of the target population, design goals, embodiment, mediating processes and outcomes based on Sandoval 2014. You also need to argue identify how your design complements, substitutes, or compensates existing practices and ideas suggested in the relevant literature. (December 20).

Distribution of Grades

100-90=AA 89-85=BA 84-80=BB

COURSE SCHEDULE

| **Date** | **Topic** |
|---|---|
| Sep 20 | Introduction to course and expectations |
| Sep 27 | Framework for K-12 Science Education |
| Oct 4 | Learning From Design and Design Framework |
| Oct 11 | Authentic Science in Science Education |
| Oct 18 | Project Based Science |
| Oct 25 | Scaffolding for Learning |
| Nov 1 | ***Presentation of Initial Design Ideas & Discussion*** |
| Nov 8 | Technology Supported Design for Science Learning |
| Nov 15 | Design for Argumentation |
| Nov 22 | Formative Assessment and Reflection |
| Nov 29 | Motivational Design |
| Dec 6 | Informal Science Learning |
| Dec 13 | Presentation of Final LE Designs and Discussion & Course Wrap Up |

**Readings**

**Sep 27**

Duschl, R. (2008). Science education in three-part harmony: Balancing conceptual, epistemic, and social learning goals. Review of Research in Education, 32, 268-291.

National Research Council (NRC). (2012). A framework for K-12 science education: Practices, crosscutting concepts, and core ideas. Washington, DC: The National Academies Press.( Read chapters 2, 3 and skim chapter 4)

NRC (2103) https://www.nextgenscience.org/get-to-know. Apendix H: Understanding the Scientific Enterprise: The Nature of Science in the Next Generation Science Standards.

**Oct 4**

Bransford, J.D., Brown, A.L., & Cocking, R.R. (2000). Design of learning environments, Chapter 6 (pp. 131-154). In How people learn: Brain, mind, experience, and school. Washington, D.C.: National Academy Press.

Edelson D. C (2002) Design research: What we learn when we engage in design, Journal of the Learning Sciences, 11:1, 105-121

William Sandoval (2014) Conjecture Mapping: An approach to systematic educational design research, Journal of the Learning Sciences, 23:1, 18-36

**October 11**

Chinn, C. A., & Malhotra, B. A. (2002). Epistemologically authentic inquiry in schools: A theoretical framework for evaluating inquiry tasks. Science Education, 86(2), 175-218.

Edelson, D. C., & Reiser, B. J. (2006). Making authentic practices accessible to learners: Design challenges and strategies in . K. Sawyer (Ed.), The Cambridge handbook of the learning sciences (pp. 335-354). Cambridge University Press.

**October 18**

Krajcik ,J. S. & Shin, N.(2014) Project-based learning. In R. K. Sawyer (Ed.), The Cambridge handbook of the learning sciences: Second edition (pp. 275–297). New York, NY: Cambridge University Press

**October 25**

Reiser J. B. (2004). Scaffolding complex learning: The mechanisms of structuring and problematizing student work, Journal of the Learning Sciences, 13:3, 273-304

Quintana, C., Reiser, B. J., Davis, E. A., Krajcik, J., Fretz, E., Duncan, R. G., ... & Soloway, E. (2004). A scaffolding design framework for software to support science inquiry. The journal of the learning sciences, 13(3), 337-386.

**Nov 8**

Linn, M. C. (2000). Designing the knowledge integration environment. International Journal of Science Education, 22(8), 781-796.

**Nov 15**
Berland, L. K., & McNeill, K. L. (2010). A learning progression for scientific argumentation: Understanding student work and designing supportive instructional contexts. Science Education, 94(5), 765-793.

**Nov 22**
Black, P., & Wiliam, D. (2009). Developing the theory of formative assessment. Educational Assessment, Evaluation and Accountability, 21(1), 5.

Lin, X., Hmelo, C., Kinzer, C. K., & Secules, T. J. (1999). Designing technology to support reflection. Educational Technology Research and Development, 47(3), 43-62.

**Nov 29**
Driscoll, M. (2005). Motivation and self-regulation in learning (p. 307-347) in Psychology of Learning for Instruction. Needham Heights, MA, Allyn & Bacon.

Järvelä, S and Renninger K. A. (2014). Designing for Learning: Interest, Motivation, and Engagement. In R. K. Sawyer (Ed.), The Cambridge handbook of the learning sciences: Second edition (pp. 668–685). New York, NY: Cambridge University Press

**Dec 6**
Yoon, S. A., Elinich, K., Wang, J., Schooneveld, J. B., & Anderson, E. (2013). Scaffolding informal learning in science museums: How much is too much? Science Education, 97(6), 848-877.

Falk, J., Storksdieck, M. (2010). Science learning in a leisure setting. Journal of Research inScience Teaching, 47(2), 194-212.

Allen, S. (2004). Designs for learning: Studying science museum exhibits that do more than entertain. Science Education, 88(S1).