TBTE 480: Curricular Design and Innovation

SYLLABUS/COURSE SPECIFICS – Fall 2007

Instructor:	**Class meetings:**	**Office:** A113 Iacocca Hall	**Phone:** 610-758-5095
Dr. Alec Bodzin	Wed 4:10-7:00 Maginnes 103	**Hours:** Thur 3:30-5:30 and by appt.	**Email:** amb4@lehigh.edu

Description:
This course investigates curricular models and their features, with a focus on how curricular design promotes learning in K-12 settings. Special emphasis is placed on technology-enabled curricula, designing for learning environments, and curriculum's role in innovation.

Format:
This course is composed of *synchronous* and *asynchronous* activities. Synchronous activities occur live and "face-to-face," while asynchronous activities may take place at different times for different learners. Face-to-face synchronous sessions will be primarily discussion based. Asynchronous activities will include readings, handouts, reviewing online materials, and completing additional activities and materials produced by students. Because some of the content for this course is delivered asynchronously, we are freer in our synchronous sessions to cover application and synthesis of the concepts covered.

Driving course questions:
How can curricular learning experiences be designed to promote deep understanding?
How can technology be used effectively in curricular designs for learning?
What is an innovative curriculum?

Course Objectives:
By the conclusion of the course, students will have demonstrated the ability to (through graded course activities to):

1. Understand how technology can be used in innovative curricular designs for learning environments.
2. Design a technology-enabled instructional unit using backward design to promote learning.

Required Text:
Wiggins, G., & McTighe, J. (2005). Understanding by Design, expanded 2nd Edition. Alexandria, VA: Association for Supervision and Curriculum Development

Optional Text:
McTighe, J., & Wiggins, G. (2004). Understanding by Design Professional Development Workbook. Alexandria, VA: Association for Supervision and Curriculum Development

Course Requirements (with percentage of final mark): <u>All</u> assignments must be completed in order to pass the course.

- Innovative Curriculum Project Paper (50%)
- UBD Instructional Unit Design Assignment (50%)

Evaluation Criteria:

All work will be evaluated in terms of

- **Completeness:** The extent to which it includes all that it should include.
- **Soundness:** The extent to which it is based on a sound theoretical and research foundation.
- **Quality:** Extent to which it demonstrates a firm grasp of material covered in class and in readings.
- **Creativity:** The extent to which it goes beyond mere verbatim reproduction of material presented in class and in readings.

Regular attendance, class participation, and **timely submission** of assignments are expected of graduate students and do not augment assigning marks. All assignments are due no later than the start of class on the date indicated on the syllabus and are to be posted electronically in the form indicated. Late postings will receive reduced marks beginning 1 hour after the due date/time.

Accommodations for Students with Disabilities: If you have a disability for which you are or may be requesting accommodations, please contact both your instructor and the Office of Academic Support Services, University Center 212 (610-758-4152) as early as possible in the semester. You must have documentation from the Academic Support Services office before accommodations can be granted.

Course Readings:

Barab, S.A., & Luehmann, A.L. (2003). Building sustainable science curriculum: Acknowledging and accommodating local adaptation. *Science Education, 87*(4), 454-467.

Baker, T. R. (2005). Internet-based GIS in support of K-12 education. *The Professional Geographer 57*(1), 44-50.

Bednarz, S. W., & D. R. Butler. (1999). "Mission Geography" and the Use of Satellite Imagery in K-12 Geographic Education - A NASA - GENIP Partnership. *Geocarto International, 14*(4), 85-90.

Bodzin, A., Waller, P., Edwards, L., and Kale, D. (2007). Investigating the use of inquiry and Web-based activities with inclusive biology learners. *The American Biology Teacher*, *69*(5), 371-377.

Chiarelott, L. (2006). Curriculum in context. Belmont, CA: Wadsworth. pp.57-74; 110-124.

Clark, D., & Linn, M. C. (2003). Designing for Knowledge Integration: The Impact of Instructional Time. *The Journal of the Learning Sciences, 12*(4), 451-493.

Fishman, B., & Krajcik, J. S. (2003). What does it mean to create sustainable science curriculum innovations? *Science Education, 87*(4), 564-573.

Glatthorn, A.A., Boschee, F., & Whitehead, B.M. (2006). Curriculum leadership: Development and implementation.Thousand Oaks: Sage Publications. pp. 73-104; 301-322.

Hewitt, T. W. (2006). Understanding and shaping curriculum: What we teach and why. 131-153.

Lin, H. T., & Fishman, B. J. (2006, April). Exploring the relationship between teachers' experience with curriculum and their understanding of implicit unit structures. Paper presented at the Annual Meeting of the American Educational Research Association, San Francisco, CA.

Linn, M.C., Clark, D., Slotta, J.D. (2003). WISE design for knowledge integration. *Science Education, Volume 87*(4), 517-538.

Linn, M. C., Davis, E.A., & Eylon, B-S. (2004). The Scaffolded Knowledge Integration Framework for Instruction. In M.C. Linn, E.A. Davis, & P. Bell (Eds.), *Internet Environments for Science Education* (pp. 47-72). Mahwah, NJ: Lawrence Erlbaum Associates.

Linn, M.C., Husic, F., Slotta, J., & Tinker, R. (2006). Technology Enhanced Learning in Science (TELS): Research Programs. *Educational Technology*, 46(3), 54-68.

National Research Council (2006). *Learning to think spatially: GIS as a support system in K-12 education*. Washington, DC: National Academy Press. p.1-10; 94-109.

Penuel, W.R., & Means, B. (2004). Implementation variation and fidelity in an inquiry science program: Analysis of GLOBE data reporting patterns. *Journal of Research in Science Teaching, 41*(3), 294-315.

Posner, G. (2004). Analyzing the curriculum. 3ed edition. Boston: McGraw Hill. pp.43-65; 69-103.

Rivet, A.E., & Krajcik, J.S., (2004). Achieving Standards in Urban Systemic Reform: An Example of a Sixth Grade Project-Based Science Curriculum. *Journal of Research in Science Teaching, 41*(7), 669-692.

Roschelle, J., Kaput, J.J., & Stroup, W. (2000) SimCalc: Accelerating students' engagement with the mathematics of change. In M. Jacobson and R. Kozma (Eds). Innovations in Science and Mathematics Education. pp.47-75. Mahwah, NJ: Erlbaum.

WEEKLY SCHEDULE Curricular Design and Innovation: Fall 2007

Readings are posted to our course Blackboard site (bb.lehigh.edu) under "Homework" and organized by week. Students are responsible for completing those materials each week BEFORE class.

Class	Class Meeting Discussion Topics	Before next class: ASYNCHRONOUS (Out-of-class) Always check BB for additions
#1 8/29	Introduction to course. Curriculum overview.	Read: Posner, p. 43-65; 69-103; Chiarelott, 57-74; 110-124; Glatthorn, 73-104; Hewitt, 131-137; 138-150.
#2 9/5	Curriculum and learning theory. Curricular models.	Read Linn et. al., 2004; IQWST Design Principles.
#3 9/12	Instructional design principles. Designing for brain-based learning. *Rosh Hashana begins at sundown. Class ends at 5:45 pm.*	Read Krajcik et. al, 2000; Baker, 2005; Bodzin, 2007; Bodzin & Cirruci, 2007.
#4 9/19	Technologies to support learning. Spatial thinking case studies.	Read Lin & Fishman, 2006; Fishman & Krajcik, 2003; Barab, & Luehmann, 2003; Glathorn Ch. 12; Bodzin et al. - Exploring Life articles and instrument
#5 9/26	Implementation Fidelity. Curriculum Evaluation. Exploring Life case study.	Read articles and explore Web links in the innovative curriculum folders. Check BB for additions. *Work on Innovative Curriculum Project Assignment.*
#6 10/3	Innovative curricula: • Computers as Learning Partner • The Web-based Inquiry Science Environment • Technology-Enhanced Learning in Science	Read articles and explore Web links in the innovative curriculum folders. Check BB for additions. *Work on Innovative Curriculum Project Assignment.*
#7 10/10	Innovative curricula: • Project-based science curriculum • IQWST – Investigating and Questioning our World through Science and Technology • The Geographic Data in Education (GEODE) Initiative - MyWorld GIS, Worldwatcher	Read articles and explore Web links in the innovative curriculum folders. Check BB for additions. Finish Innovative Curriculum Project Assignment.
#8 10/17	**Innovative Curriculum Project Paper DUE** Innovative curricula: • Problem-based historical inquiry • SimCalc Mathworlds Curriculum • Core-Plus Mathematics	Read articles and explore Web links in the innovative curriculum folders. Check BB for additions.
#9 10/24	Innovative curricula: • Virtual Environments • GLOBE Program • Think Math!	Read articles and explore Web links in the innovative curriculum folders. Check BB for additions. Read Wiggins & McTighe Ch.1-4; McTighe & Wiggins p. 1- 28
#10 10/31	Innovative curricula: • Mission Geography Introduction to Understanding by Design	Read Wiggins & McTighe Ch. 5-8.
#11 11/7	Understanding by Design: • Essential questions and learner understandings • Designing assessments	Read Wiggins & McTighe Ch. 9-11.

Class	Class Meeting Discussion Topics	Before next class: ASYNCHRONOUS (Out-of-class) Always check BB for additions
#12 11/14	Understanding by Design: Design Processes	Read Wiggins & McTighe Ch. 12-13.
#13 11/21	**Thanksgiving break. No class meeting.**	Work on UBD Instructional Unit Design Assignment.
#14 11/28	Understanding by Design: Peer review session on UBD instructional unit	Finish UBD Instructional Unit Design Assignment.
#15 12/5	**UBD Instructional Unit Design Assignment DUE.** Course wrap-up and evaluations.	

Innovative Curriculum Project Paper

Each participating student will take the lead in exploring one innovative curriculum project. A list of projects is provided below that includes at least one reading and/or the project Web site to help get you started.

You will be responsible for leading a 50-minute session in which you will present the curriculum project to the class. You will be responsible for identifying key readings and Web-based resources (if available) ten days prior to your session. *Send these to Dr. Bodzin for uploading to Blackboard.*

You will also submit a paper on the curricular project. In exploring the curriculum project, you should consider the following components. Besides reporting on each of these considerations, make sure you also do a critical analysis of each.

I. Design: What is the design of the curriculum project?

In addressing the design, consider the following:

- How does the curriculum promote learning?
- What instructional design principles, instructional models, and/or curricular models are used in the design of materials?
- What types of instructional supports are used?
- How does the curricular project create an authentic (meaningful, important, real world) learning environment for students?
- How does the material accommodate the needs of diverse learners?
- Does the curricular materials provide multiple and varied phenomena to support student learning? If so, how?
- Do materials routinely include suggestions for having students express, clarify, justify, and represent his/her ideas? Are suggestions made for when and how students will get feedback from peers and the teacher?
- What is the role of collaboration?

The following ideas are related to the design aspect but are important enough to lend itself to a distinct area in your paper.

II. **Standards Based**: What national standards (e.g., the National Science Education Standards from the NRC, Benchmarks from AAAS, NCTM Standards, Geography for Life) will students meet by engaging in the curriculum? Give specific examples.

III. **Learning Technologies**: What learning technology, (if any), is used? What role does the technology play? What are the key features of the technology? How is it used to promote learning?

IV. **Assessment**: What assessments are used? What types of feedback do students receive?

Your paper also needs to include a **critical analysis** of the following:

V. **Theoretical Framework**: What are the learning and motivation principals/ideas underlying the design of the curriculum and learning materials and held by the authors/designers, either explicitly or implicitly?

VI. Research: What research has been done? What are the results? What more could be done?

VII. Dissemination Models: How have the materials been disseminated? What type of professional development has been used? What efforts have been made to scale the materials to a much wider audience? How do the materials support teacher learning?

VIII. Conclusion: What makes this curriculum innovative?

How to Format and Submit Your Report

Your report should be double-spaced in 12-point Times New Roman font with 1" margins all around. All pages of the entire document should be numbered sequentially. Each of the sections of the document should be labeled with the appropriate heading from above and they should be presented in the order that they are presented above. Your report should include a cover page with its own title and the words "TBTE 480: Curricular Design and Innovation – Dr. Bodzin" and your name.

Important: Save your document in MS Word version 1997-2003.

Submit your paper using the Assignment Submission tool in Blackboard.

Project List:

1. **Computers as Learning Partner**
The CLP thermodynamics curriculum
Clark, D., & Linn, M. C. (2003). Designing for Knowledge Integration: The Impact of Instructional Time. *The Journal of the Learning Sciences, 12*(4), 451-493.

2. **The Web-based Inquiry Science Environment**
http://wise.berkeley.edu
Linn, M.C., Clark, D., Slotta, J.D. (2003). WISE design for knowledge integration. *Science Education, Volume 87*(4), 517-538.

3. **Technology-Enhanced Learning in Science**
http://www.telscenter.org/
http://www.telscenter.org/curricula/
Linn, M.C., Husic, F., Slotta, J., & Tinker, R. (2006). Technology Enhanced Learning in Science (TELS): Research Programs. *Educational Technology*, 46(3), 54-68.

4. **Project-based science curriculum**
Rivet, A.E., Krajcik, J.S., (2004). Achieving Standards in Urban Systemic Reform: An Example of a Sixth Grade Project-Based Science Curriculum. *Journal of Research in Science Teaching, 41*(7),669 -692.

5. ***IQWST – Investigating and Questioning our World through Science and Technology***
http://hi-ce.org/iqwst/
Research papers: http://hi-ce.org/iqwst/Pages/Papers.html

6. ***The Geographic Data in Education (GEODE) Initiative - MyWorld GIS, Worldwatcher***
http://www.geode.northwestern.edu/
http://www.myworldgis.org/
http://www.geode.northwestern.edu/investigations/
Research Papers: http://www.geode.northwestern.edu/research.htm

7. Problem-based historical inquiry
http://dp.crlt.indiana.edu/pihnet-publications.html
See publications by Dr. Thomas Brush (Indiana University) and Dr. John Saye (Auburn University)

8. **SimCalc Mathworlds Curriculum**
http://www.simcalc.umassd.edu/curriculum/
Publications: http://www.simcalc.umassd.edu/library.php
Roschelle, J., Kaput, J.J., & Stroup, W. (2000) SimCalc: Accelerating students' engagement with the mathematics of change. In M. Jacobson and R. Kozma (Eds). Innovations in Science and Mathematics Education. pp.47-75. Mahwah, NJ: Erlbaum.

9. ***Core-Plus Mathematics***
http://www.wmich.edu/cpmp/
Research papers: http://www.wmich.edu/cpmp/bibliography.html

10*. Virtual Environments*
Geology Explorer: http://oit.ndsu.edu/menu/

Saini-Eidukat, B., Schwert D., & Slator, B.M. (2002). Geology explorer: virtual geologic mapping and interpretation. Computers & Geosciences 28 (10), 1167 – 1176.

11. **GLOBE Program**
GLOBE Program Web site: http://www.globe.gov/
Penuel, W.R., & Means, B. (2004). Implementation variation and fidelity in an inquiry science program: Analysis of GLOBE data reporting patterns. *Journal of Research in Science Teaching, 41*(3), 294-315.

12*. Think Math!*
http://www2.edc.org/thinkmath/
Papers and presentations: http://www2.edc.org/thinkmath/presentations.htm

13. ***Mission Geography***
http://www.missiongeography.org/
Bednarz, S. W., & D. R. Butler. (1999). "Mission Geography" and the Use of Satellite Imagery in K-12 Geographic Education - A NASA - GENIP Partnership. *Geocarto International, 14*(4),85-90.

UBD Instructional Unit Design Assignment

You will create a technology-enabled instructional unit design using the *Understanding by Design* framework. You will use a modified UBD template format for your curricular unit design. The unit should consist of a ***minimum of 13 implementation days*** in a classroom setting for students in a K-12 grade level. Technology should be an integral part of the unit to promote learning.

Adhere to the format below for your instructional unit design submission. Related formats and examples can be found in the Wiggins and McTighe text, p. 327-332, and McTighe and Wiggins (2004).

INTRODUCTORY MATERIAL

- Unit Title:
- Grade level:
- Subject/Topic Areas:
- Key Words:
- Designed by:
- Time Frame:
- Brief Summary of Unit (including curricular context and unit goals):
- Technology application(s) used: Describe each technology application that is used in the unit and how it promotes learning.

STAGE 1 – IDENTIFY DESIRED RESULTS

- Established Goals (include national standards):
- What essential questions will be considered?

  Overarching questions (Point beyond a unit to big ideas and enduring understandings. Do not mention specific topics or events):

  Topical questions:
- What understandings are desired?

  Overarching enduring understandings for this unit (Transcend the content knowledge of the unit):

  Topical enduring understandings for this unit (Are specific to the unit topic. Involve generalizations derived from the specific content knowledge and skills of the unit):
- What key knowledge and skills will students acquire as a result of this unit?

  Students will know….

  Students will be able to….

STAGE 2 – DETERMINE ACCEPTABLE EVIDENCE

- What evidence will show that students understand? Performance Tasks:
- What other evidence needs to be collected in light of Stage 1 Desired Results? Other Evidence: (e.g. tests, quizzes, prompts, work samples, observations)

- Student Self-Assessment and Reflection:

ASSESSMENT TASK BLUEPRINT (see Wiggins and McTigue p.330 for an example).

- What understandings or goals will be assessed through this task?
- What criteria are implied in the standards and understandings regardless of the task specifics? What qualities must student work demonstrate to signify that standards were met?
- Through what authentic performance task will students demonstrate understanding? Task Overview
- What student products and performances will provide evidence of desired understandings?
- By what criteria will student products and performances be evaluated?

STAGE 3 – PLAN LEARNING EXPERIENCES

What sequence of teaching and learning experiences will equip students to engage with, develop, and demonstrate the desired understandings? List the key teaching and learning activities in sequence in a daily format. Be specific to how technology is being used to promote learning. This section needs to be written specifically so a classroom teacher could implement the teaching and learning experiences in a classroom environment.

Day 1:
Day 2:
Day 3:
Etc.
(Minimum 13 Days)

UbD DESIGN STANDARDS

In this section of your unit instructional design, clearly articulate how each facet of the design standards are met by responding to each question.

Stage 1—To what extent does the design focus on the big ideas of targeted content?

How are the targeted understandings enduring, based on transferable, big ideas at the heart of the discipline and in need of uncoverage?

How are the targeted understandings framed by questions that spark meaningful connections, provoke genuine inquiry and deep thought, and encourage transfer? Provide specific learning task examples from the unit.

How are the essential questions provocative, arguable, and likely to generate inquiry around the central ideas (rather than a "pat" answer)?

Are appropriate goals (e.g., content standards, benchmarks, curriculum objectives) identified? What curricular standards outside the core discipline are identified? (e.g., which literacy, environmental education, or mathematics standards are met for a science unit on global climate change?)

What is your evidence that valid and unit-relevant knowledge and skills are identified?

What common learner misconceptions (naïve conceptions) or predictable misunderstandings does your unit specifically address?

Stage 2—To what extent do the assessments provide fair, valid, reliable and sufficient measures of the desired results?

How do students exhibit their understandings through authentic performance tasks?

Describe how a variety of appropriate assessment formats will be used to provide additional evidence of learning?

How will assessments be used as formative feedback for students and teachers?

How will assessments be used as summative feedback for students and teachers?

Stage 3—To what extent is the learning plan effective and engaging?

How will students know *where* they're going (the learning goals), *why* the material is important (reason for learning the content) and *what* is required of them (unit goal, performance requirements and evaluative criteria)?

How will students be hooked—engaged in digging into the big ideas (e.g., through inquiry, research, problem solving, and experimentation)?

What opportunities will students have to *explore* and *experience* big ideas and receive instruction to *equip* them for the required performances?

How will students *evaluate* their work, reflect on their learning, and set goals?

How is the instructional unit *tailored* and *flexible* to address the interests and learning styles of all students?

How is instruction o*rganized* and sequenced to maximize engagement and effectiveness?

ASSESSMENT EVIDENCE

In this section, you will provide appropriate scoring tools used to evaluate student products, performances, and content understandings?

Specific Performance Task Examples and Scoring Criteria. Include the actual performance tasks the learners would receive. Include at least one analytic trait rubric.

Specific Academic Prompts. List the specific open-ended questions or problems that require the students to think critically during the unit.

Quiz and Test Items. List the specific quiz and test items that will be included in the unit to assess content knowledge. Provide an answer key.

Important: Save your document in MS Word version 1997-2003.

Submit your instructional unit design using the Assignment Submission tool in Blackboard.