

# Curriculum/Foundations

## MSED 250/554/555 (3 credit hours)

### IIT's Mathematics and Science Education Program

The overall conceptual framework for our program borrows heavily from Shulman's (1986) *Knowledge Growth in Teaching* with the ultimate focus on *the Teacher as Transformer of Subject Matter*. The program focuses on the development, revision, and elaboration of six primary domains of knowledge that both theory and research have indicated are essential for effective instruction. It is this combination of domains of knowledge that distinguishes the expert teacher from others possessing one or more of the following domains of knowledge.

1. **Subject matter knowledge:** Knowledge of foundational ideas and conceptual schemes, data and procedures within a specific subject matter area.
2. **Pedagogical knowledge:** Knowledge of generic principles and strategies of classroom instruction (e.g., instructional models and integration of technology) and management.
3. **Knowledge of schools:** Knowledge of educational contexts, i.e., the place of the classroom in the school, school in the community and other social contexts.
4. **Knowledge of learners:** Knowledge of all aspects of intellectual, social and emotional development of all students regardless of cultural, social, ethnic background.
5. **Curricular knowledge:** Knowledge of development and implementation of programs and materials.
6. **Pedagogical Content knowledge:** The way of representing and formulating subject matter knowledge that makes it comprehensible to others (i.e., knowledge of how to transform and represent subject matter so that it is comprehensible to students or others).

### Course Description

This course is a lecture/discussion course focusing on the history/sociology of education, rationales and goals of current reform efforts, curriculum design, development, and curriculum analysis. This course helps students develop a functional understanding of the various factors that influence the development and direction of secondary science curricula, and the ability to apply knowledge of subject matter, curriculum development, and curriculum theory to construct a hypothetical curriculum that recognizes cultural and individual differences with special emphasis on the interdependence of science, technology, and society. Particular emphasis is placed on the analysis and revision of existing curriculum relative to national and state reforms.

### Course Goals

- Develop a functional understanding of various factors (historical and current) that influence the development and direction of middle and secondary science and math curricula
- Explore different forms of curricula and explain their characteristics and interactions
- Develop and employ a functional understanding of Illinois and National reforms (including the standards movement) in mathematics and science and their influence on current middle and secondary curricula
- Identify and critically assess curricular issues and problems faced by middle and secondary mathematics and/or science teachers, proposing potential solutions when appropriate
- Analyze curricula for the extent that each recognizes cultural (i.e., race/ethnicity, religion, immigration status) and individual differences (i.e., gender, sexual orientation, special needs)

- Analyze curricula for the extent that each stresses the interdependence of science, technology, and society (STS) and the connections between science, technology, engineering and mathematics (STEM)
- Apply knowledge of subject matter, curriculum development, and curriculum theory to assess, refine, and develop curricular materials for middle and secondary mathematics and science classrooms

### **Textbooks and Materials**

- (a) American Association for the Advancement of Science (1993). *Benchmarks for science literacy*. New York: Oxford University Press.
- (b) National Council for Teachers of Mathematics (2000). *Principles and standards for school mathematics*. Reston, VA: Author
- (c) National Research Council (1996). *National science education standards*. Washington, D.C.: National Academy Press.
- (d) Illinois State Board of Education (2003). *Illinois Learning Standards*. Springfield, IL: ISBE.
- (e) International Technology Education Association (2000). *Standards for technological literacy*. Reston, VA: Author. Website: <http://www.iteaconnect.org/TAA/PDFs/xstnd.pdf>
- (f) Various handouts will be distributed throughout the course

### **Topical Sequence**

- Foundations of schooling in the U.S.
- The role of education in U.S. culture
- What is Curriculum?
- Whose interests are served by the curriculum?
- Determining the Curriculum
- Factors Influencing Curriculum Content
- Instruction as related to curriculum
- Learning Theory as a Curricular Influence
- What is Constructivism?
- Designing a Curriculum for ALL Students
- The "Standards" Movement (NCTM, NSTA, AAAS, NSES)
- Illinois' Perspective
- Systematic Analysis of Curricula Materials
- Integration of Technology into the Curriculum

### **Evaluation**

Curriculum Development Project (100 points)

Curriculum Review I (30 points)

Curriculum Review II (30 points)

There will be no curve. Students will strive for predetermined levels of mastery rather than compete against each other. The levels of mastery are as follows:

90 – 100%	=A	60 – 69%	=D
80 – 89%	=B	< 60%	=F
70 – 79%	=C		

**Accommodations:**

**Reasonable accommodations will be made for students with documented disabilities. In order to receive accommodations, students must obtain a letter of accommodation from the Center for Disability Resources and make an appointment to speak with me as soon as possible. My office hours are. . .**

**The Center for Disability Resources is located in the Life Sciences Building, room 218, 312-567-5744 or [disabilities@iit.edu](mailto:disabilities@iit.edu).**

## Resource Idea/Card Section Definitions and Inclusions

1. Title and Source/citation
2. **Idea:** An overview or brief description of the idea and its purpose  
For example: Have students count stripes on sunflower seeds to illustrate a normal distribution.
3. **Connection to Standards:** Specify the National Standards or Benchmark that your Idea will help students achieve.
4. **Use:** Describe when and how the idea will actually be implemented within a lesson  
For example: Please see sample resource idea/card
5. **Materials:** Specify the materials (class set or per student) that are needed for the idea
6. **Modifications:** Identify alternative uses of the idea or alternative materials if recommended materials are unavailable, and include modifications to address the diverse needs of the learners.

## Resource Idea/Card Critique Sheet

Name \_\_\_\_\_

Grade \_\_\_\_\_

### Overall Assessment:

1. I have used the following symbols at the top of each idea/card to indicate deficient items:

- 0 - Idea
  - \$ - Connection to Standards
  - √ - Use
  - \* - Modifications
  - # - Materials
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2. Variety of Ideas (e.g., demonstrations, labs, pictures, bulletin board items, etc.)

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3. Attention to inquiry/problem solving and the nature of science/mathematics.

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4. General Comments:

## Curriculum Development Project

While completing this project, you will have the opportunity to exhibit your imagination, creativity, and resourcefulness. It will also allow me to assess your ability to apply the various ideas discussed in class to the development of a science curriculum.

The focus of your assignment is to construct a curriculum that best illustrates what you envision as the most appropriate for contemporary science instruction (i.e., 2000 and beyond). The subject area and grade level addressed by the curriculum are your choices, but should be those for which you are licensed. In addition to several overall aspects of the curriculum (e.g., goals, rationale, etc.), you will be expected to construct a two week unit that best illustrates the approach, goals, and nature of the curriculum you envision (the focus on a two week unit may vary if you choose to take a thematic approach).

This project will have both a written portion and an oral presentation. The written portion of the project should include the following:

1. Rationale for the curriculum
2. Overall curriculum goals
3. Individual units and unit goals
4. 4. Instructional plans and activities for a unit of at least two weeks (i.e., 10 class meetings or 10 hours). Again, this may vary with a thematic approach.
5. Evaluation plans for the two week unit for which you have written plans

Your oral report should summarize what is included in the written report and it should approximately 15 minutes in length.

Written Report	=	90 points
Oral Report	=	<u>10 points</u>
Total Points	=	100 points

## **Curriculum Review I** **(30 points)**

This assignment will require you to submit a written review of an existing or "historical curriculum." Your curriculum review should include the following:

### 1. **Curriculum Summary**

- a) Overall curriculum goals
- b) Major unit titles and sequence
- c) Unit goals/objectives from two units
- d) Sample activity/laboratory from a selected unit

### 2. **Curriculum Evaluation**

- a) Whose interests (e.g., state, parental, etc.) are served by the curriculum goals? (Limit yourself to three goals for this part.)
- b) Is the sequence of instructional units logically and pedagogically satisfactory? Explain your answer.
- c) Are the unit goals/objectives noted in 1c above logically related to the overall curriculum goals? Explain your answer.
- d) Is the sample activity/laboratory presented in 1d above appropriate for the achievement of the unit goals/objectives? Which ones?
- e) How is the learner perceived by the curriculum developers? For example, with what family of learning theory can you infer that the curriculum developers agree? You can derive an answer to this question by analyzing selected instructional activities or laboratory activities.
- f) Critique the level of inquiry orientation in the curriculum. This may be accomplished by using the "Herron Scale" to analyze the inquiry level of 10 randomly selected activities/laboratories. Does the curriculum appear to be inquiry oriented? Is the curriculum supposed to be inquiry oriented?

## **Curriculum Review II** **(30 points)**

Using the same curriculum you reviewed in **Curriculum Review I**, assess the following:

1. Compare and contrast the rationale/goals of the curriculum with the rationale/goals of current reforms in mathematics/science.
2. Discuss each of the following in terms of curricula attention and grade-level appropriateness:
  - a) Readability
  - b) Integration
  - c) Technology
  - d) Nature of science/mathematics
  - e) Relative focus on content versus process
  - f) Relevancy