Analysis of Classrooms
MSED 200/500 (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 includes a two-hour weekly seminar along with a five-hour weekly practicum in an area school. This introductory course provides students with background in learning theory, motivation theory, classroom management, aspects of effective teaching, the use of technology, the school as a system, student diversity, as well as student emotional and cognitive development. Overall, this course represents program students’ first exposure to classrooms, students, and the culture of schools.

**Course Goals**

- Develop knowledge about the instructional activities of secondary mathematics and/or science teachers and the environment in which they teach
- Identify and critically assess issues and problems faced by secondary mathematics and/or science teachers, proposing potential solutions when appropriate
- Apply observation techniques in field based settings with science and/or mathematics teachers and appropriately report findings using evidence

**Textbooks and Materials**


(c) Various handouts will be distributed throughout the course
**Topical Sequence**
- The Contemporary Classroom: Teaching ALL Students
- Observing Classrooms
- Classroom Variables and Effective Instruction
- Levels and Categories of Learning
- Teacher Expectations and Implications
- Learning Theory: A Historical Perspective
- Modern Learning Theory
- The Developmental Theory of Piaget
- Constructivism and Social Constructivism
- Motivational Theory
- Lesson Organization/Planning
- Models of Teaching/Technology Integration
- Alternatives to Whole Group Instruction
- Classroom Management
- Classroom Climate/Environment

**Evaluation**
Grades will be based on total points received from:
- Classroom observation projects (150 pts.)
- Research reviews (150 pts.)
- Resource cards (150 pts.)
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:

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Grade</th>
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<tbody>
<tr>
<td>90 – 100%</td>
<td>A</td>
</tr>
<tr>
<td>80 – 89%</td>
<td>B</td>
</tr>
<tr>
<td>70 – 79%</td>
<td>C</td>
</tr>
<tr>
<td>60 – 69%</td>
<td>D</td>
</tr>
<tr>
<td>0 – 60%</td>
<td>F</td>
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**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.
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

2. Variety of Ideas (e.g., demonstrations, labs, pictures, bulletin board items, etc.)

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

4. General Comments:
Observation Project #1

One purpose of this introductory assignment is to introduce you to the classroom and its constituent components. Consequently, you will be asked to systematically focus your attention on three of the. Primary components of a contemporary classroom (i.e., individual students, the teacher, and classroom environment). In addition, you will be given practice in collecting both continuous and categorical data.

1. **After the initial five (5) minutes** of the class period, pick an individual student to observe. Indicate the gender, ethnicity, and seat location of the student. Then, record everything the student does (in sequence) for 10 minutes.

2. Pick a second student and observe this individual for 10 minutes. This student should be of different gender and general seat location than the first student chosen. Record your observations as you did previously.

3. Now, shift your focus to the teacher. Using the **selective verbatim technique**, record all of the teacher's questions for 10 minutes.

4. As an introduction to categorical data, you will now focus your attention on two types of teacher-initiated questions (i.e., lower level and higher level). Organize your data into a table which specifies the frequencies of the two types of questions and also include the operational definitions that you used to distinguish between the types of questions. You should observe the teacher for 10 minutes.

5. Finally, direct your attention to the classroom environment. This data should include a diagram of the classroom and a written description of items not illustrated by your diagram. For example, your diagram might indicate that there is a bulletin board along the left side of the room. However, you may wish to describe what is on the bulletin board instead of trying to draw a picture of it. You may also wish to describe the paint color and condition of the room. In other words, provide a detailed image of the room.

So, what does all this mean? What can you conclude about the students, teachers, and classroom you observed? (Yes, I am aware that the limited amount of data collected really does not allow for any conclusions). Ignore the representativeness of the data and reflect on what you have collected to:

- a) Draw three inferences that are consistent with the data collected.
- b) State two possible research questions that can be derived from the data collected.
- c) State your opinions concerning the value of the different types of data collection approaches used.

If you are well organized all the data can be collected during a single class period. However, if the task is too formidable for your current skills, you may collect the required data during different class periods. Remember, the purpose here is to introduce you to classroom observation and a few classroom variables.
Observation Project #2

During the part two weeks we have discussed on task/off: task behavior. Although there are difficulties with the measurement of this classroom variable (as we have noted during class discussions it remains an important concern for the classroom teacher and educational researcher. If students are inattentive it is doubtful that much learning will occur.

For this project you will take a detailed look at students' on task/off task behaviors. These categories are extremely broad and you will need to identify more specific subcategories for each of the general categories. For example, conversing and daydreaming are just two of many behaviors that can be considered as "off task." You will need to list and operationally define the various subcategories that you will be using for your analysis of on task/off task behavior. The students observations from Project #1 and your informal observations should help you identify behavior categories. Remember that your subcategories should enable you to record observable behaviors.

Before beginning this project, you will need to develop a research question or questions. What do you want to know about on task/off task behavior? For example, are males and females equally off task? Are students at the front of the room more on task than students seated at the back of the room? Are students more off task at the beginning, middle, or end of the class period? The development of your research question should be aided by the observations that you have already completed and, perhaps, the research reports that you have been reading.

You must use a minimum of six students for this project. For example, if you are comparing males and females, use three of each. If you are analyzing behavior with respect to seat location, then choose three students at the front of the room and three students at the back of the room. In short, divide your six students in a matter that is most appropriate for your research question. Each student should be observed for a minimum of five minutes. Finally, you should decide if you are going to collect frequencies of each behavior or the amount of time each student participates in each behavior. Additionally, you also need to decide if you will collect continuous or categorical data. The choice of data collection techniques is your choice!!!

OK, what does he want me to hand in for this assignment so that I can get the grade that I want (even though I do not really care about grades)? Your written report should include all the following:

- Your research question(s).
- Operational definitions of on task/off task and the associated subcategories
- Description of your data collection procedure
- Your observation instrument and "raw" data
- Descriptive summary of your data (e.g., mean times or frequencies)
- Results and Implications:
- The answer(s) to research question(s)
- Inferences which can be derived from your findings
Observation Project #3

The purpose of this project is to focus your attention on the interaction between teacher and student behaviors. Specifically, you will be observing teacher questioning, student responses, and teacher feedback for an entire class period.

You will be collecting data related to three general areas of concern: 1) the nature/type of teacher questions, 2) Students’ responses to questions, 3) teacher feedback. You are to develop three research questions that involve the three general areas of concern. The scientific data you choose to collect will depend upon the questions that you are asking. For example, suppose that you are investigating the following hypotheses:

1. The proportion of correct responses on factual/recall questions will be equal to the proportion of correct responses on analytical questions.

2. The proportion of correct responses given by males will be equal to the proportion of correct responses given by females.

3. The teacher provides an equal proportion of positive verbal feedback to males and females.

The order to test these hypotheses you could use an observation coding system similar to the following:

<table>
<thead>
<tr>
<th>male</th>
<th>female</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
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<tbody>
<tr>
<td>1.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
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<tr>
<td>3.</td>
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<td></td>
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<td>Etc.</td>
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</table>

Coding Key

A. Type of teacher Question

1 = factual/recall
2 = analytical

B. Accuracy of student response

1 = correct
2 = incorrect

C. Teacher feedback
1 = positive, non-verbal
2 = positive, verbal
3 = negative, non-verbal
4 = negative, verbal
5 = no feedback

To complete this observation project, you must record data for an entire class period. This means that you will gather information for every question asked by the teacher. Each hypothesis you choose to investigate does not have to involve all three areas of concern (i.e., type of teacher question, student response, and feedback) however, as a group; your three hypotheses should involve all three areas of concern.

It is important to note several characteristics of the example coding instrument that has been provided. The coding categories are not defined. For example, operational definitions of "positive, verbal" and "positive, non-verbal" teacher feedback are not given. Naturally, you will provide operational definitions for all of your coding categories. Secondly, the example observation system does not attend to certain situations that normally occur in a classroom. For example, what if the teacher asks a question but no student responds? What if the teacher asks a rhetorical question? Such instances may be ignored on the grounds that they are irrelevant or the coding system could be revised. You should consider such situations as you devise your data collection instrument.

Your submitted written report should include:

1. Your research questions
2. Description of your data collection procedure
3. Your observation instrument and operational definitions for each coding category
4. "Raw" data
5. Descriptive summary of your data (e.g., means, frequencies, percentages, etc.)
6. Conclusions and discussion:
   - Answers to your research questions
   - Inferences which can be derived from your findings
Observation Project #4

Classroom atmosphere is of critical importance to both students and teachers. Furthermore, the rapport established between teacher and students is a significant aspect of classroom atmosphere. Although it would be difficult for you to find a teacher or researcher who discounts the importance of teacher-student rapport, it is a "variable" which is not easily measured using the observation techniques you have applied in Projects 2-3. Teachers establish rapport with the whole class as well as with individual students. Consequently, questions concerning rapport are not answered by simply concluding whether it exists. You may find that the continuous and descriptive data collection techniques used in Project #1 are more helpful for this particular project.

Your assignment is to collect data specifically related to the teacher-student rapport in one of the classrooms where you are currently working. You will need to decide what "rapport" means (an operational definition may not be easy to derive) as well as decide on a question(s) of interest. Questions related to rapport are usually more global than investigating the relative frequencies of cognitive levels indicated in teachers' questions. For example, one of the following may be of interest to you:

1. How does the teacher's rapport with the class differ from that with individual students?
2. How does the teacher establish his/her rapport with students?
3. How would you characterize the rapport a teacher has with his/her class?

As difficult as rapport is to measure, its context poses problems as well. For example, there is some disagreement about whether rapport is exhibited in subject-related contexts, socially related contexts, or generic contexts (i.e., across all classroom/school contexts). Your position on this question has implications for where and when you will collect data. For example, is the best time to collect data on rapport during class discussions or during discussions prior to and following class? Perhaps, the best context to collect data is at the football game. The choice is yours.

Your submitted written report should include:

1. Your research questions or area of interest
2. Description of your data collection procedure
3. Operational definitions or conceptualization of rapport
4. "Flaw" data
5. Descriptive summary of your data (e.g., means, frequencies, quotes, etc.)
6. Conclusions and discussion:
   - Answers to your research questions
   - Inferences which can be derived from your findings
This assignment will require you to read and review five (5) research reports in an area(s) of interest. The area(s) of interest should specifically relate to the teaching of mathematics, science, and/or secondary level teaching, in general.

You must read the primary source as opposed to someone else's review of a particular research report (i.e., a secondary source). For each research report, you will submit a personal review. Each review should include, but is not necessarily limited to, the following:

a) Bibliographic citation

b) Purpose of the study

c) General design/procedures

d) Description of data analysis

e) Results and conclusions

f) Your reaction/opinion concerning:

   1. Research design
   2. Implications for teaching
   3. Future research

In addition to the ERIC database, you may find it useful to focus your attention on the following research journals:

   2. Journal of Research in Mathematics Education
   4. Science Education
   5. School Science and Mathematics