COURSE DESCRIPTION

Power in action requires some largeness and imaginativeness of vision.
- John Dewey

The goal of this course is to develop a powerful tool kit of approaches to knowing and learning in mathematics and science. This course focuses on issues of what it means to learn and know science and mathematics. What are the standards for knowing we will use? How are knowing and learning structured, and how does what we know change and develop? For the science and mathematics educator, what are the tensions between general, cross-disciplinary characterizations of knowing (e.g., intelligence) and the specifics of coming to understand powerful ideas in mathematics and science? What are the links between knowing and developing
in learning theory, and the content and evolution of scientific ideas? What are the connections between kinds of assessments and theories of knowing? How are various uses of technology associated with specific approaches to learning? Also, current issues and tensions in education will be discussed, especially as they relate to mathematics and science instruction.

CONCEPTUAL FRAMEWORK

The conceptual framework of the College of Education at UWG forms the basis on which programs, courses, experiences, and outcomes are created. With the goal of Preparing Exemplary Practitioners, our programs incorporate ten descriptors (knowledgeable, reflective, inquisitive, decisive, adaptive, proactive, leading, collaborative, culturally sensitive, empathetic), clustered into three interrelated and overlapping themes, that demonstrate our commitment to (a) Professional Excellence; (b) Field-Based Inquiry; and (c) the Betterment of Society. These themes and descriptors are integral components of the conceptual framework and provide the basis for developing exemplary practitioners who are prepared to improve schools and communities. National and state standards (INTASC, NBPTS, Learned Societies), insert applicable professional associations that guide your program, e.g. ASHA, PSC) also are incorporated as criteria against which candidates are measured.

The mission of the College of Education is to provide excellence in the initial and advanced preparation of professionals for a variety of settings, to foster an innovative learning community, and to empower a faculty committed to teaching and the dissemination of knowledge. This course’s objectives, activities, and assignments are related directly to the conceptual framework and national standards, as identified below.

APPROACHES TO INSTRUCTION

Various pedagogical methods used for this class include: Clinical interview, Interactive technology, e.g., online discussion and chat, small group discussion, lecture, concept mapping, etc.)

Course Prerequisite(s)

- Successful completion of Step 1 and Step 2
- An interest in exploring teaching

NOTE: Students must use a word processor and E-mail, and have access to a web browser. Presentations, if applicable, must be submitted in advance as PowerPoint files

COURSE OBJECTIVES

<table>
<thead>
<tr>
<th>Course Objectives and Evidence of Student Learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students will be able to…</td>
</tr>
</tbody>
</table>

A UTeach Course
<table>
<thead>
<tr>
<th>Students will be able to…</th>
<th>Evidence of Student Learning:</th>
</tr>
</thead>
</table>
| construct models of knowing and learning to guide classroom practice. | • meaningful contributions to class discussions  
• comments posted about analysis of readings  
• analysis of clinical interviews  
• written examinations |
| articulate various standards for knowing science and mathematics and articulate the implications of these standards for assessment, especially standardized assessment. | • meaningful contributions to class discussions  
• comments posted about analysis of readings  
• analysis of clinical interviews  
• written examinations |
| articulate what it means to know and learn relative to cognitive structures and describe how what people know changes and develops. | • meaningful contributions to class discussions  
• comments posted about analysis of readings  
• analysis of clinical interviews  
• written examinations |
| describe various paradigms for evaluating science and mathematics understanding. | • meaningful contributions to class discussions  
• comments posted about analysis of readings  
• written examinations |
| use the clinical interview method to make sense of someone's reasoning about a topic in science or mathematics. | • report including transcription and analysis of clinical interviews  
• rubric given to students before clinical interview to clarify what will be assessed |
| express informed opinions on current issues and tensions in education, especially as they relate to mathematics and science instruction. | • meaningful contributions to class discussions  
• comments posted about analysis of readings  
• written examinations |

**Expectations**

1. Because a majority of the learning hinges on group work done during the class time, attendance is of utmost importance. Attendance and participation are crucial to this class. Attendance will be taken every class period. Missing two classes (i.e., more than 10% of the classes) will result in one full letter grade reduction.
2. You are expected to enhance classroom discussion by completing the assigned readings and completing reading quizzes before class.

TEXTS, READINGS, INSTRUCTIONAL RESOURCES, AND REFERENCES

Required Text(s)


Additional readings and materials will be provided in class and/or on the course website: 
[http://generative.edb.utexas.edu/classes/knl2011fall/knl.htm](http://generative.edb.utexas.edu/classes/knl2011fall/knl.htm)

Additional Requirements:
Word processor, e-mail, and access to a web browser. Access to interviewees.

Tk20 Subscription. (Your final project assignment is to be submitted on TK-20.) The subscription is available at the University Bookstore or at [http://westga.tk20.com/campustoolshighered/start.do](http://westga.tk20.com/campustoolshighered/start.do) If you have purchased a subscription previously, DO NOT re-subscribe. For more information about this resource, see [http://www.westga.edu/coe/index_550.php](http://www.westga.edu/coe/index_550.php) For assistance, email [tk20@westga.edu](mailto:tk20@westga.edu)

Reading References for Knowing and Learning in Mathematics and Science


ASSIGNMENTS, EVALUATION PROCEDURES, AND GRADING

Assignments:

DAILY ACTIVE PARTICIPATION IN ALL CLASS SESSIONS:

Each student is expected to actively participate in small- and large-group discussions. The purpose of these discussions is to help us, as individuals and as a group, develop meaningful interpretations of the ideas conveyed in the readings. Being a “full participant” means that you come to class having carefully read the articles and that you are prepared with questions, comments, and criticisms based on the readings. It also means that you solicit and carefully consider the ideas of others, and build on them in a generative way.

STUDENT-LED PRESENTATIONS:

Each student (with a partner) will be responsible for leading at least one class discussion about the weekly readings.

READING QUIZZES:
There are 14 weekly Reading quizzes. Each quiz contains 3-4 open-response questions. You are required to complete these quizzes on the D2L by or before **8:00 pm every Thursday**. Late responses will count **75%** of an on-time response. The highest 10 quiz grades will count toward your final overall quiz grade.

**CLINICAL INTERVIEW: (Team Project)**

In this class, a clinical interview is an extensive verbal communication that engages someone with a purpose of elucidating characteristic patterns in a problem solving activity. You will team up with 2 or 3 classmates to conduct a clinical interview with an expert/novice paring on a topic of your choice. You will tape-record the interviews, transcribe the conversations in Word, and compare knowledge and reasoning patterns of the expert’s and novice’s problem solving process. Your team will write a report that includes introduction of the interviews, the interview transcripts, and your analyses. You can find sample interview questions, transcripts, and reports in our class X folder on D2L. We will spend class time to help you select/develop your interview questions and practice clinical interviews. Your report will be graded with feedback. If the clinical interview report is submitted late, points will be reduced by **10%** for each day late. Further details and guidelines will be discussed in class and provided on the D2L.

**MIDTERM: (Individual Project)**

This is a comprehensive mid-term exam, sampling from all we have covered up to Week 8 in the semester. You will complete the mid-term exam individually. Through the mid-term, you will demonstrate what you have learned about inquiry-based instruction (IBI) so far and how you’d apply IBI in your future teaching. Your mid-term includes two parts: a take home essay and an in-class presentation/demonstration. You’ll use the essay to demonstrate your understanding of IBI by incorporating and analyzing different perspectives on how people know and learn in math and science based on the class readings. The in-class presentation allows you to use a specific class scenario/activity to demonstrate IBI in your future teaching. You can use an excerpt from an interview or from something that a student has created to make sense of what the student has done, form judgments about what the student might subsequently be able to do, and how you might direct the student's subsequent engagement in the inquiry-based learning. Please check the Mid-Term Handout for more detailed instruction.

**FINAL PROJECT: (Team Project)**

Students are expected to collaborate with their group to produce, teach, and reflect on a standard-based lesson using pre/post assessments and literature from this course to inform their lesson planning and instruction. As a final exam grade, students will choose to present a model-eliciting activity, a generative activity, or a problem they would like to learn more about ("something that bugs you"). Further details and guidelines will be discussed in class and provided on the D2L.
TK20:

You are required to submit your final project on TK-20 as the program requirement. Further details and guidelines will be discussed in class and provided on the D2L. Your TK20 will be assessed with a 1-4 point rubric.

Evaluation Procedures

Assignments/Grading Policy

<table>
<thead>
<tr>
<th>Assignments &amp; Activities</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Reading Quizzes</strong> 20 pts. × 10 =</td>
<td>200</td>
</tr>
<tr>
<td><strong>Class Discussion</strong> 80 pts. + <strong>Leadership</strong> = 20 pts.</td>
<td>100</td>
</tr>
<tr>
<td><strong>Clinical Interview</strong> 100 pts. × 1 =</td>
<td>100</td>
</tr>
<tr>
<td><strong>Midterm Exam</strong> Written part 60 pts. + Presentation 40 pts. =</td>
<td>100</td>
</tr>
<tr>
<td><strong>Final Project/Exam</strong> Written part 150 pts. + Presentation 50 pts. =</td>
<td>200</td>
</tr>
<tr>
<td><strong>Research Participation</strong> = satisfactory/unsatisfactory</td>
<td></td>
</tr>
<tr>
<td><strong>TK20</strong> = 1-4 rubric</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>700</td>
</tr>
<tr>
<td>630 – 700 = <strong>A</strong></td>
<td></td>
</tr>
<tr>
<td>560 – 629 = <strong>B</strong></td>
<td></td>
</tr>
<tr>
<td>490 – 559 = <strong>C</strong></td>
<td></td>
</tr>
<tr>
<td>420 – 489 = <strong>D</strong></td>
<td></td>
</tr>
<tr>
<td>Below 420 = <strong>F</strong></td>
<td></td>
</tr>
</tbody>
</table>

CLASS, DEPARTMENT, AND UNIVERSITY POLICIES

**Academic Honesty:** All work completed in this course must be original work developed this semester. Students are expected to adhere to the highest standards of academic honesty. Plagiarism occurs when a student uses or purchases ghostwritten papers. It also occurs when a student utilizes ideas or information obtained from another person without giving credit to that person. If plagiarism or another act of academic dishonesty occurs, it will be dealt with in accordance with the academic misconduct policy as stated in the latest Student Handbook and the Graduate Catalog.

**Disability:** All students are provided with equal access to classes and materials, regardless of special needs, temporary or permanent disability, special needs related to pregnancy, etc. If you have any special learning needs, particularly (but not limited to) needs defined under the Americans with Disabilities Act, and require specific accommodations, please do not hesitate to make those known, either yourself or through the Coordinator of Disability Services. Students with documented special needs may expect accommodation in relation to classroom accessibility, modification of testing, special test administration, etc. For more information, please contact Disability Services at the University of West Georgia: http://www.westga.edu/studentDev/index_8884.php. Any student with a disability documented through Student Services is encouraged to contact the instructor right away so that appropriate accommodations may be arranged. In addition, certain accommodations
(which will be discussed in class) are available to all students, within constraints of time and space.

**Student Email Policy:** University of West Georgia students are provided a MyUWG email account, which is the official means of communication between the University and student. It is the student’s responsibility to check this email account for important University related information.

**Late Work Policy:** Late responses will count 75% of an on-time response (50% if submitted a week or more late). You are allowed to miss one reading response. Assignments must be submitted on the dates indicated on the course outline.

**Dropping the Course:** A student may not drop a course after the fourth class day except for good cause (e.g., health or serious personal problems, or a demonstrated need to work more hours). A student seeking to drop a class after the fourth class day should go to the Office of the Dean/Student Division for necessary approvals.

**ATTENDANCE:**

Attendance and participation are crucial to this class. Attendance will be taken every class period. Missing two classes (i.e., more than 10% of the classes) will result in ONE FULL LETTER GRADE REDUCTION.

Assigned readings are to be done before class and answers to reading questions are to be submitted the day before class.

**CLASS OUTLINE**

2013 Spring Tentative Class Outline

<table>
<thead>
<tr>
<th>Date</th>
<th>Week</th>
<th>Topic</th>
<th>Activities</th>
<th>Assignments</th>
</tr>
</thead>
<tbody>
<tr>
<td>08/30</td>
<td>1</td>
<td>Overview of the Course-Math &amp; Science</td>
<td>Log, candy bar, battery activity &amp; Multiplying fractions activity; NAEP data; memory study</td>
<td>Weekly Reading Quiz 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Literacy &amp; Proficiencies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>09/06</td>
<td>2</td>
<td>Testing &amp; Learning in Math &amp; Science Classrooms</td>
<td>Activity- Knowing, understanding, and doing… Is there a difference?</td>
<td>Weekly Reading Quiz 2</td>
</tr>
<tr>
<td>09/13</td>
<td>3</td>
<td>Effectiveness of Student-Centered</td>
<td>Observation rubric of UWG-UTeach-requirements for teachers</td>
<td>Weekly Reading Quiz 3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Instruction &amp; Assessment for Learning</td>
<td>Discussion of assessments in the history of students in this class (introducing formative, summative, educative, evalutive).</td>
<td>Draft Clinic Interview questions</td>
</tr>
<tr>
<td>Date</td>
<td>Week</td>
<td>Topic</td>
<td>Activity / Assignment</td>
<td>Reading Quiz / Clinic Interview Transcript</td>
</tr>
<tr>
<td>-------</td>
<td>------</td>
<td>------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------</td>
<td>--------------------------------------------</td>
</tr>
<tr>
<td>09/20</td>
<td>4</td>
<td>Unpacking a conceptual lesson--dividing fractions with pattern blocks.</td>
<td>Conduct your clinic Interviews Transcribe the clinic interviews</td>
<td></td>
</tr>
<tr>
<td>09/27</td>
<td>5</td>
<td>Importance of Teaching Multiple Proficiencies &amp; Learning Trajectories</td>
<td>What does a teacher DO with the results of assessment? Go over the Next Instructional Move case leading into the big idea of distribution. Statistics example, and select the big idea for clinic interview and identify related proficiencies. Investigate the different causes of the achievement gap. Discussion of NAEP data, literacy for all. Small group investigation and preparation for presentation.</td>
<td>Weekly Reading Quiz 4 Clinic Interview Transcript</td>
</tr>
<tr>
<td>10/4</td>
<td>6</td>
<td>Memory, Problem Solving, &amp; Transfer</td>
<td>How does memory work? How do you 'recall' the information you need in a setting? How does that knowledge influence what you 'see', 9 hole problem, different perspectives and observation. First chapter of &quot;My private universe&quot;--college graduates unable to answer simple science questions. Other examples? From mathematics?</td>
<td>Weekly Reading Quiz 5 Graphic representation of working memory</td>
</tr>
<tr>
<td>10/11</td>
<td>7</td>
<td>Expert vs. Novice</td>
<td>Comparing novice and experts concept maps; find experts and novices in groups and ask them questions—e.g., football</td>
<td>Weekly Reading Quiz 6 Clinic Interview transcript + analysis = Clinic Interview Paper</td>
</tr>
<tr>
<td>10/18</td>
<td>8</td>
<td>Behaviorist View of Learning--Skinner</td>
<td>Thank you/you're welcome: Slot machines Behavioral procedures your own teachers used in the classroom—systems of reward and punishment, stimulus/response, response/stimulus. How well these systems worked. Did they enhance learning? Did they help the teacher's to keep order? How did the student's feel about these systems?</td>
<td>Weekly Reading Quiz 7</td>
</tr>
<tr>
<td>10/25</td>
<td>9</td>
<td>Piaget &amp; Ausubel</td>
<td>Balance beams, conservation of numbers,</td>
<td>Weekly</td>
</tr>
</tbody>
</table>

**A UTeach Course**
<table>
<thead>
<tr>
<th>Date</th>
<th>Week</th>
<th>Topic</th>
<th>Activity/Assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>11/01</td>
<td>10</td>
<td>Bruner &amp; Active Learning</td>
<td>Algebra activity that emphasizes how we should begin with concrete go to abstract. Form collaborative team, select big idea, learning objectives, proficiencies and standards for the final project.</td>
</tr>
<tr>
<td>11/08</td>
<td>11</td>
<td>Vygotsky &amp; ZPD</td>
<td>Identify ZPD in your Math/Science class. Develop assessment tools, e.g., Likert scale, interview questions for whole class pre-assessment.</td>
</tr>
<tr>
<td>11/15</td>
<td>12</td>
<td>Learning Community &amp; Disposition (Online Class)</td>
<td>Barbie Bungee: Elaboration on Vygotsky &amp; Classroom culture. Use pre-assessment analysis data to work on the lesson plan.</td>
</tr>
<tr>
<td>11/22</td>
<td>13</td>
<td>Achievement Goals &amp; Beliefs of Intelligence</td>
<td>Dweck - Intelligence/Motivation NPR segment. Classroom teaching enactment.</td>
</tr>
<tr>
<td>11/25</td>
<td></td>
<td>Fall Break</td>
<td>No Class!</td>
</tr>
<tr>
<td>12/06</td>
<td>14</td>
<td>Learning Environment &amp; PEOE</td>
<td>Case &quot;giving meaning to measures of central tendency&quot;. Develop your final project paper with the pre-and post-assessment findings.</td>
</tr>
<tr>
<td>12/13</td>
<td>15</td>
<td>Learning Theories Covered--Presentations</td>
<td>Final Project Presentations.</td>
</tr>
</tbody>
</table>

Additional assignments: Weekly Reading Quiz, Midterm Paper & Presentation, Final Project.