## 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) 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
The instructor of this course will employ a variety of instructional strategies in teaching the content of this course. Those strategies include but are not limited to: guided discussion, modeling and simulations, cooperative and collaborative grouping, student presentations, and hands-on activities that actively engage students in the learning process.

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>
<th>Evidence of Student Learning:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students will be able to…</td>
<td>• Meaningful contributions to class discussions</td>
</tr>
<tr>
<td>Construct models of knowing and learning to guide classroom practice.</td>
<td>• Analysis of interviews</td>
</tr>
<tr>
<td></td>
<td>• Written examinations</td>
</tr>
<tr>
<td>Articulate various standards for knowing science and mathematics and articulate the implications of these standards for assessment, especially standardized assessment.</td>
<td>• Meaningful contributions to class discussions</td>
</tr>
<tr>
<td></td>
<td>• Analysis of interviews</td>
</tr>
<tr>
<td></td>
<td>• Written examinations</td>
</tr>
<tr>
<td>Articulate what it means to know and learn relative to cognitive structures and describe how what people know changes and develops.</td>
<td>• Meaningful contributions to class discussions</td>
</tr>
<tr>
<td></td>
<td>• Analysis of interviews</td>
</tr>
<tr>
<td></td>
<td>• Written examinations</td>
</tr>
<tr>
<td>Describe various paradigms for evaluating science and mathematics understanding.</td>
<td>• Meaningful contributions to class discussions</td>
</tr>
<tr>
<td></td>
<td>• Written examinations</td>
</tr>
<tr>
<td>Use the clinical interview method to make sense of someone's reasoning about a topic in science or mathematics.</td>
<td>• Report including transcription and analysis of interviews</td>
</tr>
<tr>
<td></td>
<td>• Rubric given to students before interview to clarify what will be assessed</td>
</tr>
<tr>
<td>Express informed opinions on current issues and tensions in education, especially as they relate to mathematics and science instruction.</td>
<td>• Meaningful contributions to class discussions</td>
</tr>
<tr>
<td></td>
<td>• Written examinations</td>
</tr>
</tbody>
</table>
TEXTS, READINGS, INSTRUCTIONAL RESOURCES, AND REFERENCES

Required Text(s)
Readings and materials will be provided on CourseDen.

Additional Requirement(s)
Tk20 Subscription (A course assignment is linked to TK-20.) This is available at the University Bookstore or at 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. For assistance, email tk20@westga.edu. Your final project in this course will be uploaded to TK20.

Reading References for Knowing and Learning in Mathematics and Science


ASSIGNMENTS, EVALUATION PROCEDURES, AND GRADING

Assignments and core requirements: Written assignments are final products that will be graded on both what is written (clarity, depth, insight) and how it is written (the form of the written work). Therefore, it is crucial to realize that correct grammar and spelling, proper punctuation, neatness, and adherence to assignment guidelines will affect your grade. As an educator, you will be expected to demonstrate high levels of competence not only in verbal but also in written communication with parents, administrators, and other educators. Evaluation of written assignments will be accomplished through rubrics, which will be distributed as assignments are given.

All assignments must be completed in a typed, double space format, with Times/Times New Roman font, size 12 and 1-inch margins on all sides unless otherwise indicated.

Assignments are due by 11:59 p.m. on the designated date. Due dates are listed on the course schedule; full instructions are posted on CourseDen. Assignments are to be typed and submitted to the appropriate dropbox on CourseDen (except for the final project which will also be turned in on TK20). The dropboxes will close at 11:59 p.m. on the Sunday before class. No work will be accepted in person or via email. Please do not wait until the last minute to upload your assignments; technical/computer issues will not excuse the lateness of the assignment.

Assignments:

1. **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.

2. **Reflection Assignments:** At various points during the semester you will be asked to prepare short (1-2 page) reflections on an activity, discussion, or other part of the course. Further instructions will be given for each reflection assignment and grading criteria will be posted on CourseDen.

3. **Reading notebook:** Completing the assigned reading is part of being prepared and able to participate in class activities. Because our activities will be centered on the analysis and application of the ideas we read, you will be keeping a reading notebook for each theory reading (not the math- or science-specific readings). Reading notebook entries are due by 11:59 p.m. on the Sunday before we discuss the readings in class. Each entry will
be about one page long (bullet points and incomplete sentences are ok as long as I can understand what you are getting at) and should include the following:

- Bibliographic information (APA format)
- Summary of major ideas presented
- Your analysis, interpretation, critique or questions of key ideas
- “Bottom line” What does this information mean for the learners in a classroom?

4. **Novice/Expert Interview:** As an application of what you learn in this course, you will be asked to engage a Novice/Expert pairing in a problem-based interview on a topic of your choice. In this interview, the knowledge and reasoning patterns of the novice and expert are described and compared. You will record the interviews, then transcribe and analyze the activity. Further details and guidelines will be discussed in class and provided in CourseDen.

5. **Midterm:** This is a comprehensive mid-term exam, sampling from all that we have discussed so far. There are two parts to the midterm exam: a take home "essay" and an in-class part. The essay is focused on making sense of the readings and identifying author's perspectives on how people know and learn in math and science. The in-class part is focused on student reasoning. Usually we will find an excerpt from an interview or from something that a student has created and ask you to make sense of what the student has done and form judgments about what the student might subsequently be able to do and how you might direct the student's subsequent engagement.

6. **Final 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 in CourseDen.

**TK20:** You are required to submit your final project on TK-20 AND CourseDen as the program requirement. Further details and guidelines will be discussed in class and provided in CourseDen.

### Evaluation Procedures

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Weight</th>
<th>Assessment Tools</th>
<th>Due Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Participation</td>
<td>10%</td>
<td>Rubric</td>
<td>Mondays 5:30-8:00</td>
</tr>
<tr>
<td>2. Assigned Reflections</td>
<td>15%</td>
<td>Rubric</td>
<td>Sept. 8; Sept. 23, TBD</td>
</tr>
<tr>
<td>3. Reading Notebook</td>
<td>15%</td>
<td>Rubric</td>
<td>Sundays, 11:59 p.m.</td>
</tr>
<tr>
<td>4. Novice/Expert Interview</td>
<td>20%</td>
<td>Rubric</td>
<td>Pt. 1-Oct. 7; Pt. 2-Oct. 14</td>
</tr>
<tr>
<td>5. Midterm</td>
<td>20%</td>
<td>Exam</td>
<td>October 28</td>
</tr>
<tr>
<td>6. Final Project</td>
<td>20%</td>
<td>Rubric</td>
<td>December 2 &amp; 9</td>
</tr>
</tbody>
</table>

**Grading**

A = 90 - 100%, B = 80 - 89%, C = 70 - 79%, and F = Below 70%.
CLASS, DEPARTMENT, AND UNIVERSITY POLICIES

Americans with Disabilities Act: Students with a documented disability may work with UWG Accessibility Services to receive essential services specific to their disability. All entitlements to accommodations are based on documentation and USG Board of Regents standards. If a student needs course adaptations or accommodations because of a disability or chronic illness, or if he/she needs to make special arrangements in case the building must be evacuated, the student should notify his/her instructor in writing and provide a copy of his/her Student Accommodations Report (SAR), which is available only from Accessibility Services. Faculty cannot offer accommodations without timely receipt of the SAR; further, no retroactive accommodations will be given.

UWG Email Policy: University of West Georgia students are provided a MyUWG e-mail account. The University considers this account to be an official means of communication between the University and the student. The purpose of the official use of the student e-mail account is to provide an effective means of communicating important university related information to UWG students in a timely manner. It is the student’s responsibility to check his or her email.

Credit Hour Policy: The University of West Georgia grants one semester hour of credit for work equivalent to a minimum of one hour (50 minutes) of in-class or other direct faculty instruction AND two hours of student work outside of class per week for approximately fifteen weeks. For each course, the course syllabus will document the amount of in-class (or other direct faculty instruction) and out-of-class work required to earn the credit hour(s) assigned to the course. Out-of-class work will include all forms of credit-bearing activity, including but not limited to assignments, readings, observations, and musical practice. Where available, the university grants academic credit for students who verify via competency-based testing, that they have accomplished the learning outcomes associated with a course that would normally meet the requirements outlined above (e.g. AP credit, CLEP, and departmental exams).

University of West Georgia Honor Code: At the University of West Georgia, we believe that academic and personal integrity are based upon honesty, trust, fairness, respect, and responsibility. Students at West Georgia assume responsibility for upholding the honor code. West Georgia students pledge to refrain from engaging in acts that do not maintain academic and personal integrity. These include, but are not limited to, plagiarism, cheating, fabrication, aid of academic dishonesty, lying, bribery or threats, and stealing. The University of West Georgia maintains and monitors a confidential Academic Dishonesty Tracking System. This database collects and reports patterns of repeated student violations across all the Colleges, the Ingram Library, and the School of Nursing. Each incidence of academic dishonesty is subject to review and consideration by the instructor, and is subject to a range of academic penalties including, but not limited to, failing the assignment and/or failing the course. Student conduct sanctions range from verbal warning to suspension or expulsion depending on the magnitude of the offense and/or number of offenses. The incident becomes part of the student’s conduct record at UWG.

Additionally, the student is responsible for safeguarding his/her computer account. The student’s account and network connection are for his/her individual use. A computer account is to be used
only by the person to whom it has been issued. The student is responsible for all actions
originating through his/her account or network connection. Students must not impersonate others
or misrepresent or conceal their identities in electronic messages and actions.

**Extra Credit:** Extra credit will not be available in this course. Please do your best work on the
assigned activities.

**Professional Conduct:** As teachers you have made a commitment to the education profession. As
such, you should conduct yourself at all times in a professional manner. You will demonstrate your
professionalism through the following behaviors:

1. **Attendance and punctuality are required,** since much of the value of the course will be
   through the experiences that occur during our class sessions. You must be present to learn,
   and to contribute to the learning of others. If you must be absent, please notify me in
   advance and make arrangements to get class notes from a friend. If that is not possible,
   please send an email or talk with me as soon as you can. Since our class meets only once a
   week, missing more than one (1) class session will affect your participation and
   professionalism grade.

2. **Active participation** is expected, a critical assumption for learning anything more deeply.
   The pedagogy being advocated and modeled through our course is the belief that our students
   must commit to, and be involved actively in, the problems and situations being posed. Be
   involved. Developing collegial, supportive relationships is an important aspect of the
   teaching profession.

3. **Use of laptop computers** during class is allowed only for specific course-related activities
   (e.g. composing notes, using math applets/excel/or other mathematical tools). In general,
   you should not engage in web browsing, email or other questionable unrelated activities
   during class time.

4. **Thorough preparation** for each class is expected. The better-prepared one is for any
   experience, the more one will likely benefit from it.

5. **Thoughtful reflection** following each course experience is expected. Looking back at one’s
   experiences can help to review and consolidate what is important to remember. Being
   reflective is a necessary habit of excellent teachers as it is used to evaluate ideas, feelings,
   and experiences in order to make needed changes in your practice.

6. **Deadlines** are goals, which can be altered, as we may need to do so. Flexibility is needed
   when dealing with humans, who differ in their needs in unique ways. If you need additional
   time that is reasonable and justified, please talk with me about it before the due date.

7. **High quality** is expected at all times. All participants should be expected to contribute and
   produce in very high quality ways, striving always to do the very best. This must be
   especially true of those who would choose to be a teacher of others!