Signature Page

Name of Course Being Reviewed: Reasoning, Cognition, and Epistemology in Science Education

Faculty Sponsor: Dana Zeidler

List appropriate Department Chair, Committee, College Council, and Dean approving:

APPROVAL

Chair, Stephen Thornton
{Chair--Type name and title}

Chair
{GPC Chair--Type name and title}

Chair, Ann Cranston-Gingras
{College Council Chair--Type name and title}

Associate Dean, Harold Keller
{Dean of COE--Type name and title}

SIGNATURE

Chair, Stephen Thornton

8/27/07

List other units and departments of the University that have been consulted, comments, and supporting remarks:

UNIT

CHOOSE CONCURRENCE, SIGNATURE, NONCONCURRENCE, OR DEFER RECOMMENDATION

DATE

{Type name and title}

{Type name and title}

Recommendation of the Graduate Council - Date:

Approved _________ Disapproved _________ Signature ______________________

Action by the Dean of Graduate Studies - Date:

Approved _________ Disapproved _________ Signature ______________________

New Course Effective Date (Term): ____________________
GRADUATE COURSE FORM - NEW COURSE

Fill in the requested information and submit 1 original and 9 copies of this form, the Transmittal form, the Syllabus, and the list of topics to the Office of Graduate Studies, FAO 126. If you need assistance, call the Coordinator at 974-4239.

Date: ____________________________

To: GRADUATE COUNCIL

From: Contact Person(s): Dana Zeidler

Campus Mail Code: EDU 162 Phone #: 974-7305

E-Mail Address: Zeidler@tempest.coedu.usf.edu Fax #: 974-3837

1. College: College of Education College Code: ED

Department: Department of Secondary Education Department Code: EDN

Department Budget Account Number: 172400

2. Course Prefix and Number: SCE 7762

3. Course Title (full title): Reasoning, Cognition, and Epistemology in Science Education

Abbreviated Title - 15 characters (after BANNER is implemented - up to 30 characters) including spaces and punctuation:

Reasoning Cognition Epistemology Science Education

Is the Course Title Variable? [ ] Yes [X] No

4. Credit hours: 3 If variable hours, what is the minimum ___ and maximum ___ per semester?

May the Course be repeated? [ ] Yes [X] No If yes, it may be repeated up to ____ hours.

5. What is the Grading Option? [X] Regular [ ] S/U Only [ ] Z/U Only


D - Discussion [Primarily] T - Graduate Thesis S - Supervised Teaching O - Other

L - Lab (Indicate if fee is to be assessed) Z - Directed Individual Study I - Internships (including Practicum)

7. Does this Course require automatic linkage (for example: Lab)? [X] Yes [ ] No If yes, what is the course prefix ________ number ________ section type ________ of the linked course?

8. Is this course cross-listed with another department/college? [X] Yes [ ] No If yes, indicate other department and college ________

9. Is a permit required for registration? [X] Yes [ ] No If yes, what standard comment needs to be printed for every section of this course in the Schedule of Classes? (Up to 40 characters, for example "DEPT APR REQ - EDU 303L"): ________

10. What is the Course Description? This will be as it appears in the Catalog, including prerequisites. It must be 4 lines or less and should match the description on the Transmittal Form. This course description must be written formally and succinctly, stripped of personal pronouns, verbiage, and redundancy. The purpose of the course should be emphasized, not the methods of instruction. The description should indicate whether the course is restricted to Majors, non-majors, or either. If it has a lab associated with it, if it is available only on an S/U basis, and if it is cross-linked to any other departments.

Description:

The purpose of this course is to analyze how reasoning, cognition and personal epistemology, are conceptualized in the current educational and psychological literature and apply these conceptualizations to science education. Related areas of research that have direct bearing on science education practice are also reviewed.

Note: This form is available on the USF Graduate Studies website at www.grad.usf.edu/gradcouncil/forms.html.
11. Justification - Please briefly explain why it is necessary and/or desirable to add this course:

This is required part of the Ph.D. program in Science Education.

12a) Is the course part of a required sequence in the major? [X] Yes [ ] No

What other programs would this course service? None

How many times has this course been offered as Selected Topics? At least three

If there are other programs interested in this subject matter or other programs offering courses with similar content, it is necessary to seek their concurrence -- see Item II of Signature Section.

b) What qualifications for training, and/or experience are necessary to teach this course? (List minimum qualifications for the instructor). Doctoral degree.

c) [ ] A list of topics to be covered must be attached.
[ ] A Syllabus must also be attached, and should include:
- Detailed outline of content
- Selected reference list (if applicable)
- Course Objectives
- Grading System

APPROVALS - for Course prefix/#: ________________ - Please Print or Type the Name Next to the Signature and indicate the date signed.

Department Committee Representative: ___________________________ Date: __________

Department Chairperson or Program Director: _______________________ Date: __________

College Committee Representative: ________________________________ Date: __________

College Dean or Associate Dean: _________________________________ Date: __________

Other Department Concurrence (Consultation with units and departments providing related offerings or expertise is expected and encouraged):
[ ] Not Applicable

Department: ____________________________ [ ] Concurs [ ] Does not Concur [ ] Defers Recommendation
Chairperson: _________________________________ Date: __________

Department: ____________________________ [ ] Concurs [ ] Does not Concur [ ] Defers Recommendation
Chairperson: _________________________________ Date: __________

GRADUATE COUNCIL: [ ] Approves [ ] Disapproves
Council Chairperson: ___________________________ Date: __________

GRADUATE STUDIES: [ ] Approves [ ] Disapproves
Graduate Studies Dean: ____________________________ Date: __________

Approved for term: ____________________________

For input in the ____________________________ Graduate Catalog

H:\College Graduate Programs Committee\GPC Forms\GPC NEW COURSE – 2000 – 2001 Graduate Course Form – New Course rtf
Note: This form is available on the USF Graduate Studies website at www.grad.usf.edu/gradcouncil/forms.html.
College of Education

DEPARTMENTAL COURSE SYLLABUS
GRADUATE LEVEL COURSES

The following are the required elements of a departmental syllabus in the College of Education. This syllabus should be representative of EVERY section of this course offered in the program/department.

1. Course Prefix and Number: SCE 7762 Credit Hours: 3

2. Course Title: Reasoning, Cognition, and Epistemology in Science Education

3. Regular Instructor(s): D. Zeidler

4. Course Prerequisites (if any):
   Include only those prerequisites listed in the University catalog.

5. Course Description:

   The purpose of this course is to analyze how reasoning, cognition and personal epistemology, are conceptualized in the current educational and psychological literature and apply these conceptualizations to science education. Related areas of research that have direct bearing on science education practice are also reviewed.

6. Course Goals and Objectives:

   • Examine cognitive-developmental influences on student reasoning;

   • Analyze thematic threads among personal epistemology models, beliefs and cognition, constructivism, and social factors that influence reasoning.

   • Review common errors and fallacies in student reasoning.

   • Identify how such thought processes commonly used in philosophy and logic may be incorporated into science education pedagogical strategies.

   • Analyze, synthesize and evaluate programs or models pertaining to various areas of science/science education for possible incorporation into existing and/or new instructional units.

   • Evaluate present and proposed research in the above areas in terms of how it can contribute to the literature in science education.

Assessments will include:
1. Completion of all reading assigned for class seminar.

2. Class participation during seminars based on class assignments, and synthesis / presentations of class readings.

3. Literature Review term paper that is narrow and focused on a related course topic that synthesizes current (and seminal) theory/literature and relates it to curriculum and instruction in science education. The intent is that your paper expands upon some topic(s) rather than being redundant of those topics. Incorporation of varied research (quantitative, qualitative, philosophical, positional) from diverse fields of scholarship is expected. The emphasis is on primary sources of research. Students are expected to build a thematic case for their position, and provide evidence (documentation and/or argumentative) for their claims.
4. Presentation of Term Paper in the form of a mini class seminar and activity. Students will demonstrate the connection between theory (from the research in number three above) and practice. Connections to an actual classroom activity that illustrates these points on a proposed research “study” that would highlight the assessment and/or organization or such issues is required.

7. **Content Outline:**

   **Introduction and Overview: Conceptual Framework of Thinking and Reasoning**
   - Models and Components of Thinking
   - Interrelationships among Micro Thinking Skills, Critical Thinking and Problem Solving Strategies
   - Thinking Related to Science Education

   **Cognitive-Developmental Influences on Reasoning**
   - Developmental Limitations of Student Thinking
   - Piaget’s Theory of Schemes, Structures, and Operations
   - Piaget's INRC Group and Propositional Logic
   - Comparison of Bruner, Ausubel, Novak, Gagne, Bloom, Vygotsky
   - Neo Piagetian Research

   **Representation of Knowledge**
   - Conceptual (Declarative) Knowledge
   - Procedural Knowledge
   - Expert & Novice Representation of Knowledge
   - Subject-Specific and Generic Thinking
   - Constructivism and Social Construction of Knowledge
   - Misconceptions & Alternative (Naïve) Conceptions
   - Conceptual Change Strategies and Science Education Curricular Implications
   - Pedagogical Content Knowledge

   **Common Fallacies in Student Reasoning**
   - Difficulties in Everyday Reasoning
   - Fallacious Reasoning
   - Argumentation and Discourse
   - Science Education Curricular Implications

   **Epistemological Frameworks in Science Education: Theory & Practice**
   - Reflective Judgment
   - Metacognitive Heuristics
   - Critical Thinking Appraisal
   - Cognitive Approaches to Science
   - Seminar Discussions / Reports

8. **Student Outcomes:**

   Assessments:

1. Students will complete of all reading assigned for class seminar.
2. Students will participate during seminars based on class assignments and demonstrate analysis, synthesis and evaluation of presentations of class readings.

3. Students will produce a Literature Review term paper that is narrow and focused on a related course topic that synthesizes current (and seminal) theory/literature and relates it to curriculum and instruction in science education. In doing so, students will demonstrate incorporation of varied research (quantitative, qualitative, philosophical, positional) from diverse fields of scholarship using predominantly primary sources of research. Students will build a thematic case for their position, and provide evidence (documentation and/or argumentative) for their claims.

4. Students will demonstrate conceptual understanding of course content by the presentation of a Term Paper in the form of a mini class seminar and activity. Students will demonstrate the connection between theory (from the research in number three above) and practice. Connections to an actual classroom activity that illustrates these points on a proposed research “study” that would highlight the assessment and/or organization or such issues is required.

| Class Assignments/seminar contributions | 25 % |
| Term Paper | 50 % |
| Seminar Presentation | 25 % |

9. **Grading System and Criteria:**

The grading system will follow that of the USF catalogue. **Note: Late assignments or failure to attend scheduled classes will not be accepted except with a verifiable medical or legal excuse.**

Plus / Minus system will be used in conjunction with the following main criteria:

A  Evidence of **exemplary** work and performance; a standard by which other professionals in the field may be evaluated.

B  Evidence of **excellent** work and performance; has demonstrated a high degree of professional growth and achievement.

C  Evidence of **good** work and performance; has adequately fulfilled the basic requirements for the course.

D  Lack of evidence to demonstrate good or adequate work and/or performance; basic criteria for the course has not been fulfilled.

F  Complete lack of fulfilling criteria for the course.

*All grading, whether for oral (in class) or written assignments, is based upon:*

- Originality of ideas
- Clarity of concepts and thoughts expressed
- Style and grammar
- Organization of topics
- Correct use of terminology and concepts
- Creativity

10. **Textbook(s), Reference List, and Readings (if applicable):**

Books 1 and 2 are required. Others are strongly recommended.


This text provides a comprehensive overview of the theoretical and methodological approaches to the study of personal epistemology. Of particular interest, however, are the following chapters: 3- The Reflective Judgment Model; 4- Revisiting Women’s Ways of Knowing; 7- What is Epistemological Thinking; 10- A Process Model of Epistemic Belief Change; 12- Critical elements in the Design and Analysis of Studies of Epistemology; 14- Considerations in the Design and evaluation of a Paper-and Pencil Measure of Epistemic Cognition; 16- Beliefs about science: How does Science Instruction Contribute?; 17- Characterizing Fifth Grade Students Epistemological Beliefs in Science; 18-Future Challenges and Directions for Theory and Research on Personal Epistemology.


The text is meant to serve as a general body of background knowledge in areas related to cognition. You are expected to read the text on your own and link central ideas to the topics considered in this course. Of particular interest, however, are the following chapters:

3 - Memory Structures and Models; 4- Encoding Processes; 7- Beliefs about Intelligence and Knowledge; 8- Problem Solving and Critical Thinking; 9- Building Knowledge and Reflective Thought; and 14- Cognitive Approaches to Science.


The text provides a slightly more focused research perspective from a cognitive-developmental orientation. You are expected to read the text on your own and link central ideas to the topics considered in this course. Of particular interest, however, are the following chapters /sections: 1- Introduction; 2-Infant Cognition; 3 – Early Childhood /Concepts and Categories; 4- Middle Childhood and Adolescence; Chapter 5 Social Cognition/ The Nature of Social Cognition, Similarities and Differences between Social and Nonsocial Cognition, Understanding Emotions.

5) Selected Articles: (See partial list at end of syllabus.) Inasmuch as there exists a wide array of topics in this course, numerous selected readings from (mostly) primary sources will be distributed in this course. The articles have been selected from a variety of areas that are relevant to science education. The articles represent seminal or current lines of research or theoretically based works that are expected to be fully discussed in class.


11. ADA Statement:

_Students with disabilities are responsible for registering with the Office of Student Disabilities Services in order to receive special accommodations and services. Please notify the instructor within the first week of classes if a reasonable accommodation for a disability is needed for this course. A letter from the USF Disability Services Office must accompany the request._

USF Policy on Religious Observances:

_Students who anticipate the necessity of being absent from class due to the observation of a major religious observance must provide notice of the date(s) to the instructor, in writing, by the second class meeting._