Instructor: Dr. Rebecca Schneider, Professor of Science Education  
Email: Rebecca.Schneider@utoledo.edu (preferred)  
Office Hours: Wednesday 11am to 4pm  
ACE@UT site: https://ace.oaeproject.org/  
UT Blackboard Login Site: https://blackboard.utdl.edu  
Credit Hours: 3 graduate semester hours

Catalog Description
Critical appraisal of current issues and trends in science education research. Emphasis on research investigations concerning concepts and issues in science learning theory, curriculum development and assessment.

Prerequisites: Must be admitted to the University of Toledo as a graduate level student and have graduate level writing skills

Course Overview
Designed for individuals beginning their thesis, project, or seminar paper phase of their graduate program, this course explores both theory and research in science education. We will begin with broad areas of interest and develop these into focused questions that can guide a review and critical analysis of the research literature in science education. We will examine several aspects of educational research including: ideas about how people learn, ideas about teachers and teaching, ideas that have influenced research, finding primary sources, how to read and critique research, and how to organize and write a literature review.

Framing question: What do we, as professional educators, know about learning and teaching science?

Instructional Approach
This fully online course is designed to stimulate student learning through the web-based delivery of readings, video, and audio, as well as collaborative activities involving asynchronous discussion and group projects. No on-campus meetings will be required.

As an online (distance learning or DL) course all interactions and communications will be facilitated online. You will need to prepare and participate weekly in online activities and discussions, in interactions with other students, and the course readings and assignments. Your learning and that of your peers is depended on consistent and progressive conversations, discussions, and assignments.
Although this course is somewhat flexible and adjustments are made for individual needs and schedules, this is NOT a self-paced course. Students are strongly cautioned against falling behind the overall pace of the course activities.

**Student Learning Outcomes**
During the semester, emphasis will be placed on exploring what we know, how we know it, and what we do not know in science education. The major course goal is to guide you through the process of raising important questions, reviewing literature, refining your ideas, and writing a literature review. Doing a literature review is the first step to completing your thesis, project, or seminar paper.

As the result of the course, you will gain experiences in the following.
- Examining ideas that guide research and practice in science education
- Reading, interpreting, and critiquing professional writing in science education
- Refining and communicating your ideas in writing and orally

**Student Learning Outcomes**
Learners will be able to:

1. Write an academic literature review that addresses issues or ideas about learning content or science education
2. Compose academic writing that conforms to standard language, spelling, and grammar rules and APA style
3. Describe a question that is meaningful, worthwhile that addresses and appropriate topic and scope for a current literature review
4. Demonstrate knowledge of science education including current ideas and issues in a thoughtful and substantive manner
5. Clearly and logically presents ideas for a strong argument for conclusions
6. Present a meaningful interpretation of theoretical and research-based ideas with integration, application, and implication
7. Present ideas professionally orally and in writing
8. Critique and provide productive feedback for peers.

**Activities and evaluation**
Your performance will be evaluated on the following tasks.

**Leading class discussion**
Each week one student will take the lead in initiating and guiding class discussion on the assigned reading. Discussions should engage the class in conversation about the key ideas, important frameworks, interpretations of the research and important implications from the readings in light of previous class discussions. Students should plan questions and handouts as appropriate.

**Problem statement**
This is a written statement describing the question or problem area you have chosen for you literature review and possibly your thesis, project, or seminar paper. In this short paper you will argue for the importance of this question and topic for science education and propose an approach to address this
question or problem. (Argue for the question not the answer.) This statement will be approximately 3 pages and must explore a topic in science education. This paper will be peer reviewed for use of current ideas in science education, importance, clarity, style, and structure.

**Reading plan.** Each student will define their literature review question and outline a reading plan for the review paper indicating subtopics or sub-questions. A literature review question can be answered by reading the current theory and research in science education, i.e. the literature. The reading plan will include (a) your question, (b) description of your question as worthwhile and meaningful, and (c) an annotated list of the topics and sub-topics planned for reading.

**Peer reviews**
Each student will formally review another student's problem statement paper and professional talk. These will be a written critique describing strong points and areas for improvement with suggestions. Reviews are usually one-page, three-paragraphs including descriptions of strengths, suggestions for improvements, and a wrap-up that lists action steps and highlights the potential of the paper.

**Literature review**
Each student will prepare a literature review based on their problem statement. This will be done in several steps. The first step will be to define the review question and reading plan for the paper (above). Second will be a three page problem statement that will serve as the draft of your introduction (above). Third will be to collect and read research and theoretical articles and develop notes and paragraphs. Fourth will be a professional talk using PowerPoint that will be peer reviewed. Here you will present ideas you will discuss in your final paper. Finally, you will turn in a literature review paper that includes an introduction, body, conclusion, and reference section. This paper will be in APA format, be about 25 pages (not including the title page or reference section), and will include a reference section with about 15-20 references.
Assessment Scheme: Assignments are due on the dates noted below. All work must be turned in on
due date. Grades on assignments will be lowered by one letter grade for each day an assignment is late
unless prior arrangement are made with the instructor. The requirements are subject to change and
adaptation at the discretion of the professor. You must submit an assignment on time in order to
participate in the revision option. A grade of Incomplete will be given only under extreme conditions
and with agreement of the instructor. **Students must earn a grade of C or better on each assignment
in order to earn a passing grade for the course.**

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<th>Assignment</th>
<th>Percent of Grade</th>
<th>Due Date</th>
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<td><strong>Discussion</strong></td>
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<td>Leading</td>
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<td>Reflecting</td>
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<td><strong>Problem statement</strong></td>
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<td>Reading plan</td>
<td>P/F</td>
<td>June 23</td>
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<tr>
<td>Draft for peer review</td>
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<td>June 30</td>
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<td>Final version revised with response to feedback</td>
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<td><strong>Professional talk</strong></td>
<td>15</td>
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<td><strong>Peer review</strong></td>
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<td>Problem statement</td>
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<td>Professional talk</td>
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<td>July 28</td>
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<tr>
<td><strong>Literature review paper with references</strong></td>
<td>25</td>
<td>August 7</td>
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Required Materials
*Handbook of research on science education* (pp. 3-30). Mahwah, NJ: Lawrence Erlbaum
Associates.

Researcher, 36*(9), 529-540.


Washington, D. C.: National Academy Press. (Chapter 3)

Press. [http://www.nap.edu/catalog.php?record_id=11625](http://www.nap.edu/catalog.php?record_id=11625) (Chapters 2, 4, 5, 6, and 7)

Schwab, J. (1964). The structure of the natural sciences. In G. W. Ford & L. Pugno (Eds.), *The structure
of knowledge and the curriculum* (pp. 31-49). Chicago: Rand McNally.

Recommended Materials

**University Policies**

**Policy Statement on Non-Discrimination on the basis of Disability (ADA)**
The University is an equal opportunity educational institution. Please read The University’s Policy Statement on Nondiscrimination on the Basis of Disability Americans with Disability Act Compliance.

**Academic Accommodations**
The University of Toledo is committed to providing equal access to education for all students. If you have a documented disability or you believe you have a disability and would like information regarding academic accommodations/adjustments in this course please contact the Student Disability Services Office.

**College of Graduate Studies Policies**
This course follows the policies described by the College of Graduate Studies. This includes both the general information and the Graduate Student Handbook available at:  
http://www.utoledo.edu/graduate/currentstudents/references/. Please be sure you are familiar with these documents.

Forms and other information for graduate students are also available from the College of Graduate Studies (http://www.utoledo.edu/graduate/currentstudents/index.html).
Grading Guidelines

Ideas are on track and work is well done              A
Ideas on track but there are one or two minor points to adjust               A minus
Main ideas are on track but there is at least one substantive issue to address           B plus
Main ideas are on track but there more than one substantive issue to address                        B
Main ideas are on track but there are multiple substantive issues to address                        B minus
Many ideas on track but there are key weakness to address                         C plus
Some ideas on track but there are several key weaknesses                                   C
One or more critical point or idea is wrong                                                  C minus
Only minor points are on track                                                  D plus
No ideas are on track                                                  D
You turned something in                                                   D minus

On track means consistent with ideas of the field (i.e. science education), what we are addressing in class, and where you should be at this point in the class and in your graduate program.

Substantive issues are important issues that must be attended to but are fixable without totally restructuring your work.

Key weaknesses are issues of greater impact and weaken or undermine your work. Revision will likely involve restructuring your work.

Critical points are potential deal breakers that raise significant doubts about your understanding.