

# T&L 574 Science for All: An Individual Multicultural Perspective

## Spring 2020

3 credits

Course meeting times:

Lecture: TH 5:45-8:30 TWST 224

DUE TO THE COVID-19 CRISIS, CLASSES WILL BE HELD VIA ZOOM AS NEEDED. ALL DISCUSSIONS WILL BE RECORDED AND AVAILABLE TO STUDENTS.

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Office Hours:	By appointment.

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### Required Text and Materials

Flick, L.B. & Lederman, N.G. (2006). *Scientific Inquiry and Nature of Science: Implications for teaching, learning, and teacher education*. Netherlands: Springer.

Access to SKYPE (or other video chat platform) and Google Docs.

Laptop, tablet, or smart phone

### Suggested Text

APA Manual 6<sup>th</sup> Edition

### College of Education Conceptual Framework

The College of Education contributes to the theory and practice of the broad field of education, and dedicates itself to understanding and respecting learners in diverse cultural contexts. We facilitate engaged learning and ethical leadership in schools and clinical settings. We seek collaboration with diverse constituencies, recognizing our local and global responsibilities to communities, environments, and future generations.

The connections to the conceptual framework in this course include emphases on: understanding and respecting learners in diverse cultural contexts as related to science and mathematics education, engaged learning and ethical leadership as related to science and mathematics education, and collaboration with other educators, parents and families, and school community members in efforts to improve science and mathematics education for current and future students. More specific connections are evident in the course objectives below.

### Course Description

The implications of cultural and individual diversity for understanding western scientific and mathematical thought will be explored through a variety of activities and assignments. The focus of the

course will be on how to design and teach science curricula so that all students are encouraged to learn science, develop scientific habits of mind, and to become scientifically literate.



### Course Objectives

At the conclusion of the course, students will be able to:

1. Analyze scientific presentations in the media with respect to the use of language, scientific argument, and scientific explanation.
2. Analyze their own views of science, teaching, and learning in the context of individual diversity.
3. Recognize the problems associated with teaching science so that *all* students are encouraged to learn science, develop scientific habits of mind, and to become scientifically literate.
4. Demonstrate knowledge of teaching strategies used to overcome these problems.
5. Review educational research articles in terms of the quality of the research and the conclusions proposed.
6. Demonstrate knowledge of the Washington State Science Learning Standards.
7. Demonstrate skills in instruction of, curriculum development in, and assessment of the science standards.
8. Demonstrate the ability to have a positive impact on student learning with the science standards.

### ACEI, NCATE, and WAC Labeled Objectives

1. Experience and study teaching in an interdisciplinary manner. (ACEI 4.3)
2. Study and apply a variety of developmentally appropriate experiences that demonstrate varied approaches to knowledge construction and application. (ACEI 5.0, NCATE I.D. 2, WAC 180-78-220)
3. Practice activities that stimulate reflective and critical thinking, problem-solving, and decision-making skills in science. (ACEI 5.1)
4. Gain experiences in adapting materials and assessment methods in science for specific contexts. (ACEI 5.4)
5. Study ways for helping students live productive lives beyond the year 2000. (ACEI 5.7)
6. Learn to apply current research findings on culturally and linguistically diverse populations to science teaching. (ACEI 6.2)
7. Learn to apply current research findings on students of varying ages to science teaching. (ACEI 6.3)
8. Apply current research findings on students with exceptionalities to science teaching. (ACEI 6.4)
9. Learn to analyze their own practice through a variety of data collection techniques. (ACEI 7.1)
10. Study, critically select, and use materials, resources, and technology appropriate to the age, developmental level, cultural and linguistic background, and exceptionality of the students. (ACEI 9.0, NCATE I.D. 2, EL, WAC 180-78-220)
11. Practice critical analysis and adaptation of existing materials and technology as well as the development of teacher-made materials. (ACEI 9.1)

12. Practice matching content, objectives, and teaching behaviors to the selection of materials for students. (ACEI 9.3)
13. Investigate the integration of reading, writing, and science. (ACEI 13.6)

### Grading Rubric

There will be no curve for grades in this class. Students must strive for predetermined levels of criteria. The grading levels will be the following:

A	94 %	A-	90-93%	B+	88-89%	B	84-87%
B-	80-83%	C+	78-79%:	C	73-77%	C-	70-72%
D	60-69%	F	0-68%				

Note: Papers will be assessed on each of the following criteria:

1. Clarity, conciseness, and mechanics of writing
2. Analysis of individual and multicultural perspectives
3. Understanding of the nature of science
4. Appropriate and correct use of science concepts, practices, and attitudes
5. Creativity and innovation in educational applications

Projects and Assignments	Due date:	Points
Diverse Learner Paper: This paper requires three distinct parts (see page 5) that will allow you to present your own perspective on who you are and how you teach. References should be cited and APA style used.	Feb 13	80
Analysis of Science in the Media: You will write an analysis of two science presentations in the media, one from video or TV, one from a newspaper or magazine (see page 5). References should be cited and APA style used. 40 points each.	Feb 27	80
Research Article Reviews: You will read and review two research articles on topics of your choice in multicultural science education. The specific review criteria will be provided (see page 5) and a sample review will be conducted as a class activity. References should be cited and APA style used.	Mar 26 & Apr 9	40  40
"What is Working": In this paper, you will do a "mini-research" investigation into how selected research-based strategies work with your teaching and your students (see page 6). References should be cited and APA style used.	Apr 30	100
In class/Weekly assignments: Throughout the course, you will be asked to write reactions to readings, answer or create questions pertaining to the readings, and participate in class discussions. The point breakdown for these assignments follows:	Various	40
Lead discussions: You will lead one of three discussions centered around an academic chapter concerning NOS research or Historical issues concerning the Philosophy of Science (see page 6). 3 Lead Discussions at 40 points each = 120 points	Various	120
Total Possible Points		500

### General Expectations for the Course

1. I will use the course web site (on BLACKBOARD) and email to communicate with you during the semester. You must check your WSU email and BLACKBOARD regularly. Make sure that your contact information in BLACKBOARD (and on my.wsu) is correct and sign up for emergency contact through you're my.wsu account.
2. I assume that each student will read the texts or handouts as assigned. In general, these readings provide the foundation on which our class discussion and activities will build. Specifically, we will use them as the basis for questions and lead discussions as well as quizzes and short papers. It will be the student's responsibility to raise questions or to request further discussion of any issue for which more explanation or elaboration is desired.
3. Submit each assignment to the appropriate BLACKBOARD drop box (word-processed, double spaced, 12-pt font, and in APA 6<sup>th</sup> edition style, unless otherwise indicated). Make sure that you see your document loaded in your dropbox – if you do not see it you have not submitted it properly. Typically, your graded assignment (with feedback) will be returned to you within a week. If you do not receive it, contact the instructor.

4. Late assignments: EVERY 24-hour period (including weekends), starting at 5:45 pm on the day that the assignment is due, that an assignment is late, will result in a 10% reduction of the overall grade. This course is designed for students to develop and build an understanding through the assignments and interactions with other students and the instructor. This process requires that students submit all assignments on time (due at the start of class on posted due dates), and therefore, there is a strict policy for late work. If you are absent, due dates still apply and you are expected to submit assignments electronically or ask a classmate to deliver them. The only exception to this rule is a documented MEDICAL EMERGENCY or DEATH of you or a family member. However, I will NOT accept ANY work after 5:45 pm on the date of the final UNDER ANY CIRCUMSTANCES including a documented MEDICAL EMERGENCY or DEATH of you or a family member.
5. You are responsible for any and all information discussed in every class. If you must miss class, notify the instructor in advance and ask a classmate for notes, additional short assignments (if given), or announcement of an upcoming quiz. If an in-class assignment was given and you were not present, you will receive a 0 for that assignment unless prior arrangements were made with the instructor. See the "Participation" section of the syllabus for more information on attendance.
6. If you have a documented disability and wish to discuss academic accommodations, please contact me as soon as possible. According to WSU's official Disability Services Reasonable Accommodations Statement: Reasonable accommodations are available for students who have a documented disability. Classroom accommodation forms are available through the Disability Services Office. If you have a documented disability, even temporary, make an appointment as soon as possible with the Disability Services Coordinator, Cherish Tijerina Pearson, Room 269 West Building. You will need to provide your instructor with the appropriate classroom accommodation form during the first week of class. All accommodations for disabilities must be approved through the Disability Services Coordinator.

For more information, contact a Disability Specialist on your home campus:

- Spokane [/students/current/StudentAffairs/disability/index.html](http://students/current/StudentAffairs/disability/index.html)
  - Pullman <http://accesscenter.wsu.edu>
  - Tri-Cities: <http://www.tricity.wsu.edu/disability/index.html>
  - Vancouver: <http://studentaffairs.vancouver.wsu.edu/student-resource-center/disability-services>
7. The Campus Safety Plan (<http://safetyplan.wsu.edu>) contains a comprehensive listing of university policies, procedures, statistics, and information relating to campus safety. The University emergency management website (<http://oem.wsu.edu/emergencies>) provides campus safety and emergency information. The emergency alternative site (<http://alert.wsu.edu>) provides information about emergencies and communication resources WSU will use to provide warning and notification during emergencies.
  8. Academic Integrity Violations: When a student enrolls in WSU, the student assumes an obligation to pursue academic endeavors in a manner consistent with the standards of academic integrity adopted by the University. To maintain the academic integrity of the community, the University cannot tolerate acts of academic dishonesty (WAC 504-26-010 specifically defines "cheating"). To support your skills in maintaining academic integrity, WSU T-C offers tutorials and workshops at the Writing

Center. Students are strongly encouraged to access these resources. Ignorance is an insufficient defense to accusations of academic cheating.

If a student's work is suspected of violating the university's policies on academic integrity (WAC 504-26-404), the instructor will assemble the evidence and upon reasonable notice to the student of the date, time, and nature of the allegations it order to meet with the student suspected of violating academic integrity policies.

- a.) If the student admits violating academic integrity policies, the instructor may assign a zero on the particular work in question, require the student to resubmit the assignment for a reduced grade, and/or receive an "F" in the course, and the instructor will notify the office of student conduct in writing of the allegations, the student's admission, and the sanctions imposed.
- b.) If the instructor is unable to meet with the student or if the accused student disputes the allegations(s) and/or the outcome proposed by the instructor, the instructor shall make a determination as to whether the student did or did not violate the academic integrity policy. If the instructor finds that the student was in violation, the instructor shall provide the student and the office of student conduct with a written determination, the evidence relied upon, and the sanctions imposed.

Due process as described in the policy (WAC 504-26-404) will be honored.

See <http://www.studentmediagroup.com/planners/palouse2012/#/18/> for more information about Academic Integrity definitions and policies.

9. Professional Dispositions: Teacher preparation programs at WSU assess the "professional dispositions" of all teacher candidates. This assessment occurs throughout the program, both in courses and in field experiences. A description of WSU's use of professional dispositions is available at <http://www.education.wsu.edu/studentervices/disposition/> as is the actual form used to indicate and communicate concerns and remediation, if necessary.
10. Professional Communication: The faculty members of the Elementary Education program emphasize the importance of effective written and oral communication for teachers. Students of the program are expected to demonstrate that they can meet standards of professional communication on all of their assignments. A student who fails to adhere to the conventions of writing (e.g. makes consistent grammatical and/or spelling errors, frequently misuses words or phrases, fails to organize writing in an effective manner) may be required to work with the Writing Center or complete additional coursework. Students who fail to meet expectations after being provided with opportunity for remediation and improvement may be removed from the program. Students will also be held accountable for demonstrating that they are capable of clear and professional verbal communication.
11. If you have any questions, feel free to call, e-mail, or meet with me.

### Papers & Assignments

Diverse Learner Paper Due February 13 (80 points total)

This paper requires three distinct parts; the parts must be kept separate. References should be cited and APA style used. The three distinct parts are as follows:

- a. Prepare a reflection about yourself which summarizes your understanding of your personal background and experiences (cultural, social, academic, environmental, linguistic, etc.). Include how these factors might assist and/or interfere with understanding learners' actions, reactions, etc. (27 pts.)

- b. Prepare a synthesis and analysis of the diverse students that you teach and may teach in the future. Do not confine yourself to the population you are currently teaching but demonstrate your knowledge of the student populations in America and the learning styles and needs of those diverse populations. Be sure to demonstrate your understanding of how diversity affects learning and the problems associated with teaching science so that all students have the opportunity to become scientifically literate. (26 pts.)
- c. Prepare a plan for incorporating diversity into your teaching of science. This part of the paper should include a general plan of how you will recognize and teach science to specific diversities. (27 pts.)

### Analysis of Science in the Media Due February 27 (80 points total, 40 points for each)

You will write an analysis of two science presentations in the media, one from video or TV, one from a newspaper or magazine. The following subheadings must be used for each analysis (you will have two):

- Summary of the video or article (8pts.)
- Nature of science/technology (8 pts.)
- Science Concepts, Processes, and Attitudes (8 pts.)
- Multicultural, gender, and/or diversity issues (8 pts.)
- Applications to education (8 pts.)

### Research Article Reviews First Due March 26, Second Due April 9 (80 points, 40 points each)

The two articles reviewed MUST be:

- from recognized, peer-reviewed journals
- relate to the topic of multicultural science teaching/learning
- either qualitative or quantitative research
- approved by the instructor

To access the articles:

- search in the library (ERIC, Google Scholar)
- EBSCO: <http://www.wsulibs.wsu.edu/usered/proebSCO/proebSCO.html>
- look at reference lists in other articles, texts
- ask your peers for suggestions

For each of the articles, write a short abstract including the following:

- The theoretical basis of the research
- The research problem or question
- The participants involved in the study (description, selection of, etc.)
- The data collection and analysis procedure, all data sources clearly described
- The findings, conclusions, implications, etc.

### What is Working Due April 30 (100 points)

In this paper you will present your findings from a mini-action research project that you will carry out on your own teaching. After reading about and discussing a variety of strategies that may be used in

classrooms to support ALL students in their learning of science, you will choose 2-3 strategies to find out more about and to implement in your own teaching. Then you will report on your successes and future plans. The essential parts of the paper will be:

- Documentation and research to support the use of the strategies (30 pts.)
- Implementation of the strategies (20 pts.)
- Your reflections and findings (30 pts.)
- What next? How will this impact your future teaching? (20 pts.)

#### **Student Led Discussion (120 points, 40 points each)**

You will synthesize an assigned article and lead a class discussion that examines the importance of the article in terms of past and current research and philosophy of science. You should have a power point (or Prezi, etc.) created that covers the topic and important points of the article. You must also include questions to spur conversation within the class (and to assess whether the class has read and absorbed the material). Finally, you will create a summary of the discussion to be added to dropbox by the next class session. The essential parts of the Student Led Discussion will be:

- Power point/overview of the article (20 points)
- Questions for the class that foster discussion (10 points)
- Summary of discussion (10 points)



## Tentative Course Outline and Schedule – T&amp;L 574

This Schedule is subject to change due to the needs of the class. Classes will be held via ZOOM as needed.

Date	Reading	Assignment Due
Jan 16	Introduction, NOS, Concept Maps	
Jan 23	Reading #1 Why Science?: Preface & Ch. 1 The Mismeasure of Man: Ch. 1 & 2	Mathews, 2011 <i>Student A</i> Holton, 1978 <i>Student B</i>
Jan 30	No Class	
Feb 6	Reading #2 Sci Inq & NOS: Intro & Ch. 1 Why Science?: Ch. 2	Grotzer, Miller, & Lincoln, 2011 <i>Student C</i> Holloway, 1993
Feb 13	Reading #3 Sci Inq & NOS: Ch. 2 Why Science?: Ch. 3 & 4	<b>Diverse Learner Paper</b> Carnap, 1966 <i>Student A</i> Taber 2011 <i>Student B</i>
Feb 20	Sci Inq & NOS: Ch. 3 Why Science?: Ch. 5 & 6 Denialism Intro & Ch. 1	Popper, 1963 <i>Student C</i> Southerland, Golden & Enderle, 2011 <i>Student A</i>
Feb 27	Reading #4 Sci Inq. Ch. 4 Why Science?: Ch. 7 & 8	<b>Science in the Media Paper</b> Good, 2011 <i>Student B</i> Lakatos, 1970 <i>Student C</i>
Mar 5	Sci Inq: Ch. 6 & 7 The Mismeasure of Man: Ch. 3 & 4	BouJaoude & Santourian, 2011 <i>Student A</i> Kuhn, 1977 <i>Student B</i>
Mar 12	Reading #5 Why Science?: Ch. 9 & 10	Hubbard, 1979 <i>Student C</i> Lederman, Lederman, Kim, & Ko, 2011 <i>Student A</i>
Mar 19	Spring Break-No Class	
Mar 26	Reading #6 Sci Inq.: Ch. 10	<b>Research Article Review</b> Longino, 1987 <i>Student B</i> Schwartz, 2011 <i>Student C</i>
Apr 2	Reading #7 Why Science?: Ch. 11 & 12	Firestone, Wong, Luft, & Fay, 2011 <i>Student A</i> Hempel, 1962 <i>Student B</i>
Apr 9	Reading #8 Sci Inq.: Ch. 11 & 12	<b>Research Article Review</b> Schussler & Bausista, 2011 <i>Student C</i> Kuhn, 1963 <i>Student A</i>
Apr 16	No Class	

Apr 23	Sci Inq.: Ch. 13 & 14 The Mismeasure of Man: Ch. 5 & 6	Kuhn, 1962 <i>Student B</i> Bell, Mulvey, & Maeng, 2011 <i>Student C</i>
Apr 30	Sci Inq.: Ch. 15 & 16 The Mismeasure of Man: Ch. 7	"What is Working" Paper Popper, 1975 <i>Student A</i> Clough & Olson, 2011 <i>Student B</i>
FINALS WEEK: Recap, Discussion, Food		