Washington State University
MAJOR CURRICULAR CHANGE FORM - - COURSE
(Submit original signed form and ten copies to the Registrar’s Office, zip 1035.)

| Future Effective Date: 08/16/2013 | ☑ New course | ☐ Temporary course | ☐ Drop service course |
| (effective date cannot be retroactive) | | | |
| ☐ Variable credit | ☐ Repeat credit (cumulative maximum _____ hours) |
| ☐ Increase credit (former credit ______) | ☐ Lecture-lab ratio (former ratio __________) |
| ☐ Number (former number ________) | ☐ Prefix (former prefix __________) |
| ☐ Crosslisting (between WSU departments) (Must have both departmental signatures) | ☐ Cooperative listing (UI prefix and number ________ taugh by: WSU ☐ UI ☐ jointly taught ☐ |
| ☐ Conjoint listing (400/500) | ☐ S, F grading |
| ☐ Request to meet Writing in the Major [M] requirement (Must have All-University Writing Committee Approval) |
| ☐ Request to meet GER in _____ (Must have GenEd Committee Approval) | ☐ Fulfills GER lab (L) requirement |
| ☐ Professional course (Pharmacy & Vet Med only) | ☐ Graduate credit (professional programs only) |
| ☐ Other (please list request) |

| T&L | 581 |
| course prefix | course no. |
| Learning and Development in Mathematics and Science |

| 3 | None |
| credit | lecture hrs | lab hrs | studio hrs |
| per week | per week | prerequisite |

Description (20 words or less)
The course explores and illustrates "what we know" about various aspects of mathematical learning at various grade levels.

Instructor: David Slavit
Contact: Debra Barnett
Campus Zip Code: 99660

Phone number: (360) 546-9653
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Phone number: (360) 546-9660
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- Please attach rationale for your request, a current and complete syllabus, and explain how this impacts other units in Pullman and other branches (if applicable).
- Secure all required signatures and provide 10 copies to the Registrar’s Office.

Chair/Date: 11.5.12
Dean/Date:
General Education Com/Date:
Chair (if crosslisted/interdisciplinary)*:
Dean (if crosslisted/interdisciplinary) *
Graduate Studies Com/Date:
All-University Writing Com/Date:
Academic Affairs Com/Date:
Senate/Date:

*If the proposed change impacts or involves collaboration with other units, use the additional signature lines provided for each impacted unit and college.
Course Rationale

T & L 581: Learning and Development in Mathematics and Science

T&L 581 is one of three required courses related to the foundational core of the degree. This is due to the emphasis of the course on the essential area of mathematics and science learning, and the overview of research in this area that is explored.

The research and position papers comprising the course curriculum provide an entry point into discussions of "what we know" about various aspects of mathematical learning at various grade levels. The readings also provide an overview of various theoretical and philosophical approaches used to better understand the learning of mathematics, with a focus on the K-12 level. Approaches to learning include cognitive science, constructivism, connectionist learning, and situated learning. The course explores and illustrates how the above approaches are utilized by mathematics and science educators in understanding learning. Class discussion will primarily focus on how the papers fit with the existing database on mathematics and science learning; attention will also be given to the validity of the research and research method.

The course has no anticipated impacts on other units in Pullman. The course will be available to students at all campuses who are interested in mathematics and/or science educational research. The course will be taught on a rotating basis by faculty on the Pullman, Spokane, Tri-Cities and Vancouver campuses to ensure equitability in faculty load.
T&L 581: Learning and Development in Mathematics and Science

Instructor: David Slavit  
Office: VUCB 330  
Email: dslavit@wsu.edu  
Phone: (360) 546-9653 (Office)  
Office Hours: TBA  
Prerequisites: None

OVERVIEW
This course has three main goals. The research and position papers comprising the course curriculum provide an entry point into discussions of "what we know" about various aspects of mathematical learning at various grade levels. The readings also provide an overview of various theoretical and philosophical approaches used to better understand the learning of mathematics, with a focus on the K-12 level. Approaches to learning include cognitive science, constructivism, connectionist learning, and situated learning. The papers in this course will help illustrate how the above approaches are utilized by mathematics educators in understanding learning. Class discussion will primarily focus on how the papers fit with the existing database on mathematics learning; attention will also be given to the validity of the research and research method.

COURSE GOALS
Thus there are three main goals of this course:

- Provide a forum for the discussion of "what we know" about various aspects of learning mathematics at the K-12 level,
- Provide a forum for the discussion of what it means to “understand” mathematics, and
- Provide a forum for the discussion of appropriate research methodology in mathematics education.

COURSE ASSIGNMENTS
The semester grade will be based on three activities, each weighted about equally:

Class participation. A weekly assignment for the course is the reading and contemplation of the assigned papers. Since the format of the course is that of a discussion seminar, its success depends on your preparation and careful reading of the assignments, and then your participation in class discussions. Everyone should enter the classroom ready to discuss the required material in depth. Although other
sources or personal experiences will most assuredly be relevant, it will be the theoretical frameworks, methodologies, and results of the assigned papers that will drive the class discussions. In addition, everyone will be asked to lead the class discussions at least twice during the semester. Choose a session topic in which you are interested, include the “additional” readings plus other relevant papers in your preparation, and meet with me before class (perhaps Thursday or Friday) to discuss some of the primary issues. You should prepare for your colleagues a written summary of the readings you have done (including the additional readings).

**Weekly commentaries.** Every week, a one-page paper on the assigned readings will be due. The commentary should be a review of the readings, taken as a whole. It should not be an individualized, serial review of each article. Before writing, ask yourself "what you now know" about the issues raised in the papers. The style of the commentary should take one of two forms, depending on the readings. First, if the assigned readings are reports of research, then focus your discussion on how the data effect what you know about the learning of mathematics; what can we learn from these data; what does this mean for our understanding of children’s mathematical thinking and approaches to teaching; are the data believable; is the research design appropriate and effective? Second, if the assigned readings are of a theoretical nature, then focus your discussion on the credibility of the ideas; does the author provide data to support claims; is the theory useful in either classroom practice or future research; does the theory “ring true” based on personal experience? Certain weeks contain papers of both varieties, in which case the commentary should reflect this.

**Exam.** A take-home examination will be given at the end of the semester. The exam will cover the semester readings and class discussions. The objective of this assignment is to encourage reconsideration and reflection on the major themes of the course. Incompletes will be given only in extreme cases (e.g., prolonged illnesses).

Grading will be assigned on the following scale:
A – 9-10; outstanding work
B – 8; above average work
C – 7; average work
D- 6; below average work
F – 0-5; Work fails to meet minimal requirements

**COURSE SCHEDULE**

*Week 1*  
*Course Introduction*

*Week 2*  
*Cognitive Science, Constructivism, and Mathematics Education*

3
Additional Readings

33

Part 1: Relationships between types of knowledge

Week 3  Procedural and Conceptual Knowledge


Additional Readings

Week 4  Transitioning to Conceptual Understanding


Additional Readings

Week 5  Understanding

Additional Readings

Week 6  Reification and Conceptualization


Additional Readings

Week 7

Instructional Sequencing and Conceptualization


Additional Readings


Week 8

Spring Break

Week 9

Connecting Symbols to Meanings

Week 10  Issues in Problem Solving

Additional Readings

Week 11  Misconceptions and "Bugs"

Additional Readings

Part 2: Individual cognitions within a group setting

Week 12  Reflection and Communication

Additional Reading

**Week 13 Situated Cognition outside of the classroom**

Additional Readings

**Week 14 Classroom Discourse**

Additional Readings
Disability Accommodation: Reasonable accommodations are available for students with a documented disability. All accommodations must be approved through your WSU Disability Services office. If you have a disability and need accommodations, we recommend that you begin the process as soon as possible. All accommodations must be approved through Disability Services. For more information, contact a Disability Specialist on your home campus.
- **Spokane** /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

Academic Integrity: Academic integrity is the cornerstone of the university and will be strongly enforced in this course. Any student found in violation of the academic integrity policy will be given an “F” for the course and will be referred to the Office of Student Conduct. Read http://academic integrity.wsu.edu/
For additional information about WSU’s Academic Integrity policy, procedures, and definitions, please check online at http://www.conduct.wsu.edu/default.asp?PageID=338 and http://www.conduct.wsu.edu/.
Note: Plagiarism is a violation of academic integrity. Students sometimes do not realize what constitutes plagiarism. Please read the information at http://www.wsulibs.wsu.edu/plagiarism/what.html and associated links.

Emergency Notification System: WSU has made an emergency notification system available for faculty, students and staff. Please register at myWSU with emergency contact information (cell, email, text, etc). You may have been prompted to complete emergency contact information when registering for classes on RONet.
In the event of a Building Evacuation, a map at each classroom entrance shows the evacuation point for each building. Please refer to it.
Finally, in case of class cancellation campus-wide, please check local media, the appropriate WSU web page and/or http://www.flashalert.net/. Individual class cancellations may be made at the discretion of the instructor. Each individual is expected to make the best decision for their personal circumstances, taking safety into account.

Audio, video, digital, commercial note-taking and other recording during class: Copyright (insert year) (insert: Faculty Name) as to this syllabus, all lectures, and course-related written materials. During this course students are prohibited from making audio, video, digital, or other recordings during class, or selling notes to or being paid for taking notes by any person or commercial firm without the express written permission of the faculty member teaching this course.
T&L 581: Learning and Development in Mathematics and Science

Instructor: David Slavit
Office: VUCB 330
Email: dslavit@wsu.edu
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Office Hours: TBA
Prerequisites: None

OVERVIEW
This course has three main goals. The research and position papers comprising the course curriculum provide an entry point into discussions of "what we know" about various aspects of mathematical learning at various grade levels. The readings also provide an overview of various theoretical and philosophical approaches used to better understand the learning of mathematics, with a focus on the K-12 level. Approaches to learning include cognitive science, constructivism, connectionist learning, and situated learning. The papers in this course will help illustrate how the above approaches are utilized by mathematics educators in understanding learning. Class discussion will primarily focus on how the papers fit with the existing database on mathematics learning; attention will also be given to the validity of the research and research method.

COURSE GOALS
Thus there are three main goals of this course:
• Provide a forum for the discussion of "what we know" about various aspects of learning mathematics at the K-12 level,
• Provide a forum for the discussion of what it means to "understand" mathematics, and
• Provide a forum for the discussion of appropriate research methodology in mathematics education.

COURSE OBJECTIVES
• Students will develop understanding of the core results from the research literature in the area of mathematics and science learning and development.
• Students will develop knowledge of the leading dissemination outlets for research on learning and development in mathematics and science.
• Students will become familiar with appropriate research methodologies for investigating learning and development in mathematics and science.
COURSE ASSIGNMENTS
The semester grade will be based on three activities, each weighted about equally:

*Class participation.* A weekly assignment for the course is the reading and contemplation of the assigned papers. Since the format of the course is that of a discussion seminar, its success depends on your preparation and careful reading of the assignments, and then your participation in class discussions. Everyone should enter the classroom ready to discuss the required material in depth. Although other sources or personal experiences will most assuredly be relevant, it will be the theoretical frameworks, methodologies, and results of the assigned papers that will drive the class discussions. In addition, everyone will be asked to lead the class discussions at least twice during the semester. Choose a session topic in which you are interested, include the “additional” readings plus other relevant papers in your preparation, and meet with me before class (perhaps Thursday or Friday) to discuss some of the primary issues. You should prepare for your colleagues a written summary of the readings you have done (including the additional readings).

Grading will be assigned on the following scale:
A 9-10; the student successfully led class discussion on two occasions and prepared written summaries of readings; students actively participated in class discussion on a weekly basis
B 8; the student was not fully prepared for leading class discussion during his or her assigned weeks, had difficulty generating meaningful conversation, or did not prepare an adequate written summary; OR less than active participation in class discussion throughout the semester
C 7; the student failed to perform two of the following: was not fully prepared for leading class discussion during his or her assigned weeks, had difficulty generating meaningful conversation, did not prepare an adequate written summary, or exhibited less than active participation in class discussion throughout the semester
D 6; the student failed to perform three of the following: was not fully prepared for leading class discussion during his or her assigned weeks, had difficulty generating meaningful conversation, did not prepare an adequate written summary, or exhibited less than active participation in class discussion throughout the semester
F 0-5; the student failed to perform any of the following: was not fully prepared for leading class discussion during his or her assigned weeks, had difficulty generating meaningful conversation, did not prepare an adequate written summary, or exhibited less than active participation in class discussion throughout the semester

*Weekly commentaries.* Every week, a one-page paper on the assigned readings will be due. The commentary should be a review of the readings, taken as a whole. It should not be an individualized, serial review of each article. Before writing, ask yourself “what you now know” about the issues raised in the papers. The style of the commentary should take one of two forms, depending on the readings. First, if the assigned readings are reports of research, then focus your discussion on how the data effect what you know about the learning of mathematics; what can we learn
from these data; what does this mean for our understanding of children's mathematical thinking and approaches to teaching; are the data believable; is the research design appropriate and effective? Second, if the assigned readings are of a theoretical nature, then focus your discussion on the credibility of the ideas; does the author provide data to support claims; is the theory useful in either classroom practice or future research; does the theory “ring true” based on personal experience? Certain weeks contain papers of both varieties, in which case the commentary should reflect this.

Grading will be assigned on the following scale:
A – 9-10; outstanding work, very thoughtful and reflective commentary, ideas from reading are synthesized and not just summarized
B – 8; above average work, thoughtful and reflective commentary, some ideas from reading are synthesized, but description without analysis is present
C – 7; average work, commentary shows little reflection, few ideas from readings are synthesized, focus on description
D- 6; below average work, commentary shows no reflection, ideas from readings are not synthesized, writing completely at the descriptive level
F – 0-5; Writing is incoherent or does not relate to the readings

Exam. A take-home examination will be given at the end of the semester. The exam will cover the semester readings and class discussions. The objective of this assignment is to encourage reconsideration and reflection on the major themes of the course. Incompletes will be given only in extreme cases (e.g., prolonged illnesses).

Grading for the exam will be assigned using the same scale as the weekly commentaries.

Overall grade. Grades will be assigned by equally weighting the above three assignments and using the following range:

Grading Scale:
90-100% A
80-89% B
70-79% C
60-69% D
Below 60% F

COURSE SCHEDULE

Week 1 Course Introduction
Week 2 Cognitive Science, Constructivism, and Mathematics Education

4
Additional Readings

44

Part 1: Relationships between types of knowledge

Week 3 Procedural and Conceptual Knowledge


Additional Readings

Week 4 Transitioning to Conceptual Understanding


Additional Readings

Week 5  Understanding

Additional Readings

Week 6  Reification and Conceptualization


Additional Readings

**Week 7**

*Instructional Sequencing and Conceptualization*


Additional Readings


**Week 8**

*Spring Break*

**Week 9**

*Connecting Symbols to Meanings*


**Week 10**  
**Issues in Problem Solving**

**Additional Readings**

**Week 11**  
**Misconceptions and "Bugs"**

**Additional Readings**

**Part 2: Individual cognitions within a group setting**

**Week 12**  
**Reflection and Communication**

Additional Reading

**Week 13 Situated Cognition outside of the classroom**

Additional Readings

**Week 14 Classroom Discourse**

Additional Readings
Week 15  Diverse Learners

Additional Readings

Week 16  Course Review

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- Pullman http://accesscenter.wsu.edu
- Tri-Cities: http://www.tricity.wsu.edu/disability/index.html
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