

Syllabus - Fall 2009 - ED 220: Changing Pedagogies in Mathematics and Science

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General Information

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<i>Phone:</i>610-526-7578	 (and by appointment)

COURSE DESCRIPTION

Overview

This course examines perspectives related to teaching and learning math and science, including questioning why (if at all) it is important for people to learn these subjects, what is viewed as successful teaching and learning in these disciplines, and how people learn math and science. Students have a placement (2-3 hours/week) with a local teacher and will be expected to make connections between course concepts and these placement experiences. Enrollment is limited to 20 students, with priority given to students pursuing certification or the minor in educational studies. Two-to-three hours of fieldwork is required per week (Praxis I).

This class is not a methods course. Although it will discuss some methods and issues related to them, it discusses a broad range of topics and issues relevant in math and science education today. Some students want these courses to immediately and solely focus on how students learn and how to best teach them. We will discuss some of these topics, but first want to survey the land and know what's currently happening in classrooms and happening for students and teachers. Course meetings are divided among multiple topics, but these sessions should not be viewed as discrete non-overlapping areas. The hope is that we will develop a connecting thread among these areas and relate them to your field placements and your past, current, and future experiences.

These topics are:

- Status and Value of Math and Science Education
- Culture and Content Knowledge in Math and Science Classrooms
- Learning Theory and Inquiry
- Education Research
- Discourse in Math and Science Classrooms
- Assessments

Students in the course are expected to have an active role in its development and to participate regularly. One goal is for you all to be *talking* education and not being talked *at* all the time. You'll also be responsible for leading class in some domains through group work and possibly individually. Overall, the class is meant to be semi-flexible in that there are times and places where it can respond to additional interests and demands. As listed in the course schedule below, this syllabus is an initial guide that is subject to change.

The course is not meant to provide you with "right" answers nor is it a course where you are expected to accept all that you read and hear. I want you to bring a reflective, analytical eye to the topics and to be conscious of your initial, and developing, perspectives and how they can impact what you see in classrooms, how you might facilitate classrooms, and how different decisions and actions can affect a variety of education-related outcomes.

Learning Goals for Students

Although there are many learning goals for this course and I hope students will learn many things from taking it, I want to highlight some of the main ones. This course should lead students to:

- Become exposed to diverse perspectives in education and develop a greater understanding of their own personal views as well as the affordances and constraints of different perspectives
- Enhance their observational and analytic abilities from field observations and video analyses of educational settings, especially within the disciplines of math and science
- Explain how various factors and approaches can impact experiences in math and science classrooms and construct different understandings of math and science
- Articulate how education is a science that involves valuable research, similar to and different from other sciences
- Articulate some ways people learn math and science as well as develop an understanding of theories and research that support different instructional approaches in these disciplines
- Explain their views about what math and science content are important for students to learn and why
- Understand how different discursive behaviors, as well as ways of listening, can impact students' and teachers' experiences in math and science classrooms
- Deepen understandings of specific content and reflect on the benefits and drawbacks of working as a group through working with other people to create and deliver a lesson
- Develop their self-reflective and analytical capabilities, including a deepened awareness of their initial, and developing, perspectives and how these and other factors can impact what they see in classrooms, how they might facilitate classrooms, and how different decisions and actions can affect a variety of education-related outcomes

Format of the Course

The general format of the course will be flexible and I expect high levels of student participation and activity. Most of the activities seek to actively engage you with the course material. In addition to field placement work, you will be reading, writing, presenting, debating, and questioning. ***Also, there will be one or two evening events with speakers that you will be required to attend.*** In this small class, it is important that you participate as it is difficult in a course like this to sit passively and acquire the course content. Course activities are designed to get you to think deeply. We might try a variety of things that are new for you, me, or both of us and I encourage you to venture outside your comfort zone to think and do things differently than you might have done before. Some of these things will be more successful than other approaches and hopefully these efforts will serve to model the view that experimentation is okay, and encouraged, in education especially when the reasons for these changes are to meet certain goals. The things that are tried (see "Twitter" below), and the topics that are covered, should all have a purpose. You are encouraged to provide constructive

feedback throughout the course and/or after the course has concluded. The entire course is not fixed in stone and certain things can be modified or used differently as the course unfolds.

Course Readings

There are **no required books** for this course. Most readings (if not all) will be accessible through Blackboard. Please check online for these files and download them with sufficient time in order to avoid any potential problems.

Writing Proficiency

This course is writing intensive and writing proficiency is a minimum requirement for satisfactory completion of this course. All written work must reflect adequate writing skills in order to receive a grade. You should carefully edit your work and check for spelling and grammatical errors before submitting it. Written communication is important in many professional and personal pursuits.

If you wish to receive assistance with your writing, please speak with me as soon as the thought arises (including the first day of the course) and/or go to the Writing Center located in Canaday Library Room 212 (phone #: 610-526-5656; URL: <http://www.brynmawr.edu/writingcenter/>) for free services and assistance. Haverford College also has a Writing Center and more details about it can be found online at: <http://www.haverford.edu/writingcenter/>. I may refer you to one of the Writing Centers if I feel they may be of service to you.

Access Services

Students who think they may need accommodations in this course due to the impact of a learning, physical, or psychological disability are encouraged to meet with me privately early in the semester to discuss their concerns. Students should also contact Stephanie Bell, Coordinator of Access Services (610-526-7351 or sbell@brynmawr.edu) or Rick Webb, Director of Psychological Services and Disability Services (610-896-1290 or rwebb@haverford.edu), as soon as possible, to verify their eligibility for reasonable academic accommodations. Early contact will help to avoid unnecessary inconvenience and delays.

GRADING AND ASSIGNMENTS

As with all else in this syllabus, assignments and related details are subject to change during the semester. The information below notes an initial breakdown of what will be graded in this course and a brief introduction to various assignments. Additional information about each assignment is in other sections of this syllabus and will be discussed in class.

Grading:

- | | |
|--|-----|
| • Participation/preparation/attendance | 10% |
| • Issue papers | 20% |
| • Video analysis | 15% |
| • Group project | 30% |
| • Final project | 25% |

1) Participation/preparation/attendance (10%)

Attendance, preparation and participation are expected for all class-related activities including class sessions, evening events, and field placement commitments. Tweeting and attendance and participation at your placement, including feedback from your cooperating teacher(s), can impact your participation grade. The *quality* of your participation (not just the *quantity*) is important! Attendance affects the overall learning experience for you and other members of the class. I recognize that sometimes things come up that prevent you from attending something (e.g., illness, family or personal issues) and, if possible, please inform me in advance if you have a conflict or

illness that interferes with your ability to attend. Anticipated absences (e.g., for holidays) should be known before those days and communicated to me in advance. If an absence will affect your responsibilities with your field placement, it is important that you take appropriate steps with your cooperating teacher(s) and school. You will be responsible for any material covered when you are absent and any assignments that were due or discussed. If an assignment is due on a day you are absent, you must still submit it before the listed due date/time.

Although this component of the course is currently listed as accounting for a specific percent of your course grade, particularly problematic or exemplary participation, preparation, or attendance can further impact your grade positively or negatively. More than two absences from class/field placement can lower your overall course grade and lead me, and likely you, to work with your Dean; Additional absences, especially combined with other problems, could lead to failure of the course. Communicate honestly and in a timely way about issues regarding your attendance or other concerns related to this course. Communication can improve almost every problem.

2) Issue Papers (20% = 10% graded by you, 10% graded by me)

There are a number of issues related to math and science teaching and learning that we will discuss this semester and I want you to be talking, thinking, and writing about these issues and your perspectives. These issue papers will have you respond to different questions or topics, asking you to reflect on your views. You will ultimately share and discuss these papers with peers. There are no "right" or "wrong" perspectives and you should feel welcome to take varied stances. The major request is that you truly reflect on your opinions, inspect them, do your best to clearly convey them to yourself and other people, and listen openly to other perspectives.

3) Video analysis (15%)

It is valuable to read, discuss, and consider papers that discuss teaching and issues related to education. Additionally, it is valuable to watch classrooms in action and learn from those experiences, possibly connecting things discussed in class or read in articles with what is observed in practice. You will have this opportunity throughout the course as we work to connect your experiences at your field placement with different readings, discussions, and assignments. But another related activity that can develop your eye with regards to educational issues, including your own potential teaching, is to watch videos of classrooms. There is an incredible amount of information in even a few seconds in a classroom and this assignment has you focusing on a small section of a clip to discuss things you see that relate to topics we have discussed in this course (as well as other things that might stand out to you).

4) Group project (30% total = 10% for group-generated preparatory work including your research as reflected in your lesson plan and list of references, 10% for group-led lesson and group-generated paper, and 10% for individual efforts to the group and your reflection paper)

In general, this assignment involves groups: (a) learning more about a specific issue, debate, policy, question, pedagogy, or dialogue that has been ongoing in math and/or science education, (b) developing a list of references related to the topic, (c) creating and delivering a lesson to introduce the class to this topic, and (d) writing a group paper and reflection paper related to this project. A list of possible topics (but you are free to propose something that is not in this list) is below:

- Educational technology (e.g., graphing calculators, probes, Internet, specific software)
- Standards-based curriculum
- High-stakes testing
- Informal math and science education (i.e., learning in settings outside the formal education setting, such as museums)
- Extracurricular activities (e.g., robotics' clubs)

- Certification requirements or the general topic of "teacher quality"
- In-depth comparison between U.S. and other countries in mathematics and/or science in one or more areas (e.g., teacher preparation, standards, textbooks used)
- Mathematics and science textbooks and/or instructional materials
- The emphasis on math and science literacy
- Issues related to enhancing students' interest in math and science
- Assessment-related issues in science and math (e.g., benefits and drawbacks to multiple-choice, constructed-response, and essay questions in these classes)

Note that many of the topics listed above are just starting points. It is up to your group, based on members' interests and findings from the background work that is done, to find a specific area on which to focus. For example, one topic above was recorded as "The emphasis on math and science literacy." A group might wish to investigate what "science literacy" and "math literacy" mean according to different organizations, why and when these constructs began to be emphasized, specific steps that are being taken or promoted to increase people's science and math literacy, and how an emphasis on science and math literacy overlaps with, or opposes, emphases on standardized tests.

You are asked to do more than simply "report" your findings (e.g., what you learned about math and science literacy) but to get members of the class involved in considering these issues and questions they raise or things they suggest about math and science learning and teaching. Possibly in your presentation, and definitely in your papers, you are to explain how this knowledge impacts your thinking. You are encouraged to select a topic that overlaps with something you find relevant or interesting at your field placement and can ask your peers to connect this topic to their field placements during your lesson.

5) Final project (25% total = 5% for Field Journal + 20% for Final Paper & Presentation)

The final project will have you reflect on one or more activities or lessons that took place when you were present at your field placement. Although you might not use any specific entries from your journal, using one or more entries could aid in completing this assignment. *Note that your journal is expected to be updated throughout the term as new entries should be recorded within two days after each class visit.* In addition to a final paper (of approximately 15 double-spaced pages), you will be asked to talk about your work on this project during an informal presentation one of the last class meetings. The paper will ask you to look at three topics related to this activity or lesson from three perspectives. These perspectives are:

- (a) Your perspective as a participant-observer during your visit(s)
- (b) Another person's (ideally your cooperating teacher's) perspective on that activity or lesson
- (c) Your perspective from the vantage point of what you would do and why if you were the teacher leading the activity or lesson

As mentioned, for each perspective you should view the activity or lesson as it relates to three topics in this course. These course topics were:

Status and Value of Math and Science Education
 Culture and Content Knowledge in Math and Science Classrooms
 Learning Theory and Inquiry
 Education Research
 Discourse in Math and Science Classrooms
 Assessments

A FEW WORDS ABOUT SOME POLICIES...

Participation/preparation/attendance

Review the "Grading and Assignments" portion of this file for some initial details about policies related to participation, preparation, and attendance.

Due dates

All assignments must be submitted by the due date and time. Any items submitted after this time will be considered late.

Late policy

Any assignment that is submitted late will result in a lowering of the highest possible grade for that assignment. If it's not submitted by the assigned date and time, the highest grade that it can receive will immediately be lowered to a 3.5. For each extra 24 hours it is late, the highest grade it can receive will decrease by an additional 0.5. Being absent from class does not change this policy (unless permission or an extension was granted beforehand).

Resubmitting papers

Some assignments can be resubmitted after they have been returned. This opportunity is offered in agreement with a general view of writing as an ongoing process. A resubmitted paper is not guaranteed a higher grade than the original paper. If you are interested in pursuing such an option, please speak with me face-to-face or through email within 2 days of receiving your returned paper.

An official word about academic honesty

Students are strongly encouraged to discuss the course material, papers, assignments, and projects with their peers, both in and out of class. Aside from instances where collaboration for final products has been explicitly discussed, it is expected that all products, including oral presentations, will be completed by students individually and will be the result of each student's individual thoughts and ideas, unless otherwise indicated (by citation, other than course readings). Students are encouraged to refer to Bryn Mawr's Academic Honor Code (<http://www.brynmawr.edu/character/honorcode.shtml> and <http://honorcode.blogs.brynmawr.edu/code/>) or to see me with any questions or concerns about plagiarism or improper collaboration. Students who commit an act of academic dishonesty could receive a 0.0 on the assignment, in the course, and/or face other consequences.

"In reports and other written work, sources of information and of ideas and opinions not the student's own must be clearly indicated; the source of direct quotations must be acknowledged. Failure to do so constitutes plagiarism" (From the Honor Code approved during Spring Plenary 2009 as posted at <http://honorcode.blogs.brynmawr.edu/code/>).

Meeting with Howard outside of class

I have listed office hours on the first page of this syllabus and I also encourage students to email me questions or concerns. If you are unable to make office hours, I am willing to meet with you one-on-one, or in small groups, when you feel the need to talk. Depending on the given day, I might be able to talk briefly right after class and some issues might be resolved without a separate meeting. Your learning is very important to me.

FIELDWORK

Field placements

Students are expected to complete at least 10 field placement visits (2-3 hours/week) with a local teacher. Students should make connections between course concepts and these placement experiences and you are encouraged to raise questions or comments about them during class or in private exchanges with me. ***Please keep me informed of any problems or concerns related to this fieldwork.*** We will talk in class about general guidelines for these placements and associated work.

These placement sites have agreed to have you participate in constructive ways in their rooms and might expect varying degrees of engagement with classroom happenings. It is up to you and the cooperating teacher(s) to discuss your role in the classroom. To aid this process of negotiation, you need to compose a one-page introduction of yourself to give to your placement teacher. In this letter, which should be typed, neat, and error-free, you should introduce yourself, say something about your interest in education, and express something about how you think you might be able to participate constructively in this classroom. Make suggestions and requests, not assumptions or assertions, about what you will be able to do. Although the teacher(s) might want you to work one-on-one with students at times, I'd like those instances to be relatively rare and want you to observe and interact with a larger group of students (and the teacher(s)) when possible.

One purpose of the letter is for you to think through these things for yourself and to share them with the teacher. Remember that you are a guest in this teacher's classroom, and must therefore be respectful of the values and practices s/he embraces, but you may also make known your own enthusiasm and your willingness to assist in various ways. This letter should be prepared (i.e., ready to be given to the teacher, with a copy for me) by the first day you visit your field placement.

At the end of your visits at the school, we request that each student write a thank you note to the teacher(s) with whom you have been working. These teachers allow these placements to support your education; they receive no remuneration for doing so. Teachers generally do not get the recognition that they deserve for the challenging job they embrace, and they often appreciate any thanks and feedback they can get. In your thank you note be sure to identify at least one (if not more) thing that you really appreciated and learned as a result of being in that particular classroom.

At the end of the placement, we will ask your cooperating teacher to write an evaluation of your participation. This evaluation contributes to your course grade, and it could impact your candidacy for student teaching, should you choose to pursue that option through the Education Program.

It is ESSENTIAL that you complete all of your field placement visits, and that you do so responsibly. Many teachers, administrators, and students expect you to be present, and if you miss days or show up late, the relationships the Education Program has with these teachers and schools are jeopardized. More details about these placements, as well as work associated with them, will be discussed in other sections of this syllabus as well as in class itself.

Important Note: All course writings referring to your field placement **must use pseudonyms**. All sources must be cited completely and properly, using APA, MLA, or Chicago style guidelines.

Field Journal

At these placements you are **not** expected solely to observe happenings and are instead expected to be involved in the classroom activities. ***The Praxis program does not want these spaces to be viewed as labs and you are discouraged from taking extensive notes at sites (but you can bring a pad or paper to record some notes).*** You are encouraged to speak with teachers, students, and other

school members when convenient and could even ask selected individuals some interview questions if time allows and make efforts to schedule time to talk when you are both free (e.g., after school).

Although you are not to record extensive notes while at your placement, keeping a regular field journal will help you keep track of issues, events, and questions to pursue in class discussions and assignments. These entries can include observations about the surrounding community, the school building, the classroom space itself, demographics of the school and class, as well as information about teachers, students, and the curriculum and instructional approaches you observe. They can cover a variety of topics and after each visit you are to record some notes. These notes should be typed in the appropriate blog on Blackboard. It is recommended that blog entries be written as Word documents first and then cut and paste into the text boxes online. Although these entries are places for your own learning and self reflection, other members of the class will be expected to read and comment on them. Additionally, you might find that some of these entries will be helpful when completing other assignments for the course. Each entry should be at least three (3) paragraphs in length and demonstrate thoughtful engagement and reflection around something related to your placement. *Each entry should be recorded within two days after each class visit.*

Given the focus of this class, you are asked to use (but not limited to) these guidelines when recording these entries:

1. Describe how something at your placement today (e.g., an interaction, things on the walls) affects explicit and/or implicit messages about the status and value of math or science education in this space.
2. Discuss the culture that's developed and supported in the class and how this culture might affect the students and teacher.
3. Describe any misconceptions you see that are voiced by members of the class and how they are handled. Consider paying close attention in later visits to how/if these conceptions remain, change, or impact subsequent math or science learning activities.
4. Explain instructional approaches observed and how they might have affected students' learning of any topics during that visit.
5. Examine the discourse that seems valued in class (and it could change depending on the activities or instructional approaches on a given day) and what messages that might communicate to students.

Draw on your experiences in your placement to contribute to class discussions. Remember that all course writings referring to your field placement **must use pseudonyms** and this applies to the journal entries and any online postings you make.

Field placement timeline

Students will be engaged in about 3 hours of fieldwork per week over a 10-week period. It is important to obtain a calendar of holidays/days off for the fieldsite and to coordinate the days they plan to be at the site with that schedule. Students are not expected to do fieldwork during Fall Break, but should not plan to leave early or come back late from break, if that means that they will miss fieldwork scheduled on the Friday before or the Monday after break. Below is an estimated timeline for some things related to the field placement component of this course.

August 31 – September 4	Introduction to Praxis component Complete schedule preference form for Sept. 7 Apply for Pennsylvania Child Abuse Clearance and Criminal Background Check
September 7 - 11	Students matched with Praxis fieldsites/projects As soon as you hear about your field placement (by Friday), setup an appointment with this person to schedule a time to meet next week
September 14 – 18	Students go to fieldsites to meet with supervisors and fill out fieldwork agreements Complete introduction letter to give to your teacher In-class presentation from Praxis Program
September 21 – 25	Week #1 of Fieldwork
September 28 – October 2	Week #2 of Fieldwork
October 5 – 9	Week #3 of Fieldwork
October 11 – 16	FALL BREAK
October 19 – 23	Week #4 of Fieldwork
October 26 – 30	Week #5 of Fieldwork
November 2 – 6	Week #6 of Fieldwork
November 9 – 13	Week #7 of Fieldwork
November 16 – 20	Week #8 of Fieldwork
November 23 – 27	Week #9 of Fieldwork Field supervisor evaluation forms are mailed this week
November 30 – December 4	Week #10 of Fieldwork Student evaluations completed this week
December 7 – 11	Week #11 / Make-up week

RESOURCES

Books and online resources

Although there are no required books, below are a few recommended resources that could be helpful for course assignments or in future work you do:

- Bybee, R. W. (1997). *Achieving scientific literacy: From purposes to practices*. Portsmouth, NH: Heinemann.
- Kilpatrick, J., Swafford, J., & Findell, B. (2001). *Adding it up: Helping children learn mathematics*. Washington, DC: National Academies Press.
- National Council of Teachers of Mathematics. (2003). *Principles and standards for school mathematics* (3rd ed.). Reston, VA: Author.
- National Research Council. (1996). *National science education standards*. Washington, DC: National Academy Press.
- Rutherford, F. J., & Ahlgren, A. (1990). *Science for all Americans*. New York: Oxford University Press.
- Tobias, S. (1990). *They're not dumb, they're different: Stalking the second tier*. Tuscon, AZ: Research Corporation.

Additionally, many online resources can be helpful. Specific ones that I will list below contain videos and clips from actual classrooms and educational settings. When discussing education, it can often be helpful to explicitly examine moments and exchanges between and among people in classrooms and other settings. This course might make use of some sites listed below.

Sites that contain videos and clips related to math and science education:

- Secondary Science Teacher Preparation Program - Michigan State University:
 - <https://www.msu.edu/~scienced/Videos.html>
- Tools for Ambitious Science Teaching - Discourse Tools:
 - <http://depts.washington.edu/mwdisc/>
- Modeling Middle School Mathematics:
 - <http://mmmproject.org/mathscapeS.htm>
 - MathScape: Looking Behind the Numbers: <http://mmmproject.org/lbn/videomachine.htm>
 - MathScape: String Shapes / Shaping Up: <http://mmmproject.org/ss/videomachine.htm>
- PBS TeacherSource . Math . Videostreaming Search Grades 3-5:
 - http://www.pbs.org/teachers/mathline/lessonplans/search_3-5.shtm
- Annenberg videos:
 - Teaching Math: A Video Library, 9-12: <http://www.learner.org/resources/series34.html>
 - Science K-6: Investigating Classrooms: <http://www.learner.org/resources/series116.html>
 - Teaching High School Science: <http://www.learner.org/resources/series126.html>

The next two sites are a bit more general in that they concentrate on a variety of topics related to schools and teaching:

- Inside Teaching, a project of The Carnegie Foundation for the Advancement of Teaching:
 - <http://gallery.carnegiefoundation.org/insideteaching/quest/collections.html>
- Teachers TV - Free education videos and resources for professional development:
 - <http://www.teachers.tv/>

Twitter

Twitter is a micro-blogging service that allows users to send and read other users' "tweets," which are text-based posts of up to 140 characters in length. Other people who follow the person's feed will receive these tweets. In an effort to use new technology that could help meet course goals, I would like to try using this service for the course. I established a Twitter profile for the class named "bmc_hglasser1" and each enrolled student must create her/his own account. We will each follow everyone's tweets in an effort to:

- Further develop ourselves as a community. I would like us to see class members as more than simply other people who come together a few times each week to discuss selected topics. Developing a better understanding of each other could enhance classroom conversations through increasing people's willingness or comfort to talk in class and could lead everyone to see fellow class members as more three-dimensional. As a result, greater respect might be exhibited among participants. As part of this "three-dimensional" aim, I encourage people to feel comfortable tweeting about more than just course-related entries.
- Continue (or start) conversations outside the times allotted for class meetings. These dialogues can allow for further conversing and processing of ideas and course material with things happening outside the class (e.g., something read online or heard on TV).
- Maximize teachable moments. Typically, it is difficult to teach in context because courses often seem to happen "outside" many other events that have relevance to course discussions. Twitter has the opportunity for us to engage in more teachable moments in context.
- Enhance certain writing skills. It's useful to develop ways to strongly communicate ideas concisely. By being limited to 140 characters, you must choose words carefully. Essays and longer pieces allow you to go into greater depth, but the character constraint can push people to make a summary statement(s). Although 140 characters might seem very short to many people, view certain entries as the headline to an article (many headlines for newspapers are well under 140 characters in length) and your essay or longer piece of writing to be the story that follows and further supports that headline.
- Enhance reflective thinking and metacognition. Micro-blogging, and engaging with other people in conversations through these media, often requires people to reflect on their thinking and ways to concisely communicate their ideas to other people. These skills are helpful for both teaching and learning. Consider how Twittering or other activities can further develop students' metacognitive abilities in K12 classrooms.

There are an incredible number of sites and applications related to Twitter and I am confident that many additional ones will be developed during this semester. Please feel free to search online for ones that you would like to use and share useful ones with other people. Some initial tips:

1. To shorten URLs that you might post in your messages, I recommend <http://tinyurl.com/> or <http://tinyyarro.ws/>
2. Use the @ sign before a username, such as @hglasser_bmc1, to specifically reply to another user (other people can read these posts)
3. A hashtag is a word or phrase that is prefixed with # before it and it allows for easy

means to search for tweets related to a certain topic. *For now, I'd like all your posts related to this class to contain the "#ed220" hashtag.*

4. Have fun! Please feel comfortable posting about things that are not entirely related to the course. Such posts can help us better learn our community member's interests, sense of humor, and views. But remember to be respectful in your postings!
5. Use Twitter to post questions or comments to class members about an assignment, reading, or event at your field placement.
6. There are some applications that you might find useful of helpful for managing your Twitter account(s) such as Seesmic (<http://www.seesmic.com/>) or TweetDeck (<http://tweetdeck.com>).

Twitter can be great for posting links to events, news stories, or videos, but it can also a wonderful service for enhancing and fueling conversations. You are strongly encouraged to:

- Post entertaining, interesting, and useful links. Similarly, suggest events such as TV shows, readings, or talks that might be of interest to the group or specific individuals.
- Follow other people and organizations that interest you personally, including some that relate to the course. Following them can keep you connected with certain dialogues as they unfold and provide more insight into these people and groups. Some Twitterers who you might wish to consider following (and I welcome additional suggestions) are:

Twitter Name	Twitter Bio
NCTM	The National Council of Teachers of Mathematics is a public voice of mathematics education, providing vision, leadership and professional development to support
MathEdLeaders	NCSM provides aspiring, new, and seasoned education leaders professional learning opportunities to support and sustain improved student mathematics achievement [NOTE: NCSM stands for Network Communicate Support Motivate]
dyscalculic	Ever joked about having MATH DYSLEXIA? It's called dyscalculia. 5% of the world is affected, but no one seems to know it exists. We need to change that!
NSDL	The National Science Digital Library (NSDL) is an online network of teaching and learning resources in Science, Technology, Engineering, and Math. Funded by NSF
PASTEM	A public/private partnership aimed at improving STEM education in Pennsylvania
Science_Ed	[No Bio, but some good posts related to science education]
educationweek	Education Week, American education's newspaper of record.
lmjax	I'm passionate about education policy impacting minorities, STEM initiatives, NASA education programs, and nonprofit work; love writing, good eats

I do not want Twitter to simply be another tool in promoting a teacher-centered class. Although I will try to get things going early in the semester, I do not want there to be an individual person leading the Twitter dialogues throughout the term. It's another opportunity for everyone to get more experience talking about these issues and connecting with things outside our classroom space.

Twitter is an experiment for me as an instructor, and it can serve as a model encouraging you to consider using novel approaches in your classrooms. Some things will be more successful than other things, but you should be able to learn something from each experience. Oftentimes, things need tweaking more than total junking. I debated mandating a certain number of tweets per week or establishing some rotation for people to assume responsibility for keeping things active through Twitter. Aside from a few initial ideas and assignments, I've decided to primarily see how things develop through our use of Twitter. I do not want you to feel compelled to tweet obsessively, but would like everyone to give it a try, as part of your participation in this class. This plan might be revisited later in the term, but please post things about readings, placements, and more as we consider what form our Twittering takes in this course.

Blackboard

This course will make use of Blackboard, which can be accessed from any computer connected to the Internet at <http://blackboard.brynmawr.edu>. Course assignments will often be submitted through Blackboard and you should assume all written assignments must be uploaded or posted there unless otherwise discussed. It is recommended that blog entries be written as Word documents first and then cut and paste into the text boxes online. Other assignments should be double-spaced and saved as Microsoft Word files (written in Times New Roman 12 point font, or something of a similar size with standard margins of approximately 1" on all sides). Any file that's uploaded should be titled in such a way that makes it easy for me (or other people) to identify the content of the file. For example, assignments should be titled with the name of the assignment and your last name e.g. IssuePaper1_Glasser.doc. Assignments should be submitted before or on the deadline. Deadlines are for your (and my) benefit. However, in extenuating circumstances, I would rather have a late paper of better quality, than one that is on time and thrown together. If you can't submit work you are happy with on time, then please talk with me *beforehand*.

COURSE SCHEDULE

(This is a guide and subject to change)

Topic: Status and Value of Math and Science Education

Week 1:

Session 1: Monday, August 31

Introductions and course overview

Session 2: Wednesday, September 2

Readings due:

- Course syllabus
- U.S. Department of Education. (1983). A nation at risk. *A nation at risk: The imperative for educational reform* Retrieved Wednesday, April 8, 2009, from <http://www.ed.gov/pubs/NatAtRisk/risk.html>
- Polya, G. (2002). The goals of mathematical education, part 1. *Mathematics Teaching*(81), 6-7.
- Polya, G. (2002). The goals of mathematical education, part 2. *Mathematics Teaching*(81), 42-44.

Other work due:

- Setup Twitter account and start following "bmc_hglasser1" and classmates
- Upload to Blackboard your first issue paper by 12pm on Sunday, Sept. 6
- Field placements: Stop by Civic Engagement Office (Cambrian Row) and complete Pennsylvania Child Abuse Clearance and Criminal Background Check
- Field placements: Complete and submit schedule preference form

IMPORTANT: *Sunday, September 6:* Upload to Blackboard your first issue paper by 12pm today.

Week 2:

Monday, September 7: NO CLASS – LABOR DAY

Session 3: Wednesday, September 9

Readings due:

- Other class members' issue papers
- U.S. Department of Education. (2008). A nation accountable: Twenty-five years after a nation at risk. Retrieved Friday, April 17, 2009, from <http://www.ed.gov/rschstat/research/pubs/accountable/>
- Schmidt, W. H., McKnight, C. C., & Raizen, S. A. (1997). A splintered vision: An investigation of U.S. science and mathematics education. *Wisconsin Teacher of Mathematics*, 48(2), 4-9.

Other work due:

- Bring two printed copies of your issue paper to class
- Field placements: By Friday, you should hear about your placement. As soon as you hear, setup an appointment with your cooperating teacher(s) (field placement match) to schedule a time to meet with her/him the week of September 14

Week 3:

Session 4: Monday, September 14

Visitor from the Praxis Program: Field placement discussions

Readings due:

- National Center for Education Statistics, U.S. Department of Education. (2000). *Highlights from the Third International Mathematics and Science Study-Repeat (TIMSS-R)* (No. NCES 2001-027). Washington, D.C.: U.S. Government Printing

Office.

- A resource to consider but not required reading:
 - After reading the above *Highlights from the Third International Mathematics and Science Study-Repeat (TIMSS-R)*, which highlights some results from the 1999 TIMSS and makes some comparisons between it and the 1995 TIMSS, review tables and figures at the following link to see results from the 2007 TIMSS: <http://nces.ed.gov/timss/tables07.asp>

Other work due:

- Field placements: Complete your one-page introduction letter to give to your cooperating teacher (and bring two copies to class).
- Field placements: Visit your placement sites this week and complete the Praxis Fieldwork Agreement with your cooperating teacher

Topic: Culture and Content Knowledge in Math and Science Classrooms

Session 5: Wednesday, September 16

Readings due:

- Ma, L. (1999). Introduction. In *Knowing and teaching elementary mathematics: Teachers' understanding of fundamental mathematics in China and the United States* (pp. xvii-xxv). Mahwah, NJ: Lawrence Erlbaum.
- Ma, L. (1999). Subtraction with regrouping: Approaches to teaching a topic. In *Knowing and teaching elementary mathematics: Teachers' understanding of fundamental mathematics in China and the United States* (pp. 1-27). Mahwah, NJ: Lawrence Erlbaum.

Other work due:

- Field placements: Confirm that you're comfortable posting, commenting on, sorting, uploading images/video, and, in general, using the blog tool in Blackboard.
- Upload to Blackboard your second issue paper by 12pm on Friday, Sept 18

IMPORTANT: *Friday, September 18:* Upload to Blackboard your second issue paper by 12pm today.

Week 4:

Session 6: Monday, September 21

Readings due:

- Other class members' issue papers
- Tobias, S. (1990). Stemming the science shortfall at college. In *They're not dumb, they're different: Stalking the second tier* (pp. 7-18). Tuscon, AZ: Research Corporation.
- Tobias, S. (1990). Introductory physics: The Eric "experiment". In *They're not dumb, they're different: Stalking the second tier* (pp. 19-32). Tuscon, AZ: Research Corporation.

Other work due:

- Bring two printed copies of your issue paper to class
- Field placements: Visit your placement sites this week (week #1 of fieldwork) as it should be your first of at least 10 visits; inform your cooperating teacher about fall break if you will miss a visit that week

Session 7: Wednesday, September 23

Readings due:

- Schiebinger, L. (1999). The clash of cultures. In *Has feminism changed science?* (pp. 67-91). Cambridge, MA: Harvard University Press.

Other work due:

- Upload to Blackboard your third issue paper by 12pm on Friday, Sept 25.

IMPORTANT: *Friday, September 25:* Upload to Blackboard your third issue paper by 12pm today.

Topic: Learning Theory and Inquiry

Week 5

Session 8: Monday, September 28

Readings due:

- Other class members' issue papers
- Bransford, J. D., Brown, A. L., & Cocking, R. R. (2000). Learning: From speculation to science. In *How people learn: Brain, mind, experience, and school: Expanded edition* (pp. 3-27). Washington, D.C.: National Academy Press.
- Skemp, R. R. (1978). Relational understanding and instrumental understanding. *Arithmetic Teacher*, 26(3), 9-15.

Other work due:

- Bring two printed copies of your issue paper to class

Session 9: Wednesday, September 30

Readings due:

- Hestenes, D., Wells, M., & Swackhammer, G. (1992). Force concept inventory. *The Physics Teacher*, 30(3), 141-158.
- Watson, B., & Kopniecek, R. (1990). Teaching for conceptual change: Confronting children's experience. *Phi Delta Kappan*, 71(9), 680-684.

Other work due:

- Upload to Blackboard your fourth issue paper by 12pm on Sunday, Oct 4
- Bring two printed copies of your issue paper to class

IMPORTANT: *Sunday, October 4:* Upload to Blackboard your fourth issue paper by 12pm today

Week 6:

Session 10: Monday, October 5

Readings due:

- Other class members' issue papers
- Sewall, G. T. (2000). Lost in action. *American Educator*, 24(2), 4-9, 42-43.
- Olson, S., & Loucks-Horsley, S. (Ed.). (2000). *Inquiry and the National Science Education Standards: A Guide for Teaching and Learning*. Washington, D.C.: National Academies Press. (pp. 24-33 – selected pages as seen in the downloadable file on Blackboard)

Other work due:

- Bring two printed copies of your issue paper to class

Session 11: Wednesday, October 7

Readings due:

- Cavanagh, S. (2009). Students found to pick up science outside school. *Education Week* Retrieved Friday, May 8, 2009, from <http://www.edweek.org/ew/articles/2009/01/14/18informal.h28.html?tkn=UTNFo>

[qv0w1LhfMGK5YJgj15VMJEwBWw4YaYQ](#)

- Kaplan, L. S., & Owings, W. A. (2003). No Child Left Behind: The Politics of Teacher Quality. *Phi Delta Kappan*, 84(9), 687-692.
- Peck, C., Cuban, L., & Kirkpatrick, H. (2002). Techno-promoter dreams, student realities. *Phi Delta Kappan*, 83(6), 472-480.
- Reys, B. J., Reys, R. E., & Chávez, O. (2004). Why mathematics textbooks matter. *Educational Leadership*, 61(5), 61-66.

Other work due:

- Video Analysis paper: Due by 4pm on Friday, October 9

Week 7: Fall Break: Monday, October 12 – Friday, October 16

Please inform your placement teacher if you won't be attending your placement this week.

Topic: Education Research

Week 8

Session 12: Monday, October 19

Readings due:

- Berliner, D. C. (2002). Educational research: The hardest science of all. *Educational Researcher*, 31(8), 18-20.
- Marzano, R. J., Pickering, D. J., & Pollock, J. E. (2001). Applying the research on instruction: An idea whose time has come. In *Classroom instruction that works: Research-based strategies for increasing student achievement* (pp. 1-10). Alexandria, VA: Association for Supervision and Curriculum Development.

Other work due:

- Field placements: Review other class members' field journal entries
- Upload to Blackboard your fifth issue paper by 12pm on Tuesday, Oct 20

IMPORTANT: *Tuesday, October 20:* Upload to Blackboard your fifth issue paper by 12pm today.

Session 13: Wednesday, October 21

Readings due:

- Other class members' issue papers
- Marzano, R. J., Pickering, D. J., & Pollock, J. E. (2001). Cooperative learning. In *Classroom instruction that works: Research-based strategies for increasing student achievement* (pp. 84-91). Alexandria, VA: Association for Supervision and Curriculum Development.
- Marzano, R. J., Pickering, D. J., & Pollock, J. E. (2001). Setting objectives and providing feedback. In *Classroom instruction that works: Research-based strategies for increasing student achievement* (pp. 92-102). Alexandria, VA: Association for Supervision and Curriculum Development.

Other work due:

- Bring two printed copies of your issue paper to class

Topic: Discourse in Math and Science Classrooms

Week 9:

Session 14: Monday, October 26

Readings due:

- Lemke, J. (1990). Introduction: Talking Science. In *Talking science* (pp. ix-xiii). Norwood, NJ: Ablex.
- Lemke, J. (1990). Two minutes in one science classroom. In *Talking science* (pp. 1-25). Norwood, NJ: Ablex.

Other work due:

- Group project: Reminder – Contact me to arrange a time for your group to meet and talk with me about two weeks before your group presentation. Be sure to provide people at Canaday enough notice to scan any readings you want uploaded to Blackboard.

IMPORTANT:

Tuesday, October 27: Panel session #1 from 7:00pm-9:00pm; location Taylor G

Session 15: Wednesday, October 28

Readings due:

- Kurth, L. A., Anderson, C. W., & Palinscar, A. S. (2002). The case of Carla: Dilemmas of helping *all* students to understand science. *Science Education*, 86(3), 287-313.
- Not required, but also valuable and related:
 - Anderson, C. W., Holland, J. D., & Palinscar, A. S. (1997). Canonical and sociocultural approaches to research and reform in science education: The story of Juan and his group. *The Elementary School Journal*, 97(4), 359-383.
 - Kelly, G. J. (2007). Discourse in science classrooms. In S. K. Abell & N. G. Lederman (Eds.), *Handbook of Research on Science Education* (pp. 443-470). Mahwah, NJ: Lawrence Erlbaum Associates.

Week 10

Session 16: Monday, November 2

Readings due:

- Davis, B. (1997). Listening for differences: An evolving conception of mathematics teaching. *Journal for Research in Mathematics Education*, 28(3), 355-376.

Topic: Assessments

Session 17: Wednesday, November 4

Readings due:

- Black, P., Harrison, C., Lee, C., Marshall, B., & Wiliam, D. (2003). Introduction: Why study this book? In *Assessment for learning: Putting it into practice* (pp. 1-5). Buckingham, UK: Open University Press.
- Black, P., Harrison, C., Lee, C., Marshall, B., & Wiliam, D. (2003). Putting the ideas into practice. In *Assessment for learning: Putting it into practice* (pp. 30-57). Buckingham, UK: Open University Press.

Week 11:

Session 18: Monday, November 9

Readings due:

- Jorgenson, O., & Vanosdall, R. (2002). The death of science? What we risk in our rush toward standardized testing and the three R's. *Phi Delta Kappan*, 83(8), 601-605.
- Sloane, F. C., & Kelly, A. E. (2003). Issues in high-stakes testing programs *Theory into practice*, 42(1), 12-17.
- Tobias, S., & Baffert, A. (2009). No Child Left Behind: Subjugating science to rigors of NCLB a formula for disaster. *TucsonCitizen.com* Retrieved Friday, May 8, 2009, 2009, from <http://www.tucsoncitizen.com/daily/opinion/108523.php>

Other work due:

- Field placements: Review other class members' field journal entries

IMPORTANT:

Tuesday, November 10: Panel session #2 from 7:00pm-9:00pm; location Taylor G

Session 19: Wednesday, November 11

Readings due:

- TBA

Other work due:

- TBA

Topic: Group Presentations

Week 12:

Session 20: Monday, November 16

Group presentation(s)

Readings due:

- TBA

Other work due:

- Group project: Lesson plan, list of references, and group paper are due by time you present. The reflection paper is due within one week of your presentation.

Session 21: Wednesday, November 18

Group presentation(s)

Readings due:

- TBA

Other work due:

- TBA

Week 13:

Session 22: Monday, November 23

Group presentation(s)

Readings due:

- TBA

Other work due:

- Field placements: Field supervisor evaluation forms are mailed this week.
- Field placements: Consider writing a thank you note to the teacher(s) with whom you've been working.

Wednesday, November 25: NO CLASS - THANKSGIVING

Topic: Potpourri and Putting it All Together

Week 14

Session 23: Monday, November 30

Visitor: Rashmi Kumar (Problem Based Learning (PBL) & associated topics/readings)

Readings due:

- Tan, O. S. (2004). Students' experiences in problem-based learning: three blind mice episode or educational innovation. *Innovations in Education and Teaching International*, 41(2), 169-184.
- White, B. Y., & Fredriksen, J. R. (1998). Inquiry, modeling, and metacognition: Making science accessible to all students. *Cognition and Instruction*, 16(1), 3.
- Another suggested resource:

- Crane, T., Wilson, J., Maurizio, A., Bealkowski, S., Bruett, K., Couch, J., et al. (2003). *Learning for the 21st Century: A Report and Mile Guide for 21st Century Skills*. Washington, DC: Partnership for 21st Century Skills.

Other work due:

- Field placements: Student field placement evaluations completed this week (?)
- Field placements: Review other class members' field journal entries

Session 24: Wednesday, December 2

Readings due:

- TBA

Other work due:

- TBA

Week 15:

Session 25: Monday, December 7

Readings due:

- TBA

Other work due:

- TBA

Session 26: Wednesday, December 9

Other work due:

- Final project due along with informal presentations

Week 16: Final Exams - Monday, December 14 – Friday, December 18

ASSIGNMENT: ISSUE PAPERS

These issue papers, each being approximately 2-3 pages in length (when double-spaced), are to be shared with other members of the class before the due dates. ***You must upload your paper to Blackboard by noon the day before it will be discussed in class so that other people can access it. Print two copies of your paper and bring them to the class in which they will be discussed.*** This component of the course will comprise 20% of your final grade, 10% determined by me and 10% determined by you. Although you will receive a grade from me, you should not expect each individual paper to be graded. One goal of the course is to discuss education as a research-based discipline, and the practice of not grading your papers agrees with analyses Black, Harrison, Lee, Marshall and William (2003) reported, namely that learning gains have been found to be greatest when students received comments without accompanying grades. Instead of returning each paper to you with a grade, I might comment on them and will ultimately provide a grade for your total work on these issue papers. The grade is determined partly by the depth of reflection, clarity of explanations, and your interactions with other people during related discussions of your paper and their papers.

The 10% that will be determined by you will be a result of your reflective analyses. Later in the semester you will be asked to respond to questions related to these assignments and will then be asked to record the appropriate grade you believe you deserve for this work. Questions you might be asked include:

1. Did you complete all of the papers and share them at the desired times?
2. What kind of effort did you put into the papers (i.e., did you really use them to further your thinking about educational issues)?
3. Did you integrate your own experiences and perspectives, an analytical exploration of the issues raised in the readings, and your field placements as appropriate?
4. Did you read and listen carefully and respond constructively to your peers' papers?

Issue paper #1: What is important to learn in math and science

Many teachers have heard questions like, "When am I ever going to need this?" and this paper has you discussing what math and science you believe students need to learn and why. If students know enough to manage their finances, decipher graphs and data presented in news stories, and perform basic computations that are needed in daily life, is that sufficient (i.e., do they truly need to know how to calculate the volume of a cone)? Why or why not? Restated, what is important that they be required to learn and why?

Issue paper #2: Content knowledge and pedagogical knowledge

What's your position regarding the relative importance between content knowledge and pedagogical knowledge? Why? You can also address the following fictitious situation (or a similar one) to discuss your response to these opening questions:

Imagine that you are an administrator at a high school and you need someone to teach an additional section of chemistry for a short period of time. If you had to choose between two current teachers at the school to pick up this extra section, would you prefer to ask:

- (a) Another chemistry teacher in the school who knows the content well but is not well known as a good teacher (students claim this teacher struggles to teach the content well), or
- (b) A history teacher in the school who knows little about chemistry but gets great reviews from students, colleagues, and parents as a great teacher.

Although this decision (while not necessarily legal in all instances) would be affected by multiple other factors (e.g., does each teacher want to teach this section? If so, what are her/his reasons?), assume all other factors roughly balance out such that the main decision boils down to the debate between content knowledge and pedagogical knowledge.

Issue paper #3: Culture of Your Field Placement

Discuss the culture and environment at your field placement. For example, you can consider ways lessons are structured, typical tasks done during observations, assignments students are to complete at home, how grades are determined, what a typical lesson looks like, the general "feel" and attitude during lessons and in class (e.g., competitiveness), who spends most of the time talking, how students gain control of the floor to make comments, ask questions or answer questions (and how regularly these separate behaviors occur), or other things that stood out. Explain how different types of student might be more/less successful in this class and what aspects of the environment might be most welcoming and discouraging to different students.

NOTE: If you haven't seen a live class yet, you still should have met with the teacher and been to the school. Discuss aspects of the classroom environment (or consider asking the teacher some of the above questions during your first meeting). Your paper might be based only on one observation, and possibly conversations between you and the teacher, so you might not be able to address many of these areas with confidence. But I want you to record your early impressions and hunches. These views might be revisited in later assignments or discussions.

Issue paper #4: Conceptual knowledge and procedural knowledge

Several articles we've read have seemingly prioritized conceptual knowledge over procedural knowledge (e.g., Skemp, 1978). But to function effectively in daily life most people often simply need procedural knowledge. Why and when is conceptual knowledge valuable? Why and when is procedural knowledge valuable? Which do you think should be prioritized in math and science classrooms and why?

NOTE: You might want to reflect or build upon some of your writings or thoughts from the earlier paper where you discussed what math and science you believed students need to learn and why.

Issue paper #5: Education Research

Berliner (2002) discussed that some people claim education research is "soft" and lacks the same rigor, controls, and reproducibility that is often noted in research performed in the "hard" sciences (e.g., physics, chemistry). Such a view positions education as more of a "fluff" academic field, if it's viewed as an academic field at all. Discuss one or more issues related to this topic that interest you. Some suggested questions to explore are:

- Should education strive to be viewed as an academic field with rigorous research practices?
- Is education a science? Is teaching a science? Is the study of education, teaching, or learning a science? Such questions require some description and reflection on what it means for something to be a "science."
- What makes a science "harder" or "softer?" What do such labels do to or for different fields? Why is/was there ever a need or desire to label fields or disciplines as harder or softer?

ASSIGNMENT: VIDEO ANALYSIS

Review clips of math or science lessons found at the sites listed under the "Course Readings and Resources" section of this syllabus. Find one clip, or portion of a clip, of approximately 2-5 minutes in length that you will analyze in detail. The selected clip must be from a class lesson (i.e., although the clip could concentrate on group work that took place with a lesson, it cannot be a clip of a one-on-one interview or tutoring). If you want to recommend a clip from another website or resource, please seek permission for the clip beforehand.

In the paper, describe the specific clip (record a direct link to it in your paper as a footnote) and the exact times in the clip that will be discussed in your paper. Explain the focus of the lesson and some details about the class, such as the number of students, demographic information about the students in class that day, how students are seated (or not seated), or any other details that you feel are relevant to setting the stage for someone who is first reading about this lesson and the analyses you are about to provide.

For your analyses, *focus on one topic* (and related issues) and use information from the clip itself to make claims. You are encouraged to use actual quotes from the clips (remember to cite the times these quotes or events occurred in the clips) and you *should not* make claims that cannot be supported by things seen in the clip itself. Although the issue papers and other assignments (e.g., group presentation and final project) might lead you to make use of your intuition, feelings, and more "subjective" data in your writings (and the idea of subjectivity and its impact on the perceived rigor of education research are valuable topics that we plan to touch upon in some course topics), this assignment asks you to be selective with the data you use and to only cite evidence that is clearly visible within the clips themselves.

This paper should be about 5-7 pages in length (when double-spaced) and should ideally focus on only one topic. As opposed to discussing multiple topics or various things you observe and can claim, I want you to dig deeply into the clip and the topic to argue what your observations imply and mean. For example, is procedural knowledge prioritized over conceptual knowledge? What in the clip enables you to make that claim? What does this prioritizing suggest about the way math (or science) is presented and positioned to the students? Is math (or science) simply a tool? Is it a creative discipline? Alternatively, you could look at how misconceptions or preconceptions are handled. What happens when a misconception is voiced? How do the students and teacher respond? How, if at all, is it addressed? What do these behaviors suggest about the importance of students' lived experiences or preconceptions? Are students' conceptions at the start of lessons or units acknowledged or sought? Is science (or math) portrayed as a series of facts with little value being placed on whether or not these facts agree or conflict with students' experiences?

Do not feel pressure to forcibly insert course readings into your paper and analyses. The paper is meant to highlight your attentiveness to educational phenomena and your ability to make claims and insights based on what takes place in a classroom. The readings and discussions from class provide multiple topics and lenses for looking at these clips. Regardless, it is important that you clarify and define constructs that you use so readers can more easily understand your claims (e.g., what do you mean by "conceptual knowledge" and how is a specific observation evidence of it?).

ASSIGNMENT: GROUP PROJECT

The class will be divided into multiple groups and each group will lead class for approximately 60 minutes on a topic related to math and science education that either has not been focused on in the readings or a topic that has been discussed but one that you wish to explore in greater depth.

Each group must seek resources and information about this topic in order to become more knowledgeable about it and develop ways to teach and lead class in a lesson that centers on it. Information can be found online, from conversations, or at the library. In the paper you will ultimately write, as well as the lesson you will lead, you must provide a list of references you used so other people can do further research on their own. Therefore, it is important that you keep track of the sources you consult and the places from which information is obtained. Do not cite sources that you did not fully review (and remember to consider the credibility of your sources).

Although your searches should initially cast a broad net regarding the topic you've selected, your group must work to find a narrowed focus for the lesson you will lead.

The project has both individual and group components and counts for 30% of your final grade (10% for group-generated preparatory work including your research as reflected in your lesson plan and list of references; 10% for group-generated lesson plan and paper; 10% for individual efforts to the group and your reflection paper). More details about the lesson plan, list of references, group paper, reflection paper, and other requirements are below.

LESSON PLAN: Your group is to develop a detailed lesson plan that should introduce classmates to your topic, inform them about its importance in math and/or science education, and raise some of the current challenges, debates, or questions that surround this topic. Your submitted lesson plan, due the day of your presentation, should be very detailed and clear, explaining what you will teach and how. It should note who will be responsible for what things during the plan and time estimates for the plan to push you to consider how you'll use your allotted time. Part of this lesson plan must include relevant readings from your list of references (approximately 20-40 pages) for members of the class to read before your lesson. These readings should be made available through Blackboard to classmates at least one week before your presentation. If the readings need to be scanned, they can be submitted to Canaday Library's scanning services. If you bring them to Canaday, you will need to include your names on the required paperwork as well as my name and course information. It is important that you supply these to the library early because it can often take 2 weeks (possibly longer) for them to turnaround these scan requests during the semester. They cannot accept rush requests. After the articles are posted on Blackboard, send a message to the class telling us what readings have been uploaded, why they were chosen, and if there are specific things we should do or keep in mind when approaching them). As a group, teach the class on your assigned day. Electronically send me your lesson plan and list of references.

LIST OF REFERENCES: Prepare a group-generated list of references (using an appropriate citation format) and be sure to provide a hardcopy handout of this list to classmates the day of your presentation. It should also be uploaded to Blackboard. This list should be comprehensive such that it will provide an excellent starting point for people who wish to learn more about this topic.

REQUIRED MEETING: About two weeks before your presentation, meet with me to discuss your plans. If you think you might want articles scanned for people to access through Blackboard, you might want to meet with me even earlier to ensure that there will be enough time for these scan requests to be completed at Canaday. Contact me to arrange a time to talk. Expect this meeting to take about 30-60 minutes. It is mandatory for all group members and you should arrive with a draft of your lesson plan, your list of references, and suggested readings the class will be asked to

complete. Your group will probably need to meet again after this meeting to incorporate my comments and suggestions into your work for the project.

GROUP PAPER: As a group, submit a paper (about 4-5 pages when double-spaced) the day of your presentation that briefly discusses what you learned about your topic (your presentation should convey this information in more depth) and how the experience impacted your views on the topic on which you concentrated as well as views you have about teaching.

REFLECTION PAPER: Each person should also send me a separate file within one week of completing the presentation in which you discuss aspects related to your and your group's work on this task. This double-spaced paper should be about 3-4 pages in length. It should describe the work you did on this group project, the role(s) and responsibilities other people in your group assumed and how well members of your group communicated and functioned cooperatively. Note benefits and drawbacks to completing this project as a group and any general (or specific) things you learned about group work from working with other people on this presentation and lesson.

NOTE: This assignment is meant to be collaborative and lead you to develop greater products than if you worked alone. I expect groups to work well together and you are encouraged to talk with me if you have questions about your group's work or any aspect of the assignment. As for grading, students will be graded as a group as well as individually. Group grades will be impacted by the lesson plan, list of references, the presentation itself, the group paper, and how well the group functioned. The individual grade will be affected by how well each person worked in the group and her/his individual efforts and contributions to this assignment. Therefore, any individual's poor performance on one or more components of this project needn't affect other group members' grades.

ASSIGNMENT: FINAL PROJECT

The final project will have you reflect on one or more activities or lessons that took place when you were present at your field placement. Although you might not use any specific entries from your journal, using one or more entries could aid in completing this assignment. ***Note that your journal is expected to be updated throughout the term as new entries should be recorded within two days after each class visit.*** In addition to a final paper (of approximately 15 double-spaced pages), you will be asked to talk about your work on this project during an informal presentation one of the last class meetings. The paper will ask you to look at three topics related to this activity or lesson from three perspectives. These perspectives are:

- (a) Your perspective as a participant-observer during your visit(s)
- (b) Another person's (ideally your cooperating teacher's) perspective on that activity or lesson
- (c) Your perspective from the vantage point of what you would do and why if you were the teacher leading the activity or lesson

As mentioned, for each perspective you should view the activity or lesson as it relates to three topics in this course. These course topics were:

Status and Value of Math and Science Education
Culture and Content Knowledge in Math and Science Classrooms
Learning Theory and Inquiry
Education Research
Discourse in Math and Science Classrooms
Assessments

Note that something like "culture and content knowledge in math and science classrooms" does not mean you need to discuss both the issue of "culture" and "content knowledge." Those were purposefully combined in the course but can be disentangled for this assignment (i.e., one of your topics could be "culture" and/or another one could be "content knowledge"). Additionally, you can use one topic discussed by our course speakers or from the group presentations in place of ***one*** of your three topics.

Throughout the paper you are encouraged to make use of readings, discussions, and other things from this course to build your claims and explain your reasonings. Although we will spend time discussing this paper in class, some initial details and suggestions are described below:

Introduction: This section need not be long (about 2 double-spaced pages) and should introduce the class, school, and lesson or activity so readers have a better understanding of the setting and what the paper will discuss. It should also introduce the three topics that will be used as lens for analyzing the specific lesson or activity in this class.

Your perspective as a participant-observer during your visit(s): Use your field journal, issue papers, personal reflections and/or possible artifacts to assist you in discussing what you observed and experienced. Connect these things to the topics you selected. Be clear to support your claims based on specific evidence from these events or explicitly state what conclusions are based on your own intuitive feelings and try reflecting on why these feelings arose. Although there will be times when this course and readings will emphasize the use of observable data to provide credence to the view that education is a science, similar to the way science is traditionally defined by the natural sciences, your feelings, and other things that are often hidden from view or seen as more subjective, are valid

sources of data. It is important that you inspect all data that you report, seek its origins, meanings, and implications, and clarify these things for your readers.

Another person's (ideally your cooperating teacher's) perspective on that activity or lesson: I recommend scheduling time to talk with your cooperating teacher and entering that conversation with some preset questions. Since the specific lesson or activity you discuss might have transpired weeks ago, provide information about specific events that transpired that you'd like the teacher to reflect or comment on. Your field notes and ability to help describe events can remind the teacher of things that transpired that day. Additionally, you are welcome to ask her/him about previous times s/he taught this activity/lesson and how it has, or has not changed over time. Therefore, these conversations do not need to be constrained to the specific time when you saw the lesson but could, in part, discuss this activity more generally.

Your perspective from the vantage point of what you would do and why if you were the teacher leading the activity or lesson: Take a step away from the other perspectives explored in this paper and consider how and why you would have implemented the activity/lessons. Consider what might you have changed, or done similarly, if it were your class and how these decisions relate to the three course topics you have been discussing throughout the paper.