EDUC 540 Mathematics for Teachers in Diverse and Inclusive Educational Settings (N-6)
2 credits
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Spring 2016 semester Room 706

"Nothing in life is to be feared. It is only to be understood."
Marie Curie, French Physicist (1867-1934)

Course Overview
In this course, we aim to deepen our personal mathematical knowledge while furthering our understanding of what effective mathematics teaching looks like. In each session, we will do math together, play concept teaching math games and create a discourse around our collaborative engagement. We will explore the essential elements of a constructivist mathematics classroom in which all learners are collaborating to make sense of mathematics. To design a classroom so that *understanding* is its primary goal requires substantive, long-term effort. It requires thoughtful explorations of attitudes and beliefs as well as practices and expectations. This course will address the moral imperative that all students are capable of learning mathematics starting with very young learners and continuing through one's life. By the time the semester is over, it is this instructor's hope that participants will have an appreciation for why mathematics is really defined as the 'study of relationships' and 'the science of pattern'. It is our hope that teachers who take this course will gain confidence in their ability to make deeper meaning of mathematics for themselves and their students.

Enduring Understanding
Participation in math explorations throughout ones career promotes a growing confidence in the ability to make deeper meaning of mathematics.

Essential Questions
How does confidence in the ability to make deeper meaning of mathematics influence a teacher's practice?
How does a practice influenced by a deeper understanding of mathematics enhance a student's learning?

Goals of the Course
- To learn in an environment that integrates all six *NCTM Principles*: Equity, Curriculum, Teaching, Learning, Assessment, and Technology;

- To begin to understand the big ideas in mathematics as we explore and develop strategies and models for math learning and teaching;
- To design a teaching tool embedded in a math lesson that supports students in learning a concept;
- To support teachers in developing a working belief system about the theories and tenets that affect teaching and learning mathematics;
- To engage with the *Common Core State Standards and Practices for Mathematics* (CCSS).

To accomplish these goals, you will be expected to attend all classes, complete a number of required readings, prepare a variety of written assignments and presentations, and actively participate in the dynamic work during class sessions. Given the workshop nature this course, absences and lateness are only acceptable in emergency situations. Your lack of presence is viewed as a loss to the other people in your table group. Please make every effort to contact both your instructor and the class TA by email if you anticipate an absence. Be mindful that your active participation, presence, and support are *essential* to our learning community. **We take care of our own needs while recognizing our responsibility to the group.**

Professional Standards
All of your assignments will demonstrate the ways in which you have explored and integrated the areas identified in a number of professional standards identified by both the National Association for the Education of Young Children (NAEYC) and the Association for Childhood Education International (ACEI). Standards addressed in your assignments include: an understanding of child development; the ability to construct learning opportunities for *all* students, including those with diverse learning needs across the age spectrum, by employing an array of developmentally appropriate teaching strategies which motivate and support active student engagement, positive relationships and student collaboration, critical thinking, and problem solving; an understanding of and ability to use literacy concepts, approaches and teaching strategies to design and implement lessons based on a knowledge of students, learning theory, curriculum connections, curricular goals, and community; the ability to use formal and informal assessment strategies to plan, evaluate and strengthen instruction; and your ability to reflect deeply on your own work.

The following professional standards are addressed and should be evidenced in your assignments:

ACEI Standards (for those of you in the course who are aiming for Childhood certification)
1.0   Development, Learning and Motivation
2.3   Mathematics
3.1   Integrating and Applying Knowledge for Instruction
3.2   Adaptation to Diverse Students
3.3   Development of Critical Thinking and Problem Solving
3.4   Active Engagement in Learning
3.5   Communication to Foster Collaboration
4.0   Assessment for Instruction

NAEYC Standards *(for those aiming for Early Childhood certification)*
Standard 1: Promoting Child Development and Learning
Standard 3: Observing, Documenting and Assessing to Support Young Children and Families
Standard 4: Using Developmentally Effective Approaches
Standard 5: Using Content Knowledge to Build Meaningful Curriculum

Disabilities Services Office (DSO)
Bank Street has both a legal obligation and a philosophical commitment to making reasonable accommodations in order to meet the needs of students with disabilities. If you are a student with a disability and are eligible for accommodations, or if you have particular learning needs that I should know about, please make a point of informing me. Bank Street complies with the ADA and has a Disabilities Service Office. Any student requiring specific academic accommodations should contact the Coordinator of the Disabilities Service Office, Val Burr, at vburr@bankstreet.edu. Or call 212-875-4791 . If you are already registered with the Disabilities Service Office, please let me know what your particular need is.

For all students, if you have specific learning needs that you would like me to know about, please let me know by the end of the first session so we can work together to facilitate your learning. Students who wish to use multimedia formats or other constructions to complete assignments will be encouraged to do so.

Academic Integrity
Students at Bank Street are expected to adhere to high standards of academic integrity. Students should be aware of the definition of plagiarism. (Plagiarism is the use of another person's ideas, words, or theories as one's own—or without citation—in an academic submission.) What does this mean?
- All work submitted must be original.
- Any reference to another person's work (including ideas, theories, or concepts) must be cited explicitly.
- Work presented as actual experience cannot be invented or fabricated.

APA Citation Guidelines:
- All sources cited in writing must be included in a References list at the end of the writing. Conversely, only sources cited in the writing should be included in the References list.
- When a direct quotation is cited within a post, quotation marks must be used, and the author's name, year of publication, and page number must be included.
- When paraphrasing another's work, one must cite the original source, giving credit to the original author. When paraphrasing, page numbers are not necessary, but the author's name and year of publication are required.
- Electronic resources must be cited as well. Materials found on the internet are subject to copyright laws.
- For help and examples of citations for all resources go to the Bank Street Library's APA link at: http://libguides.bankstreet.edu/apa.

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Required Texts and Articles to read

Burns, M. (2007). *About teaching mathematics: A k-8 resource* (3rd ed.). Sausalito, CA: Math
> Solutions Publications. Accessible through the library's on line catalogue as an e-book (Additional note: the brand new 4th edition is much more expensive. It is a great additional resource but the third is a classic and works well for EDUC540)

Clements, D. H., & Battista, M. T. (2002). Constructivist learning and teaching. In National Council of Teachers of Mathematics, *Putting research into practice in the elementary grades: Readings from journals of the NCTM* (pp. 6-8). Reston, VA: NCTM. (this is an article required for Assignment #2 found at http://investigations.terc.edu/library/bookpapers/mis_constructing.cfm

Hiebert, J. (1997). *Making sense: Teaching and learning mathematics with understanding.* Portsmouth, NH: Heinemann. (required book and needs to be purchased)

Labinowicz, Ed (1980) *The Piaget Primer (pp1-95)* (This is on e- reserves for you. Hal will give you the web connect site to download your own copy)

Melnick, Hal PhD, (2000, 1987) *The Concept Teaching Game: A Rationale* In Thought and Practice; the journal of the Graduate School of Education . Volume 1, Number 1, Spr 1987. Shared with you now at: https://www.dropbox.com/s/c1lylwwcs9udgyi/Concept%20Teaching%20Game%20article%20revision11-1.doc?dl=0

National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics.* Reston, VA: NCTM.(The sections of this text to be read can be found on our my.bankstreet page for you. If you prefer hard copy , there are many copies in the library on the 5th floor and it may be purchased directly from NCTM.org)

K-12 Math Curriculum Center, EDC (1997- present) *Perspectives on Math Change for the Elementary years curriculum* found at (http://www2.edc.org/mcc/pubs/mperspectives.asp) This is the reading for Journal #6 at the end of the semester.

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Common Core Standards for Mathematics. Available free: www.corestandards.org.

Additional Readings suggested in course syllabus by week
(articles are found on the my.bankstreet resources section)

Behrend, J. L. (2003, January). Learning-disabled students make sense of mathematics. *Teaching Children Mathematics, 9*(5), 269-273.

Bresser, R. (2003, February). Helping English-language learners develop computational fluency. *Teaching Children Mathematics, 9*(6), 294- 299.

Carter, S. (2008, October). Disequilibrium and questioning in the primary classroom: Establishing routines that help students learn. *Teaching Children Mathematics, 15*(3), 134-137.

Charles, R. I. (2005). Big ideas and understandings as the foundation for elementary and middle school mathematics. *Journal of Mathematics Education Leadership*, *7*(3), 9-24.

Clements, D. H. (1999, March). Subitizing: What is it? Why teach it? *Teaching Children Mathematics, 5*(7), 400-405.

Clements, D. H., & Battista, M. T. (2002). Constructivist learning and teaching. In National Council of Teachers of Mathematics, *Putting research into practice in the elementary grades: Readings from journals of the NCTM* (pp. 6-8). Reston, VA: NCTM.

Falkner, K. P., Levi, L., & Carpenter, T. P. (1999, December). Children's understanding of equality: A foundation for algebra. *Teaching Children Mathematics, 6*(4), 232-236.

Karp, K. et al (August, 2014) 13 Rules that Expire *Teaching Children Mathematics, 21*(1), 14-25.

Renne, C. (2004, January). Is a rectangle a square? Developing mathematical vocabulary and conceptual understanding. *Teaching Children Mathematics*, *10*(5), 258-263.

Russell, S. J. (2000, November). Developing Computational Fluency with Whole Numbers. *Teaching Children Mathematics, 7*(3), 154-158.

We suggest you view the linked library screencasts to assist in your library searches as additional readings exist well beyond this list above. Go to
https://www.bankstreet.edu/library/how-can-i/learn-more-screencasts/#find-a-journal

Also view APA guidelines for your papers in this course at
https://www.bankstreet.edu/library/research-tools/apa-reference-list-guide/

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Assignments

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There are four assignments including the ongoing reflective 6 entry journal . A google folder in your name has been shared with you. Please go there and create four folders ,one for each assignment. All papers need to be entered by the due date listed on the chart of due dates found on our my.bankstreet page. Timeliness will influence grading since material you read will all be discussed in class sessions at the due date.

Assignment #1: Six Ongoing Reflective Journals

Reflective math learning journaling is a major component of the course. This allows for a more personal interaction between you and your instructor(s). Each journal is, in essence, a reflection of your experiences in our class. Each journal might include any of the following:

- A reflection on the math processes you participated in during the class; something you learned, something you have confusion about, a personal reaction to a math experience;
- Descriptions of any teaching of mathematics you have facilitated or observed;
- A reflection of your own math understandings and the group processes you are experiencing in class;
- Reflection on any of the NCTM *Principles* or CCSS *Practices*;
- A comment on any additional readings, and questions and/or reactions about events in the class.

Important Note: No student will be able to receive credit for *Math For Teachers* without having submitted the 6 journals when they are due. These assignments cannot be made up at the end of the semester. They are process assignments and need to reflect the long haul of your experience over the semester. All six entries must be entered by you inside your google folder. By the end of semester each will have comments made by Hal or our TA for you to re read for your journal #7. Please include a final entry (a summation journal #7) on how well you feel you achieved your goal(s) for this course as stated in your HPP paper (assignment #2)

Dates for journal submissions are as follows:

#Journal 1 -Due Jan 26ᵗʰ (Session #2). Enter journal #1 into your Assignment #1 folder on the google doc folder shared with you by Hal. This is due before Jan 26ᵗʰ. Include your reaction to class #1 as well as your reading in Marilyn Burns About Teaching Math (Part1) *Raising the Issues* .
#Journal #2 –Due Feb 2nd. (Session #3) Include your reaction to reading Ed Labinowicz's Piaget Primer. What enduring understandings about learning might you take away from the writing and research of this world renowned genetic epistemologist who invented the idea of constructivism as a theory of learning?
#Journal #3 – Due Feb 23ᵃ (Session # 6) Include comments on your reaction to Marilyn Burns About Teaching Math Part 3. *Teaching Arithmetic*. How are these kinds of problems children solve similar or different from the kind of math problems you worked with everyday when you attended elementary school? Please react.
#Journal #4 - Due March 22ᵃ (Session #10) Based on readings and experiences in this class so far, how do you define computational fluency as the same or different from 'learning your basic facts".
#Journal #5   Due April 5ᵗ(Session #11) In this journal entry please write up an analysis of the chapter you read in the book Making Sense: Teaching Math with Understanding by James Hiebert , et al.   (I will have you sign up for chapter reads. We will do a jigsaw-like text based discussion using a google doc protocol. Bring hardcopy or accessible electronic version to class tonight.)
#6 Journal #6 Due April 19ᵗ In addition to posting in your google doc folder please again bring a hard copy to class . In this journal you are to write about your reaction to what you read in the *Perspectives on Math Change for the Elementary years curriculum* (http://www2.edc.org/mcc/pubs/mperspectives.asp) . Read only one of the three elementary curricula descriptions and write about your impressions.   Be prepared for a fishbowl conversation where you teach others about what you read.
+ A final journal #7 is to be added at the very end of the course addressing how well you achieved the goals you set for yourself in Assignment #2 .

Assignment #2 : The Academic paper assignment – *The History Principles and Philosophy of Math Reform paper.*
For this assignment, please read the following **three** selections first for this paper. .
1) From the Principles and Standards for School Mathematics (NCTM, 2000 found in our library and /or electronically on you're my.bankstreet)

> Chapter 1: A Vision for School Mathematics, (pp.3-8 if you are reading the book in our library)   ⌷SEP⌷
> Chapter 2: Principles for School Mathematics, (pp. 11-27)⌷SEP⌷
> Chapter 3: Standards for School Mathematics, (pp. 29-31)

I have placed a *pdf* version of this text on your my.bankstreet resources page or you may find the full text Principles and Standards for School Mathematics (2000,NCTM) , on the library shelves on the fifth floor) .
⌷SEP⌷
2) Please carefully read and comment on "Constructivist Learning and Teaching", Clements and Battista , a reprint from the Arithmetic Teacher Journal to help clarify what 'constructivism' means in math reform.
⌷SEP⌷http://www.artemisillustration.com/assets/text/Constructivist%20Learning.htm

3) Also read and comment on Making Sense: Teaching and Learning Mathematics with Understanding (Heinemann, 1997) read pp vii - page 15.

Write a 2-3 page reaction paper to your readings about the history, principles and philosophy of instruction behind the math reform effort today. ⌷SEP⌷*Please include the following 4 points in your reaction paper:*⌷SEP⌷

> *a) Describe each NCTM principle in a sentence or two (maximum)   and then react to the six NCTM principles   AND to the Clements and Battista article. Comment on how similar or different the image portrayed compares to   the math education you received. Comment on implications for your future math teaching.*⌷SEP⌷
> *b) What questions/concerns do you have about the issues you read?*⌷SEP⌷
> *c) In your best judgment how would you say the school in which you are working is implementing the five dimensions of   classroom instruction developed in Chapter 1 of Making Sense : Teaching and Learning Mathematics with   Understanding. If you are not in a school   right now comment on how well your own elementary school education   matched what Hiebert is describing.*⌷SEP⌷
> *d) At this point in your own professional growth, what do you feel you need to study, learn, and practice as a teacher of mathematics? (FOR AGES 3 THRU 6TH GRADERS)   What areas will you be working on in this class to further your skills as a math educator to students of   any age? How do these personal goals relate to the Standards 2000?   You will be asked to summarize the degree to which you have accomplished your goals in a final reflection (journal #7 to be handed in at the very end of the course .*

+ ADDITIONAL READING NOTE FOR TEACHERS OF 3,4 or 5 year olds.
⌷SEP⌷
For those of you teaching nursery or pre school please read New York state's Pre School Planning Guide Part 2. (The math section only) The complete booklet can be found at
http://www.p12.nysed.gov/ciai/pub/presch2.pdf
pages 1-32.
These pages articulate how New York State wishes teachers to implement math standards in classrooms of 3, 4 and 5 year olds. This should help explain the notion of NCTM Standards for the early years . Please add the following citation for this article in your paper as well. [The University of the State of New York (1998) Pre - School Planning Guide pp31-33, State

Education Department, Albany, NY 12234]

Assignment #3: Lesson Plan and Math Concept Teaching Game

In this course we will explore, experience, and reflect on what constructivist, developmentally responsive content and conceptually rich math teaching means. Your Lesson Plan and Math Concept Teaching Game assignment should build on both the in-class math investigations we do and the feedback you have received on your earlier assignments. The foundation of your work for this assignment should be your understanding of child development, math content, and the array of teaching techniques that support and actively engage children with a range of learning styles as well as special needs. Can you adapt your lessons to meet children who have language issues, psycho social challenges, temporal/sequential or spatial organizational disability, attention issues and challenges with higher thinking?   The lesson plan and math concept teaching game you design should demonstrate that you have given thought to who your students are, as individuals and as a group, and what experiences they bring to the classroom, as well as your goal to foster active engagement in math learning, math communication, and math collaboration among your students. Further, your work here will demonstrate your ability to build opportunities into your planning to assess the effectiveness of your teaching approaches and your students' learning. Your lesson plan should either simply show how you would introduce your game or focus on some outgrowth or additional concept related to your game would be taught.
There are two parts to this assignment:
1) The directions to your game which should include age you aim for, the materials required to play, the common core standards it addresses, the key concept you are teaching and it must also include a visual photo of your game and its parts. This will be posted on a shared folder for all students in our class to access.
2) The second part is the lesson plan that you are to design for implementation of your game itself or for an extension of your game after students have learned from the game. This lesson should build on the concept that your game specifically taught. Here is the link to Hal's Four Part Lesson Planning tool .
https://www.dropbox.com/s/oo646sv8rcnfafk/Four%20part%20Lesson%20Planning%20Template%20for%20Introducing%20or%20Extending%20your%20Concept-teaching%20Game%20.doc?dl=0
Please follow that plan and submit both the game and the lesson plan into your Assignment #3 Google folder.

To help clarify what we mean by a concept teaching game (and to distinguish it clearly from a teacher directed activity here is Hal's article explaining his view of what a 'concept teaching game' means :

https://www.dropbox.com/s/c1lylwwcs9udgyi/Concept%20Teaching%20Game%20article%20revision11-1.doc?dl=0

In this article I try to explain the game that my former fourth graders at PS 50 Queens designed for me. They showed me how Pattern Blocks could be played to insure that everyone in his class understood the concept/meaning of fractions and even how to operate using fractions. The game was a big hit in the school.

+Additional in class + outside follow up group or partner assignments

Assignment #4
Solving a Perplexing Math Problem with 3 others at your table. Please solve the problem together in class and out of class and collectively present to Hal your group powerpoint with each person's comments embedded.

Exploring Perplexing Math Problems:
For this assignment you will explore your own mathematical interests by selecting (along with your most recent table group) one perplexing problem which you all will explore. Please divide up responsibility for the work, share emails , meet out of class if necessary but present one finished product for your entire group. There will be one powerpoint that the group produces.

You and your partners will explore one perplexing problem that demonstrates your understandings of the process of how one 'does' mathematics . It can demonstrate to your instructor how you have learned to engage with the 'doing' of mathematics as a professional teacher and how well you learned from working with others.   Use screen shots, or any other technology components you knowusing Powerpoint. (a relatively ubiquitous technology tool you may wish to use with students some day)

We will provide you a selection of problems that you can select from.   You are welcome to select one problem that your table group solved in class too. If you and your partners have a different problem that you would like to explore, please share the problem with Hal first so he can assure everyone that it is a genuine adult challenge for you. You will present your problem solving exploration using a multi media   PowerPoint format (I have a template for you to use- see below) with photographs of your work, The goal is for you to communicate effectively your efforts, thinking, findings, and conclusions from your problem exploration. You can use Bank Street Tech Fellows for technical help. (extension #4642) There are digital cameras, digital videos, and every computer at Bank Street has PowerPoint. You can make an appointment with a Tech Fellow to help with any digital/computer technology.

Your "Perplexing Problem" selection should challenge you and will be evaluated based on the degree of adult challenge that the problem affords you , the strategies employed and the manner in which you successfully communicated all that. (ie.. Did your group understand the problem, develop strategies reasonings and procedures , and communicate all that quite well ? One of the slides ask your group to self evaluate in those three categories as well.)

Good math problems have more than one way to be solved . You should confirm your problem solution with <u>at least two ways</u> to demonstrate clear thinking about the problem and its solution.   It is also helpful to share false starts or procedures. Those errors or dead-ends are part of the process of 'doing mathematics.'

<u>In the powerpoint write up we would like you to address the following points:</u>
- ❖ What is the problem - a copy of the problem must be included.
- ❖ What is the mathematical "work" you did to show evidence of understanding.   Be sure to say what the "big math ideas"are that are embedded in the problem . This is really important! How did you explore the problem?
- ❖ How did you "unpack" your understanding of the content? Each powerpoint slide might show another aspect of your strategy.
- ❖ Present at least two different ways this problem can be explored and solved.   One way must include manipulative tools.
  Aim to communicate all mathematical avenues explored, including ones that didn't work. Communication could include words, pictures, drawings,   graphs, charts, diagrams, photographs of manipulative arrangements, etc. Did you use any strategies such as the search for a pattern? Or working backwards? Or using a simpler situation ? Or using equations? Or drawing pictures? Or using materials , etc.   Indicate the strategies you used.
- ❖ Individuals should add the following (using one powerpoint slide for each question below is fine....with a quote next to each person's name)
  - o What mathematics would you say you learned as a result of doing this problem ?
  - o What did you learn about yourself as a member of a cooperative learning group?

Hal will provide you the <u>powerpoint</u> <u>Perplexing Math Problem Template (click here to download)</u>   to use   that deals with most of the above.   Ask him to email it to you if you cannot link it here.   Ask for sample powerpoint problem solved by former students - just for fun.   Here is one. It was called <u>"The Marriage Problem"</u>

Assessment

The grade for EDUC 540 will be based on the following criteria:
- ❑ Timely and consistent engagement throughout *all* fourteen sessions;
- ❑ Contributions to the learning community;
- ❑ Completing all reading assignments and engaging in classroom and online community discourse where applicable;
- ❑ Submitting 6 reflective journals on time;
- ❑ Completing the Lesson Plan and Concept Teaching Game assignment;
- ❑ Meeting the relevant standards.

You will be graded on the totality of your work, which includes quality of class participation, small group work, contributing to and expanding discussions, reading mindfully, growth during the course, the six journals, the lesson plan and embedded content game, and a

consistent and thoughtful presence. Being present, prepared, and focused is of utmost importance. Your grade in this course will reflect how much you have grown and how deeply you've reflected on the issues and concerns that you have tackled for yourself as a teacher developing your own mathematical understanding.

All journal assignments *must* be posted in google docs on time and should be typed, double-spaced. If you have difficulty completing an assignment on time, please let the instructors know. Only extenuating circumstances will be excusable for handing assignments in late. All assignments should be submitted with your name and the title of the assignment in the subject heading (eg. HalM, Journal #1).

Math Resource Room: The Math Resource Room contains many materials that are helpful, including some copies of NSF-funded curricula and manipulatives. Binders filled with concept teaching games are found there as well. It is located in the basement level in room C8.

Session One: January 19th

Essential Question : What does it mean to 'do' mathematics?
   Enduring Understanding: Children can make sense of the shape of
mathematical data in developmentally increasingly sophisticated   ways.

- Opening remarks, course overview, norms and beliefs about what it was like to learn math when we each attended elementary school.
- Doing math with others in our class. (Data representation across the various ages)
- What is the course is all about? *Six Principles (NCTM), Five Dimensions for school math programs (Hiebert) and the eight Common Core State Standards for Mathematical Practice (2014)*

  Work due after session one
- ➢ Write Journal #1 – include reaction to reading Marilyn Burns <u>About Teaching Math</u> (Part 1) and reaction to this first class . Post on google doc folder . (see details under **Assignments**).
- ➢ <mark>Suggested article to read and highlight for next week in addition to reading Burns Part 1 is Karp, K. et al (August, 2014) 13 Rules that Expire *Teaching Children Mathematics, 21*(1), 14-2 .</mark> (Note: All additional articles to read are found in your my.bankstreet resources page for this course.)

Session Two: Jan 26th

Essential Question : What does math teaching that emphasizes conceptual understanding look like?
   Enduring Understanding: No one should ever be asked to
memorize math procedures that do not make sense to them.
(Melnick).

- Today's Do Now! *Rename today's date*   Where's the math?
- Journal #1 is due inside your google folder before tonight . Hal should have shared the folder with you by now.
- The *Math Teaching Practices* in action- teaching for conceptual understanding within the context of a game like Action Fractions. [*Big Idea from the Common Core is 1) specifying the 'whole' and 2) 'explaining what is meant by equal parts , and 3) MP 6 Attend to Precision]*
- Extending and adapting any lesson for the full range of students. Samples of fraction lesson planning for the full range/age of children.

  <u>Work due after session two</u>

➤ Be sure to include your reaction to reading <u>The Piaget Primer</u> by Ed Labinowicz pp 1-95 found on e-reserves for your journal #2 due next session (Feb 2nd), Session #3 (see details under **Assignments #1).** What are the enduring understandings we could take from Piaget's one-on-one interviews of children? See the you tube video called *Piaget on Piaget* for the original video with his descriptions of what constructivism means. https://www.youtube.com/watch?v=I1JWr4G8YLM

➤ Before class I suggest that you go to the site below and watch a number of videos of math moments in classes with 3, 4 or 5 year old children. What math is happening in each short video clip? Resources to look at: http://bankstreet.edu/graduate-school/student-resources/ec-math-videos/

➤ Suggested article to read and highlight for next week Clements, D. H. (1999, March). Subitizing: What is it? Why teach it? *Teaching Children Mathematics, 5*(7), 400-405.

Session Three: February 2nd

Essential Question : How does understanding child development theory help you select appropriate mathematics tasks and curriculum materials?
Enduring Understanding: Teachers who understand that it is "OK to not know yet" and who themselves are comfortable with disequilibrium can become the best teachers of math.

• Today's Do Now! Play the *Make Ten* game at your tables. Where is the math? What is the tool or math model embedded in this game to support accessible learning ? How does it model the concept of ten?

• Math and Development
   1)View Baby Math video from NYU research

   2) Learning from Piaget and Vygotsky. Applying the big ideas from Piaget and Vygotsky. (eg. What are the implications perception-bound thinking?)

   3) Observation Assessment – For the second part of today's class please bring ear buds for viewing videos http://bankstreet.edu/graduate-school/student-resources/ec-math-videos/ Click on 'read more' to understand Hal's *Early Childhood Framework* . Watch the 5 minute montage video by clicking on the 'PLAY' screen . Then preview a number of videos to watch again in our class tonight with a partner. The 'Observation template' is downloadable and may be filled in by both of you. Partners can submit one video observation assessment to instructor for review.

<u>Work due after session three</u>

- ➢ Start working on the three required readings for your HPP Academic Paper, *The History Principles and Philosophy of Math Reform.* Be sure to end your paper by naming one or two goals you have for your own learning in this course. (see details under **Assignment #2**). Submit paper onto your google doc folder no later than the day before our 5th class. (Feb 16th)
- ➢ Suggested article for next class Carter, S. (2008, October). <mark>Disequilibrium and questioning in the primary classroom: Establishing routines that help students learn</mark>. *Teaching Children Mathematics, 15*(3), 134-137.

Session Four: February 9th

Essential Question: Why is it essential to ask all children (including ELL students) to write, draw and explain their thinking in this era of Common Core?
  Enduring Understanding: Multiple solution strategies shared within a classroom broadens and deepens the potential for all children's learning of mathematical problem solving .

- • Today's Do Now! Play *The Joining Board* concept teaching game at your tables. Where is the math?
- • Writing and Discussion in Math
  - Look at students' written work together so we can learn to analyze different ways children represent their mathematical thinking and solutions.
  - Listening to children discussing a mathematical lesson. Number Talks in the kindergarten. Why? How can this be done in ways that are developmentally appropriate ways and in ways it is not?

  <u>Work due after session four</u>
  - ➢ Look at the Illuminations Interactives free website from NCTM http://www.nctm.org/Classroom-Resources/Interactives/ or http://www.nctm.org/Classroom-Resources/Browse-All/?cp=1&tx=199
  - ➢ Pick one or two games at your level of teaching interest to play with a partner during our next class. Be prepared to discuss the Common Core Standards addressed, the Common Core Practices addressed and the Big Math Ideas addressed, if any.
  - ➢ Suggested additional article for next week . <mark>Russell, S. J. (2000, November). Developing Computational Fluency with Whole Numbers. *Teaching Children Mathematics, 7*(3), 154-158</mark>.
  - ➢ Homework table work. Start entering your ideas onto your table's Google Community Discourse doc for the language of each of the four whole number operations. For each problem try to answer "What is the problem asking you to do? Be sure to write it out as a question. Use unfix cubes at home to help you find your words. Here is the new link for your class this semester https://docs.google.com/a/bankstreet.edu/document/d/1g8PABvlNDdG1MeAcsre3S4Ff8XKX_Rf8uP7jKgvSO3c/edit?usp=sharing

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Session Five: February 16

- Today's Do Now! Play ten frame compare at your tables using the tens frames tool from http://www.k-5mathteachingresources.com Where is the math?
- Protocol for sharing our learning with one another. Please bring a hard copy of your HPP paper. Use of the 'constructivist listening protocol' to support the equity principle. Everyone's voice can be heard!
- How can technology tools support deep and profound math learning for children and teachers.
- Go to your first *Google Discourse Community* task. For each problem at your tables try to post answers to "*What is the problem asking me to do?*" Computational fluency requires understanding both the number operations concepts and the varied language to make meaning and see connections.

For Spring semester (2016)

4:45 class go to this link
https://docs.google.com/a/bankstreet.edu/document/d/1E66XzAvPwRBVJ82QReeCUTG6fgWOcqRItG9iIEMQ8pw/edit?usp=sharing

7:00 class go to this link and try answering the questions for you and your table mates
https://docs.google.com/a/bankstreet.edu/document/d/16q1EwY04m5thGDizgvNz0-Rupbdk9SJRs3ePZKeXJyk/edit?usp=sharing

Work due after session five
➢ Suggested article for next class discussion Behrend, J.L.(2003, January) . Learning –disabled students make sense of mathematics. *Teaching Children Mathematics, 9(5),269-273*
➢ Journal #3 reflecting upon Burns (Part 3) is due before the next session (see Assignment #1 for details)

Session Six: February 23rd

Essential Question : How can you teach the same grade level standards to all children across the K-12 range?
Enduring Understanding: To meet all children's needs a teacher must understand 8 distinct neuro-constructs (or cognitive demands put upon learners when solving any math problem). We must unearth where a child is strong and use that   strength *to teach to the area of concern.*

- Today's 'Do Now!' – Post two different mathematical strategies that you and your table mates like to solve *52 X21* **but first** play Roll a Rectangle as a concept teaching game. What mathematical numerical model is being taught here? How is this different from the model of multiplication as equal groups? What is its value?
- Multiplication learning - Teaching multiplication in a *standards-based manner* in today's inclusive classrooms. Applying Bank Street's <u>Math for All</u>   Neuro-developmental framework as a model for teaching all children.

   <u>Work due after session six</u>
   ➢ At home start working on the Geometry Menu packet given out in class . Use your geoboards to start solving the Letricia Problem for next week's in-class math collaborative problem solving.
   ➢ Suggested article to read and highlight for next class Renne, C. (2004, January). Is a rectangle a square? Developing mathematical vocabulary and conceptual understanding. *Teaching Children Mathematics, 10*(5), 258-263

Session Seven: March 1st

Essential Question : How can geometric problem solving serve to also teach number and measurement ?
Enduring Understanding: Mathematical connections are skillfully unearthed by teachers when they ask for multiple solutions for   any *one math   problem.*

- Today's Do Now! Work on the *5 x 8* 'Cut a Card' task.
- Play "How Big"; a geometric estimation game for *5-6* year olds.
- Doing math together: *A Geometry Menu* With your tablemates please solve the Letricia Problem. Show at least two different strategies on your posters. Use geo-dot paper, geoboards , scissors and markers.

<u>Work due after session seven</u>
- ➢ Study the 8 math Practices Standards. Look at these posters available for all teachers from the Jordan School District in Utah. Why not them up for your grade level students? But more importantly come prepared to discuss in the context of our class work on Letricia's problem . Go to http://www.debbiewaggoner.com/math-practice-standards.html

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Session Eight: March 8th

Essential Question : What do the <u>8 Math Practice Standards</u> **look and feel like during collaborative problem solving?**
> *Enduring Understanding: A 'collective intelligence' emerges*
> *through carefully structured collaborative problem solving.*

- • Do Now! Living the Common Core practices: Are you ready yourself to be a collaborative math learner? In your group of four solve the problem on your table in as many ways as your group can solve it. Be ready to share one method on the document camera. What is the difference between 'small group learning ' and 'collaborative group math learning".
- • Experience Quick Images across the grades (visual /numerical thinking)

    <u>Work due after session eight</u>
- ➢ Suggested article to read and highlight: <mark>Bresser, R. (2003, February). Helping English-language learners develop computational fluency. *Teaching Children Mathematics, 9*(6), 294- 299.</mark>
- ➢ Talk with your table mates about which Perplexing Math Problem you want to delve into for your Powerpoint assignment #4 . Whole class will be devoted to your finalizing your Powerpoint presentation on April 12th.

Session Nine: November 10   March 15th

Essential Question: How does a well-developed number sense in the early years support math success in later years (K-12)?
> *Enduring Understanding: Understanding the structure of the*
> *number system provides a solid grounding for K-12 math success.*

- • Today's 'Do Now!' Examine a variety of *Place Value* tools. Organize them from the most concrete to the more abstract.

- • What is Place Value anyway? If it is considered a big idea , what is so big about it? Conceptual understanding of place value is essential for understanding conventional US algorithms for operations with whole numbers. Tonight we will use the *powers*

of ten materials to understand conventional addition/subtraction and multiplication algorithms. What other algorithms might be more child invented?
- Doing math together . Using manipulatives solve the problem *What is 5% of 40 ?* in at least two ways.
- Learning to analyze the *Cognitive Demand of a Task* [Margaret Schwan Smith].
- Show: Another *Number Talk* Video - older grades.

Work due after session nine
➢ Journal #4 (due next week- March 22) – define computational fluency for yourself – How is it different from learning 'basic facts'- due before the next session (see Assignment #1 for details
➢ Consider watching video of Sherry Parish (one hour video) author of Number Talks book and DVD . She discusses her evolution as a teacher of five minute routine called Number Talks. Videos of children are included in the you tube talk found in the resources section of your my.bankstreet for this course

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Session Ten: March 22nd

Essential Question: How can children solve division problems by using what they know about addition, subtraction, or multiplication?

    Enduring Understanding: Both procedural and conceptual thinking   are equally required for understanding whole number division work as   well as fraction/decimal operations.

• Today's 'Do Now!' - At your table share all the ways your table mates know to solve $47{,}398 \div 7 = ?$
• Journal #4 is due tonight on Computational Fluency- Protocol for sharing your thoughts will be used tonight.
• View video of 3rd graders doing division with remainders
• How a concept teaching game teaches deeply – Fourth grader describes how she divide 128 by 6 using Leah's *Arrayzing race* model for division.
• Long Division using a constructivist approach. Meaning matters ! (partial quotient method, the open array method, etc)

Work due after session ten
➢ By now you and your group should start selecting one perplexing problem that your table will have solved in at least two ways. In two weeks you will devote the entire class time to finalizing your solutions and your final powerpoint. You might have to be in touch with one another outside of class. All four of you will submit the same powerpoint . (See assignment #4)
➢ Journal #5 is due next class: Write your journal based on your reading of the chapter you signed up for from James Hiebert's   Making Sense book (this will be done on a collective Google Doc Book Club page in class next week)

Session Eleven : April 5th
Essential Question: How do the five inter-related dimensions of teaching interact to create a classroom committed to 'teaching for understanding'.
Enduring Understanding: Work with fractions and decimals rests 1 largely upon conceptual understanding of whole number operations   and use of models to demonstrate that understanding.

• Today's 'Do Now!' -Hanging fractions, decimal , percentages on a number line
• Game Sharing Session #1
• Jigsaw 5,3,2,1 protocol for unpacking each chapter in Making Sense : Teaching for Understanding (James Hiebert) Journal #5 discussed tonight
• Fraction Operations – returning to Hal's five question diagnostic with fraction operation. (eg. Why is ½ ÷ 1/6 = 3 wholes?   What does each whole look like here? How can this also be done on a number line model...an array model?
• View video of 5th graders at a Bank Street like school in China solving a complex division of fraction task.

Work due after session eleven
    Be ready to work on your perplexing problem for the full class next week. We suggest you solve your group problem quietly on your own and then share strategies and refine the group powerpoint in class next week.

Session Twelve: April 12th

Essential Question: How does 'communication and reflection' help you understand yourself as a math thinker?
Enduring Understanding: It is important to know your own strengths as a math problem solver.

• Whole class dedicated to your table group finalizing work on your *Perplexing Math Problem Assignment* (see assignment #4). List of problems as options is found on your my.bankstreet *Resources* page.

  Work due after session twelve
    ➢ Journal #6 due: Curriculum Material analysis of Investigations or Everyday or Trailblazers curriculum (See assignment #1 again for details)

Session Thirteen: April 19ᵗʰ

Essential Question : What do algebra tasks look like in the elementary grades?
> *Enduring Understanding: Patterns that lead to functions are at the heart of algebraic thinking.*

- Today's 'Do Now! Play Cartesian Coordinate 'Four in a Row'
- Game Sharing Session #2
- Algebra across the grades . In groups solve the "Piles of Tiles" problem (color tiles pattern leading to algebraic expression) View 2 videos of this lesson at grade four.

Work due after this session
All your work is to be carefully entered and labeled well in your google doc folder for next session. Submit all four assignments labeled in the following way:

Assignment #1 *Reflective Journal entries*
(1. First Name, Last Initial, Journal#1) - Please leave all journals numbered 1-6 (+ #7 final entry summarizing how you have or have not achieved original goals in your HPP paper .

Assignment #2 *HPP academic paper*
First Name, Last Initial Assignment #2 HPP paper

Assignment #3 Concept Teaching Game and Concept Teaching Game Lesson Plan
     First name, Last Initial Assignment #3a Concept Teaching Game

     First name Last Initial Assignment #3b- Lesson plan for concept teaching game (include directions, Common Core
     Standards addressed, the big idea / the concept, and photo of game)

Assignment #4 – Perplexing Math Problem Powerpoint Group work
All 4 group members first names, Perplexing Math Problem Powerpoint (eg Terri, Hal, Tom
Pina,PerplexingProblem.pptx)

Session Fourteen: December 15   April 26ᵗʰ

Essential Question : What is mathematics?
> *Enduring Understanding: You answer this one.*

- Game Sharing Session #3
- Sharing our powerpoints
- Final words

List of dates and work due for each of the indicated 14 sessions- Sp '16
EDUC 540 Section 01 (Tues 4:45-6:45 PM) and Section 02(Tues 7-9 PM)

Session	Date	Work Due
1	Jan19th	Introductory Session *For next week Journal #1 is to be entered into your assignment 1 Google folder* : Look at Assignment #1 description in syllabus for dates and suggested readings for all 6 journals. For this journal be sure to include comments on Marilyn Burns *Part 1 : Raising the Issues*
2	Jan 26th	**Journal #1** is due (look at Assignment #1 in Syllabus for details
3	Feb 2nd	**Journal #2** is due on reading of Piaget Primer (look at Assignment #1 for details) Also in preparation for session #3 and 4 Before class please go to site below to see early childhood videos * http://bankstreet.edu/graduate-school/student-resources/ec-math-videos/ 1) Click on 'read more' to understand Hal's *Early Childhood Framework* 2) Watch the 5 minute montage video by clicking on the 'PLAY' screen
4	Feb 9th	
5	Feb 16th	**Assignment #2 is now due** : HPP academic reaction paper inAPA Style. (see Assignment #2 in Syllabus for detailed readings and questions to address) Bring hard copy to class and also place electronic version in google folder for Assignment #2
6	Feb 23rd	**Journal #3 Due**: Include comment on your readings of Burns part 3 (pp 171-232)
7	March 1st	
8	March 8th	
9	March 15th	Has your table group of four selected a perplexing problem yet (Assignment #4)?
10	March 22nd	**Journal #4 Due:** From any articles or texts read so far describe your definition of computational fluency.
11	April 5th	**Journal #5 Due**: before tonight you selected one chapter from Hiebert's <u>Making Sense</u> book to write about in journal #5- For Google Doc Book Club share. First sharing of concept games (This is part of assignment #3)
12	April 12th	Whole class dedicated to your table's Perplexing Problem group work
13	April 19th	**Journal #6 due:** Curriculum Material analysis of <u>Investigations</u> or <u>Everyday</u> or <u>Trailblazers</u> curriculum (All are NSF funded and NCTM principles based) Second sharing of games
14	April 26th	**All assignments must be collated and finalized with how well you achieved your personal goals for the course Be sure to organize your google doc folders** , Third sharing of games,

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Please use your bankstreet.edu email for most guaranteed and timely communication
with us at Bank Street.