

## **MATH 871: Current Research in Mathematics Education Summer 2015 (July 6 – 31)**

### **Instructor**

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Bio: I recently finished my second year as an assistant professor in the Mathematics and Statistics Department at the University of Nebraska-Kearney. I teach a variety of courses at UNK, but specialize in mathematics education. My research currently focuses on how educators learn to teach mathematics for conceptual understanding. Prior to this role, I worked in the K-12 system for ten years as a secondary mathematics teacher and instructional coach. My K-12 career was spent in Lincoln Public Schools and Grand Island Public Schools. While teaching and coaching, I earned my Masters degree and doctorate from UNL. I also taught Math Methods at Washburn University for a year and have had the opportunity to teach a number of graduate courses through UNK and UNL. My husband, Patrick, is a teacher in Kearney Public Schools and we have three children: Denelle (9), Kael (5), and Xander (9 months).

Availability: During the week, I will be checking my email and Blackboard repeatedly. Therefore, you can expect a response within 24 hours during the week. My availability is more restricted during the weekend. If you send me an email or post a question on Blackboard during the weekend, please allow me 48 hours to respond.

Office Hours: In addition to being available via email, I also plan to be available via a virtual meeting room once a week for “office hours.” I will determine office hours based on your availability times (which we will be gathering the first few days of class). If you have questions or concerns, please join me. I will be on-line for at least an hour during office hours and will be happy to help. I am hoping to be able to record and post these sessions as additional support. If the office hour times do not work for you, you can always contact me via email.

### **Course Prerequisite**

Admission into the graduate program for a Master of Arts in Education in Curriculum and Instruction: Mathematics Education.

### **Course Description**

This course is designed to give you an opportunity to read and analyze research in the areas of mathematics teaching and learning. We will examine various ways of studying these topics and analyze what has been learned from their study. The main goal of this course is for you to become knowledgeable about the theoretical and empirical research literature on mathematics education and how the research can be applied to the mathematics classroom. The course is also designed to help you cultivate practices that are important for scholarly work such as critical analysis, argumentation, and writing.

As you will see from the readings, research and development in mathematics education draws on many different fields, leading to a collage of ideas and practices, not all informed by research. As we read and discuss articles in this class we will strive to identify what is known from practice and what is known from research.

## Course Objectives

At the end of this course you should be able to:

- Locate research and journal articles related to specific math education topics.
- Identify various approaches to the study of mathematics education topics.
- Articulate major findings in the area of mathematics education.
- Discuss educational issues verbally and through writing, using research to support a stance.
- Apply findings, both from practice and research, to the classroom.

## Materials

All readings for the class will be posted on Blackboard or can be found through the NU Library system. You need a fast internet connection, and computer with a webcam and a speaker to participate in distance meetings with your small groups. (Some groups may choose to meet in person, if physically possible.) Headphones are also very helpful.

## Technology Details

We will use Blackboard ([blackboard.unk.edu](http://blackboard.unk.edu)) as our main hub for announcements and information sharing. I will post information, links, and assignments for each module.

For Modules 2, 3, and 4, you will be meeting with your group to discuss the readings. If you choose to meet virtually, I am open to the telecommunications option your group chooses to use. I am working to determine the virtual meeting system that UNK promotes, as then we would receive technical support through the UNK Help Desk. Other groups in the past have chosen to use GoogleChat or Skype.

You will also be using VoiceThread ([www.voicethread.com](http://www.voicethread.com)). VoiceThread is a web-interface and therefore does not need to be downloaded. Each of you will have an individual account created to use.

## Library Details

You will be using the UNK Library via internet to find research articles. You can reach the library home page by going to [www.unk.edu](http://www.unk.edu), then clicking on Academics-Library. Or once you are logged into Blackboard there is a tab at the top labeled “UNK Library.” In order to access the articles in the library, you will need to sign in using your Blackboard username and password. More detailed guidelines and suggestions for researching the databases will be posted on Blackboard.

## Course Requirements

This is a reading-intensive course. You are expected to read assigned readings before group meetings. It is essential that you keep up with the readings and come prepared to group meetings.

When preparing for class discussion, you should try to focus on the following points:

1. What is the author’s main idea and argument? What concepts are the author using/defining?
2. How has the author constructed the argument? How is the text organized? How was the concept explored or the research conducted?
  - If the text is based on empirical research, how was the study designed?
  - If the text is not based on empirical research, what is the author using to support the claims being made?
3. How do the author’s ideas fit with other readings or ideas from this course or other courses?
4. What are some other ideas in the paper that may not be central to the author’s argument but seemed relevant to you? What would you like to know more about?
5. How can the knowledge you gained from this article be applied to your classroom?

Writing is an important part of scholarly work and will be a large part of your graded work for this course. All written work for this class should double spaced, with reasonable margins (~1 inch all around) and a reasonable sized font (12 point). Please proofread your work carefully before turning it in to me. Use the capabilities of your word processor to check for spelling and grammar errors. Enlist the help of a peer to assist with punctuation and clarity of writing. Your writing should conform to the style specified in the Publication Manual of the American Psychological Association (APA formatting).

### *Expectations*

You are expected to take your work seriously, participate in class discussions, complete all assignments to the best of your ability, and turn them in on time. You will get more out of the course if you maintain a positive attitude, ask questions, are supportive of your classmates, accept support from your classmates and are patient with yourself (it takes time to master new ideas).

Class participation is expected, both for you to learn and so that others may benefit from your input. Participation includes your input during the weekly face-to-face or virtual group discussions. You will be required to not only respond to specific discussion prompts, but to ideas brought up by others in your group. You will also be expected to insert your own comments/ideas into the discussions based on your interpretations of the readings.

### *Groups and Collaboration*

Collaboration with your colleagues will be **essential** to this course. Teachers have much to offer one another when it comes to learning mathematics and understanding research. Thus you will be placed into groups of 3-5 people based on availability and preferences information you provide. It is very important that we find ways for you to work together, both formally and informally. This may mean email, teleconferencing, in-person meetings, whatever works best for you and your group members' learning. Keep in mind that while we strongly encourage you to find ways to work together on all assignments, you are to submit your work individually (unless otherwise indicated).

Note: Please understand that this is the first time this particular course has been offered. Also, I am a strong believer in modifying instruction based on the students' needs. **As a result, I may modify some components of the course based on our experiences.** Please provide me with feedback on ways to improve the course. There will be a formal evaluation at the end of the course, but since I prefer to respond to feedback before the course is over, I may solicit feedback in some of the assignments throughout the course.

# Assignments

## *Module Assignments*

1. Class Introduction Video (individual task) and Quiz – Module 1  
You will use VoiceThread to create a short, 2-3 minute video to introduce yourself to others in the class. Once all intro videos have been submitted, you will watch each video and learn more about your colleagues. A quiz will be given in Module 2 to assess your new knowledge of your peers.
2. Readings and Discussion Participation (group task) – Modules 2, 3, and 4  
We will discuss readings online in small groups. You are expected to analyze and reflect on all readings and to come to meetings prepared to contribute to the discussion. It is crucial that you keep up with the readings because the quality of the discussion will depend on the extent of your participation, and your grade will be partially determined by the amount and quality of your participation. You will meet on-line (or in person) with your group for 2 hours each module to discuss the assigned readings. I will also attend these discussions, largely as a spectator. You and your group members are responsible for leading and carrying the discussion.
3. a. Group Summary (group task) – Modules 2, 3, and 4  
After your group discussions, your group is responsible for posting a one or two paragraph summary of your discussion on the appropriate Blackboard Discussion Board. The group is responsible for determining who will post the summary each module. A different group member will post each week. I highly recommend that you take the last 10 minutes of your group discussion to summarize what you discussed over the 2 hours. This will not only bring closure to your learning, but will also give direction to the group summary that is to be posted.  
  
b. Response to Group Summaries (individual task) – Modules 3, 4, and 5  
Each student will individually read and respond to the group summaries posted by the other groups for the last module. (You do not need to respond to your own group summary.) Your response should include one thing you found interesting in their summary, one thing your group discussed that either paralleled or differed with that group's discussion, and one question you have been thinking about concerning this topic.
4. Three Brief Individual Writing Assignments (individual task) – Modules 2, 3, and 4  
For each set of readings, you will respond in writing to questions or writing prompts related to the module theme. Responses should be thorough but concise. Post these completed assignments in the appropriate Blackboard Assignment Folder. I will be the only one to read these writing assignments.
5. a. Communicating Research Video (individual task) – One module, which you will be assigned.  
Individuals will be assigned one module in which he/she will create a 4-5 minute video using VoiceThread. This assignment is meant to be a way for you to practice articulating what you are reading and thinking in a professional manner. Choose a specific idea or topic that you read about in the module. I recommend you choose an idea that you find interesting and that you would like to share with a colleague or administrator. Then use VideoThread to video yourself sharing that research-based idea. You could discuss where it is found in the research, how it is supported by research, how you plan to incorporate this learning into your profession and why you find it important. Communicating research and analysis of research is an important skill to have as an educator!

b. Response to Communicating Research Videos (individual task) – Modules 3, 4, and 5  
 Each person in the class is required to watch and respond to each posted Communicating Research Video. After watching each reflection video, click on the comment icon and leave a short (1-2 minute) **video** response. This will occur after Module 2, 3, and 4 and needs to be completed prior to the beginning of the next Module. Your response should be specific to the topic of the video. You can make comments on points they discussed and expand upon those points. You are helping them deepen their communication of the idea. (Your video response is NOT an evaluation of their video, but instead should focus on the research content or application of the research.)

*Course Projects – Due Friday, July 31 at 11:59pm (central time zone)*

6. Annotated Bibliography (individual task)

Your annotated bibliography will include all readings from the course AND a minimum of 6 other articles used in your final research paper. Each reading will have a citation in APA format, a summarizing paragraph and a reflection/application paragraph. A document explaining an annotated bibliography and the grading rubric is posted on Blackboard – Start Here – Long-term Course Assignments.

7. Final Research Paper (individual task)

Select 8 articles/chapters/papers written on a self-chosen topic in mathematics education. (You may include as many articles we read in this class you would like, but you can only count at most 2 papers among the eight.) Read them and write a 5-page summary of the major ideas, views, stances, and discussions related to the topic. The final page of this paper should discuss how you plan to apply this information to your classroom. A document with more details about the Research Paper and the grading rubric is posted on Blackboard – Start Here – Long-term Course Assignments.

8. Philosophy of Teaching Mathematics (individual task)

Prepare a 3-page statement of your personal philosophy of teaching mathematics. Clearly articulate the ideals to which you are strongly committed and describe how these commitments will be manifested in your teaching. You do not need to reference specific research necessarily. This is more of the application of all you have read, discussed, and internalized throughout the course. A document that more thoroughly explains expectations and grading is posted on Blackboard – Start Here – Long-term Course Assignments.

## Assessment

ASSIGNMENT	WEIGHT	DETAILS	POINTS
Class participation and group discussion (including peers' evaluation of your participation)	20%	One grade for all 4 weeks	200
Introduction Video and Quiz	10%		100
Group Summaries & responses	10%	Modules 2, 3, & 4	100
Individual writing assignments	10%	Modules 2, 3, & 4	100
Communicating Research Video and responses	10%	Your video and video responses to each class member's video	100
Annotated Bibliography	10%	See document on Bb	100
Research Paper	20%	See document on Bb	200
Philosophy	10%	See document on Bb	100

For all your assignments, the following general issues will be considered for grading purposes:

- Has the participant done what was asked for and specified in the description of the assignment?
- Has the participant made connections to pertinent readings discussed in class and to the literature on the subject under study? Has the participant properly cited the readings discussed in class? Has the participant looked for references beyond classroom readings?
- Is the work clearly written/presented? Are the ideas well developed? Are they coherently woven together and presented in an orderly fashion? Is the work presented in “academic style”?
- Does the work demonstrate that the participant spent time in completing the assignment? Is it thoughtful?

### Grading for Written Work

Written work will be assessed on the quality of your writing as well as your interpretation and understanding of course content. The following general guidelines will be used to assign letter grades to **written work**; borderline papers may get a letter grade with a + or -. It is expected that papers receiving grades lower than B will be revised and resubmitted within 1 week of receiving instructor feedback.

*A Outstanding performance.* The assignment is of excellent quality and contains no technical errors. Writing shows evidence of understanding, synthesis, and reflection upon course material.

*B Good performance.* The assignment is of good quality but not exceptional and contains only minor technical errors. Writing shows evidence of understanding of course material.

*C Poor Performance.* The assignment is of acceptable quality but contains numerous or serious technical errors. Writing shows incomplete or inconsistent understanding of course material.

*D Unacceptable Performance.* The assignment is of poor quality and below acceptable standards. Writing does not show evidence of understanding of the course material.

*F Lack of performance.* The assignment was not completed.

### Grading for Class Participation/Discussions

In order for everyone to benefit from the discussions and class activities, please exercise the utmost professionalism in your interactions during class. Monitor your participation to be sure that you are not dominating the conversation or are not being shut out of the discussion. Remember that the quality of your participation is more important than the quantity. Be respectful in the way you assert your opinions and ideas and in the way you respond to the ideas and opinions of others. Remember to disagree with ideas, not with people. The following general guidelines will be used to assess **class participation**:

*A Outstanding Contribution.* Insightful and thoughtful comments, questions, and or summary reflecting a careful reading and analysis of the material.

*B Adequate Contribution.* Comments are accurate but not particularly insightful or thoughtful. Demonstrates an understanding of the readings but not necessarily a very deep or careful analysis.

*C Marginal Contribution.* Makes little contribution to the group discussion or does a poor job of summarizing/analyzing material. Primarily tells stories, anecdotes, or personal experiences with no analysis or reflection.

*D Unacceptable Contribution.* Contribution below acceptable standards or comes to group discussions having not completed all of the readings.

## Grading Scale and Corresponding Point Totals

	Points (out of 100)	Points (out of 200)
A+: 97-100%	98.5	197
A: 94-96%	95	190
A-: 90-93%	91.5	183
B+: 87-89%	88.5	177
B: 84-86%	85	170
B-: 80-83%	81.5	163
C+: 77-79%	78.5	157
C: 74-76%	75	150
C-: 70-73%	71.5	143
D+: 67-69%	68.5	137
D: 64-66%	65	130
D-: 60-63%	61.5	123

## Module Details

Below is a general outline of tasks to be completed throughout each module. More detailed instructions will be posted on Blackboard at the beginning of each module. A few key things to note:

- Module 1 and Module 5 are only two and three days long respectively.
- Modules 2, 3, and 4 begin on a Wednesday and end on a Tuesday at 11:59pm (central time zone). Thus all tasks must be completed by 11:59pm.
- You will be working on several individual assignments throughout the course that are due on Friday, July 31 at 11:59pm. These course projects (Annotated Bibliography, Research Paper and Philosophy of Teaching Mathematics) are not included in the modules. It is your responsibility to continually be working on these three assignments during the four weeks.

### Module 1: Introductions (Monday, July 6 – Tuesday, July 7)

#### Objectives:

- Students will become familiar with the set-up of the course and the technology that will be used.
  - Students will communicate availability and preferences for group discussions.
  - Students will begin brainstorming ideas for research paper.
1. Read syllabus (scour, not skim)
  2. Watch my Module 1 Instruction Video - VoiceThread
  3. Complete Time Availability and Preferences Form
  4. Watch my Class Introduction Video and create your own Class Introduction video - VoiceThread
  5. Post classroom frustrations/concerns/passions on Blackboard Discussion Board. (This will be a way for you to start brainstorming ideas for your Final Research Paper.)
  6. Look through Blackboard and become familiar with the on-line set-up. If you have not already done so, I recommend you start getting the reading materials (articles, chapters, etc.) downloaded onto your computer/device or printed and ready. The readings can be found under the Reading tab or embedded within each module folder.

### Module 2: Teaching Mathematics (Wednesday, July 8 – Tuesday, July 14)

#### Objectives:

- Students will learn more about the other students in the class.
  - Students will read key research articles focused on effectively teaching mathematics.
  - Students will articulate major findings in the area of teaching through discussions and writing.
  - Students will apply research findings on teaching to their own practice.
1. Watch my Module 2 Instruction Video - VoiceThread
  2. Watch the intro videos of all colleagues and complete the Class Introduction Quiz
  3. Read assigned articles
  4. Meet with group to discuss (2 hours)
    - a. Need to notify me of meeting times/days and how you will meet
  5. After group discussion, one person from the group posts Group Summary in Discussion Board
  6. Submit Individual Writing Assignment
  7. Communicating Research Video (I will assign these to 1/3 of the class.)

### **Module 3: Beliefs and Knowledge (Wednesday, July 15 – Tuesday, July 21)**

#### Objectives:

- Students will read key research articles focused on educators' beliefs and knowledge needed to be an effective teacher of mathematics.
  - Students will articulate major findings in the area of teachers' beliefs and knowledge.
  - Students will self-reflect on their own beliefs and knowledge.
  - Students will apply key ideas about teachers' beliefs and knowledge to pre-service teacher education and their own future education.
1. Watch my Module 3 Instruction Video – VoiceThread
  2. Watch Communicating Research Video from Module 2 and respond. - VoiceThread
  3. Read Group Summaries from Module 2 and respond. – Blackboard Discussion Board
  4. Read assigned articles
  5. Meet with group to discuss (2 hours)
    - a. Need to notify me of meeting times/days and how you will meet
  6. After group discussion, a different person from the group posts Group Summary in Discussion Board
  7. Submit Individual Writing Assignment
  8. Communicating Research Video (I will assign these to a different 1/3 of the class.)

### **Module 4: Teacher Development (Wednesday, July 22 – Tuesday, July 28)**

#### Objectives:

- Students will read key research articles focused on teacher development
  - Students will articulate major findings in the area of professional development and teacher training.
  - Students will apply key ideas about teacher development to their current (and future) careers.
1. Watch my Module 4 Instruction Video – VoiceThread
  2. Watch Communicating Research Video from Module 3 and respond. – VoiceThread
  3. Read Group Summaries from Module 3 and respond. – Blackboard Discussion Board
  4. Read assigned articles
  5. Meet with group to discuss (2 hours)
    - a. Need to notify me of meeting times/days and how you will meet
  6. After group discussion, a different person from the group posts Group Summary in Discussion Board
  7. Submit Individual Writing Assignment
  8. Communicating Research Video (for the final 1/3 of the class)

### **Module 5: Summarize and Apply (Wednesday, July 29 – Friday, July 31)**

#### Objective:

- Students will summarize and apply knowledge gained throughout the course.
1. Watch my Module 5 Instruction Video - VoiceThread
  2. Watch Communicating Research Video from Module 4 and respond. – VoiceThread
  3. Read Group Summaries from Module 4 and respond. – Blackboard Discussion Board
  4. Complete Peer Evaluation of Group Members
  5. Finish course projects (listed below) and post in corresponding folder on Blackboard.
    - a. Annotated Bibliography
    - b. Research Paper
    - c. Philosophy of Teaching Mathematics

Dates	Theme	Readings
<b>MODULE 1</b> Mon, July 6 – Tues, July 7	Introductions	<ul style="list-style-type: none"> <li>• Syllabus *<i>Can also start on future readings.</i></li> </ul>
<b>MODULE 2</b> Wed, July 8 – Tues, July 14	Teaching Mathematics	<ul style="list-style-type: none"> <li>• Krainer (2005) – What is “Good” Mathematics Teaching, and How Can Research Inform Practice and Policy?</li> <li>• Heibert, Grouws (2007) – The Effects of Classroom Mathematics Teaching on Students’ Learning</li> <li>• Smith (1996) – Efficacy and Teaching by Telling: A Challenge for Reform</li> <li>• Lockhart (2008) – A Mathematician’s Lament</li> <li>• Fenstermacher &amp; Richardson (2005) – On Making Determinations of Quality in Teaching</li> </ul>
<b>MODULE 3</b> Wed, July 15 – Tues, July 21	Beliefs and Knowledge (CK, PCK, PK)	<ul style="list-style-type: none"> <li>• Philipp (2007) – Mathematics Teachers’ Beliefs and Affect <b>-OR -</b> Thompson (1992) – Teachers’ Beliefs and Conceptions: A Synthesis of the Research</li> <li>• Pajares (1992) – Teachers’ Beliefs and Educational Research: Cleaning Up a Messy Construct</li> <li><b>-OR-</b> Leatham (2006) – Viewing Mathematics Teachers’ Beliefs as Sensible Systems</li> <li>• Hill et al. (2007) – Assessing Teachers’ Mathematical Knowledge: What Knowledge Matters and What Evidence Counts?</li> <li>• Ball et al. (2010) – Content Knowledge for Teaching: What Makes It Special?</li> <li>• Shulman (1986) – Those Who Understand: Knowledge Growth in Teaching</li> </ul>
<b>MODULE 4</b> Wed, July 22 – Tues, July 28	Teacher Development	<ul style="list-style-type: none"> <li>• Brown, Borko (1992) – Becoming a Mathematics Teacher</li> <li>• Darling Hammond et al. (2009) – Professional Learning in the Learning Profession: A Status Report on Teacher Development in the United States and Abroad</li> <li>• Garet et al. (2001) – What Makes Professional Development Effective? Results from a National Sample of Teachers</li> <li>• Sherin, van Es (2009) – Effects of Video Club Participation on Teachers’ Professional Vision</li> <li>• Battey, Franke (2008) – Transforming Identities: Understanding Teachers across Professional Development and Classroom Practice</li> <li>• Heck et al. (2008) – Studying the Effects of Professional Development: The Case of the NSF’s Local Systemic Change Through Teacher Enhancement Initiative</li> </ul>
<b>MODULE 5</b> Wed, July 27 – Friday, July 31	Summarize and Apply	