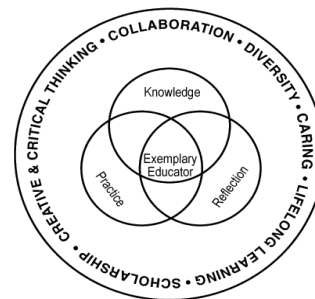


Fall 2016

MATH 410

## Methods of Instruction in the Mathematics Curriculum for the Middle School



**INSTRUCTOR:** Dr. Helen Adi Khoury

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### **TEXTBOOKS:**

- Rubenstein, R., Beckmann, C., & Thompson, D. (2008). *Teaching and Learning Middle Grades Mathematics* (With CD). John Wiley and Sons, Inc. [ISBN: 978- 0- 470-41350-0]. [Required].
- National Council of Teachers of Mathematics. (2014). *Principles to Actions: Ensuring Mathematical Success for All*. Reston, VA: Author. [ISBN: 978- 0-87353-774-2]. [Required].
- National Council of Teachers of Mathematics. (2000). *Principles and Standards for School Mathematics*. Reston, VA: Author. . (Note: You Do Not need to purchase this book)
- The New Illinois Learning Standards, consistent with the *Common Core State Standards-Mathematics* by the National Governors Association Center for Best Practices, Council of Chief State School Officers. (2010). (Note: This document is available at [http://www.isbe.net/common\\_core/pls/level1/pdf/math-standards.pdf](http://www.isbe.net/common_core/pls/level1/pdf/math-standards.pdf))
- Other assigned readings.

### **COURSE GOALS:**

In this course, you will explore the teaching of mathematics in the middle school, in terms of both what to teach and how to teach it, with an emphasis on middle school students' mathematical thinking and understanding. The purpose of this course is to engage you in inquiry-driven mathematics education experiences to help guide your teaching experiences and give you tools that will enable you to continue to inquire and learn as part of your work as a teacher. Current national reforms in mathematics education (e.g., the *Principles and Standards for School Mathematics* [National Council of Teachers of Mathematics, 2000], *Principles to Actions: Ensuring Mathematical Success for All* [NCTM, 2014], and the New Illinois Learning Standards, consistent with the *Common Core State Standards-Mathematics* [National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010]) and mathematics education researchers recommend that middle school mathematics teachers think in new ways about the content of their instruction (what to teach) and their instructional practices (how to teach). This course is intended to engage *you* as a learner and help *you* develop as a teacher of mathematics in ways that are consistent with mathematics education research and the calls of reform.

In this course, you will explore how students learn mathematics and what is meant by deep understanding of mathematics. You will learn how to teach mathematics for meaning-making and for students to see relationships and connections among mathematics topics and between mathematics and other subjects. You will also learn how to develop a classroom learning environment that promotes students' understanding of mathematics for all. Major topics covered include: *The Learning of Mathematics, Students' Reasoning with Patterns and Algebra, Creating a Supportive Learning Community and Classroom Environment, Students' Reasoning with Rational Numbers and Their Uses, Lesson Planning and Instruction, Students' Reasoning in Geometry, Transformations and Measurement, Students' Reasoning with Data Analysis and Probability, and the Use of Formative Assessment in the mathematics classroom.*

Specifically, you will:

- Develop knowledge of the content, effective methods, and materials necessary to teach mathematics in the middle school.
- Learn about research on middle school students' mathematical thinking and about current reform principles and practices related to the teaching and learning mathematics.
- Learn how to build a learning environment that supports the teaching and learning of mathematics.
- Learn to consider and accommodate the different characteristics of diverse students to support their learning of mathematics.
- Learn how to assess students' mathematical thinking and how to plan instruction.
- Learn to make instructional decisions about the use of curricular materials (such as textbooks, other print and electronic resources), manipulatives, and technology in the teaching of mathematics in the middle school.

#### **EVALUATION:**

|                                                                                                                                                                                                                |            |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 1. Attendance, professional disposition & in-class supportive participation .....                                                                                                                              | 20 points  |
| 2. Reflections, shared electronic resources, shared readings, and other class assignments                                                                                                                      | 20 points  |
| 3. A written summary report and reflection <b>on each of two conceptually-related</b> research publications on middle school students' mathematical thinking (2 x 20 points for each)                          | 40 points  |
| 4. A written report and reflection on an interview with a middle school student, assessing his/her mathematical thinking on a problem-solving activity selected from one of the published articles in #3 above | 30 points  |
| 5. Report of an Interview with a Middle/High School Mathematics Teacher.....                                                                                                                                   | 10 points  |
| 6. Two inquiry-based consecutive mathematics lesson plans for the middle school. The first of these lessons will be implemented in our class (see #7 below). (2 x (10+5)) points                               | 30 points  |
| 7. Instructional Implementation and Reflection of a non-routine problem-solving and an inquiry-based lesson (see #6 above)                                                                                     | 30 points  |
| 8. Exams: Mid-Term and Final .....                                                                                                                                                                             | 20 points  |
| <hr/>                                                                                                                                                                                                          |            |
| TOTAL                                                                                                                                                                                                          | 200 points |

### **GRADING SCALE \*:**

|     |                                                                |
|-----|----------------------------------------------------------------|
| A   | Equal to or greater than 93% to 100% of total points           |
| A - | Equal to or greater than 90% and less than 93% of total points |
| B + | Equal to or greater than 86% and less than 90% of total points |
| B   | Equal to or greater than 83% and less than 86% of total points |
| B-  | Equal to or greater than 80% and less than 83% of total points |
| C   | Equal to or greater than 70% and less than 80% of total points |
| D   | Equal to or greater than 60% and less than 70% of total points |
| F   | less than 60% of total points                                  |

\* In addition to the above criteria, in order to receive a grade of "C" or better, you need to attend regularly, you need to be supportive of others in class, you need to participate in all class activities and discussions, you need to maintain a positive and a professional disposition in mathematics education, and you need to complete all required in-class and out-of-class assignments, as specified by your instructor. In case you may need additional time to complete an assignment because of a specific situation that you may have, please consult with your instructor in private.

### **DESCRIPTION OF COURSE REQUIREMENTS AND ASSIGNMENTS:**

#### **#1. Attendance, professional disposition, and in-class participation: (20 points)**

You are expected to attend regularly, be prepared for the assignments on a daily basis, participate in all class discussions and activities, cooperate, maintain a general positive professional disposition, be professionally supportive of all, and maintain a positive mathematical disposition.

Your mathematical disposition will be assessed using the recommendations of Standard 10 of the NCTM *Curriculum and Evaluation Standards* (National Council of Teachers of Mathematics [NCTM], 1989, p. 233). The components of students' mathematical disposition are:

- (a) Confidence in using mathematics to solve problems, to communicate ideas, and to reason;
- (b) Flexibility in exploring mathematical ideas and trying alternative methods in solving problems;
- (c) Willingness to persevere in mathematical tasks;
- (d) Interest, curiosity, and inventiveness in doing mathematics;
- (e) Inclination to monitor and reflect on their own thinking and performance;
- (f) Valuing the application of mathematics to situations arising in other disciplines and everyday experiences;
- (g) Appreciation of the role of mathematics in our culture and its value as a tool and as a language.

#### **#2. Reflections, shared electronic resources, shared readings, and other class assignments: (20 points)**

Different assignments will be given during the semester for a total of 20 points. These include reflecting in writing on specific issues, sharing in class findings of specific NCTM electronic resources, evaluating mathematics curricula and on-line lessons, anticipating middle school students' problem-solving strategies, sharing summaries of research-based readings and leading related discussions.

**#3. A written summary report and reflection on each of two conceptually-related research publications on middle school students' mathematical thinking [2 x 20 (points for each report)] (40 points)**

*Exploring Professional Resources*

**The first summary report for assignment #3 is due on**

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The first of these Summary Reports needs to be on a research-based publication included on the CD of your textbook. Select a published article from the CD of your book, but please remember that later on (for assignment #4) you need to select a problem-solving activity from this same publication in order to conduct a related interview with a middle school student to assess his/her mathematical thinking.

With your first written summary report, please provide a hard copy of the selected article that you are summarizing. Also please attach a copy of the given rubrics, to be used to assess this report, as a cover page, to be followed by your report and then to be followed by the hard copy of the publication that you are summarizing.

**This second summary report for assignment #3 is due on**

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The second of these Summary Reports needs to be a summary of a research-based article, on a conceptually mathematical related topic that was covered in the first publication you selected for your first Summary Report. This second selected publication needs to have appeared in **NCTM's *Mathematics Teaching in the Middle School* between 2010 and 2016.**

Please follow the same above guidelines for submitting this second research-based summary report.

**#4. A written report on an interview with a middle school student assessing his/her mathematical thinking on one of the activities selected from one of the two published articles in #3:**

*Professional Collaboration, Practice, and Reflection.* (30 points).

**This interview assessment report is due on**

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After you re-read the published article (in #3 above), select one good problem-solving activity from this article for a one-on-one interview with a middle school student asking them to solve this problem. Develop a set of questions ahead of time before your interview. Include these questions in the report and as an appendix to the report. The expected duration of the interview is about 30 minutes. During the interview, please focus on the middle school student's mathematical thinking and problem-solving strategies - not only on his/her correct or incorrect answers, and on his/her mathematical reasoning and conceptual understanding as s/he attempts to solve the problem. Please make sure to document your interactions while the student is solving the problem or the related set of problems. In deciding about

your own interview protocol, you may follow the interview protocols, the questioning, or the follow-ups suggested by the published article. Do not wait until the very end of the student's problem-solving experience to start asking your questions. Try to find out if and what alternative problem-solving strategies your student may suggest when you probe for other solution strategies. Audiotape the interview (if possible), analyze your data, describe in detail the findings in your report, and then compare what you find to what is already published in the literature and what you have learned from the experience.

Please follow the attached indicators and rubric. These will be used to assess this report.

So, for your report, please include a one paragraph summary of the article, a description of the problem you selected, the student you interviewed (without any personal identification), the interview setting, the questions asked, the student's answers and strategies, your findings and analysis. Toward the end of your report, please discuss and reflect as to what you have learned from this experience and how one may follow-up with this student to enhance his/her mathematical thinking.

Make sure to include a page for the references used at the end of your report. Also please make sure that the total length of your written report is about six typed double-spaced pages, with a readable font-size (font Calibri or Ariel fonts and size 11), followed by a reference page and student's handwritten work. In addition, please attach as Appendices a copy of (1) the article, (2) the problem-solving activity you selected, (3) the questions that you had prepared before the interview, and (4) other artifacts including written work by the student. Also please make sure to attach at the very front a blank copy of the rubric to be used to assess this report, along with your name and the date when you hand-in this report.

Follow the APA style of writing. This report will be evaluated on its merits as a professional means of communicating in writing with other mathematics teachers and mathematics educators.

**#5. Report of an Interview with a Middle/High School Mathematics Teacher: *A Professional Collaboration Experience*. (10 points). This assignment is due on \_\_\_\_\_**

You will interview a middle school or a high school mathematics teacher to gain insights into issues related to active teaching practices. You will receive detailed information on this assignment in class. This assignment may be substituted for a summary report to be prepared by attending an approved professional seminar (lecture) in mathematics education.

**#6. Two inquiry-based consecutive mathematics lesson plans for the middle school. The first of these lessons will be implemented in our class (see #7 below) (2 x (10+5)) points for each lesson plan and Commentary: *Professional Collaboration, and Practice*. (30 points)**

For this assignment, you (either alone or with one partner) need to prepare two consecutive lesson plans, and a Commentary for each. These inquiry and problem-solving-based lesson plans may be adapted from Connected Mathematics or Mathematics in Context. You are teaching ONLY the first lesson plan in class. Both lesson plans and Commentaries are due the day you teach your lesson in class (please see assignment #7). Please make sure not to plan "Review" or "Practice" lessons.

These lesson plans need to follow the given lesson plan template (adapted from your textbook TLMG, and following the edTPA guidelines and specifications). Make sure that the lesson plans and Commentaries are typed separately. Each needs to be single-spaced with 1" margins on all sides, using Ariel font, with 11-point size. The following are additional edTPA specifications for each lesson plan: No more than 4 pages per lesson, label each lesson plan as lesson 1, or lesson2. The same applies for each Commentary.

The total possible grade for each lesson plan is 10 points, and the total possible grade for each lesson Commentary is 5 points. Each lesson plan will be evaluated according to the lesson planning evaluation rubric that you are given. These are aligned with the following NCTM CAEP Standards:

Standard 3 (Content Pedagogy), with 7 indicators

Standard 4 (Mathematical Learning Environment), with 5 indicators, and

Standard 6 (Professional Knowledge and Skills). With 2 indicators.

**#7. Instructional Implementation and Reflection of a non-routine, problem-solving, and an inquiry-based lesson plan (see #6 above: ) Professional Collaboration, Practice, and Reflection (30 points)**

These lesson implementations are expected to start the Week of \_\_\_\_\_

You are expected **to teach lesson 1** that you planned in #6 above, either individually or with a partner, in our class. This lesson needs to be related to the mathematics middle school curriculum. You need to consider the NCTM Principles and Standards, the CCSS-M Standards, and the Illinois Learning Standards throughout the implementation of your lesson. The duration of each lesson presentation is to be about 40 minutes. The criteria/rubrics to be used to assess your teaching will be given to you and will be discussed in class.

In your presentation, you are expected to use calculators, or other technologies, and manipulative materials. Again the mathematical content and teaching practices for your lesson implementation need to be consistent with the recommendations of the NCTM Principles and Standards (2000), the Common Core, and aligned with the Illinois Learning Standards

You are also expected to write a self evaluative short report about your teaching of the lesson. Guidelines are provided separately. This reflective Self-Evaluation of your teaching is due one week after you teach the lesson in class .

**#8. A Mid-Term and a Final Exam: (20 points)**

You will complete a mid-term and a final exam during the semester as scheduled. You will have access to manipulative materials that are available in the Mathematics Education Lab during the exams. The final exam will be comprehensive. You must take both exams at the scheduled times.

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**Note 1: NIU Student Conduct :**

Academic honesty and mutual respect (student with student and student with instructor) are expected in this course. Academic misconduct, as defined by the Student Judicial Code, will not be tolerated.

**Note 2: Qualified Students with Disabilities:**

NIU abides by Section 504 of the Rehabilitation act of 1973 which mandates reasonable accommodations be provided for qualified students with disabilities. If you have a disability and may require some type of instructional and/or examination accommodation, please contact me early in the semester so that I can provide or facilitate in providing the accommodation you may need. If you have not already done so, you will need to register with the **Disability Resource Center** (formerly ACCESS Center) on campus. The telephone number of the Disability Resource Center is 815-753-1303. This center provides services such as administering exams with accommodations for students with disabilities

**Note 3: General Classroom Etiquette:**

- Set your cell phone to vibrate during class and only use your cell phone when it is a true emergency.
- Phones, laptops, tablets, and other electronic devices can be used for in-class work, except when requested not to by the instructor (e.g., when asked to bring print copies; during exams and in-class reflections). This policy will be revoked for individuals who use phones, laptops, tablets, and other electronic devices for purposes outside the realm of course activities in MATH 410.
- No audio recording, taking photos or snapshots, or videotaping is allowed during class, except in cases of special accommodations documented by the NIU Disability Resource Center.
- Arrive on time, come prepared for class, stay to the end of class, and be in the classroom for the entire session, unless you have an emergency situation.
- Only students who are registered for this course should attend class sessions.
- Give your attention to the presenters during class, whoever they may be.
- Professional disposition is expected at all times.

**Note 4 : Changes and adjustments may be made in the syllabus when judged appropriate by the instructor. Such changes, should they occur, will be announced in class.**

**Note 5: Course Lab Fee:** A lab fee charged for enrollment in this course is used to replace and update materials pertaining to instruction of the course and research on instruction of the course.