

TD 5320 Mathematics Pedagogy and Curriculum in Elementary and Middle Grades (4 credits)
Summer 2018
Oakland University
School of Education and Human Services
Teacher Development and Educational Studies

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Class Schedule Tuesday/Thursday, 5:30 – 8:50 pm

Office Hours Tuesday/Thursday, 5:00 – 5:30 pm or by appointment

Catalog Description: This course “assists prospective teachers in developing sound pedagogical strategies and instructional techniques for teaching mathematics in the elementary and middle school.”

Readings: All required/optional readings will be made available online via Moodle (<https://moodle.oakland.edu>)

Michigan Certification Standards (MCS) for Elementary Teachers: Mathematics

Candidates demonstrate knowledge, understanding, and application of the major concepts, procedures, and reasoning processes in mathematics that define number systems and number sense, geometry, measurement, statistics and probability, and algebra in order to foster student understanding and use of patterns, quantities, and spatial relationships that can represent phenomena, solve problems, and manage data.

Candidates will know and demonstrate an understanding of how to teach:

- 1.3.1 Number sense and knowledge of development, multiple representations of numbers and number systems; concepts of number, number theory, and number systems;
- 1.3.2 Numerical computation; use of four basic operations (addition, subtraction, multiplication, and division) in multiple contexts; modeling, explanation, and development of a variety of computational algorithms;
- 1.3.3 Estimation strategies to quantities, measurements, and computation to determine the reasonableness of results;
- 1.3.4 Measurable attributes of objects and the units (non-standard and standard), systems (customary and metric), and process of measurement; application of appropriate techniques, tools, and formulas to determine measurements of two- and three-dimensional objects;
- 1.3.5 Major concepts of Euclidean geometry from a variety of perspectives, including coordinate and transformational;
- 1.3.6 Question formulation that can be addressed with data; collection, organization, display, and interpretation of relevant data; selection and use of appropriate statistical methods, descriptive and inferential, to analyze data, make predictions, and make decisions;
- 1.3.7 Basic concepts of probability; interpretation of probability in real-world situations, construction of sample spaces; modeling and comparing experimental probabilities with mathematical expectations; using probability to make predictions;
- 1.3.8 Patterns, relations, and functions; understand and apply concepts of variable and function; represent and analyze mathematical situations and structures using algebraic symbols; model and solve contextualized problems using various representations, such as graphs, tables, and equations;
- 1.3.9 Knowledge of historical development of mathematics that includes the contributions of underrepresented groups and diverse cultures; and
- 1.3.10 Axiomatic systems and proofs in different branches of mathematics, such as algebra and geometry; describe and

represent mathematical relationships; use mathematical modeling to solve real-world problems.

InTASC (Interstate Teacher Assessment and Support Consortium) Standards

(http://www.ccsso.org/Documents/2013/2013_INTASC_Learning_Progressions_for_Teachers.pdf)

* *The standards listed below are the focus in this course. But the remaining standards are also integrated into the course.*

- Standard #4 Content Knowledge: The teacher understands the central concepts, tools of inquiry, and structures of the discipline(s) he or she teaches and creates learning experiences that make these aspects of the discipline accessible and meaningful for learners to assure mastery of the content.
- Standard #6 Assessment: The teacher understands and uses multiple methods of assessment to engage learners in their own growth, to monitor learner progress, and to guide the teacher's and learner's decision making.
- Standard #7 Planning for Instruction: The teacher plans instruction that supports every student in meeting rigorous learning goals by drawing upon knowledge of content areas, curriculum, cross-disciplinary skills, and pedagogy, as well as knowledge of learners and the community context.
- Standard #8 Instructional Strategies: The teacher understands and uses a variety of instructional strategies to encourage learners to develop deep understanding of content areas and their connections, and to build skills to apply knowledge in meaningful ways.
- Standard #9 Professional Learning and Ethical Practice: The teacher engages in ongoing professional learning and uses evidence to continually evaluate his/her practice, particularly the effects of his/her choices and actions on others (learners, families, other professionals, and the community), and adapts practice to meet the needs of each learner.

High-Leverage Teaching Practices (<http://www.teachingworks.org/work-of-teaching/high-leverage-practices>)

* *The practices listed below are the focus in this course. But the remaining practices are also integrated into the course.*

- HLP #2 Explaining and modeling content, practices, and strategies
- HLP #3 Eliciting and Interpreting Individual Students' Thinking
- HLP #4 Diagnosing particular common patterns of student thinking and development in a subject-matter domain
- HLP #17 Interpreting the results of student work, including routine assignments, quizzes, tests, projects, and standardized assessments

TD 5320 Course Outcomes:

TD 5320 is one of the required courses in Oakland University's Elementary Education Program. Upon completion of the program, teacher candidates should demonstrate the ability to:

- 1) Explain and model the key concepts and skills of mathematics appropriate to K-8 mathematics curriculum [MCS 1.3.1 ~ 1.3.10; INTASC 4; HLP 2].
- 2) Identify current trends in mathematics education policy, goals, and standards [InTASC 7].
- 3) Design mathematics lessons that address content/practice standards and adaptations in order to be responsive to the needs, values, and a diverse group of students [InTASC 4, 7, 8; HLP 4].
- 4) Elicit and interpret students' mathematical thinking and plan appropriate instruction [InTASC 6, 7, 9; HLP 3, 17].
- 5) Utilize assessment strategies to monitor the development of mathematical concepts and skills [InTASC 6, 7, 9; HLP 3, 4, 17].

Field Experience:

You will need to make an arrangement to work with a fourth grade student outside of class time for a 30-minute Math Assessment Interview. If you cannot make this arrangement, please contact your instructor for arrangements.

Methods of Instruction

Throughout the semester several modes of instruction will be used by the instructor. The variety of modes are meant to provide a model for students enrolled in TD 5320 that can be used or adapted for use in K-8 grade classrooms with varying degrees of effectiveness; however, the modes of instruction presented are not meant to be inclusive of all effective modes. In TD 5320

students will participate in lectures, large group discussions, small group discussions, deductive inquiry and problem solving, cooperative learning groups, supervised field work, micro- and peer-teaching, critical reviews and performance tasks.

Course Assignments and Assessment

*** Detailed directions, resources, submission forms, and rubrics are in Moodle. [See "Assignments" section in Moodle].**

1. Exams (100 points): Performance Demonstrations/ Exam #1 (50 pts) & Exam #2 (50 pts):

You will take exams with one of your classmates or alone. It is your choice. You should make your final decision and sign the partner exam contract by Class #3. It is important for you to learn new terminology; however, tests and questions will primarily cover concepts and ideas rather than memorized facts. A variety of short answer, picture drawings, essay questions and performance tasks will be included on tests covering all readings and lab work. Notes will **not** be used. You must meet and study with your exam partner outside of class if you choose to take exams with your partner. Opportunities will be provided to use the lab and its materials. If you miss an entire class period without making it up, your exam partner may opt to join another group for the exam. You may be asked to take alone. [MCS 1.3.1 ~1.3.10; InTASC 4, 8; HLP 2]

2. Class Participation/Weekly Quizzes (65 points)

As a future teacher, I expect you to exhibit a desire to learn and be an active participant in the learning process. This course is not a lecture class. Your participation in each class session is very important. Everyone needs to ask questions and share experiences. For maximum credit, class contributions must show evidence of intense participation. For both large and small group discussion/work, you need to show: (a) the ability to link assigned reading to discussion and relate relevant ideas, (b) the best effort to create an atmosphere conducive to learning. Several short quiz scores will be included in the class participation points for some selected sessions. After each session, you must submit your self-evaluation using participation slip. [MCS 1.3.1 ~1.3.10; InTASC 9]

** Note: Please follow the procedures listed below in case of absence:*

(a) Provide a courtesy email so that your group members or exam partners can be prepared accordingly.

(b) You may earn partial credits (up to 2 points, no self-evaluation allowed) only if you provide a detailed summary of the class content you missed prior to the next class meeting (Limit one chance per semester).

(c) Refer to the partner exam policy/contract.

3. Lab Assistant (15 points)

Each week a small group will serve as lab assistants. The rubric indicates your duties (see Moodle). You must self-evaluate your performance using the rubric and submit to me after you complete your duties. [MCS 1.3.1 ~ 1.3.10; InTASC 8]

4. Online Agenda Assignments (50 points)

There is two asynchronous online sessions. For each session, an agenda describing the assignments will be posted on Moodle. The agenda is comprised of activities that will serve as a foundation for the major course assignments. I expect that it will take approximately the same time to complete as a set of on-campus session activities (approximately 3.5 hours). You are expected to complete the agenda by next class meeting. The agenda will have a variety of formats including: readings, exploring and evaluating online teaching resources, observing and using materials with K-8 students, posting answers to questions, and participating in the online discussion. The completion of each assignment will be documented using a variety of Moodle tools (e.g., WebEx recorded lectures, WebEx live meetings, Assignment Module, Discussion Forum, Chat, Quiz, Survey). [MCS 1.3.1 ~1.3.10; InTASC 4, 7, 8]

5. Assessment Packet (100 points): [Multi-phase assignment – see Moodle assignment section for directions and requirements for each phase] [MCS 1.3.1, 1.3.2; InTASC 4, 6, 7, 8, 9; HLP 3, 4, 17]

IMPORTANT NOTES:

- This assignment has multiple phases. You are required to submit/bring work-in-progress (e.g., draft) by the scheduled date in each phase for feedback. Failure to submit/bring your work-in-progress in each phase will result in the loss of 10 percent of the total points for the assignment.
- For the last phase of this assignment (student interview), each of you will work with a fourth grade student. You are representing yourself as a qualified pre-professional who has worked diligently to prepare herself/himself to effectively teach mathematics to children. You should be a professional in actions, dress, behavior, language, and demeanor. You are also representing Oakland University. If there is evidence that you have not adequately prepared for this assignment, or do not appear to be ready to work with children and assume the associated responsibilities, then you will not be allowed to

complete the implementation portion of the assignments. This decision will be rendered by a week prior to the school visit. Examples of evidence include, but are not limited to, limitations in participation/attendance, late assignment submissions, poorly developed assignments, or inadequate preparation such as not having all required materials on the scheduled day. For cases when the instructor indicates you are not prepared for this teaching assignment, attendance at the course sessions is still required and your course grade will be based on the percentage earned by assignments submitted.

- Photos, videos or other media: You are required to upload a sample video clip of your actual interview session to Moodle. Please follow the protocol for video-recording provided in Moodle.
- 1) **Math Assessment Development: Initial Draft (20 points):** You are to design a student assessment interview that is appropriate for a 4th grade student related to fractions. You are not allowed to use existing assessment items without modifications. The purpose of this assignment is to provide you an opportunity to identify key concepts and skills for a particular topic and to design student assessment interview questions for your students. You must know how to assess your students' knowledge of mathematics concepts to design effective instruction.
 - 2) **Peer Group Collaboration (10 points):** You will conduct a mock interview in class (Peer Group Collaboration Session) and get feedback from your group members. You will then modify your assessment items for final submission. You need to bring the first draft of teacher version and student version of assessment to the peer group collaboration session, and need to conduct mock assessment interviews and share feedback in class.
 - 3) **Math Assessment Development: Revised/Final Draft (40 points):** Submit your final/revised math assessment prior to administering the assessment interview with an elementary student. Make sure that you fully incorporate the feedback you received from the instructor and peers in your final draft.
 - 4) **Student Interview and Analysis/Reflection Report (30 points):** Conduct the assessment interview with a student. Document the interview based on the recording or notes taken during the interview session. Document the student's work. Analyze and assess the student's mathematical understanding based on the rubric you developed. Include summaries of at least two resources to be used for your intervention plan.

6. Lesson Design (50 points) [InTASC 4, 7, 8]

- 1) **Thinking Through a Lesson Protocol (30 points):** Working in small groups, you will select *a fraction-related lesson* and modify it using Thinking Through a Lesson Protocol (TTLP). Although the structural components of a lesson are important, a focus on structural components alone is not sufficient to ensure that students learn mathematics. The main purpose of the TTLP is to prompt you in thinking deeply about a specific lesson. This emphasizes a focus on students' mathematical thinking alongside the actions you will take to prompt such thinking.

Although you are working in small groups, this is an independent assignment. First, review the Fraction Progression Module in Online Session #1. Second, decide which grade level lesson you will choose. In one small group, there should be an equal distribution of grade levels (e.g., In a group of three people, each person selects 3rd, 4th, and 5th grade-level lesson respectively). Please avoid lessons for review/practice. TTLP will be discussed in detail during class [course knowledge base: a, b, c, d, e, f, g, h, i, j, m, n, o]

- 2) **Lesson Launch Demonstration (20 points):** Meet with small group members and demonstrate your lesson launch that is thought out in advance and noted in your TTLP. Report your reflection using the provided form.

7. LessonSketch Slides (20 points) [InTASC 7, 8]

You will depict the instruction and/or classroom environment using LessonSketch tool (lessonsketch.org) that explicitly incorporates the idea of *Equitable Mathematics Instruction*. "Access and Equity" is one of guiding principles for school mathematics (NCTM, 2014). The purpose of this assignment is to provide you with the opportunities to examine this principle and think about how applicable this principle is in your classroom. You will produce a minimum of 5 slides and 1 paragraph of explanation about your depiction. See the *Assignment* section in Moodle for more detailed directions.

Grading Standards:

TD 5320 will be graded using the University's 32-point scale, 1.0-4.0. Your earned total points (400 possible) will determine your grade in this class. Students who complete each assignment should not assume that full credit will be given. The quality of the assignments will be considered (e.g., well-organized and neat presentation, correct citation format, spelling, grammar, meeting deadlines, and degree of insight displayed in the completed assignment will be considered in the evaluation of each assignment). The purpose of evaluation of tests, outside assignments (daily work), fieldwork, and class participation is to provide a well-rounded

picture of each student's potential for becoming a member of the teaching profession. Higher final grades should reflect students who hold the potential to become model members of the mathematics teaching profession.

Grading Scale:

4.0 (100 – 98.60 %)	3.3 (86.59 – 84.60 %)	2.3 (73.59 – 72.60 %)	1.3 (63.59 – 62.60 %)
3.9 (98.59 – 96.60 %)	3.2 (84.59 – 82.60 %)	2.2 (72.59 – 71.60 %)	1.2 (62.59 – 61.60 %)
3.8 (96.59 – 94.60 %)	3.1 (82.59 – 80.60 %)	2.1 (71.59 – 70.60 %)	1.1 (61.59 – 60.60 %)
3.7 (94.59 – 92.60 %)	3.0 (80.59 – 79.60 %)	2.0 (70.59 – 69.60 %)	1.0 (60.59 – 59.60 %)
3.6 (92.59 – 90.60 %)	2.9 (79.59 – 78.60 %)	1.9 (69.59 – 68.60 %)	
3.5 (90.59 – 88.60 %)	2.8 (78.59 – 77.60 %)	1.8 (68.59 – 67.60 %)	
3.4 (88.59 – 86.60 %)			
	2.7 (77.59 – 76.60 %)	1.7 (67.59 – 66.60 %)	
	2.6 (76.59 – 75.60 %)	1.6 (66.59 – 65.60 %)	
	2.5 (75.59 – 74.60 %)	1.5 (65.59 – 64.60 %)	
	2.4 (74.59 – 73.60 %)	1.4 (64.59 – 63.60 %)	

Course Policy

- 1) Academic Integrity: Cheating and plagiarism are considered serious infractions at Oakland University as delineated in the Oakland University Catalog. In your assignments, any material or another person's ideas must be documented and should be cited under a separate section. All allegations of academic misconduct will be reported to the Dean of Students and, thereafter, to the Academic Conduct Committee for adjudication. Anyone found guilty of cheating in this course will receive a course grade of 0.0, in addition to any penalty assigned by the Academic Conduct Committee.
- 2) Late Policy: Late (after the class starting time of day due) assignments will be scored in the following manner:
Up to one session late: score x 90% Up to two sessions late: score x 80%
Assignments more than two sessions late will not be accepted unless special arrangements have been made and approved prior to the due date.
- 3) Concerns Report Policy: A formal report will be filed when there is a concern about professional competency, professional responsibilities, and professional relationships.
- 4) Attendance Policy: Students who have three unexcused absences will automatically receive a concern report that will be submitted to the Faculty/Student Concerns Committee.
- 5) All written requirements of this course must be type-written. Submission format should be in size 12 font, Times New Roman, single-spaced. Use one blank line between paragraphs with no paragraph indentation. Under no circumstances will hand-written work be accepted unless specifically stated in the syllabus or by the instructor.
- 6) You must have access to the *Publication Manual of the American Psychological Association* (6th ed.). Washington, D.C.: American Psychological Association. Writing style and bibliographic citations must follow the guidelines presented in the manual.
- 7) Electronic Interruptions: Electronic devices (laptops, phones) are to be used only for course-related activities in class except in case of an emergency. If an emergency does arise, please be sure to discuss this with the instructor.
- 8) Appointments: You are welcome to visit my office for extra help or additional information. If I am not in my office, please leave your message on my answering machine or send an email to set up an appointment. In case you cannot show up for an appointment, notify your instructor immediately.
- 9) Accommodation: Faculty in the School of Education will make every effort to accommodate unique and special needs of students with respect to speech, hearing, vision, seating, or other possible disabling conditions. Please notify the instructor as soon as possible of requested accommodations and ways to help.
- 10) Email Response: Course instructor will respond to students' emails within 24 hours on weekdays and 48 hours on the weekend.
- 11) Online Activities/ Online Submission:
 - Use an Internet connected computer with the most updated versions of your favorite web browser installed. *Use of smartphones and tablets is not recommended.*
 - In the event that your computer crashes or Internet goes down, it is essential to have a backup plan to be able to log in from another computer or another location as needed.
 - For the problems with logging in, maneuvering the course, or posting work, first check to see if it is a technical problem by communicating the problem through "Moodle Help" as described above, or call the e-Learning and Instructional Support Office at (248) 805-1625 during business hours or submit a help ticket: <http://www2.oakland.edu/elis/help.cfm?lms=2>.
 - For questions or concerns related to course content, email the course instructor.

- For online sessions, the agenda will be posted in advance. You have opportunities to share helpful information or questions via the Teachers' Lounge Forum. Before beginning the online activities, go through the agenda and read all instructions well before you get started.
- Write all of your assignments in a Word or other word processing program file and copy and paste it in discussion or assignment posting or attach the file for assignment submission. This prevents loss of work when weather or problems with the system temporarily freezes up the OU system or Moodle.

* **Course Evaluation:** Please complete your course evaluation by the last day of class (<http://www.oakland.edu/evals>).

Assessment Record

Exam #1	50 points	
Exam #2	50 points	
Online Sessions	50 points	
Math Assessment Packet	100 points	
Lesson Design	50 points	
Lesson <i>Sketch</i> Slides	20 points	
Lab Assistant	15 points	
Class Participation & Weekly Quizzes	65 points	
Total	400 points	

Major Topics and Tentative Course Schedule

Tuesday/Thursday 5:30 – 8:50 pm

Notes:

1. The following course schedule and assignments due dates are subject to change. It is your responsibility to check Moodle and/or emails for corrections or updates to the syllabus. Any changes will be posted in Moodle and/or through email.
2. All reading will be available online via Moodle. Read all materials prior to class.

Week#/Date	Topics	Assignment Due
#1: 7/3 (T)	Course Introduction Teaching Practice Standards: CCSS Content & Practice Standards NCTM Principles to Actions (8 mathematical practices) InTASC Standards High-Leverage Practices Measurement Clinical Interview Rehearsal	<ul style="list-style-type: none"> • Weekly Quiz • Readings
#2: 7/5 (TH)	<u>Online Session #1 (See Moodle for Agenda)</u> Virtual Manipulatives Exploration Review of CCSS/Principles to Actions Course Assignment Preparation HLPs Preview Explore: Assessment Items Review: Fractions Progression Modules	
#3: 7/10 (T)	Fantasy Land (Place Value/ Base System) Time & Money Addition & Subtraction (Models) Fact Families/Basic Facts	<ul style="list-style-type: none"> • Weekly Quiz • Readings/Essential Questions • Readings • List of Exam Partners • Online Session #1 Assignments (40 points)
#4: 7/12 (TH)	Addition & Subtraction (Algorithms) Decimal Lab Fraction Lab 1 (Egg Cartons, Fraction Circles, Pattern Blocks, Tangrams) Basic Geometry Concepts	<ul style="list-style-type: none"> • Weekly Quiz • Readings/Essential Questions
#5: 7/17 (T)	HLP: Eliciting and Interpreting Student Thinking <u>Exam #1 (50 points)</u>	<ul style="list-style-type: none"> • Math Assessment Development Initial Draft (20 points) • Part 1 of Exam #1
#6: 7/19 (TH)	** Flipped Classroom: Need to watch WebEx lecture prior to class ** Sphere Lab Fraction Lab 2 (Fraction Bars) Video: Weird Numbers Multiplication & Division Models <u>Debriefing: Math Assessment Development Initial Draft</u>	<ul style="list-style-type: none"> • Weekly Quiz • Readings/Essential Questions
#7: 7/24 (T)	Multiplication & Division (Algorithms) Metric (2D) Integers: Operations	<ul style="list-style-type: none"> • Weekly Quiz • Readings/Essential Questions

	Concrete Binomials – FOIL(?)	<ul style="list-style-type: none"> Lesson Design: TTLP (30 points)
#8: 7/26 (TH)	<u>Peer Group Collaboration: Mock Assessment Interview</u> <u>Lesson Design: Lesson Launch Demonstrations</u>	<ul style="list-style-type: none"> Weekly Quiz Materials for Peer Group Collaboration (10 points)
#9: 7/31 (T)	<u>Field Work (Math Assessment Interview)</u>	<ul style="list-style-type: none"> Math Assessment Development Final Draft (40 points)
#10: 8/2 (TH)	<u>Field Work (Math Assessment Interview)</u>	<ul style="list-style-type: none"> Lesson Design: Lesson Launch Demo Reflection (20 points)
#11: 8/7 (T)	Algebraic Ideas and Algebra Spatial Sense Metrics Volume 3D Metrics 1 st , 2 nd , 3 rd Dimensional Relationships Probability Games	
#12: 8/9 (TH)	HLP: Explaining and modeling content, practices, and strategies <u>Exam #2 (50 points)</u>	<ul style="list-style-type: none"> Part 1 of Exam #2
#13 8/14 (T)	<u>Online Session #2 (See Moodle for agenda)</u> PtA: Application to Practice Research into Practice Exploration of Fraction Models	
#14 8/16 (TH)	<u>Presentations (LessonSketch)</u> <u>Danielson Framework</u> Course Evaluation http://www.oakland.edu/evals	<ul style="list-style-type: none"> Online Session #2 Assignments (10 points) LessonSketch Slides (20 points) Assessment Packet: Student Interview Analysis/Reflection Report (30 points)
#15 (Final Exam week)	Assignment Pick-up Individual Meetings	

Selected Resources

Common Core State Standards for Mathematics: <http://www.corestandards.org/Math>

High Leverage Teaching Practices: <http://www.teachingworks.org/work-of-teaching/high-leverage-practices>

Illustrative Mathematics: <http://www.illustrativemathematics.org/>

Interstate Teacher Assessment and Support Consortium (InTASC):

http://www.ccsso.org/Documents/2013/2013_INTASC_Learning_Progressions_for_Teachers.pdf

LessonSketch: lessonsketch.org

National Council of Teachers of Mathematics. (2014). *Principles to actions: Ensuring mathematical success for all*. Reston, VA: Author

PARCC - Partnership for Assessment of Readiness for College and Careers: <http://www.parcconline.org>

Smarter Balanced Assessment Consortium: <http://www.smarterbalanced.org>