EDUC 510U: Concepts and Methods in Elementary Math[1]
Summer 2022: 3 credit hours

This course is the first in a two course elementary math methods sequence. Both courses offer an in-depth examination of fundamental mathematical concepts and subject-specific pedagogy while emphasizing and integrating state and national standards, problem-solving approaches, use of manipulatives and technology, current research, and learning theory.

In terms of content:
- 310/310U/510U focuses on whole numbers and their operations, algebraic thinking in the early grades (patterns and classification), measurement, probability, and statistics.
- 311/311U/511U focuses on rational numbers and their operations, algebraic thinking in the later grades (variables, functions, order of operations), and geometry.

In terms of pedagogy:
- 310/310U/510U focuses on the pedagogy of guided math, math discourse, and the standards of mathematical practice.
- 311/311U/511U focuses on the pedagogy of differentiation and collaborative teaching strategies. It includes a supervised practical experience using a Response to Intervention (RTI) approach that emphasizes using data to make decisions based upon students' needs, monitor progress, and develop individualized mathematical interventions.

General Course Information
CRN: 30760
Class Sessions: Tuesday/Thursday, 4:20-6:50 pm   *Location:*   Fountain Hall, G13

Instructor Information
Instructor: Dr. Patricia Stohr-Hunt   *Email:*   pstohrhu@richmond.edu
Office: Fountain Hall, G36   *Telephone:*   (804) 289-8432 (office)
Office Hours: Monday-Thursday, 3:00-4:00 pm   (804) 690-2696 (cell)
          Other hours by appointment. Meetings can be in person or on Zoom.

Course Materials
The following textbook is required for class.
     Small, M. (2019). *Understanding the math we teach and how to teach it K-8*. Stenhouse.

You will be keeping a visual and problem-solving notebook for the semester. You will need a notebook that is 100-120 pages, at least 8 x 10 inches with a soft cover and binding (no spiral binding), and plain pages with no lines or grids (unruled).

The course **blog** contains assignment guidelines, class slides, and more.
https://blog.richmond.edu/elemmath/

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[1] **Copyright Information** - The materials provided by the instructor in this course are for the use of the students enrolled in the course. Copyrighted course materials may not be further disseminated. Selling or distributing course materials may violate the Honor Code at the University of Richmond. Learn more about copyright law and restrictions at:
http://libguides.richmond.edu/copyright

Additional instructional resources can be found on the course **Google site**.
https://sites.google.com/site/urelemmath/

Introduction
You cannot teach what you do not know. There is a large body of evidence from which educational researchers have concluded that the quality of teacher subject matter knowledge directly affects student learning. Nowhere is this more apparent than in the teaching of mathematics. We also know that "a teacher's subject matter knowledge of school mathematics is a product of the interaction between mathematical competence and concern about teaching and learning mathematics (Ma, 1999)." As a result, this course is focused on developing your mathematical competence so that you will not only **know** the mathematics you will teach one day, but also feel utterly **confident** in discussing and explaining it.

**Note – In order to distinguish between you (college students) and the children you will one day teach (elementary students), you will be hereafter referred to in this syllabus as <u>candidates</u>.

Goals/Competencies
This course is designed to help teacher candidates develop the fundamental knowledge and skills necessary for the effective teaching of elementary school mathematics. To do so, they must understand the following principles:

- **Basic Ideas**. Elementary math consists of basic ideas that recur throughout the curriculum, creating a solid foundation on which to build future math learning.
- **Multiple Perspectives**. Mathematics can be taught and understood in a variety of ways. Candidates who develop multiple perspectives on each basic math topic will have complete knowledge of those topics.
- **Connectedness**. Candidates must make connections among mathematical concepts and procedures. When reflected in teaching, these connections will result in students' learning a unified body of knowledge instead of a series of isolated topics.
- **Longitudinal Coherence**. Candidates must demonstrate a fundamental understanding of the entire elementary mathematics curriculum. Candidates who can do so will not only be prepared to review and reinforce important concepts that students have studied previously, but will also be well positioned to lay a proper foundation for what those students will be learning in the future.

The goals of this course are further focused on ensuring candidates develop their skills and abilities in the licensure competencies outlined below.
- The ability to integrate English, mathematics, science, health, history and social sciences, art, music, drama, movement, and technology in learning experiences.
- The use of differentiated instruction and flexible groupings to meet the needs of learners at different stages of development, abilities, and achievement.
- The use of appropriate methods, including those in visual and performing arts, to help learners develop knowledge and basic skills, sustain intellectual curiosity, and problem-solve.
- The ability to modify and manage learning environments and experiences to meet the individual needs of children, including children with disabilities, gifted children, children who are English learners, and children with diverse cultural needs.
- The ability to use formal and informal assessments to diagnose needs, plan and modify instruction, and record student progress.

- The ability to analyze, evaluate, and apply quantitative and qualitative research.
- The ability to adapt task and interactions to maximize language development, conceptual understanding, and skill competence within each child's zone of proximal development.
- Understanding of the *Virginia Standards of Learning for Digital Learning Integration* and the ability to use technology as a tool for teaching, learning, research, and communication;
- Be proficient in strategies to increase vocabulary and concept development;
- Demonstrate the ability to develop comprehension skills in all content areas;
- Understanding of the mathematics relevant to the content identified in *Virginia's Early Learning and Development Standards (ELDS), Birth-Five Learning Guidelines* and the *Virginia Standards of Learning* and how the standards provide the foundation for teaching mathematics in grades preK-6. Experiences with practical applications and the use of appropriate technology and concrete materials should be used within the following content:
  (a) Number systems and their structure, basic operations, and properties;
  (b) Elementary number theory, ratio, proportion, and percent;
  (c) Algebra: fundamental idea of equality; operations with monomials and polynomials; algebraic fractions; linear and quadratic equations and inequalities and linear systems of equations and inequalities; radicals and exponents; arithmetic and geometric sequences and series; algebraic and trigonometric functions; and transformations among graphical, tabular, and symbolic forms of functions;
  (d) Geometry: geometric figures, their properties, relationships, and the Pythagorean Theorem; deductive and inductive reasoning; perimeter, area, and surface area of two-dimensional and three-dimensional figures; coordinate and transformational geometry; and constructions; and
  (e) Probability and statistics: permutations and combinations; experimental and theoretical probability; data collection and graphical representations including box-and-whisker plots; data analysis and interpretation for predictions; measures of center, spread of data, variability, range, and normal distribution.
- Understanding of the sequential nature of mathematics and vertical progression of mathematical standards.
- Understanding of the multiple representations of mathematical concepts and procedures.
- Understanding of and the ability to use the five processes – reasoning mathematically, solving problems, communicating mathematics effectively, making mathematical connections, and using mathematical models and representations – at different levels of complexity.
- Understanding of the contributions of different cultures toward the development of mathematics and the role of mathematics in culture and society.
- Understanding of the appropriate use of calculators and technology in the teaching and learning of mathematics, including virtual manipulatives.
- Understanding of and the ability to use strategies to teach mathematics to diverse learners.

Pedagogical Framework
This course will focus on in-depth discussions of mathematical concepts guided by the following questions:
- What is the mathematical concept?
- What are the difficult points of teaching the concept?
- What are the important points of teaching the concept?
- What are the errors and confusions that students tend to have when learning this concept?
- What are the solutions for these pedagogical problems?

In discussing solutions for pedagogical problems, class sessions will revolve around small-group work and hands-on activities.

To be successful in this course, you should expect to spend *an average of 10-14 hours each week* preparing for class, participating in class sessions, studying course-related materials, and completing assignments and projects.

Technology

Technology is an important tool in this course. It is used for communication, collaboration, delivery of instruction, and development of assignments. Course resources are made available and files are exchanged using UR blogs, Google Drive, and email.

This course addresses the CAEP Cross-Cutting Theme of Technology by offering candidates multiple technology-based tools to effectively engage P-12 learners. In studying course materials and completing assignments, it is expected that candidates will develop proficiencies in applications of digital media and technological capabilities. Skills developed in this class include:
- Accessing and integrating digital content and technology tools for P-12 students' learning
- Critically evaluating the quality and relevance of digital academic content
- Designing and incorporating online learning experiences into instructional plans
- Using online tools for formative and summative assessment

Professional Growth Portfolio

For the professional growth portfolio that you will complete during the Pre-Internship Workshop, you will be required to submit artifacts of your graded assignments from the pedagogy courses you have taken. It is important to save assignments from each of your courses to have a selection from which to choose what will be included in your professional growth portfolio.

Professionalism

As a part of your preparation for becoming a teacher, you are expected to meet the professional standards outlined below and in the Professional Behaviors and Dispositions form.
In this course, you are expected to:
- Approach each class session and your work with curiosity, flexibility, patience, and care.
- Show respect for others.
- Arrive on time and participate fully in every class session.
- Contribute to class discussions in both small and whole group settings, ask questions, and actively engage with your classmates.
- Know due dates for work and turn assignments in on time.
- Communicate your needs, questions, and concerns to your instructor in a timely manner.

Attendance

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It is the position of the university that students are expected to attend all meetings of all classes in which they are enrolled. Regulations governing licensure for school personnel and education programs in Virginia determine much of what we teach. Upon completion of the teacher education program, we certify to the Virginia Department of Education that each candidate seeking licensure has met the required competencies for their endorsement area. Because of the sheer quantity of skills and knowledge required for licensure, we not only teach a breadth of concepts and topics in class but also

model different instructional strategies. When candidates are not in class, it is impossible to determine whether they adequately have mastered the objectives for that session. Further, when candidates miss class, they not only deprive themselves of a learning opportunity, but they also deprive their future students of a completely prepared teacher. Consequently, attendance at every class session is critical and required.

Absences due to illness or University-required quarantine are excused absences and will not be penalized. If you are sick, you should not attend class and will not be required to provide formal documentation from a healthcare provider. In the event of excused absences, we will support your efforts to maintain progress toward the course goals/competencies. This includes allowances for make-up work or delayed work.

Absences for Religious Observances and Holidays
The University is a secular institution that values a diversity of religious expression. Any student may be excused from class or other assignments because of religious observance. A student who will miss an academic obligation because of religious observance is responsible for contacting his or her professor within the first two weeks of the semester. The student is responsible for completing missed work in a timely manner. The entire religious observance policy may be found at:
http://registrar.richmond.edu/services/policies/religiousobsv.html

Student Athletes
If you are a current UR student-athlete and will need to miss one or more class sessions due to athletics, please share your official letter (listing all dates of absences) with your instructor within the first two weeks of the semester so we may develop a plan for the missed class sessions and work.

Student Support
Accommodations for a Disability/Disabilities
The University of Richmond is committed to a culture of inclusivity and strives to ensure that members of our campus community with disabilities have the opportunity for full participation and equal access to campus resources. Students with disabilities must apply for accommodations through the Office of Disability Services as soon as possible. The main purpose of the Office of Disability Services is to make sure students with disabilities have the same chance for success (defined as average performance or better) as students who do not have disabilities. The following link provides information and required forms: http://studentdevelopment.richmond.edu/disability-services/index.html
If you have a documented disability through the Office of Disability Services and need any specific accommodations, please email your instructor within the first two weeks of the semester so that we may schedule a private meeting to discuss further.

Additional Academic and Personal Support Services
Attached to this syllabus is a page that describes the services available from a range of units on campus. If you have difficulties this semester, either academic or personal, please don't hesitate to take advantage of the resources available.

Course Work
Honor Code
It is expected that all candidates will adhere to the honor system. Unless otherwise instructed, all work in this course should be completed independently. Any collaborative exercises will be clearly explained and defined. Assignments require the written pledge of adherence to the honor code, stated as follows:
> *"I pledge that I have neither given nor received unauthorized assistance during the completion of this work."*

Note - Even though most work will be submitted electronically, you must still pledge your assignments.

Preparing Assignments
All written work must be completed electronically and should meet the high-quality standards expected of a career teacher. Present your assignments as you would if they were to be reviewed by a future administrator, member of the school board, or parents of prospective students.

Please use the **Seventh Edition of the APA Manual** as the guide for writing and referencing your work. For help with citation formats, see the following resources:
> APA Style Blog: https://blog.apastyle.org/
> Purdue OWL APA Formatting and Style Guide:
> https://owl.purdue.edu/owl/research_and_citation/apa_style/apa_formatting_and_style_guide/general_format.html

Deadlines
All assignments for this course are outlined in the syllabus and presented on the first day of class. Candidates are expected to plan and work ahead so that assignments will be turned in on time. Late assignments will be accepted, but they generally will not receive full credit for the work.

All coursework must be completed in full on or before the last day of class. A grade of incomplete (Y or I) will be given only if a candidate has met with the instructor and is making regular and reasonable progress toward mastering the appropriate criteria for a grade AND if advance arrangements have been made for completing the course requirements within a specified period of time.

Revisions
In teaching this course, my goal is to help you move beyond basic comprehension of the ideas and strategies presented to a deeper understanding of the topics. We will provide you with many opportunities to practice new skills and offer regular feedback on your performance until those skills become automatic and habitual. Such understanding typically requires continuous interaction with the ideas and strategies in a manner that allows you to be reflective and self-critical of your work while presenting you with the option to revise and make changes to this work before receiving a final grade.

Assignments

Candidates will complete the following assignments designed to develop and demonstrate basic competencies in the planning and design of elementary mathematics instruction. Please see the course map that follows for specific information on due dates.

How To Learn Math for Students

Candidates will complete this short, online course prior to, or during the first week of the semester. It is designed to support learners of math in the areas of: (1) building a positive relationship with mathematics; (2) teaching students to develop a growth mindset; (3) learning powerful mathematics strategies; and (4) seeing mathematics as a living subject, important to their lives. Candidates will be required to submit a screenshot as proof of completion.

Visual Notebook

Drawing is a powerful tool that boosts learning and improves recall by challenging learners to explore an idea in different ways. Visual notetaking is the process of representing ideas non-linguistically. Visual notetaking can include concept mapping, but also more artistic ways of visually capturing and representing ideas. Candidates will keep a visual notebook that highlights their understanding of the mathematics content and pedagogy described in course readings, videos, class sessions, blog posts, and daily life. Notebooks must be brought to class each session and will be shared in small groups. See **Visual Notebook Guidelines** for more information.

Problem Solving Activities

Candidates will be introduced to a novel problem each class that they will study and solve. Candidates will consider and reflect on their own and others' understandings and solution strategies, the specific ideas/content the problems might help to develop in children, how the problems might be used in instruction, and how the problems might contribute to students' growth in mathematical understanding. At the end of the semester, candidates will write a final reflection in which they describe their position on using problem solving activities in math instruction and offer strategies for doing so.

Unit Plan

Candidates will unpack the standards for a unit of instruction for any topic in K-6 math. They will outline the progression of instruction, plan daily lessons, develop all formative and summative assessments (to include performance assessments), and provide additional resources for instruction. In completing this semester-long project, candidates will turn in components of the unit plan along the way. For more information about the requirements and scope of this project, see the **Unit Plan Guidelines**.

Grading
The assignments you will do for class are a series of performance assessments designed to allow you to demonstrate your mastery of the course objectives. The grade you receive is NOT a measure of how long these assignments take nor how hard they are perceived to be. The products and performances used for grading are not measures of labor but rather measures of learning. Much of the work you do is focused on learning and practicing specific skills. During these activities, you should feel that it's okay to struggle, or even fail. That is part of the learning process. If everything you do is collected and given a grade, you won't have the time or space you need to really learn. This means that not every assignment will receive a grade, though every assignment will receive feedback. Feedback is necessary so that you can track your progress and adjust what and how you are learning as you work toward mastery of course goals. Remember, your focus needs to be on learning and NOT the accumulation of points.

When assignments are scored, points will be allocated in the following manner.

Assignment	Point Value
How To Learn Math for Students	20 pts
Visual Notebook	50 pts
Problem Solving Activities	30 pts
Unit Plan	50 pts
Total Points Possible	150 pts

Your final grade will be based on the percent of total points earned.

Grade	Percent Earned	Grade	Percent Earned	Grade	Percent Earned
A+	99-100	B+	88-89	C+	78-79
A	94-98	B	84-87	C	74-77
A-	90-93	B-	80-83	C-	70-73

Note Regarding Graduate Course Credit
Graduate credit is allowed only for courses approved for graduate credit in which grades of 'B-' (2.7) or better are received. No credit toward graduation will be given for a graduate course in which the student earns a grade lower than 'B-' (2.7). Candidates enrolled in graduate programs are expected to maintain at least a 'B' (3.0) average to remain in the program. A student who earns less than 'B-' (2.7) in two graduate courses will not be permitted to continue in the degree program.

Course Map

Date	Class Content NOTE: Your Notebook must be brought to **EVERY** class session. We will begin class by reviewing your visual notes and problem-solving activities.	Work and Assignments Assignments are to be completed **before** coming to class. Readings and notebook entries to be completed **after** class sessions.
Class 1 **5-16**	**Course Introduction and the Teaching of Math** • Overview of Course • Visual/Problem Solving Notebooks • Math Standards – SOL and Common Core • Research on Best Practices	• Visual notes for "My Life in Numbers"/Math Autobiography • Problem-solving autobiography • SET problem and reflection
Class 2 **5-18**	**Planning for Instruction** • How Students Learn Math • Unpacking the Standards • Standards of Mathematical Practice	• Read Chapter 1, Chapter 2, and Chapter 4 to p. 74 • Visual notes on reading and ideas from class • Suguru problem and reflection
Class 3 **5-23**	**Planning for Instruction** • Planning for Math Workshop • Daily Math Routines • Assessment in Math	**How to Learn Math for Students Course** • Read Chapter 3 and Chapter 4 from pp. 75-88 • Watch Math Workshop videos • Visual notes on reading and ideas from class • Strimko problem and reflection
Class 4 **5-25**	**Introduction to Number Sense** • Subitizing • Counting (Rote, Rational, and Strategic) • Understanding and Representing Numbers • Conservation of Number	**Set Up Unit Plan Web Site and Share It** • Read Chapter 5 • Visual notes on Chapter 5 and ideas from class • Hidato problem and reflection
Class 5 **5-30**	**Numeration and Place Value** • Systems of Numeration • Ideas and Models for Place Value • Developing Place Value Concepts and Procedures • Quantitative Estimation	• Read Chapter 8 • Visual notes on reading and ideas from class • Futoshiki problem and reflection
Class 6 **6-1**	**Introduction to Addition and Subtraction** • Developing Meaning for Operations • Basic Fact Fluency • Solving Word Problems	**Unit Outline and Lesson Plan Draft(s)** • Read Chapter 6 to p. 118 and Chapter 7 to p. 142 • Visual notes on reading and ideas from class • Kakuro problem and reflection
Class 7 **6-6**	**More on Addition and Subtraction** • Multi-digit Algorithms • Diagnostic Assessment and Remediation	• Read Chapter 9 to p. 188 • Visual notes on reading and ideas from class • Ken-Ken problem and reflection

Date	Class Content	Assignments Due
Class 8 **6-8**	**Introduction to Multiplication and Division** • Developing Meaning for Operations • Basic Fact Fluency • Solving Word Problems	**Content and Notes for Unit** • Read Chapter 6 from pp. 118-135 and Chapter 7 from pp. 142-148 • Visual notes on reading and ideas from class • Shikaku problem and reflection
Class 9 **6-13**	**More on Multiplication and Division** • Multi-digit Algorithms • Diagnostic Assessment and Remediation	• Read Chapter 9 from pp. 189-208 • Visual notes on reading and ideas from class • Game of 24 problem and reflection
Class 10 **6-15**	**Mental Math** • Mental Computation • Computational Estimation **Discourse in Math Instruction** • Math Talk • Rich-Tasks	**Annotated Bibliography** • Read Burns – *Mental Math* and *Wagganer – Creating Math Talk Communities* • Visual notes on video and ideas from class • Witzzle problem and reflection
Class 11 **6- 20**	**Algebraic Thinking** • Classification • Patterns in Objects, Pictures, Numbers, & Tables **Problem Solving** • Developing and Applying Successful Strategies	• Read Chapter 14 to p. 326 • Visual notes on reading and ideas from class • Fencing Numbers problem and reflection
Class 12 **6- 22**	**Probability and Statistics** • Collecting Data and Data Analysis • Introduction to Graphing • Descriptive Statistics • Introduction to Probability • Developing Probability Concepts	**Unit Assessment and Lesson Plan(s)** • Read Chapters 19 and 20 • Visual notes on reading and class ideas • Sujiko problem and reflection
Class 13 **6- 27**	**Measurement** • Direct Comparison • Nonstandard Measurement • US Customary and Metric Systems • Length, Weight/Mass, Volume/Capacity, & Temperature	• Read Chapter 17 to p. 443 and Chapter 18 from pp.477-486 and pp. 491-502 • Visual notes on reading and class ideas • Star Battle problem and reflection • Final problem-solving reflection
Class 14 **6- 29**	**Time** • Telling Time (analog and digital) • Elapsed Time **Money** • Denominations • Counting and Making Change **Final Course Reflection**	**Publish Unit Plan** • Read Chapter 18 from pp. 502-513. • Visual notes on reading and class ideas • Final class reflection in visual notes
Finals Week	**No Class Sessions**	**Turn in Visual Notebook with Problem-Solving Activities**

Academic and Personal Support Services

There are numerous resources across campus that can support you academically, personally, and professionally as you navigate the university and endeavor to successfully complete courses and your program of study. Among these are:

Academic Skills Center (http://asc.richmond.edu, 289-8626 or 289-8956): Assists students in assessing their academic strengths and weaknesses; honing their academic skills through teaching effective test preparation, critical reading and thinking, information processing, concentration, and related techniques; working on specific subject areas (e.g., calculus, chemistry, accounting, etc.); and encouraging campus and community involvement.

Boatwright Library Research Librarians (http://library.richmond.edu/help/ask/ or 289 8876): Assist students with identifying and locating resources for class assignments, research papers and other course projects. Librarians also assist students with questions about evaluating and citing sources. Students can email, text or IM a librarian, or schedule a personal research appointment to meet with a librarian in the first floor Research and Collaborative Study area.

Career Services (http://careerservices.richmond.edu/ or 289-8547): Can assist you in exploring your interests and abilities, choosing a major, connecting with internships and learning experiences, investigating graduate and professional school options, and landing your first job. We encourage you to schedule an appointment with a career advisor during your first year.

Counseling and Psychological Services (http://caps.richmond.edu or 289-8119): Assists students in meeting academic, personal, or emotional challenges. Services include assessment, short-term counseling and psychotherapy, crisis intervention, psychiatric consultation, and related services.

Disability Services (http://disability.richmond.edu/ or 289-8032): The University of Richmond is committed to equal opportunity in education and employment for persons with disabilities and complies with the ADA Amendments Act of 2008 (ADAAA), the Americans with Disabilities Act of 1990 (ADA) and the Rehabilitation Act of 1973, which includes Section 504. Individuals with disabilities are protected from discrimination and may be entitled to accommodations that will assist in their pursuits at the University.

Speech Center (http://speech.richmond.edu or 289-6409): Assists with preparation and practice in the pursuit of excellence in public expression. Recording, playback, coaching and critique sessions offered by teams of student consultants trained to assist in developing ideas, arranging key points for more effective organization, improving style and delivery, and handling multimedia aids for individual and group presentations.

Writing Center (http://writing.richmond.edu or 289-8263): Assists writers at all levels of experience, across all majors. Students can schedule appointments with trained writing consultants who offer friendly critiques of written work.