MATH-156: MATHEMATICS FOR ELEMENTARY TEACHING II

Effective Term
Fall 2026

BOT Approval Date
12/11/2025

Discipline
MATH - Mathematics

Course Number
156

Course Title
Mathematics for Elementary Teaching II

Short Title
Math for Element. Teaching II

Credit Status (CB 04)
D - Credit - Degree applicable

Units

Lecture Units
3.00

Total Units
3.00

Hours

Lecture Contact Hours
48-54

Out of Class Hours Lecture
96-108

Total Contact Hours
48 - 54

Total Out of Class Hours
96 - 108

Total Student Learning Hours
144 - 162

Distance Education
Yes

Distance Education

Distance Education Type
Hybrid Only

Are you using publisher content?
No

Regular Substantive Interaction

Instructor-to-student, student-to-student, and student-to-content contact shall be distributed in a manner that will ensure regular substantive interaction (RSI) is maintained not only weekly but also for the duration of the course. Instructor interactions should be equivalent in time, quality and consistency to the engagement students would receive in a face-to-face course—for example, through announcements, discussion participation, personalized feedback, video messages, or other instructional communications. Instructors are expected to be responsive to student inquiries within a 24-72 hour time frame excluding holidays. RSI will be maintained through a variety of methods: • Orientation - Students must be oriented to the online and face-to-face portions at the start of the course. • Announcements - Announcements using the course management system must be posted at least weekly to keep students current on course events, due dates, materials, etc. • Discussion Forums - Content-related discussion forums within the designated CMS will include appropriate instructor participation and will be initiated and maintained, with timely feedback provided. Instructors are required to monitor the discussions and related activities to provide guidance and direction. Open-ended discussion boards may be used to further learning and interaction. • MSJC Communication – Instructor will use MSJC-administered communication tools (such as email or the designated CMS communication tools) to regularly communicate with and provide ease of access to students. • Timely Feedback - Timely feedback on student work will be provided by the instructor, which may include comments and/or rubrics, within the Grades area of the designated CMS. • Scheduled Meetings – Hybrid and synchronous courses will meet at regularly scheduled times. ADA Compliance - All course interactions and content must be designed with accessibility in mind and meet ADA requirements.

Additional Regular Substantive Interaction

Students are required to meet once per week for face-to-face sessions

Catalog Description

This course develops an advanced understanding of geometry, measurement, and proportional reasoning within the K-8 mathematics curriculum. Students analyze and justify relationships among two- and three-dimensional figures, apply measurement principles, model proportional and geometric problems, and explore transformations and symmetry. Emphasis is placed on using spatial reasoning, constructing and critiquing mathematical arguments, and connecting concepts to real-world and classroom contexts to support conceptual understanding for elementary learners.

Requisites

Prerequisite(s)

Prerequisite(s) (must be taken before)
MATH-155 (with a grade of C or better)

Codes

TOP Code (CB 03)

1701.00 - Mathematics, General

CIP Code

13.1311 - Mathematics Teacher Education.

Repeatability Code

No

Grading Option

Letter grade OR P/NP

Minimum Qualifications

Minimum Qualifications	And/Or
Mathematics (Masters Required)	End

GE Information

Check GE Types Requested

AA/AS G - Math Competency

Learning Objectives

Learning Objectives

Learning Objective
1. Analyze and justify geometric relationships among two- and three-dimensional figures.
2. Evaluate and apply measurement systems, units, and tools to solve real-world and mathematical problems involving length, area, surface area, volume, and angle measure.
3. Synthesize multiple representations of proportional relationships to model and solve problems involving scaling, similarity, and unit conversions.
4. Investigate transformations and symmetry to interpret and create geometric patterns, tessellations, and designs.
5, Construct and analyze geometric models to visualize and explain spatial relationships in two- and three-dimensional contexts.
6. Integrate geometric and measurement concepts to design tasks that promote conceptual understanding in K–8 classrooms.
7. Critique and refine mathematical explanations to ensure precision and coherence in both oral and written communication.
8. Connect geometric concepts to algebraic reasoning by identifying and generalizing patterns in geometric and functional relationships.
9. Interpret and evaluate real-world applications of geometry and measurement, emphasizing culturally relevant and equitable contexts.
10. Develop and justify multiple strategies for solving geometric and measurement problems, reflecting on the reasoning processes involved.

Learning Outcome Information

Course Learning Outcomes

Learning Outcome
1. Students will demonstrate understanding of proportional reasoning as a tool for comparing quantities and solving problems, including unit conversions.
2. Students will justify geometric relationships and patterns using reasoning based on fundamental geometric ideas.
3. Students will analyze spatial relationships to solve geometric problems.

Content

Course Lecture Content

1. Measurement Concepts
   a. Measurable attributes: length, area, volume, angle.
   b. Measurement systems: U.S. Customary and Metric,
   c. Tools, formulas, and strategies for measurement. For example, standard (inches, centimeters, etc) versus non-standard (objects such as whiteboard markers, cell phones, etc),
   d. Classroom applications: modeling and selecting appropriate measurement activities. For example, allowing students to measure with “things around the room”,
2. Proportional Reasoning
   a. Ratios, rates, and proportions,
   b. Applications: similarity, scaling, and unit conversions. For example, converting a recipe designed for four servings to one designed for nine servings.
   c. Modeling proportional relationships: tables, diagrams, visual tools.
   d. Classroom strategies: developing proportional reasoning in K–8 students. For example, connecting the concept of multiples to proportional reasoning.
3. Two-Dimensional Geometry
   a. Points, lines, planes, segments, rays, angles.
   b. Parallelism, perpendicularity, and angle relationships. For example, complements, supplements, and vertical angles.
   c. Classifying triangles and polygons by sides and angles.
   d. Properties: congruence, similarity, symmetry.
   e. Using geometric language to describe and justify relationships.

4. Transformations and Symmetry
    a. Types of transformations: translation, rotation, reflection, and dilation.
    b. Symmetry in shapes, patterns, and tessellations. For example, use tessellations found in mosques.
    c. Modeling and visualizing transformations. For example, using patty paper to see symmetry.
    d. Classroom applications: hands-on activities and pattern exploration.
5. Perimeter, Area, and Volume
    a. Perimeter and area of polygons and irregular shapes.
    b. Surface area and volume of prisms, cylinders, pyramids, and cones,
    c. Connections between measurement and proportional reasoning. For example, if the sides of a cube are increased by two, the volume increases by eight.
    d. Designing K–8 tasks to develop conceptual understanding
6. Spatial Reasoning and Visualization
    a. Developing mental models of 2D and 3D shapes.
    b. Visualizing rotations, reflections, and transformations.
    c. Using manipulatives and digital tools for geometric reasoning.
    d. Supporting students in developing abstract thinking.
7. Geometric Modeling
    a. Constructing models to solve geometric problems. For example, using cylinders to determine the volume of a cone.
    b. Applying geometric models to real-world contexts.
    c. Connecting geometric and algebraic representations. For example, the dimensions in geometry are reflected in the exponent of a monomial.
    d. Classroom strategies for inquiry-based learning and problem-solving
8. Patterns and Functional Relationships
    a. Recognizing numeric, geometric, and visual patterns.
    b. Linking patterns to algebraic reasoning and functions. For example, triangular numbers.
    c. Designing lessons to develop pattern recognition and reasoning
9. Mathematical Argumentation and Justification
    a. Constructing and critiquing logical arguments about geometry and measurement.
    b. Communicating reasoning precisely in oral and written formats.
    c. Classroom discourse: supporting students in explaining and justifying solutions.
10. Integration and Applications
    a. Synthesizing geometry, measurement, transformations, and proportional reasoning.
    b. Connecting concepts to K–8 curriculum standards.
    c. Applying knowledge to real-world, culturally relevant, and instructional contexts.
    d. Reflecting on multiple problem-solving strategies.

Methods of Instruction

Method

Activity

Integration

Activities can be used to allow students to interact with the content. The context for an activity can be culturally relevant to address diversity, equity, and inclusion. For example, an activity to address proportional relationships, scaling, and unit conversions in a real-world, culturally relevant, and equitable context, the instructor introduces the concept of ratios and proportions using a familiar context — recipes. The class discusses how food is an expression of culture and identity. Students work in small groups to share recipes from their own cultural backgrounds or research recipes from diverse communities. Each group selects one recipe and identifies the quantities of ingredients used. Students create proportion problems by scaling the recipe for different serving sizes (e.g., doubling, halving, or adjusting for 10 servings). They calculate new quantities, discuss measurement conversions, and identify the unit rates involved. Groups represent their reasoning with tables, double number lines, and ratio equations

DE Adaptations for MOI

Instructions for each activity can be written and uploaded directly to the CMS for easy student access. A dedicated discussion board should be created within the CMS to allow students to ask questions and seek clarification about the activity in a collaborative space. Student work products can be submitted through the CMS and shared using the Peer Review feature, enabling students to exchange assignments randomly and solve the mathematical problems provided by their peers. To ensure accessibility and inclusivity, all mathematical notation should be formatted in a screen reader–compatible format, and alt text should accompany visual elements such as number lines or chip models. In addition, audio explanations can be embedded within the CMS to support diverse learning preferences and enhance comprehension.

Method

Discussion

Integration

Discussions, either student-to-student or teacher-to-student, can be used to make claims, consider others' claims, and possibly revise their original claims. For example, a discussion can be started to justify multiple strategies for solving geometric and measurement problems, and reflecting on the reasoning process with the two prompts: “Why is it important for students to know more than one way to solve a geometric or measurement problem?” and “How can exploring different strategies deepen conceptual understanding rather than just procedural skill?”

DE Adaptations for MOI

Discussions can be structured through discussion boards in the CMS. Accessibility can be increased by creating prompts written in plain language with glossary links for key mathematical terms, along with options for students to post audio or video (with captions and transcripts) in addition to text.

Method

Homework

Integration

Homework can be used for independent practice of concepts covered in class. For example, a homework assignment can be used for students to draw and identify relationships by choosing three different 3D figures, drawing a net, and explaining how the geometric properties of the 2D shapes relate to the 3D figure.

DE Adaptations for MOI

The homework assignment can be posted in multiple formats (Word, HTML, PDF, etc), with screen-reader compatibility and alt text for visuals. Students can submit typed, handwritten (uploaded), or audio responses via the CMS.

Method

Lecture

Integration

A lecture can be used to introduce foundational topics. For example, a lecture can be used to explain the history of measurement systems, units, and tools so that students can evaluate and apply them to problems involving length, area, surface area, volume, and angle measure.

DE Adaptations for MOI

Lectures can be recorded and posted in the CMS with interactive checks (embedded polls or quizzes). All videos will adhere to accessibility guidelines and standards, and downloadable notes in accessible formats will be provided. Videos in the CMS also allow for comments, for which students can ask for any clarifications.

Methods of Evaluation

Method

Class Participation

Integration

Class participation will serve as a method of evaluation to measure the degree of mastery of specific learning objectives. Participation will occur during lectures and individual practice sessions. For example, the instructor may ask students to identify and generalize patterns in geometric relationships, then ask how geometric design influences access in public spaces (e.g., wheelchair ramps, playgrounds, or urban layouts). How do measurement choices affect equity or inclusion? Students will then respond on paper and submit it to the instructor. The instructor will provide timely feedback within a week, and the evaluation will be based on the correctness of the response.

DE Adaptations for MOE

In an online learning environment, class participation can be facilitated through discussion boards within the CMS. Students will submit their responses to discussion prompts in these forums, engaging in dialogue with peers and the instructor to deepen their understanding of mathematical concepts and practices. A scoring rubric will be provided to clearly outline the expectations for high-quality responses and to promote consistency and transparency in grading. The instructor will provide timely feedback, typically within three days of submission, to support ongoing learning and improvement.

Method

Exams/Tests

Integration

Exams will serve as a method of evaluation to measure the degree of mastery of specific learning objectives. The outcomes of these assessments will inform both the instructor and the student about areas that demonstrate strong understanding as well as those that may require further clarification, review, or targeted support to strengthen mathematical proficiency.
Examinations will assess both conceptual understanding and procedural fluency through a variety of question types, including problem-solving tasks, application-based scenarios, and explanations of mathematical reasoning. For example, to investigate transformations, the student creates a pattern using an equilateral triangle by reflecting the triangle over a vertical line and then rotating it 120° clockwise around a fixed point. They then draw after both transformations. They describe each transformation using correct mathematical terminology (reflection line, rotation center, rotation angle, direction) and explain how combining transformations affects the symmetry of the pattern. Grading will be based on both correctness and completion, using a clear rubric established by the instructor. Feedback should be given to students within a week of submission.

DE Adaptations for MOE

Exams can be administered through the CMS and should offer multiple ways for students to demonstrate understanding, such as written responses, digital submissions, or oral explanations. Grading will be based on both correctness and completion, using a clear rubric established by the instructor. Feedback should be given to students within a week of submission.

Method

Projects

Integration

Projects will serve as a comprehensive method of evaluation that allows students to integrate multiple learning objectives and demonstrate a deeper understanding of mathematical concepts through application, analysis, and communication. For example, a project idea can have students design a scaled model of a community (e.g., neighborhood, park, or school campus) by applying measurement systems, geometric designs, and geometric models to create a detailed, mathematically accurate, and visually appealing design. Projects may be completed individually or in small groups and submitted digitally through the CMS. Evaluation will be based on the accuracy of the mathematics, the depth of conceptual understanding, the clarity and organization of the presentation, and the ability to communicate mathematical reasoning effectively. The instructor will provide constructive and timely feedback, typically within one week of submission, to support continued learning and growth.

DE Adaptations for MOE

Students can submit projects in the CMS through collaborative documents, slide presentations, or accessible video recordings, providing flexibility in how they communicate their ideas.. Student work will be assessed on the correctness of their responses, as well as their ability to clearly communicate reasoning. A scoring rubric will be given to students to ensure clarity of what is expected. Feedback should be given within a week of submission.

Method

Homework

Integration

Homework exercises will serve as a formative method of evaluation designed to help students reinforce and apply newly learned learning objectives. Homework provides an opportunity for students to practice problem-solving, strengthen their understanding, and identify areas that may require further clarification before summative assessments. Homework will be evaluated based on the accuracy, completeness, and clarity of student responses. Timely instructor feedback will be provided to guide students toward deeper understanding and mastery of the targeted learning objectives. For example, a homework assignment could provide three sample student solutions to geometry or measurement problems (these could involve area, volume, or transformations) and have students critique and refine mathematical explanations to ensure precision and coherence.

DE Adaptations for MOE

Homework can be submitted using the CMS by uploading files. Students will be graded on the accuracy of their responses, with clear guidance and support to ensure equitable opportunities for success. Feedback should be given within three days of submission, and students should be allowed to make corrections and resubmit based on the feedback given

Assignments

Assignment Type

Reading

In-class and/or outside of class

Outside of class

Formative or Summative

Formative

Assignment

Student Assignment: Exploring Geometric Shapes and Their Properties

Read the article “Understanding Polygons and Polyhedra: Properties and Relationships” (provided in the course materials or via the assigned textbook). Pay close attention to:
Classifications of polygons and their properties (e.g., number of sides, angles, diagonals).
Relationships between different shapes (e.g., how squares relate to rectangles, prisms relate to cubes).
Properties of three-dimensional solids, including vertices, edges, faces, and the use of nets.

Assignment Instructions:
Reflection (Written Response): Summarize the key properties of at least three different two-dimensional shapes and two three-dimensional solids discussed in the reading.
Explain in your own words how understanding these properties can help solve problems in real-world contexts (e.g., architecture, art, engineering).

Evaluation Criteria:
Reflects on the reading with an accurate summary.
Provides clear, logical reasoning and justification for how understanding these properties can help solve problems in real-world contexts.
Writing is organized, clear, and free of major errors.

Feedback will be given within a week of submission.

How assignment will be adapted in online format

This reading can be uploaded into a CMS page and checked for accessibility. Notations can be made by making hard copies for students who need them. The writing for submission can allow for text, file upload, audio, or video to ensure all students have a format that is suitable for them. Feedback will be given within a week of submission.

Assignment Type

Writing

In-class and/or outside of class

Outside of class

Formative or Summative

Summative

Assignment

Read the chapter “Spatial Reasoning and Geometric Modeling in Elementary Mathematics” (available in the course textbook or online course materials). Focus on:
How visualization helps in understanding three-dimensional shapes.
Techniques for constructing and interpreting geometric models.
Applications of spatial reasoning in problem-solving.
Diversity, equity, and inclusion considerations.

Assignment Instructions:

Write a 1–2 page summary of the key concepts from the reading. In your summary, explain in your own words why spatial reasoning is important for solving geometric problems.

Application through Writing:

Imagine you are designing a small playground for a school. Describe, in writing, how you would use geometric shapes and spatial reasoning to plan the layout. Include at least three types of geometric shapes (2D or 3D) and describe how their properties influence your design. Explain how visualization and modeling help you solve problems like fitting equipment, estimating area, diversity, equity, and inclusion, or ensuring safety.

Justification:
Provide a short paragraph (3–5 sentences) explaining the reasoning behind your design choices. Include how visualization or geometric modeling helped you identify potential issues or improve the layout.

Submission:
Submit a typed document (1–2 pages) using clear headings: Summary, Application, and Justification.
Include any diagrams, sketches, or digital drawings that support your writing (optional but encouraged).

Evaluation Criteria:
Demonstrates understanding of spatial reasoning and geometric modeling.
Provides clear, logical reasoning and justification for design decisions.
Reflects on the reading with an accurate summary and thoughtful application.
Writing is organized, clear, and free of major errors.

Feedback will be given within a week of submission.

How assignment will be adapted in online format

These task instructions can be uploaded into a CMS page and checked for accessibility. Notations can be made by making hard copies for students who need them. The project submissions in the CMS can allow for text, file upload, audio, or video to ensure all students have a format that is suitable for them.

Diagrams or sketches may be drawn digitally, photographed, or created with online tools such as GeoGebra, Canva, or Google Drawings.

Students may optionally record a short video explaining their design and reasoning if they wish to supplement their written submission.

Feedback will be given within a week of submission.

Assignment Type

Writing

In-class and/or outside of class

In-class

Formative or Summative

Formative

Assignment

Part 1: Measurement Stations

Rotate through three stations in the classroom as instructed:
Station A: Use rulers and measuring tapes to measure the length, width, and height of classroom objects. Calculate perimeter and area where applicable.
Station B: Use protractors to measure angles of polygons drawn on worksheets or physical models.
Station C: Use graduated cylinders, scales, or other tools to measure the volume or weight of classroom items.

Part 2: Problem-Solving Tasks
Using the measurements collected, solve three application problems:

Problem 1: Calculate the total area of a tabletop and determine the amount of covering needed.

Problem 2: Determine the volume of a container using measurements obtained at Station C.

Problem 3: Given a triangular board with measured angles and sides, calculate missing angles and side lengths using appropriate formulas.

Part 3: Reflection and Justification
Write a short paragraph explaining the tools and techniques used for each measurement task.
Justify why each tool was appropriate and describe any challenges encountered.

Assessment Criteria:
Accuracy of measurements and calculations.
Appropriate selection and use of measurement tools.
Logical reasoning and justification of methods.
Completeness and clarity of written reflection.

Feedback will be given within a week of submission.

How assignment will be adapted in online format

Students can use household objects to complete measurement tasks. Digital rulers, virtual protractors, and online measurement simulators can substitute for classroom tools.
Students submit photos, videos, or screenshots of their measurements and calculations through the CMS. Reflection can be typed and submitted as a document or recorded as a short screencast.

Feedback will be given within a week of submission.

Course Materials

Textbooks

Bassarear, T (2020). Mathematics for Elementary School Teacher 7th Cengage.

Open Educational Resources

Math 212 Geometry and Measurement for Elementary Teachers
https://flexbooks.ck12.org/user:55b647e9ecb8/cbook/ck-12-interactive-geometry/?referrer=library

Class Size Information

Class Size
40

Class Size Category
A - Lecture/discussion 40

Diversity and Inclusion

Course Design and Materials: Course will incorporate diverse perspectives, authors, and examples that reflect a variety of cultures, identities, and lived experiences. Instructional materials will be reviewed regularly to ensure representation, inclusivity, and alignment with equity-minded practices across disciplines.

Inclusive Learning Environment: Instructors will establish classroom norms and policies that promote respect, civil discourse, and belonging in both online and face-to-face classes. Clear expectations for communication and engagement will support a learning space where all students feel valued and heard.

Accessible Instruction: Course content will be delivered using accessible design. Materials will follow accessibility guidelines within the CMS, including captioned media, readable document formats, and multiple means of engagement to support diverse learning.

Equitable Teaching Practices: Instructors will use transparent and grading criteria, varied assessment methods, and timely feedback to promote fairness and student success. Opportunities for revision, reflection, and multiple demonstrations of learning may be incorporated when appropriate to the discipline.

Culturally Responsive Pedagogies: Instructional strategies will encourage critical thinking about diverse perspectives and systems of power relevant to the course content. Faculty will foster opportunities for students to connect course material to real-world contexts.

Ongoing Reflection and Improvement: Faculty will engage in continuous professional development related to IDEAA principles and reflect on course practices using metacognition to identify opportunities for increased equity, inclusion, and accessibility.

Explain how diversity and inclusion(e.g., gender, culture/race, sexuality, etc.) is infused into the course.
Diversity and inclusion are intentionally embedded throughout the course by ensuring that geometric and measurement concepts are taught through culturally relevant, equitable, and accessible contexts. For example, instructors can have students analyze geometric relationships and apply measurement systems using examples drawn from global and local cultures, such as traditional art, architecture, and community spaces, validating the mathematical knowledge inherent in diverse experiences. Real-world applications emphasize equity, accessibility, and representation in community and classroom contexts, and the development of multiple strategies encourages students to recognize and respect diverse problem-solving approaches. Across all outcomes, students are guided to reflect on cultural, social, and experiential dimensions of mathematics, ensuring learning is meaningful, inclusive, and responsive to all learners.

Describe how assignments, instruction, evaluation, course content, and interactions are contextualized for diverse learners promoting an equitable course.
Assignments are designed with multiple entry points to accommodate diverse learners, including those with different cultural backgrounds, language proficiencies, and learning styles. For example, word problems incorporate real-world contexts from a variety of cultures and everyday experiences, allowing students to connect mathematical concepts to their own lives. Assignments also offer choices in format (written explanations, visual representations, or oral presentations) to ensure all students can demonstrate understanding in ways that align with their strengths. Scaffolding is provided through guided examples, prompts, and differentiated support, ensuring equitable access to complex problems.

Instruction integrates multiple strategies to address diverse learning needs. Visual aids, manipulatives, and interactive technology support conceptual understanding for students who benefit from concrete representations of abstract ideas. Teachers use culturally responsive examples and analogies to make concepts relatable across different communities. Collaborative learning is encouraged, pairing students with diverse perspectives to enrich problem-solving discussions, build reasoning skills, and foster mutual respect. Instruction also emphasizes growth mindset principles, encouraging students to value effort and reasoning over speed or correctness alone.

Evaluation practices are designed to fairly assess students' understanding of quantitative reasoning, rather than just procedural fluency. Multiple forms of assessment—such as project-based tasks, performance tasks, written explanations, and traditional quizzes—allow students to demonstrate mastery in ways that reflect their strengths. Rubrics highlight reasoning, application, and clarity of

communication. Teachers provide timely, constructive feedback to support continuous improvement, and accommodations are made for learners with specific needs, ensuring assessments are equitable and accessible.

Interactions

Explain how the course will incorporate student-to-student interaction.

Students will work in pairs or small groups to solve mathematical problems involving measurement and geometry. For example, they might work together to construct geometric models, calculate areas and volumes, or analyze data sets. Group work encourages students to explain their reasoning to one another, compare strategies, and learn from diverse approaches. This not only deepens conceptual understanding but also develops communication and teamwork skills, which are critical for future educators.
For example, collaborative and discussion-based learning can be used to interpret, critique, and apply geometry and measurement concepts in real-world and culturally relevant contexts. Students can work in small groups or pairs to analyze design problems, community layouts, or mathematical models, such as floor plans, playgrounds, or public spaces. Each student brings their perspective, informed by their background or prior experiences, fostering an environment where multiple cultural contexts are shared and respected.

In a distance education format, students can share solutions and work together using shared documents, online whiteboards (e.g., Jamboard), or virtual manipulatives like GeoGebra.

Explain how the course will incorporate instructor-to-student interaction.

The instructor actively engages with students by modeling problem-solving strategies, explaining mathematical procedures step by step, and verbalizing the reasoning behind each step. The instructor facilitates class discussions by encouraging students to explain their thinking, justify their answers, and explore multiple ways to solve problems. Individualized feedback is provided on classwork, formative assessments, and participation to help students strengthen their understanding. Additionally, the instructor meets with students individually or in small groups through mini-conferences to address misconceptions and provide enrichment opportunities.

For example, the instructor can actively guide students to interpret and evaluate real-world applications of geometry and measurement through a culturally responsive and equity-centered lens. Instructors can pose targeted questions that encourage students to consider how designs, measurements, and spatial arrangements impact accessibility, representation, and fairness in diverse communities. They provide feedback on student reasoning, emphasizing precision, clarity, and inclusivity in both written and oral explanations, while modeling how multiple perspectives and real-world contexts can inform problem-solving. Additionally, instructors can facilitate reflection, prompting students to assess not only the mathematical correctness of their solutions but also the cultural relevance and social implications of their applications. Through these interactions, students are supported in connecting mathematics to meaningful, inclusive contexts and developing critical thinking that integrates both conceptual understanding and equity considerations.

For students who are participating remotely or in a hybrid format, the course includes specific modifications to ensure that interaction with the instructor remains meaningful. Synchronous online sessions via video conferencing allow students to engage in live instruction, ask questions, and work collaboratively in breakout rooms. Discussion boards are used for asynchronous interaction, where students can post questions and share solutions while the instructor provides timely feedback. Digital formative assessments, such as online quizzes and polls, allow the instructor to monitor student understanding and respond quickly to misconceptions. Accessible recorded lessons provide students with the opportunity to review instruction at their own pace, and virtual office hours allow for one-on-one or small group support, ensuring that remote students receive the same level of personalized guidance as those attending in person.

Explain how the course will incorporate student-to-content interaction.

Students engage directly with course content to develop a deep understanding of mathematical concepts and teaching strategies. Students interact with content by reading assigned texts, analyzing worked examples, solving problems, and applying mathematical reasoning to real-world and classroom scenarios. They explore concepts through hands-on activities, manipulatives, and visual models, which allow them to connect abstract ideas to concrete experiences. Students also complete assignments that require them to reflect on their learning, make connections between different mathematical concepts, and justify their solutions, fostering critical thinking and comprehension.

For example, student-to-content interactions can engage students with learning materials that emphasize real-world applications of geometry and measurement in culturally relevant and equitable contexts. Students interact with case studies, accessible videos, readings, and problem sets that highlight diverse communities, inclusive design, and authentic spatial reasoning challenges. While working independently, students analyze scenarios such as playground layouts, urban planning, or community spaces, evaluating how measurement decisions and geometric structures affect accessibility and fairness. They reflect on the social, cultural, and ethical dimensions embedded in these problems while applying precise mathematical reasoning, notation, and problem-solving strategies. Through this direct engagement with thoughtfully designed content, students develop the ability to connect mathematical concepts to meaningful, inclusive contexts and critically assess the broader impact of their solutions.

For students participating in a remote or hybrid format, the course ensures that content engagement remains rich and meaningful. Accessible digital textbooks, accessible online readings, and accessible instructional videos allow students to access content at any time. Interactive simulations, virtual manipulatives, and online problem-solving platforms provide opportunities for active engagement with mathematical concepts. Assignments and reflection activities are submitted through the CMS, where students receive structured guidance and feedback from the instructor. Additionally, accessible recorded lessons and step-by-step tutorials allow students to review and revisit challenging concepts at their own pace, ensuring continuous interaction with the content regardless of location.

Explain how the course will incorporate student-to-self interaction (metacognitive).

Students engage in self-reflection and independent learning to deepen their understanding of mathematical concepts and teaching practices. They monitor their own progress by checking their solutions, evaluating their reasoning, and identifying areas where they need improvement. Students are encouraged to set personal learning goals, reflect on their problem-solving strategies, and make connections between new content and prior knowledge. Journals, learning logs, and reflective assignments provide structured opportunities for students to think critically about their learning process and develop metacognitive skills.

For example, student-to-self interactions can encourage students to engage in personal reflection and self-assessment while working on geometry and measurement tasks in culturally relevant and equitable contexts. Students can evaluate their own reasoning, strategies, and solutions, considering not only mathematical correctness but also the fairness, accessibility, and cultural relevance of their approaches. Reflection prompts might ask students to consider questions such as: “How would this design impact different members of a community?” or “Do my calculations and representations respect the context and diversity of the situation?” By critically examining their own work, students develop greater awareness of the social and cultural dimensions of mathematics, strengthen conceptual understanding, and practice self-regulation and metacognition in solving real-world problems.

For students participating in remote or hybrid formats, opportunities for self-interaction are preserved and enhanced through digital tools. Online journals, discussion posts, and reflection prompts allow students to document their learning progress and reasoning. Accessible recorded lectures and accessible interactive tutorials enable students to revisit content at their own pace, which supports independent practice and self-assessment. Additionally, digital quizzes and self-check exercises provide immediate feedback, helping students evaluate their understanding and adjust their study strategies. These modifications ensure that all students can engage thoughtfully with their own learning process, whether in-person or online.

Key: 2104