

MTED 5322
Pedagogical Content Knowledge in Teach Math
Fostering Geometric Reasoning
Spring 2018 – Syllabus

University of Texas at El Paso
 College of Education, Department of Teacher Education

Instructor	Dr. Song An	E-mail	saan@utep.edu
Phone	915- 747-7616 (office)	Office Hours	M & T 10:00 am– 12:15 am Other time by appointment
Office/Lab	College of Education, EDUC 808 and EDUC 201		
Class Time	Saturday 8:30am – 11:15 pm Education Building 201 On-line discussions throughout the semester		
This syllabus is subject to change as needed. Any changes to the syllabus will be announced in class.			

Course Description

Students enrolled in this course are offered a research-based and multi-faceted look at issues regarding the learning and teaching of geometry in the K-12 curriculum. The course will focus on the development of geometric reasoning through the mathematics of “space” -- spatial reasoning, measure, estimation, dimension, form (shape), and proof. A key objective of the course is for students to understand and appreciate how geometry is integrated into other mathematical domains such as numeracy and algebra. Based on scholarly work, the course is organized around four major themes: 1) the nature of geometry as a domain of mathematics (including historical perspectives), 2) a constructivist-based analysis of math students’ geometric reasoning and learning, 3) the role of technology and mathematical modeling in fostering geometric reasoning, and 4) the nature and role of geometric proof across grade levels.

Course Objectives/Student Learning Outcomes

<i>Students enrolled in this section will have multiple academic goals to achieve:</i>	<i>Instructor will use following assessments to evaluate students’ learning outcomes</i>
1. Study research trends and issues in the teaching and learning of geometry	<ul style="list-style-type: none"> • Course graded assignments • Lesson demonstrations
2. Identify and discuss problems associated with different research designs	<ul style="list-style-type: none"> • Course graded Assignments • Online discussions
3. Synthesize and re-conceptualize pedagogical content knowledge in geometry	<ul style="list-style-type: none"> • Course graded assignments • Online discussions
4. Develop curriculum that can facilitate geometric reasoning	<ul style="list-style-type: none"> • Formative exams • Group mini lesson teaching
5. Develop assessments that can evaluate students’ geometric reasoning	<ul style="list-style-type: none"> • Course graded assignments • Formative exams

Attendance, Participation and Professionalism

Attendance of individuals in the class is required and unexcused absences will result in a grade reduction. University rules regarding absences will be followed for the required class meetings. There will be a student sign-in sheet at the beginning of each class. If a student misses a session, it is the responsibility of the student for knowing and completing all work required. Each attendance will count towards the final grade. Two tardies (including early leaves) will count as one absence. More than two absences may result in a student earning one-letter grade lower in the course.

Students are expected that students will attend all classes and actively participate in working on projects and class discussions. Students are expected to prepare for each class session. Lateness to class is strongly discouraged. With the emphasis on collegiality it is important that all group members be in class to contribute to the group's effort in developing an understanding of what it means to teach mathematics effectively.

All students are expected to demonstrate the ethical and professional values associated with K-12 Level Education. It is critical teaching candidates adopt and exhibit a professional demeanor at each point in their teacher preparation. Evidence of professional dedication will be expected through all work during classes and practicum, seminar, internship, and clinical experiences. Credit for participation and professionalism will be part of the evaluation. *Wireless phone usage is strictly prohibited in class.*

Assignment Format and Late Assignments

All assignments must be submitted electronically unless specified. It is highly recommended you save all your work electronically and possibly a hardcopy for your records before turning it in. The following format is **required** for every assignment submitted. Deviating from the format may result in reduced points, returned paper, or rejection of the assignment completely. All assignments should be **single spaced** and typed with 12-point font; page numbers should be included if more than one pages. **You must label your assignment as you save it containing your name and the assignment name.** Only assignments submitted complete and on time will be considered for full credit. Without evidence that you were unavailable (sick) for the entire range of days, the assignment will be given a zero. Any assignments turned more than one week late (or the range of dates for submission) will receive zero points.

Policy on Academic Dishonesty

The University of Texas at El Paso prides itself on its standards of academic excellence. In all matters of intellectual pursuit, UTEP faculty and students must strive to achieve based on the quality of work produced by their individual. In the classroom and in all other academic activities, students are expected to uphold the highest standards of academic integrity. Any form of scholastic dishonesty is an affront to the pursuit of knowledge and jeopardizes the quality of the degree awarded to all graduates of UTEP. It is imperative, therefore, that all faculty, insist on adherence to these standards.

Any student who commits an act of scholastic dishonesty is subject to discipline. Scholastic dishonesty includes, but is not limited to cheating, plagiarism, collusion, the submission for credit of any work or materials that are not attributable in whole or in part to another person, taking an examination for another person, and any act designed to give unfair advantage to a student or the

attempt to commit such acts. Proven violations of the detailed regulations, as printed in the Handbook of Operating Procedures (HOP) and available in the Office of the Dean of Students, may result in sanctions ranging from disciplinary probation, to failing grades on the work in question, to failing grades in the course, to suspension or dismissal among others.

Students with Special Needs

The American with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protections for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides a reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please notify your instructor and contact Disabled Student Services (DSSO) at 747- 5148 or at dss@utep.edu or come by Room 106 Union East Building.

Course Requirement

Attendance and Class Participation

Your active participation in each class session is vital to your learning as well as to the learning of other students in the class. I expect you to attend all class meetings prepared for active, collaborative, participation during the session, whether it is whole group discussion, small group activity, or individual reflection. Preparation for class involves completion of assigned readings and tasks. Active participation includes, but is not limited to, the following: asking probing question about the reading assignments, making comments during class discussions, bringing relevant handouts, or journal articles to class for distribution to classmates, making recommendations for further reading on a topic under discussion, suggesting activities to enhance the investigation of a philosophical issue, and being prepared to answer questions about assigned topics. If you are unable to attend a particular class session, please let me know beforehand. You are responsible for contacting someone in the class to find out what transpired in your absence.

Activity Demonstration (20% of Course Points)

You will demonstrate two activity-based geometry lessons (lessons that you developed in the online discussions) on two specified dates in class. The demonstration should be about **45 minutes** in length. In the lesson demonstration, you will provide interactive activities to the class. You will distribute your manipulatives and other related handouts to all of your classmates during the demonstration. Your role in the activity demonstration is to be a "peer leader", that is while other students work in small groups, you will be providing content activities, and will help to maintain and encourage student interest and focus on conceptual understanding through interactions.

Online Discussions and Assignments

Online Discussions (40% of Course Points—5Pts × 8)

In specific weeks, you will participate a series online discussions about pedagogy for geometry throughout the semester. Each student should post answers to each week's discussion questions (no less than 300 words), the answer should be concise, meaningful, well thought-out, and articulate. Post your first response by the due days and post your follow up responses in the

following two days. Read all the postings of your peers, and interact with your peers in a positive manner. You will reply at least three of your classmates' posts in a meaningful way.

Assignments (40% of Course Points—6Pts × 5 + 10Pts)

In Assignment 1-5, you will select read articles in one of the three journals (*Teaching Children Mathematics*, *Mathematics Teaching in the Middle School*, and *Mathematics Teacher*) about geometry and/or measurement. The articles will be available in each week's module and you will review and write a comprehensive reflection paper for a specific topic that you learned from each lesson. Each lesson review report should be no less than 500 words. In your review report, not to just summarize or synthesize the article contents, the key task is for you to EVALUATE the activities. A critique does not necessarily have to criticize the piece in a negative sense. Your reaction to the text may be largely positive, negative, or a combination of the two.

In Assignment 6, as the course final project, this assignment requires you to identify the trend of geometry education by exploring journal articles from one of the top-tier mathematics teacher journals (*Teaching Children Mathematics*, *Mathematics Teaching in the Middle School*, and *Mathematics Teacher*) about geometry and/or measurement. Specifically, you will select 10-15 articles published in the past 4 years on the topic of geometry and/or measurement. Explore the patterns across these studies from the perspective of coherence in research topic and methodology. You will write a report (free essay format, at least 800 words) to demonstrate the trend of geometry education that you identified.

Required Reading List

- Jones, K. (2002), Issues in the Teaching and Learning of Geometry. *In*: Linda Haggarty (Ed), *Aspects of Teaching Secondary Mathematics: perspectives on practice*. London: Routledge Falmer. Chapter 8, pp 121-139.
- Sinclair, N., & Bruce, C. D. (2015). New opportunities in geometry education at the primary school. *ZDM*, 47(3), 319-329.
- Sinclair, N., Bussi, M. G. B., de Villiers, M., Jones, K., Kortenkamp, U., Leung, A., & Owens, K. (2016). Recent research on geometry education: an ICME-13 survey team report. *ZDM*, 48(5), 691-719.
- Jones, K. (2000), Critical Issues in the Design of the Geometry Curriculum. *In*: Bill Barton (Ed), *Readings in Mathematics Education*. Auckland, New Zealand: University of Auckland. pp 75-90.
- Clements, D. H. (2003). Teaching and learning geometry. *A research companion to principles and standards for school mathematics*, 151-178.

Self-Selected Reading Materials

- *Teaching Children Mathematics*
- *Mathematics Teaching in the Middle School*
- *Mathematics Teacher*

(All three journals are accessible through the *UTEP library website*)

General Calendar

Changes may be made in this syllabus when judged appropriate by the instructor

Date		Assignments and Due dates
Week 1 Jan 20	Face to Face Session Levels of Geometrical Thinking	Discussion 1 <i>Due Jan 28</i>
Week 2 Jan 27	Face to Face Session Levels of Geometrical Thinking	Discussion 2 <i>Due Feb 4</i>
Week 3 Feb 3	Online Session Issues of Geometry Education	Assignment 1 <i>Due Feb 11</i>
Week 4 Feb 10	Online Session Issues of Geometry Education	Discussion 3 <i>Due Feb 18</i>
Week 5 Feb 17	Online Session Geometry Teaching Methods	Assignment 2 <i>Due Feb 25</i>
Week 6 Feb 24	Online Session Geometry Teaching Methods	Discussion 4 <i>Due Mar 4</i>
Week 7 Mar 3	Face to Face Session Geometry Teaching Methods	Assignment 3 <i>Due Mar 11</i>
Week 8 Mar 10	Face to Face Session Geometry Teaching Methods	Discussion 5 <i>Due Mar 18</i>
Week 9 Mar 17	Spring Break	
Week 10 Mar 24	Online Session Geometry Teaching Methods	Assignment 4 <i>Due Apr 1</i>
Week 11 Mar 31	Online Session Research in Geometry Education	Discussion 6 <i>Due Apr 8</i>
Week 12 Apr 7	Online Session Research in Geometry Education	Assignment 5 <i>Due Apr 15</i>
Week 13 Apr 14	Online Session Research in Geometry Education	Discussion 7 <i>Due Apr 22</i>
Week 14 Apr 21	Online Session Research in Geometry Education	Discussion 8 <i>Due Apr 29</i>
Week 15 Apr 28	Online Session Research in Geometry Education	Assignment 6 <i>Due May 6</i>
Week 16 May 5	Face to Face Session Research in Geometry Education	