

EDMA 5153-221: Problem Centered Learning in Mathematics

Course Description:

This course will focus on a Problem Centered Learning environment as a means for learning. It is intended to meet the needs of those involved in mathematics teaching at any level. The class is designed so that participants engage in non-routine problem solving using a Problem Centered Learning approach. Likewise, participants will engage in discussions and experiences exploring notions of problem posing education and issues of social justice and global responsibility through problem solving. This experience will become the basis for reflecting on such approaches to the teaching and learning.

Class Dates, Location and Hours:

Dates: September 26 – October 1, 2017
Location: Classes held at Building 2784, Room 301, Kapaun Air Station on Vogelweh Air Base.
Hours: Tuesday - Friday 6:00-9:30 pm; Saturday and Sunday 8:30 a.m.-4:30 p.m.
Last day to enroll or drop without penalty: August 28, 2017

Site Director:

Email: apramstein@ou.edu. Phone: DSN 480-6807, Civilian 06371-47-6807.

Professor Contact Information:

Course Professor: Dr. Stacy Reeder
Mailing Address: 820 Van Vleet Oval, ECH 114
Norman, OK 73019
Telephone Number: 405-325-1498
E-mail Address: reeder@ou.edu
Professor availability: The professor will be available via e-mail to students before and after the class sessions. On-site office hours are half an hour before and after each class session, by appointment.

Instructional Materials:

Materials posted on the OU Canvas learning management system: Access Canvas at <https://canvas.ou.edu>, enter your OU NetID and password, and select course to access material. If you require assistance with Canvas, please click on the Help icon. You can search the Canvas guides, chat with Canvas support, or contact OU IT.

Course Objectives:

1. To engage in non-routine problem solving as a means towards reflecting on teaching and learning.
2. To explore problem solving activity as one of constructing patterns and relationships.
3. To explore issues of social justice and global responsibility through problem solving.
4. To engage in collaborative activity in a classroom setting.
5. To examine the relationship of discourse and learning.
6. To reflect on and evaluate alternative assessment strategies in the classroom.

Course Outline:

Prior to In-Person Class Meetings:

Date	Assignment
Week 1 Aug 29-Sep 4	Familiarize yourself with the course Canvas site. You may also want to begin reading the articles and chapters found on the course Canvas site. Problem Solving Reflection: In 2 to 3 paragraphs provide a reflection on your experience with and abilities related to problem solving. Please do not limit your thinking in this reflection to traditional mathematics problem solving but rather consider that academics and life present opportunities for problem solving in a variety of forms. What is your response when faced with a problem? How do you tackle problems? Do you recall methods that have worked for you in the past and try to apply them to the current particulars of the situation? Does one method for problem solving serve you well in all situations? If so, what is it and please explain.
Week 2 Sept 5-11	Read Articles 1 and 2 and complete the Readings and Response and Discussion as described in the Assignments, Grading and Due Dates section of the syllabus below. Please note that a Readings Response and Discussion is due for each reading. Since there are 2 articles this week, you should post 2 responses.
Week 3 Sept 12-18	Read Articles 3, 4 and 5 complete the Readings and Response and Discussion as described in the Assignments, Grading and Due Dates section of the syllabus below. Please note that a Readings Response and Discussion is due for each reading.
Week 4 Sept 19-25	Read Articles 6, 7, and 8 and complete the Readings and Response and Discussion as described in the Assignments, Grading and Due Dates section of the syllabus below. Please note that a Readings Response and Discussion is due for each reading.

During In-Person Class Meetings: September 26- October 1, 2017

Topic	Readings	Activities & Assignments
Tuesday	Articles 9 & 10 – Do not complete an on-line post for these but rather take notes and be prepared to discuss in class.	Non-routine problem solving & presentations Problem Centered Learning – It has many sisters, brothers and cousins! What is problem centered learning? What does it look like across the disciplines? How do we empower our students to be critical questioners and thinkers?
Wednesday	Article 11	Non-routine problem solving & presentations Discuss articles 9 & 10 What is the role of discourse and communication in teaching and learning? reflection (1 page in class)
Thursday	Article 12	Non-routine problem solving and presentations Discuss article 11 What is social justice? reflection (1 page in class)

Topic	Readings	Activities & Assignments
Friday	n/a	Watch documentary film Discuss article 12 Work in groups to develop a non-routine task based on information and ideas from the documentary film. Make sure the task: <ul style="list-style-type: none"> • is rich in content, • contains true problem-solving, • provides time to explore, • matches how the brain learns, and • allows for discourse.
Saturday am	n/a	Work on non-routine tasks developed by the class based on the documentary film. Work with a partner to develop a problem based lesson plan to be presented on Sunday in class.
Saturday pm	Article 13	Work with a partner to locate five resources for problem centered learning activities. Develop an annotated bibliography with links to be shared with class.
Sunday am	n/a	Discuss Article 13 Problem based lesson plans presented by 3 or 4 groups. The wonderful world of children's and young adult literature – the role it can play in a problem based classroom and for social justice.
Sunday pm	Article 14 – Complete Readings and Response and Discussion on Canvas.	Problem based lesson plans presented by 3 or 4 groups.

Following In-Person Class Meetings: October 2-20, 2017

Week 6, 7, 8 Complete Research Paper. **This should be submitted via the course Dropbox in Canvas no later than 8:00 pm, Friday, October 20, 2017.**

Note: If you choose to read the course articles and chapters posted on Canvas using an iPad or some other handheld device make sure to use an app that will allow you to highlight and make notes. This will aid you greatly in the in-class discussions.

Assignments, Grading and Due Dates:

Readings Response & Discussion, 15%

Write a response to each article of the assigned readings. One paragraph should include what you believe to be the most salient points the author made and/or what you found challenging. A second paragraph should include how this reading impacts you as an educator or future educator. Conclude your readings response with a question based on the content of the readings for your classmates. Once all readings responses are submitted on Monday, use Tuesday through Friday to respond to no fewer than two of your classmates' questions.

Class Participation, 10%

Class participation is a qualitative judgment of student preparation, intellectual curiosity and articulation of ideas as well as a quantitative assessment of class attendance.

Notebook, 20%

The purpose of the notebook is to help you, as a learner, reflect on and record your problem-solving process. Given that problem solving and inquiry learning are quite similar, we will borrow the concept of notebooking from science. Please note the following excerpt about science notebooks:

Science notebooks contain information about the students' classroom experiences and students are encouraged to use them as scientists would, before, during, and after all investigations. They are a place where students formulate and record their questions, make predictions, record data, procedures, and results, compose reflections, and communicate findings. Most importantly, notebooks provide a place for students to record new concepts they have learned (<http://www.sciencenotebooks.org/notebookFeatures/>).

Further, in science classes, students are often asked to record their claim when they approach new investigations or inquiries and then later reflect on this claim and include their evidence. For the purpose of general problem solving, you should address and include the following for each problem:

- What is your conjecture? Address this when you approach each new problem and record your thinking at that time (e.g., based on previous experience with this type of problem, pure guess, etc.). Please note that your conjecture may change as you move through the problem-solving process.
- Record your problem-solving methods – all the ones that did not work! This will be referred to as the path to the solution. It can be messy and that is okay!
- Record your final solution as well as the pathway that helped you arrive at this solution. You may wish to re-write and edit this final pathway so it is as eloquent as you would like. Also, this will help you follow your thinking at a later date if you return to this problem.
- What is your proof? How can you convince someone else, or several others, that your solution makes sense and is valid? Address this when you have completed solving the problem with your group.

Your notebook should be the place you record your problem-solving process -- attempts, fails, and successes. Finally, your notebook will serve as a tool for reflective thinking. At the end of each class period, you should reflect on your experiences from class and your problem-solving processes. The following prompts may help with your reflective process:

- What significant ideas did you develop during the class?
- Describe the environment in which you are engaged in thinking or the dynamics of your group.
- What are any other thoughts or questions you have about problem centered learning?

Note: Notebooks for this class should be completed by hand so you can readily record your thoughts, ideas, sketches, messy ideas, as well as the final product.

Annotated Resources List, 10%

Develop a list of 5 to 7 resources that will/could be helpful to you and other teachers who plan to incorporate problem solving and/or social justice issues in their teaching. Each resource should include how it can be purchased or how it can be accessed, the cost (if applicable), and a description of the resource. Please make every attempt to include resources that have not been presented or are a part of those being used for the class. This assignment will be completed in class and should be presented as 1 to 2 PowerPoint slides and posted to the course Canvas Assignments. In the weeks following the face-to-face portion of the course, I will combine the slides and send everyone a complete PowerPoint file with all resources.

Problem Solving Lesson or Problem Based Lesson, 20%

Choose a problem or issue situated in a global context related to global responsibility or social justice. Develop a lesson plan(s) or problem-solving unit that will engage your students not only in the learning of meaningful content through authentic problem solving but also raise student awareness of either global responsibility or the selected issue of social justice. Your lesson plan or problem-solving unit should

include learning objectives, materials needed, a time-line for the lesson plan, a description of all activities students will be involved in, all open-ended questions you would ask students to engage them in discussion, and a description of how students will be evaluated. Please align this lesson plan with the grade level and subject area most relevant to you. (See resources and resource list in Canvas as well as the Lesson Plan Format)

Culminating Assignment, 25%

You will write a research paper and the topic of your paper will be negotiated during the face-to-face portion of the class. The topic of this paper must be connected to a topic related to the class this semester. The idea here is that you have practice reading, synthesizing research, and sharing your synthesis regarding topics of interest to the education. The expectation of this paper is that it be in publishable form. The paper should be 10 to 12 pages in length and be based on a minimum of 15 references.

Grading:

This is a letter-graded course: A, B, C, D, or F.

Notice: Failure to meet assignment due dates could result in a grade of I (Incomplete) and may adversely impact Tuition Assistance and/or Financial Aid.

POLICIES AND NOTICES

Attendance/Grade Policy

Attendance and participation in interaction, individual assignments, group exercises, simulations, role playing, etc. are valuable aspects of any course because much of the learning comes from discussions in class with other students. It is expected that you attend all classes and be on time except for excused emergencies.

Excused absences are given for professor mandated activities or legally required activities such as emergencies or military assignments. It is the policy of the University to excuse absences of students that result from religious observances and to provide without penalty for the rescheduling of examinations and additional required class work that may fall on religious holidays. Unavoidable personal emergencies, including (but not limited to) serious illness; delays in getting to class because of accidents, etc.; deaths and funerals, and hazardous road conditions will be excused.

If you are obtaining financial assistance (TA, STAP, FA, VA, Scholarship, etc.) to pay all or part of your tuition cost, you must follow your funding agency/institution's policy regarding "I" (Incomplete) grades unless the timeline is longer than what the University policy allows then you must adhere to the University policy. Students who receive Financial Aid must resolve/complete any "I" (Incomplete) grades by the end of the term or he/she may be placed on "financial aid probation." If the "I" grade is not resolved/completed by the end of the following term, the student's Financial Aid may be suspended making the student ineligible for further Financial Aid.

Students are responsible for meeting the guidelines of Tuition Assistance and Veterans Assistance. See the education counselor at your local education center for a complete description of your TA or VA requirements.

Academic Integrity and Student Conduct

Academic integrity means honesty and responsibility in scholarship. Academic assignments exist to help students learn; grades exist to show how fully this goal is attained. Therefore all work and all grades should result from the student's own understanding and effort.

Academic misconduct is any act which improperly affects the evaluation of a student's academic performance or achievement. Misconduct occurs when the student either knows or reasonably should know that the act constitutes misconduct. Academic misconduct includes: cheating and using unauthorized materials on examinations and other assignments; improper collaboration, submitting the same assignment for different classes (self-plagiarism); fabrication, forgery, alteration of documents, lying, etc...in order to obtain an academic advantage; assisting others in academic misconduct; attempting to commit academic misconduct; destruction of property, hacking, etc...; intimidation and interference with integrity process; and plagiarism. All students should review the Student's Guide to Academic Integrity at http://integrity.ou.edu/students_guide.html

Students and faculty each have responsibility for maintaining an appropriate learning environment. All students should review policies regarding student conduct at <http://studentconduct.ou.edu/>

Accommodation Statement

The University of Oklahoma is committed to making its activities as accessible as possible. For accommodations on the basis of disability, please contact your local OU Site Director.

Adjustment for Pregnancy/Childbirth-Related Issues

Should you need modifications or adjustments to your course requirements because of documented pregnancy-related or childbirth-related issues, please contact me as soon as possible to discuss. Generally, modifications will be made where medically necessary and similar in scope to accommodations based on temporary disability. Please see <http://www.ou.edu/content/eoo/faqs/pregnancy-faqs.html>.

Title IX Resources

For any concerns regarding gender-based discrimination, sexual harassment, sexual misconduct, stalking, or intimate partner violence, the University offers a variety of resources, including advocates on-call 24/7, counseling services, mutual no-contact orders, scheduling adjustments, and disciplinary sanctions against the perpetrator. Please contact the Sexual Misconduct Office at smo@ou.edu or (405) 325-2215 (8-5), or the Sexual Assault Response Team at (405) 615 -0013 (24/7) to report an incident. To learn more about Title IX, please visit the Institutional Equity Office's website at <http://www.ou.edu/content/eoo.html>

Course Policies

Advanced Programs policy is to order books in paperback if available. Courses, dates, and professors are subject to change. Please check with your OU Site Director. Students should retain a copy of any assignments that are mailed to the professor for the course. Advanced Programs does not provide duplicating services or office supplies.

Any and all course materials, syllabus, lessons, lectures, etc. are the property of professor teaching the course and the Board of Regents of the University of Oklahoma and are protected under applicable copyright.

For more information about Advanced Programs, visit our website at: <http://www.goou.ou.edu/>

INSTRUCTOR VITA

Stacy Reeder, Ph.D.

Education

Ph.D. Instructional Leadership and Academic Curriculum, Mathematics Education. July 2002.
University of Oklahoma.

Current Positions

- 2013 – Present Chair, Department of Instructional Leadership and Academic Curriculum
- 2009 – Present Associate Professor, Instructional Leadership and Academic Curriculum, Mathematics Education, University of Oklahoma, Norman, OK.
- 2005 – 2009 Assistant Professor, Instructional Leadership and Academic Curriculum, Mathematics Education, University of Oklahoma, Norman, OK.
- 2002 – 2005 Assistant Professor, School of Teaching and Curriculum Leadership, Mathematics Education; Reading and Math Center Coordinator (2004 – 2005). Oklahoma State University, Stillwater, OK.

Frequently Taught Advanced Programs Courses

- ILAC 5143 Theory and Research in Education
- EDUC 6930 Introduction to Teaching

Major Areas of Teaching and Research Interest

- Mathematics Education
- Teacher transformation
- The Role of Listening in Teaching and Learning
- Rational Number Content Knowledge
- Teaching Mathematics for Social Justice

Representative Publications and Presentations

Publications (2010-2017)

- Reeder, S. (2017). Deep understanding of fractions supports student success in algebra. In Stewart, S. (Ed). *And the Rest is Just Algebra*. (pp. 79-93). Springer International Publishing.
- Stewart, S., & Reeder, S. (2017). Algebra underperformances at college level: What are the consequences? In Stewart, S. (Ed) *And the Rest is Just Algebra*. (pp. 3-18). Springer International Publishing.
- Reeder, S. & Bateiha, S. (2016). Prospective elementary teachers' conceptual understanding of integers. *Investigations in Mathematics Learning*, 8(3), 16-29.
- Reeder, S. & Stewart, S. (2016). The existence, persistence, and significance of common algebra errors on student success in university mathematics. In M. B. Wood, E. E. Turner, M. Civil, & J. A. Eli (Eds.), *Proceedings of the 38th annual meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education* (pp. 705). Tucson, AZ: The University of Arizona.
- Utley, J. & Reeder, S. (2016). Developing leadership capacity: The impact of an elementary mathematics specialists program. In M. B. Wood, E. E. Turner, M. Civil, & J. A. Eli (Eds.), *Proceedings of the 38th annual meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education* (pp. 440). Tucson, AZ: The University of Arizona.
- Stewart, S., & Reeder, S. (2016). Common algebra errors in university courses: Existence, persistence and significance. In C. Csikos, A. Rausch, & J. Szitanyi (Eds.). *Proceedings of the 40th Conference of the International Group for the Psychology of Mathematics Education*, Vol I, pp. 241, Szeged, Hungary, August 3-7.

- Bateiha, S. & Reeder, S. (2014). Transforming preservice teachers' perceptions of mathematical knowledge for and through social understanding. *International Journal of Education for Social Justice*, 3(1), 71-86.
- Reeder, S. (2014). Cleared for takeoff: Paper airplanes in flight. Reprinted in *Virginia Mathematics Teacher*, 41(1), 24-27.
- Reeder, S. L. & Bates, R. (2013). Mathematics teacher candidates' understanding of function. In Reeder, S. and Matney, G. (Eds.). *Proceedings of the 40th Annual Meeting of the Research Council on Mathematics Learning*. Tulsa, Ok.
- Utey, J. & Reeder, S. (2012). Prospective elementary teachers' development of fraction number sense. *Investigations*, 5(2), 1-13.
- Reeder, S. (2012). Cleared for takeoff: Paper airplanes in flight. *Mathematics Teaching in the Middle School*, 17(7), 402-408.
- Reeder, S. & Abshire, G. (2012). Talking about the Greek Cross. *Mathematics Teaching in the Middle School*, 17(9), 558 – 563.
- Reeder, S. & Bateiha, S. (2011). The role of listening in teacher transformation and pedagogic practice. In Wiest, L. R. & Lamberg, T. (Eds.). *Proceedings of the 33rd annual meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education*. Reno, NV.
- Bateiha, S. & Reeder, S. (2011). A transformation of preservice teachers' perceptions of their beliefs of mathematics and social issues. In Wiest, L. R. & Lamberg, T. (Eds.). *Proceedings of the 33rd annual meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education*. Reno, NV.
- Turegun, M. & Reeder, S. (2011). Exploring students' conceptual understanding of statistical measures of spread. *Community College Journal of Research and Practice* 45(5), 410-426.
- Reeder, S. & Bateiha, S. (2010). Examining prospective elementary teachers' conceptual understanding of integers. In Brosnan, P., Erchick, D. B., & Flevares, L. (Eds.). *Proceedings of the 32nd annual meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education*. Columbus, OH: The Ohio State University.

Representative Honors and Awards Received

- Awarded, University of Oklahoma Regents Superior Teaching Award, University of Oklahoma, April 9, 2015.
- Awarded, Teaching and Advising Award, University of Oklahoma, Jeannine Rainbolt College of Education, March 28, 2014.
- Awarded, Jon E. Pedersen Excellence in Graduate Mentoring Award, University of Oklahoma, Jeannine Rainbolt College of Education, March 28, 2014.
- Awarded, Outstanding Service Award, Oklahoma Council of Teachers of Mathematics, June 12, 2010.
- Awarded, Junior Faculty Award, University of Oklahoma, College of Education, April 20, 2007.

Major Professional Affiliations

- School Science and Mathematics Association
- Association of Mathematics Teacher Educators
- American Education Research Association
- National Council for Teachers of Mathematics
- International Group for the Psychology of Mathematics Education, North American Chapter
- Research Council on Mathematics Learning
- Oklahoma Council for Teachers of Mathematics