Course Inventory Change Request

New Course Proposal

Date Submitted: 02/09/15 11:43 am

Viewing: STEM 5010: Data Analysis and Problem Solving in STEM

Last edit: 02/12/15 10:08 am

Changes proposed by: cantrellp

Course Prefix: STEM
Course Number: 5010

Effective Semester: Fall 2015

Department: Education (EDU)

School: School of Education

Course Title: Data Analysis and Problem Solving in STEM

Short Course Title: Data Analysis in STEM

Credits: 3

Workload Factors: 4.5

Primary Grade Type: Standard Letter

Secondary Grade Type:

Instructor: Yes

In Workflow
1. EDU Chair
2. EDU Admin
3. EDU Dean
4. University Curriculum Committee Chair
5. Banner

Approval Path
1. 02/10/15 3:24 pm
Chizu Matsubara (matsubara): Approved for EDU Chair

2. 02/18/15 4:38 pm
Robyn Whipple (whipple): Approved for EDU Admin

3. 02/19/15 1:47 pm
Brenda Sabey (sabey): Approved for EDU Dean

Catalog Description

This course will develop a firm problem-solving foundation. Using skills and strategies applied in mathematical contexts practicing teachers will learn to gather data, work with others, present solutions orally to the whole class, and write up detailed solutions. This course will also provide practicing teachers a deeper understanding of probability and data representation and analysis. Special attention in this course will be given to children’s typical error patterns, problem solving strategies, interpreting and assessing students’ work and learning, and integration of the National Council of Teachers of Mathematics Process Standards and the Standards for Mathematical Practice. Instructor permission required.

Course Rotation:
Fall (odd)

Justification for course/change:
School of Education received a grant to develop and teach a six-course cycle in STEM Education for the new STEM Teaching Endorsement offered by the Utah State Office of Education. The grant will pay the tuition for 20 teachers to take all six courses. This course will become part of the STEM Strand for the new Masters in Education Program. This grant to develop and teach the six courses for the STEM Teaching Endorsement was also awarded to Brigham Young University, Utah State University, and Weber State University. The Utah State Office of Education provided all awardees with detailed frameworks for all six courses; so all four universities will be developing similar courses based on these frameworks. Since the courses are all under development at the current time, no course prefixes or numbers are known at this time.
Course Learning Outcomes:

1. Select appropriate strategies to solve a problem.
2. Solve challenging mathematical problems in groups and individually.
3. Write problem-solving summaries, communicate orally solution processes and conclusions, and improve collaboration skills.
4. Communicate data analysis and problem-solving strategies orally, visually, and in writing, as well as facilitate effective discourse in a positive mathematics learning environment.
5. Collect and organize data using tally marks, tables, pictographs, bar graphs, line graphs, frequency tables, line plots, stem-and-leaf plots, circle graphs, scatter plots, histograms, and box-and-whisker plots.
6. Select and interpret measures of central tendency (e.g. mean, median, and mode, including the impact of outliers).
7. Select and interpret measures of dispersion (e.g. range, variance, standard deviation, percentiles).
8. Identify and apply concepts of probability including: likely, unlikely, certain, impossible, sample space, experimental and theoretical, and recognition of probability as a value between 0 and 1.
9. Conduct experiments with and without replacement and compare theoretical and experimental probabilities.
10. Analyze misrepresentation and misleading data that exists in the real world, in order to become informed “consumers” of data.
11. Develop lesson plans including assessments to teach to your own students that incorporate the above outcomes as appropriate to your grade level.
12. Develop a unit test using a test blueprint.
13. Record reflections on how your mathematical and pedagogical thinking changes over the course of the semester.

How do your Course Learning Outcomes align to your Program Learning Outcomes?

This course is part of a series of six courses that will qualify teachers to receive the new STEM Teaching Endorsement granted by the Utah State Office of Education. We are therefore aligning the course objectives with the Utah Effective Teacher Standards. The complete document detailing the
standards, the essential dispositions, and an assessment rubric are found here:
http://www.uen.org/k12educator/uets/
The alignment of the 10 Utah Effective Teaching Standards with the learning objectives for this course are found in the table below.

Utah Effective Teaching Standards Course Learning Objectives by Number
1. Learner development 1
2. Learning differences 11
3. Learning environments 11
4. Content knowledge 1, 2, 3, 4, 5, 6, 7, 8, 9, 10
5. Assessment 11, 12
6. Instructional planning 11
7. Instructional strategies 4, 11
8. Reflection and continuous growth 13
9. Leadership and collaboration 2, 3
10. Professional and ethical behavior 10

Schedule of lesson
 activities that meet Course Learning Outcomes

• Mixed practice problem-solving sessions, communicate strategy selected and solution.
• A data-based investigation into a classroom question (relating data to instruction).
• Mathematical problem solving tasks: Strategically selected mathematical tasks focused on developing problem solving strategies and exposing important ideas about data analysis.
• Clinical interview: Design an interview for your classroom students to determine student understanding of data analysis and problem solving, including interview questions with extensions to press for student understanding. Videotape and conduct three interviews. Select one student and analyze the video using a rubric that assesses both student understanding and the interview process.
• Differentiated lesson: Select one of the course objectives. Develop a lesson to meet the objective for the whole group. Then develop differentiation activities for at least three populations (e.g., gifted students, English Language Learners, Students with Disabilities).
• Action research project: Develop a classroom research project about teaching concepts of mathematics for your own classroom. Consult the mathematics education literature, citing at least three sources from peer-reviewed journals. Develop a research question, which could be a new teaching idea, assessment, or curriculum strategy for rational numbers in your class. Collect data, and analyze the results.
• Case study: Write a case presenting the mathematical thinking of a student or group of students. Be sure to include details in your narrative, such as student dialogue, your questions, and what you were thinking as you listened to the students. Analyze the student thinking and discuss the questions that are raised for you in the students’ mathematical thinking.
• Lesson study cycle: Work with a group to develop a task-based lesson including anticipated student responses, questions for classroom discourse, and formative assessment. One person in the group will teach the lesson while other members of the group observe student thinking. Group members
refine the lesson in response to the observation data and then teach and analyze the lesson in their own classes.

- Reflections on your own mathematical understanding: Keep a reflections log that discusses: a mathematical idea from the session that is new or important for you, a question you have, and an application of the mathematical idea for your classroom. Reading research – choose from possible articles and do an assignment based on the article; discussions, agreement/disagreement, impact in classrooms.

Assessment activities that provide evidence of student learning

- Content exams, performance tasks, and homework for determining participants’ mathematical knowledge for teaching on the topic of data analysis, probability, and problem-solving. (Note: clinical interview, differentiated lesson plan, action research project, case study, lesson study cycle, and reflection log are considered performance tasks and will be scored.)