Grade 5 Mathematics: Numbers, Operations, and Learning Theories

Instructional Design – Job Aid Trainer Notes

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LEARNING THEORY

This instructional design will be based on situated learning theory. Based on their own personal experiences, culture, and beliefs, teachers bring a wealth of knowledge and perspectives. While the instructor acts as the facilitator, it is anticipated that within the framework of the course, students will be able to guide their own learning and discourse while making connections between themselves, the content, and theories (Hennessy, 1993).

It is not enough for teachers to possess knowledge of the content. Equally important is for them to understand the context in which it is to be applied. This pedagogy coupled with content knowledge allows teachers to maximize their impact in the classroom (Ball & Bass, 2000).

According to McLellan (1996), learning does not efficiently and optimally occur if the content is learned out of context. A connection needs to be made between the student and content thereby authenticating it. This necessitates the need for strong pedagogical skills. "Effective teaching necessitates informed and dynamic pedagogy that leverages powerful teaching practices for all students." (Herring et al., 2015)

Knowing different learning theories and how students respond enables the teacher to connect to their students in meaningful ways.

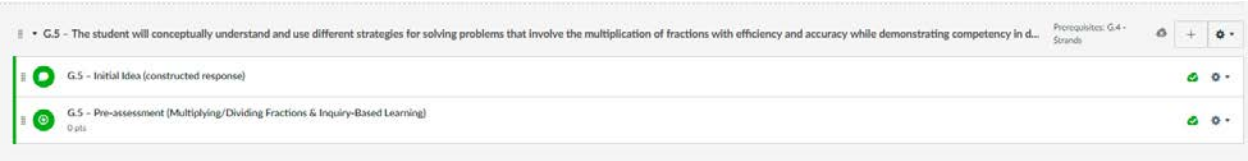
Developing new pedological skills often presents a pedological dilemma (Windschitl, 2002). Educators are often bound to curriculum guidelines and timeframes which leaves them attempting to integrate innovative ideas into old systems. However, the effort is worth the struggle as students become active learners taking ownership of their education.

SCHEDULING

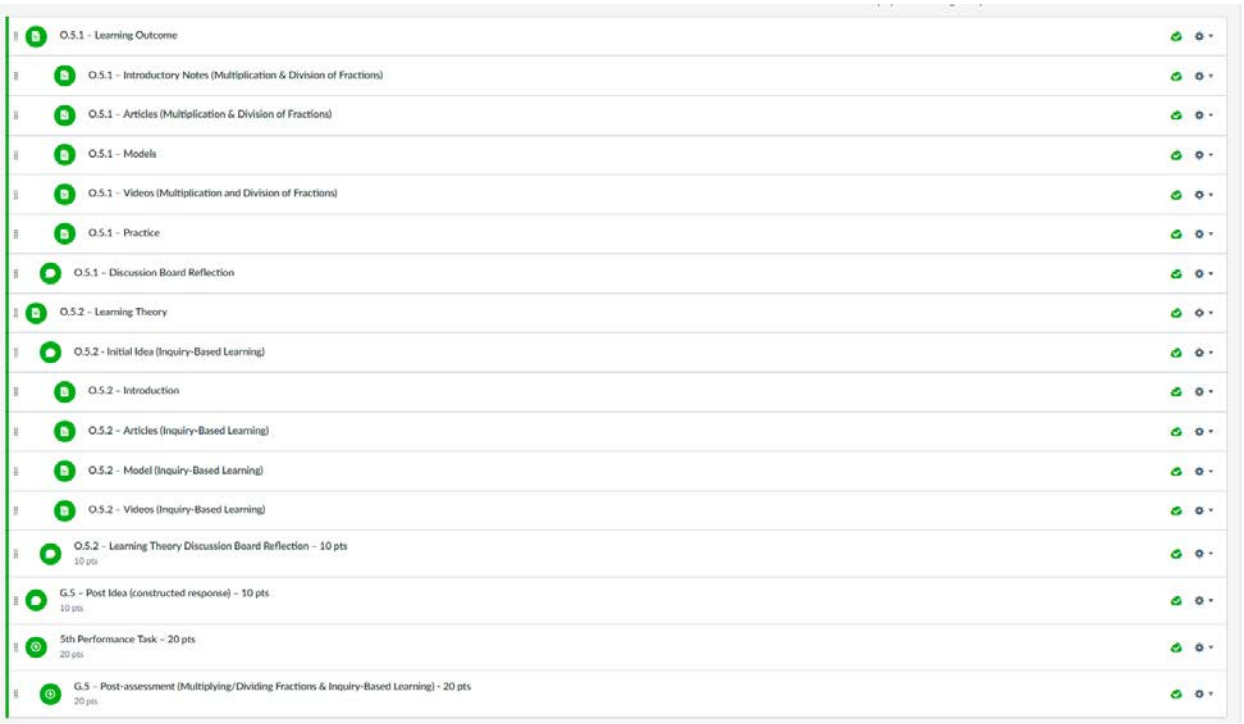
Each module is approximately 8-9 hours long. In total, there are 5 modules. This course is recommended to be completed over the course of one long semester or the summer. This gives a teacher some flexibility to miss an occasional week as dictated by their schedule. This course was designed to allow students to work at their own pace, however, an administrator may want to pace the course. In this event, keep in mind that each module is designed to be completed, at a minimum, two-week period.

TIPS AND TRICKS

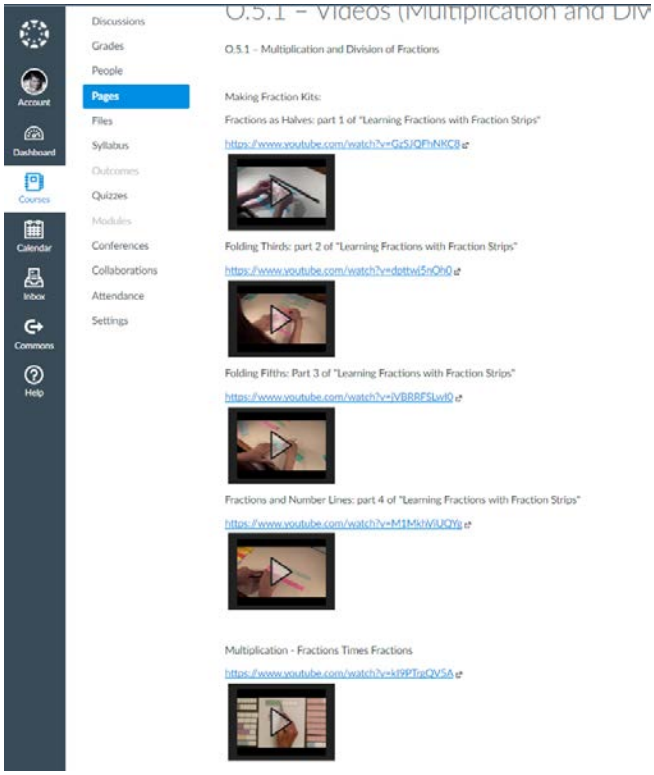
Every module begins with an initial idea and a pre-assessment. These are valued at zero points. These are repeated at the end of the module to charge growth for both the teacher and student.



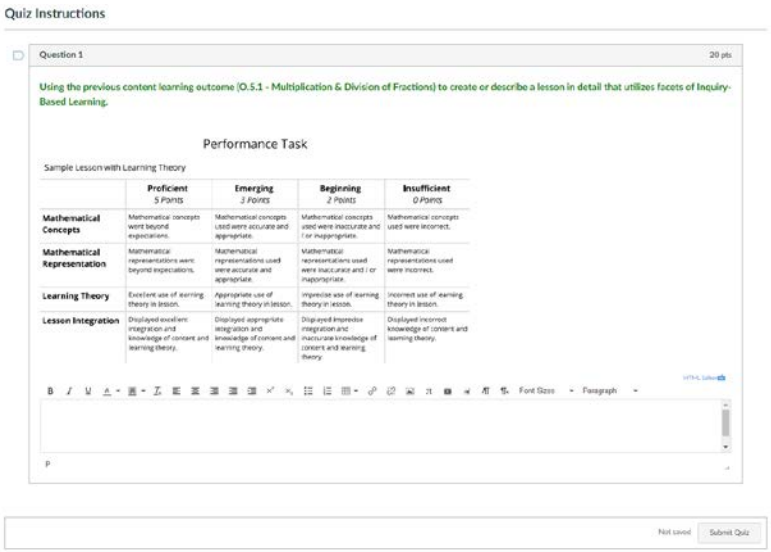
Each of the five modules follow this framework.



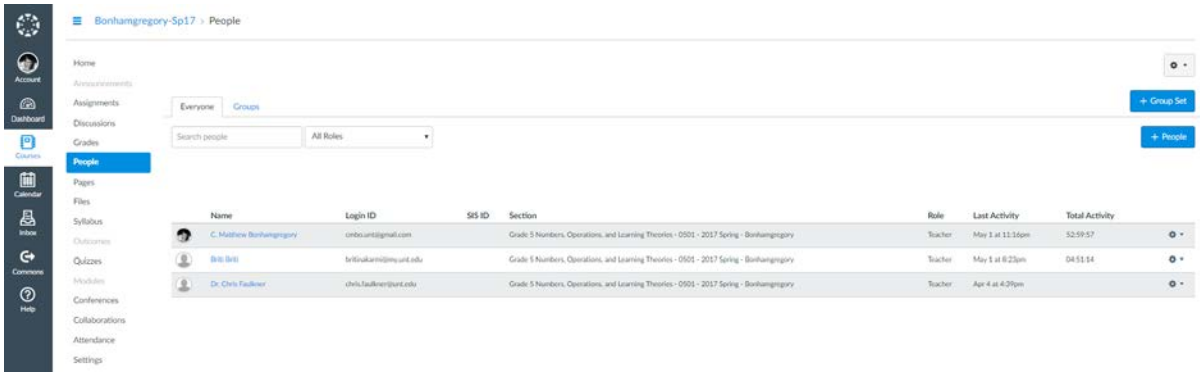
Most videos are embedded YouTube videos. Links that do not contain an embedded thumbnails link to an external site.



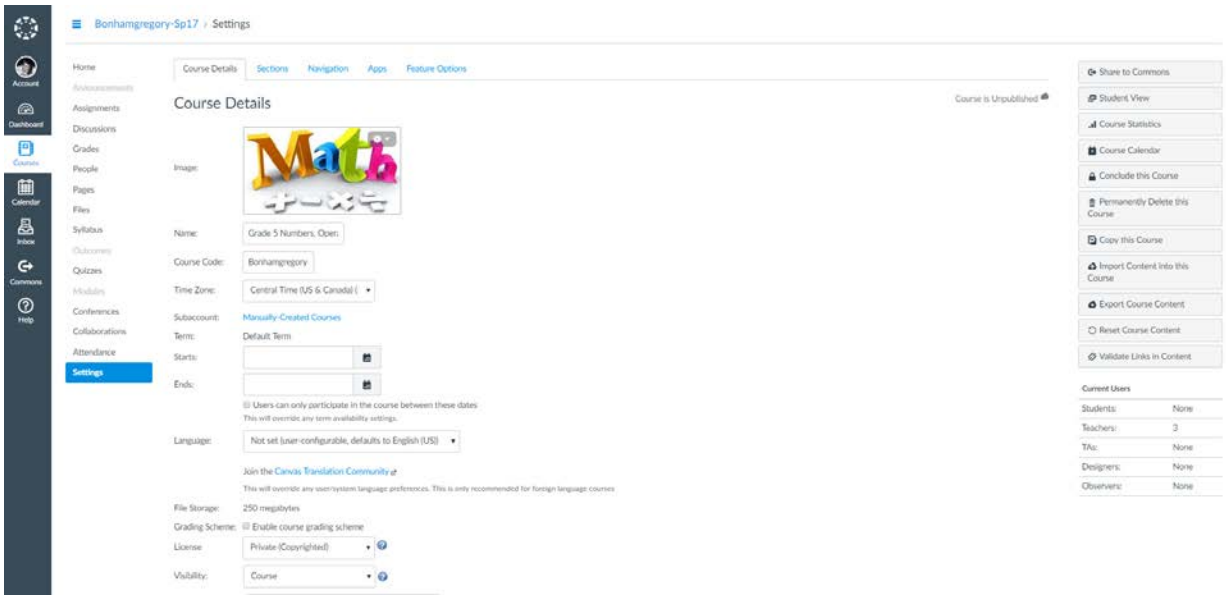
Discussions and Performance Task have post rubrics for easy view while the student responds.



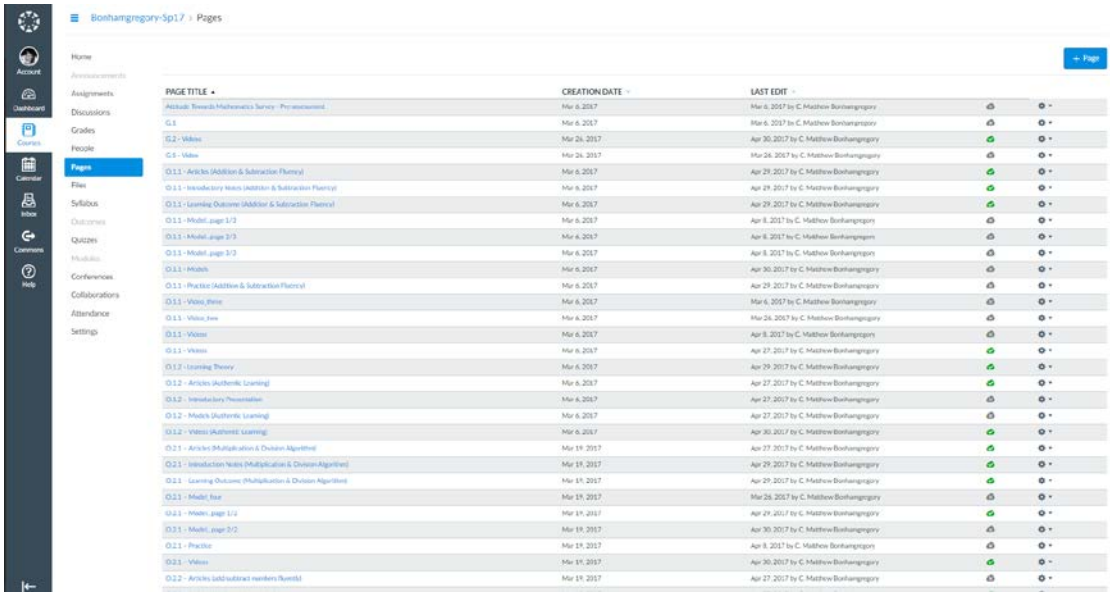
To add students, select the people tab and then find the "+People" button on the right.



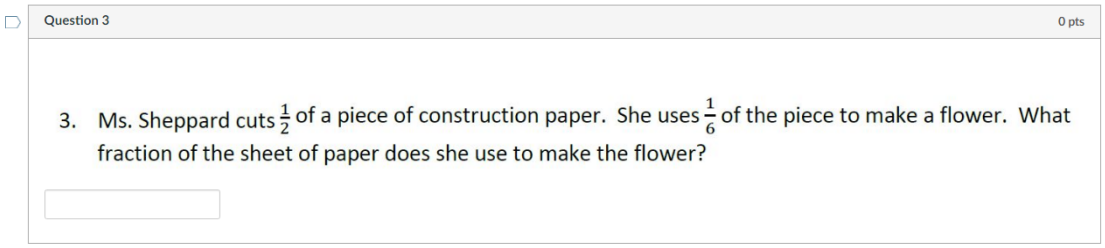
Copy assignments or quizzes from the setting screen. Select "Import Content into this Course". It is highly recommended that one item is imported at a time.

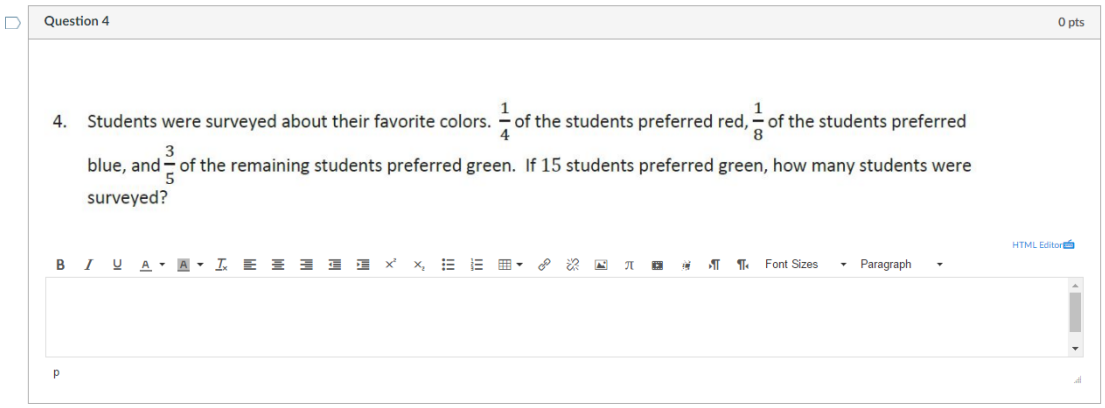


A list of pages can be found on the “pages” tab. Same for “files” and “quizzes”



Create different question and response types to meet the needs of your students and content.





ENVIRONMENT

The purpose of this class is to build content knowledge and pedagogy through an important domain – Numbers and Operations. Arguably, this domain is featured most often throughout the other domains and competency is paramount. As such, it is imperative that students have a solid, conceptual understanding of these skills before they move on to secondary school (Burns, 2007).

The target audience for this training module are Grade 5 teachers who teach mathematics, relevant school support staff, and parents as permitted. However, this module would prove beneficial to Grade 4 and 6 teachers to gain insight on their students, either in where they need to be heading in their development or the prior year's content (Herring et al., 2015).

The format of this eCourse follows a repetitive format allowing the user to become comfortable with the modules while developing an understanding of course expectations (Freiberg & Driscoll, 2004). The modules are constructed as follows:

- Initial Idea
- Pre-assessment
    - Question 1: Content
    - Question 2: Content
    - Question 3: Content
    - Question 4: Content
    - Question 5: Learning Theory

Stated Goal(s)

Stated Learning Outcome

- Introduction (text / importance)
- Models (pictures / graphics)
- In Action – Videos
- Practice (questions)
- Discussion Board Reflection

Stated Learning Theory Outcome

- Initial Idea (discussion board)
- Introduction (text)
- Models (pictures / graphics)

- In Action – Videos

- Discussion Board Reflection - 10 pts
- Post Idea – 10 pts
- Parallel post-assessment – 5 questions, 4 pts each
  - Question 1: Content
  - Question 2: Content
  - Question 3: Content
  - Question 4: Content
  - Question 5: Learning Theory
- Performance Task – 20 pts

Students will need computers with internet access with the ability to run Canvas and a Google account. Optional software is mobile device for recording video or photographs for bulletin board discussions.

ASSESSMENT OF LEARNING

Each module has an assessment containing five questions worth four points each. It also contains a graded discussion board prompt worth 10 points and post-idea discussion worth 10 points.

There is a performance task at the end of each module worth 20 points. It requires the student to create a hypothetical setting where they are to create a basic lesson using the learning theory and content from that set.

The constructed response and the performance task will be graded using a rubric (see appendix).

- 5 modules divided into two parts – content and learning theory (40 points each, 200 points total possible)
- 5 performance tasks (20 points each, 100 points total possible)
- Total possible points for the class: 300

A = 94-100%	C = 73-76%
A- = 90-93%	C- = 70-72%
B+ = 87-89%	D+ = 67-69%
B = 83-86%	D = 60-66%
B- = 80-83%	F = 0-59%
C+ = 77-79%	

RESEARCH

Data will be gathered through pre-assessments and post-assessments which will be administered each module. Data gathered will be used to evaluate students' growth of knowledge.

Data will be gathered during the course using the discussion board. Constructive responses given during the post-idea will be evaluated using the rubric and compared to the initial idea.

A survey regarding students' attitude towards mathematics will be administered before and after the course. This data will be analyzed to determine if the modules had an impact on their feelings towards mathematics. (Tapia, 1996)

GOALS AND OBJECTIVES

G.1 – The student will conceptually understand and use different strategies for basic operation computations, solving problems with efficiency and accuracy while demonstrating competency in developing a lesson based on Authentic Learning.

- Initial Idea
  - What role does fluency play in a society where everyone seemingly has access to some type of calculator?
- Pre-assessment: Five questions pertaining directly to the goal.

O.1.1 – Students will add and subtract positive numbers fluently.

- Introduction (text / importance)
- Articles
  - 5th Grade Games to Build Fluency
  - Addition and Subtraction - The Big Ideas and Essential Understandings
  - Big Idea Estimation Question
  - Cognitive Processes That Account for Mental Addition Fluency Differences
  - Developing Computational Fluency with the Help of Science
  - Developing Teachers' Computational Fluency - Examples in Subtraction
  - Fluency in Subtraction Compared with Addition
  - How Number Line Estimation Skills Relate
  - Manipulatives - When Are They Useful
  - Mental Math
  - Strategies in Subtraction Problem Solving in Children
- Videos
  - Struggles with Fact Fluency
  - Reinventing Math Instruction with Technology with Greg Tang
  - Strategies for Addition and Subtraction Facts
  - Different Addition Algorithms
  - Different Subtraction Algorithms
  - Adding and Subtracting Numbers Fluently

    - Operation Strategies
- Discussion Board Reflection
    - What does it mean to add and subtract numbers fluently?

O.1.2– Students will integrate basic operations content with Authentic Learning to develop a classroom lesson.

- Initial Idea (discussion board)
    - What does Authentic Learning mean to you?
- Articles
    - Authentic Learning - Via Storyboarding
    - Authentic Learning for the 21st Century
    - Connected Reflection and Intentional Learning
    - An Instructional Design Framework
    - Review of Research on PBJ
    - The Components of Authentic Learning
- Models
- Videos
    - What is Authentic Learning?
    - 5 tips for an Authentic Learning Environment
    - Lessons for Life - Learning and Transfer
    - Watch It, Do It, Know It - Cognitive Apprenticeship
    - How to escape education's Death Valley
- Discussion Board Reflection - 10 pts
    - Summarize Authentic Learning and describe the possibilities and challenges of implementing this theory in your own classroom.
- Post Idea – 10 pts
    - What role does fluency play in a society where everyone seemingly has access to some type of calculator?
- Parallel post-assessment – 5 questions, 4 pts each: Five questions pertaining directly to the goal.
- 1st Performance Task – 20 pts
    - Using the previous content learning outcome - O.1.1 – to create or describe a lesson in detail that utilizes facets of Authentic Learning.

G.2 –The student will conceptually understand and use different algorithm strategies for solving multiplication and division problems with efficiency and accuracy while demonstrating competency in developing a lesson based on Anchored Instruction.

- Initial Idea
    - What is an algorithm?
    - Reflecting on how many different strategies you have to divide and multiply, explain how having a conceptual understanding of multiplication and division increases your ability to retain and use algorithms.
- Goal Videos
    - General Operation Teaching Strategies
- Pre-assessment: Five questions pertaining directly to the goal.

O.2.1 – Students will multiply with fluency a three-digit number by a two-digit number and solve with proficiency for quotients of up to a four-digit dividend by a two-digit divisor using the standard algorithm.

- Introduction (text / importance)
- Article
    - A systematic replication and extension of using incremental rehearsal to improve multiplication skills
    - Effectiveness of a multicomponent treatment for improving mathematics fluency
    - Teaching algorithm from around the world

    - Toward computational fluency in multidigit multiplication and division
    - Developing automaticity in multiplication facts: integrating strategy instruction with timed practice drills.
    - Learning multiplication: the easy way.
    - The relations between number property strategies, working memory, and multiplication in elementary students.
    - Seeing spots and developing multiplicative sense making.
    - Reflections on "multiplication as original sin": the implications of using a case to help preservice teachers understand invented algorithms.
- Models (pictures / graphics)
- In Action – Videos
    - What is an Algorithm?
    - Meanings and Models for Operations
    - Partial Product Multiplication
    - Teaching Multiplication - The Standard Algorithm
    - Times table trick using your hands
    - How to Easily Memorize the Multiplication Table I The Great Courses
    - A Different Multiplication Algorithm…
    - Divisibility Tests and Factors
    - Long Division – Standard vs. Big 7
    - Partial Quotients
- Practice (questions)
- Discussion Board Reflection
    - Explain the difference between conceptual and procedural learning? Give examples.

O.2.2 – Students will integrate multiplication and division strategies content with Anchored Instruction to develop a classroom lesson.

- Initial Idea (discussion board)
    - What do you think Anchored Instruction means?
- Articles
    - Anchored Instruction and Its Relationship to Situated Cognition
    - Assessing and tracking students' problem solving performances in anchored learning environments
    - Effects of Blended Instructional Models on Math Performance
    - Impact of Enhanced Anchored Instruction in Inclusive Math Classrooms
    - Multimodality of learning through anchored instruction
    - Weighing the benefits of anchored math instruction for students with disabilities in general education classes
- Models (pictures / graphics)
- In Action – Videos
    - Anchored Instruction Recorded Presentation
    - Anchored Instruction
    - Principles of Anchored Instruction
    - Anchored Instruction Examples
    - Teach Teachers to Create Magic
    - Anchored Instruction Math Example
    - Using Videos to Anchor Instruction
- Discussion Board Reflection - 10 pts
    - Summarize Anchored Instruction and describe the possibilities and challenges of implementing this theory in your own classroom.
- Post Idea – 10 pts

    - What is an algorithm?
    - Explain how having a conceptual understanding of multiplication and division increases the number of strategies you possess thereby increasing efficiency and accuracy.
- Parallel post-assessment – 5 questions, 4 pts each: Five questions pertaining directly to the goal.
- 2nd Performance Task – 20 pts
    - Using the previous content learning outcome - O.2.1 – to create or describe a lesson in detail that utilizes facets of Anchored Instruction

G.3 – The student will conceptually understand and use different strategies for modeling multiplication and division problems with efficiency and accuracy while demonstrating competency in developing a lesson based on Problem-Based Learning.

- Initial Idea
    - Give examples of situations where modeling multiplication is utilized or how modeling proves to be more beneficial than only using an algorithm.
- Pre-assessment: Five questions pertaining directly to the goal.

O.3.1 – Students will represent multiplication and division, including decimals with products to the hundredths, using objects and pictorial models such as area models.

- Introduction (text / importance)
- Articles
    - Making Sense of Decimal Multiplication
    - Preservice Elementary Teachers' Knowledge for Teaching the Associative Property of Multiplication
    - The Role of Implicit Models in Solving Verbal Problems in Multiplication and Division
    - The Unsolved Problem of Teachers' Mathematical Knowledge
    - Tracking Decimal Misconceptions
- Models (pictures / graphics)
- In Action – Videos
    - Area Model Multiplication
    - Area model multiplication (2)
    - Multiplication Area Model Method 3 digit by 2 digit
    - Multiplying Decimals Using a Model
    - Multiplication
    - Box Multiplication
    - Euclid's Division Algorithm Shown with Area Model
    - Using the Area Model - Long Division
    - Dividing decimals by decimals shading
- Practice (questions / virtual manipulatives)
- Discussion Board Reflection
    - What are the benefits of using an area model to teach multiplication or division?

O.3.2 – Students will integrate multiplication and division modeling strategies with Problem-Based Learning to develop a classroom lesson.

- Initial Idea (discussion board)
    - What does Problem-Based Learning mean to you?
- Articles
    - Effects of Problem-Based Learning on Student Attitudes, Achievement and Retention of Learning in Math Course
    - Encouraging equitable enrollment
    - Encouraging equitable enrollment--a second look
    - Enriching Science and Math Through Engineerings

    - Problem-Based Learning, What and How Do Students Learn
    - Problem-Solving Effects in Teaching and Learning Mathematics
    - Using the Discipline of Agricultural Engineering to Integrate Math and Science
- Models (pictures / graphics)
- In Action – Videos
    - Project Based Learning: Explained
    - Project-Based Learning: Success Start to Finish
    - What if Schools Taught Us How to Learn
    - Teaching Methods for Inspiring the Students of the Future
    - Project-Based Learning in an Actual Classroom
    - Integrated Subjects + Theme/Project-Based Learning
- Discussion Board Reflection - 10 pts
    - Summarize Problem-Based Learning and describe the possibilities and challenges of implementing this theory in your own classroom.
- Post Idea – 10 pts
    - Give examples of situations where multiplication or division models are utilized or how modeling proves to be more beneficial than only using an algorithm.
- Parallel post-assessment – 5 questions, 4 pts each
- 3rd Performance Task – 20 pts
    - Using the previous content learning outcome - O.3.1 – to create or describe a lesson in detail that utilizes facets of Authentic Learning.

G.4 – The student will conceptually understand and use different strategies for solving problems that involve the addition and subtraction of fractions with efficiency and accuracy while demonstrating competency in developing a lesson based on Sociocultural Learning Theory.

- Initial Idea
    - Why must we find common denominators when adding or subtracting fractions?
    - When given the following fraction set $\{\frac{1}{2}, \frac{13}{16}, \frac{3}{4}, \frac{5}{11}, \frac{13}{39}\}$, what mental strategies can be used to successfully represent, compare, and order the fractions on a 0 to 1 number line?
    - Conceptually, what is the difference between a proper fraction and improper fraction?
- Pre-assessment: Five questions pertaining directly to the goal.

O.4.1 – Students will represent and solve addition and subtraction of fractions with unequal denominators referring to the same whole using objects and pictorial models and properties of operations.

- Introduction (text / importance)
- Articles
    - Developing Algorithms for Adding and Subtracting Fractions
    - Development of Fraction Concepts and Procedures in U.S. and Chinese Children
    - Establishing Benchmarks
    - Identifying Learning Difficulties with Fractions
    - The Role of Representations in Fraction Addition and Subtraction
    - The Whole Story - Understanding Fraction Computation
- Models (pictures / graphics)
- In Action – Videos
    - Making Fraction Kits:
    - Fractions as Halves: part 1-4 of "Learning Fractions with Fraction Strips"
    - Adding Fractions with Unlike Denominators (using fraction strips)
    - Subtraction - Different Denominators
    - Adding and Subtracting Fractions with Unlike Denominators

    - Addition Step 1 Models for Adding Fractions
    - Addition Step 2 - Like and Unlike Denominators
    - Addition Step 3 Mixed Numbers
    - Subtraction Step 1 Models for Subtracting Fractions
    - Subtraction Step 2 - Different Denominators
    - Subtraction Step 3 Mixed Numbers
    - Practice (questions)
- Discussion Board Reflection
    - Why does simply adding the two different denominators yield the correct answer?
    - Is it possible to add more than two fractions at once? Subtract? Explain.
- **O.4.2 – Students will integrate adding and subtraction of fraction strategies content with Sociocultural Learning to develop a classroom lesson.**
- Initial Idea (discussion board)
    - What do think Sociocultural Learning means?
- Articles
    - Beyond Error Patterns - A Sociocultural
    - Learning Mathematics in a Classroom Community of Inquiry
    - Sociocultural perspectives in research on and with mathematics
    - Using Sociocultural Theory to Teach Mathematics
    - Vygotsky Sociocultural Theory and its Implications to the Role of Teachers in Learning of Mathematics
    - Vygotsky's Neglected Legacy - Cultural-Historical Activity Theory
- Models (pictures / graphics)
- In Action – Videos
    - Vygotsky sociocultural development | Individuals and Society
    - Vygotsky's Sociocultural Theory
    - Collaborative Learning Builds Deeper Understanding
    - Sociocultural Learning Examples
    - Learning from Others - Learning in a Social Context
    - Learning as We Grow - Development and Learning
- Discussion Board Reflection - 10 pts
    - Summarize Sociocultural Learning and describe the possibilities and challenges of implementing this theory in your own classroom.
- Post Idea – 10 pts
    - Why must we find common denominators when adding or subtracting fractions?
    - When given the following fraction set 1/2, 13/16, /4, 5/11, 13/39, what strategies can be used to successfully represent, compare, and order the fractions on a 0 to 1 number line?
    - Conceptually, what is the difference between a proper fraction and improper fraction?
- Parallel post-assessment – 5 questions, 4 pts each: Five questions pertaining directly to the goal.
- 4th Performance Task – 20 pts
    - Using the previous content learning outcome - O.4.1 – to create or describe a lesson in detail that utilizes facets of Authentic Learning.

G.5 – The student will conceptually understand and use different strategies for solving problems that involve the multiplication and division of fractions with efficiency and accuracy while demonstrating competency in developing a lesson based on Inquiry-Based Learning Theory

- Initial Idea

    - When we add or subtract fractions, we must find common denominators to solve. When multiplying, we do not – we can multiply the two different denominators together. What is(are) the difference(s) between adding and subtracting fractions versus multiplying them?
- Pre-assessment: Five questions pertaining directly to the goal.

O.5.1 – Students will represent and solve multiplication and division fraction problems when referring to the same whole using objects and pictorial models, including area models.

- Introduction (text / importance)
- Articles
    - Enhancing Prospective Teachers' Knowledge of Children's Conceptions - The Case of Division of Fractions
    - Focusing on Fractions and Decimals
    - General and Math-Specific Predictors of Sixth-Graders Knowledge of Fractions
    - Ideas About Fractions
    - Individual Difference in Conceptual and Procedural Fraction Understanding
    - Measurement and Fair-Sharing Models for Dividing Fractions
    - The Richness of Children's Fraction Strategies
    - Unfolding Fraction Multiplication
- Models (pictures / graphics)
- In Action – Videos
    - Making Fraction Kits:
    - Fractions as Halves: part 1-4 of "Learning Fractions with Fraction Strips"
    - Multiplication - Fractions Times Fractions
    - Models for Multiplying Fractions and Whole
    - Multiplication - Mixed Numbers and Reciprocals
    - Model Dividing Fractions by Fractions
    - Dividing by Fractions and Whole Numbers
    - Whole Number Quotients
- Practice
- Discussion Board Reflection
    - How can a strip, pictorial, or area model be used to teach multiplying and dividing fractions?

O.5.2 – Students will integrate multiplication or division of fraction strategies content with Inquiry-Based Learning to develop a classroom lesson.

- Initial Idea (discussion board)
    - What does Inquiry-Based Learning mean to you?
- Introduction (text / importance)
- Articles
    - Assessing Long-Term Effects of Inquiry-Based Learning
    - Critical alignment in inquiry-based practice
    - Facilitating parental engagement in school mathematics
    - How we teach - Inquiry in teaching and learning mathematics
    - Impact of Inquiry-Based Learning
    - Inquiry-based learning in mathematics and science
    - Learning to teach mathematics through inquiry based
    - Planning, enactment, and reflection in inquiry-based teaching
- Models (pictures / graphics)
- In Action – Videos
    - Building on What We Know - Cognitive Processing
    - How We Organize Knowledge - The Structure of the Disciplines
    - Inquiry-Based Learning: Developing Student-Driven Questions
    - Finding Inspiration and Liberation through Inquiry Based Education

    - How to Get into Inquiry-Based Learning: Part 1 – First Steps to Inquiry
    - How to Get into Inquiry-Based Learning: Part 2 – Working Towards Open Inquiry
    - How to Get into Inquiry-Based Learning: Part 3 – 5 Skills to Become an Inquiry Teacher
    - How to Get into Inquiry-Based Learning: Part 4 – 4 Student Inquiry Skills to Nurture and Assess
- Discussion Board Reflection - 10 pts
    - Summarize Inquiry-Based Learning and describe the possibilities and challenges of implementing this theory in your own classroom.
- Post Idea – 10 pts
    - Explain why multiplying the numerator to the numerator and the denominator to the denominator yields the correct answer when multiplying two fractions together.
    - Explain why "keep, change, flip" (multiplying the reciprocal of the second fraction) works when dividing fractions.
- Parallel post-assessment – 5 questions, 4 pts each: Five questions pertaining directly to the goal.
- 5th Performance Task – 20 pts
    - Using the previous content learning outcome - O.5.1 – to create or describe a lesson in detail that utilizes facets of Authentic Learning.

APPENDIX

Attitude Towards Mathematics Survey - Post-assessment

Tapia, M. (1996). Attitudes Toward Mathematics Inventory (ATMI). Retrieved from http://www.pearweb.org/atis/tools/48

Discussion Board Rubric (10 pts):

Discussion Board

	Proficient *3 Points*	**Emerging** *2 Points*	**Beginning** *1 Points*	**No Contribution** *0 Points*
Quality	Comments are appropriate. Thoughtful, courteous, reflective, and respectful	Comments are appropriate. Courteous and respectful	Comments are present but are minimal.	No comments.
Relevancy	The post is related to the topic and prompt classmates for further discussion.	The post is related to the topic.	Post is somewhat related to topic.	Post is not related to topic.
Contribution	Contributed to the discussion in a positive manner. Is aware of the needs of the class. Shows creativity in approach.	Contributed to the discussion in a positive manner. Shows creativity in approach.	Contributed to the discussion in some way.	No contribution.

Performance Task Rubric (20 pts):

Performance Task Sample Lesson with Learning Theory	**Proficient** *5 Points*	**Emerging** *3 Points*	**Beginning** *2 Points*	**Insufficient** *0 Points*
Mathematical Concepts	Mathematical concepts went beyond expectations.	Mathematical concepts used were accurate and appropriate.	Mathematical concepts used were inaccurate and / or inappropriate.	Mathematical concepts used were incorrect.
Mathematical Representation	Mathematical representations went beyond expectations.	Mathematical representations used were accurate and appropriate.	Mathematical representations used were inaccurate and / or inappropriate.	Mathematical representations used were incorrect.
Learning Theory	Excellent use of learning theory in lesson.	Appropriate use of learning theory in lesson.	Imprecise use of learning theory in lesson.	Incorrect use of learning theory in lesson.
Lesson Integration	Displayed excellent integration and knowledge of content and learning theory.	Displayed appropriate integration and knowledge of content and learning theory.	Displayed imprecise integration and inaccurate knowledge of content and learning theory.	Displayed incorrect knowledge of content and learning theory.

EVALUATION OF DESIGN

Using Google Forms, students are asked to take the following post-course survey:

1. Please fill in the following fields:
    - Instructor:
    - eCourse to evaluate:
2. What overall rating would you give the eCourse?
    - Excellent
    - Very good
    - Good

- Fair
- Poor

3. Please indicate your level of agreement with each of the following statements:

- Strongly
- Disagree
- Disagree
- Neutral
- Agree
- Strongly Agree
  - The eCourse objectives were clear
  - The eCourse design clear and well written
  - The assignments were appropriate for the level of this class
  - The eCourse increased my interest in the subject
  - The eCourse corresponded to my expectations

4. What overall rating would you give the teacher?

- Excellent
- Very good
- Good
- Fair
- Poor

5. Please indicate your level of agreement with each of the following statements:

- Strongly Disagree
- Disagree
- Neutral
- Agree
- Strongly Agree
  - The teacher demonstrated knowledge of the subject matter
  - The teacher was effective in communicating the content of this eCourse
  - The teacher encouraged feedback from the class
  - The teacher showed genuine concern for the students
  - The teacher was enthusiastic about the content

6. Would you recommend this eCourse to other students?

- Definitely
- Probably
- Not sure
- Probably not
- Definitely not

7. Please provide any comments or suggestions that might help improve this eCourse in the future?

REFERENCES

Ball, D. L., & Bass, H. (2000). Interweaving content and pedagogy in teaching and learning to teach: Knowing and using mathematics. In J. Boaler (Ed.), Multiple perspectives on mathematics teaching and learning (pp. 83–104). Westport, CT: Ablex.

Burns, M. (2007). Raising the issues. In ABOUT TEACHING MATHEMATICS: A K-8 RESOURCE (3rd ed., pp. 3-66). Sausalito, CA: Math Solutions.

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