

Week Two Lesson Map

ITL528 SS Integrated Design II

Frank Jamison

Dr. Eric Fraunfelder

March 17, 2024

Standards

Content Standard	<u>CCSS.MATH.CONTENT.HSA.REI.C.6</u> Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables (Common Core State Standards Initiative, 2021)
Visual and Performing Arts Standard	<u>Prof.VA:Cr2.1 (Arts)</u> Engage in making a work of art or design without having a preconceived plan (California Department of Education, n.d.).
Additional content standard outside of your content area.	<u>HS-PS2-4 Motion and Stability: Forces and Interactions</u> Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects (National Research Council, 2013).

Learning Objective

- ▶ **Solve Systems of Linear Equations with Precision:** Students will be able to accurately solve systems of linear equations using both graphical and algebraic methods (substitution and elimination), demonstrating a clear understanding of the concepts and processes involved.
- ▶ **Apply Systems of Linear Equations to Real-World Problems:** Students will be able to apply their knowledge of systems of linear equations to solve real-world problems, particularly in the context of physics (e.g., using mathematical representations of Newton's Law of Motion and Gravitational Law), showing their ability to transfer mathematical skills to practical situations.

Lesson Plan Rationale

The lesson plan is designed to build on students' existing knowledge of linear equations, progressively guiding them towards mastering systems of equations, a more complex concept. The plan considers the skills and understanding students have acquired in previous mathematics and science courses, starting the week with a review and moving towards the application of these concepts in physics, relating to Newton's Laws.

To engage with students' personal and cultural backgrounds, the lesson plan includes activities that allow for the integration of their unique experiences and viewpoints, such as creating art based on mathematical concepts without a predefined outcome. This method acknowledges and values the diversity of student backgrounds and encourages them to draw on their cultural and socioeconomic experiences.

Day 1: Introduction to Systems of Linear Equations

Objective: Students will understand the concept of a system of linear equations and the graphical method of solving them.

Activities:

Warm-Up: Review of linear equations and graphing.

Direct Instruction: Introduce systems of linear equations and vocabulary (solution, consistent, inconsistent, dependent, independent).

Guided Practice: Solve a few systems of linear equations graphically.

Independent Practice: Students work on a worksheet solving systems of linear equations graphically.

Assessment: Exit ticket with a simple system of linear equations to solve graphically.

Day 2: Algebraic Methods of Solving Systems

Objective: Students will learn algebraic methods (substitution and elimination) for solving systems of linear equations.

Activities:

Warm-Up: Quick review of Day 1.

Direct Instruction: Teach substitution and elimination methods.

Guided Practice: Work through examples using both methods.

Independent Practice: Students solve systems of equations using substitution and elimination on a worksheet.

Assessment: Quick quiz on solving systems using substitution and elimination.

Day 3: Application in Science (Newton's Laws and Gravitational Law)

Objective: Students will apply their knowledge of systems of linear equations to solve problems related to Newton's Laws and Gravitational Law.

Activities:

Warm-Up: Review of Newton's Laws and Gravitational Law.

Direct Instruction: Demonstrate how systems of linear equations can be used to solve problems in physics.

Guided Practice: Solve a problem as a class that involves creating and solving a system of equations related to force and motion.

Independent Practice: Students work on physics problems that require setting up and solving systems of linear equations.

Assessment: Homework assignment with physics problems that involve systems of linear equations.

Day 4 : Integration with Visual Arts

Objective: Students will create a visual representation of a system of linear equations, emphasizing the artistic process without a preconceived plan.

Activities:

Warm-Up: Discussion on how math can be visual and artistic.

Direct Instruction: Introduce the concept of creating art based on mathematical principles.

Guided Practice: Students start creating a piece of art representing a linear equation system (e.g., using lines and colors to represent different equations and their solutions).

Independent Practice: Students continue working on their art pieces, exploring different ways to represent systems of equations visually.

Assessment: Peer critique session where students share and discuss their art pieces.

Day 5: Review and Summative Assessment

Objective: Students will review key concepts from the week and demonstrate their understanding through a choice board assessment.

Activities:

Warm-Up: Quick review game (e.g., Kahoot) covering the week's topics.

Review: Address any questions or confusion from the week.

Summative Assessment: Students complete a choice board assessment, where they can choose from various tasks that demonstrate their understanding of systems of linear equations, their applications in science, and their integration with visual arts.

Assessment: Choice board assessment.

Instructional Strategies

The instructional plan for the entire week employs UDL principles and content -specific strategies to enhance learning and accessibility. It incorporates visual, auditory, and hands-on approaches for varied learning styles and encourages student choice in demonstrating understanding. Strategies like scaffolding, modeling, and collaborative activities such as think-pair-share are used daily to deepen comprehension. Adaptations for diverse learners include differentiated challenges, technology aids for immediate feedback, and recordings for self-paced learning. Flexible grouping and culturally relevant examples cater to all students, ensuring a supportive and engaging environment throughout the week.

Student engagement with math, visual and performing arts (VPA), and science content will be supported by various instructional strategies. Modeling will be used daily to demonstrate new concepts, especially in math, where each step in solving equations will be shown. Scaffolding will help build upon what students already know, with prior knowledge in math and science being used as a foundation for new learning. Inquiry through strategic questioning will keep students actively thinking and connecting with the content.

In VPA, students will create artwork without a preconceived plan, using math concepts they've learned. This interdisciplinary approach allows students to express their understanding creatively. The lesson plans will guide students through activities with clear, step-by-step instructions, ensuring they know what is expected in the math and VPA components.

Assessment will be formative, with exit tickets and peer discussions in math, and summative through a choice board that integrates all content areas, allowing students to showcase their learning in diverse ways. Digital tools, like graphing calculators and art applications, will be utilized to engage students with the content practically and interactively.

Academic Language Development

To address academic language development and support English learners and Standard English learners, the week-long lesson will integrate strategies such as explicit vocabulary instruction, visual aids, and scaffolding. Key terminology necessary to access the content includes mathematical terms like "system of equations," "graphical solution," and scientific concepts from Newton's Laws. Visual arts vocabulary may also be included as part of the interdisciplinary approach. Strategies like modeling language use, encouraging peer discussions, and providing multilingual resources will ensure that all students can engage with and understand the essential vocabulary.

Assessments

Throughout the week, I'll utilize informal and formative assessments such as exit tickets, peer reviews, and class discussions to gauge students' comprehension of the content. This immediate feedback will highlight which concepts need reinforcement and which students might require additional support or enrichment. With this data, I will adapt subsequent lessons, tailoring instruction to address gaps in understanding or misconceptions. For example, if many students struggle with a particular type of equation, I can review that concept in greater detail. This responsive approach ensures that teaching is dynamic and tailored to the evolving needs of the class.

Focus Students

For Jun, the lesson plan leverages her strengths in math and music by including pattern recognition and rhythm in mathematical concepts, facilitating her engagement and understanding. Assistive technologies like graphic organizers and bilingual dictionaries aid her writing and English language development. The plan supports her English Language Development (ELD) goals by integrating content-based language instruction, focusing on mathematical vocabulary, and providing a variety of representation modes to enhance her grasp of academic language.

Juan benefits from the lesson plan through the integration of voice-to-text technology, which assists him in overcoming challenges with writing due to his Specific Learning Disabilities. Visual supports and step-by-step explanations in math cater to his learning needs and support his ELD goals by clarifying academic language and processes. Small group discussions and one-on-one support, potentially outside of classroom hours, further aid his English language development, particularly in explaining complex ideas.

Maricela's plan utilizes her interest in art, translating word problems into visual formats, which helps bridge her understanding of math and strengthens her academic language skills. Using visual aids and manipulatives addresses her difficulties with comprehension and supports her ELD goals by making content more accessible. Group work with language models and additional language development services inside and outside the classroom contribute to her overall English proficiency.

Resources

California Department of Education. (n.d.). *California Content Standards*. Retrieved March 13, 2024, from <https://www2.cde.ca.gov/cacs/id/web/31081>

Common Core State Standards Initiative. (n.d.). *High School: Algebra » Reasoning with Equations & Inequalities » Solve systems of equations. » 6 | Common Core State Standards Initiative*. Retrieved March 13, 2024, from <https://www.corestandards.org/Math/Content/HSA/REI/C/6/>

National Research Council. (2013). *HS-PS2-4 Motion and Stability: Forces and Interactions | Next Generation Science Standards*. <https://www.nextgenscience.org/pe/hs-ps2-4-motion-and-stability-forces-and-interactions>