SECONDARY MATHEMATICS LESSON PLAN

TEACHER: Mr. Sinnott
SCHOOL: Ronkonkoma Middle School
DATE: January 27, 2025
CLASS: Algebra 1 Honors
TOPIC: Solving Systems of Linear Equations (Substitution method)

Context for Learning

Describe the class this lesson is designed for (e.g. type of class, any cooperating teacher requirements, curriculum or textbook, the overall number of students, students with IEPs/504s, ELLs, etc).

The class I am instructing is an 8th grade Algebra 1 Honors course. Relative to my fourth period class, there are 24 (10 male, 14 female) students and only 3 students have an IEP/504 plan. One student has autism, another has Aspergers, and another has ADHD. There is no formal textbook to follow as all lessons and materials are produced by myself or my cooperating teacher.

Note: The unit packet and WINK sheet were originally produced by my cooperating teacher.

NYS Next Gen Mathematics Learning Standard(s)

List the NYS Standard(s) addressed in this lesson.

- NY-8.EE.8 → AI-A.REI.6a → (+)-A.REI.6b

Lesson Objective(s)

List at least three observable and measurable learning objectives. Your learning objectives should be rigorous and target different levels of Bloom's taxonomy.

1. SWBAT find the value of a single variable in a system via substitution.
2. SWBAT find both variables of a given system via substitution.
3. SWBAT set up a system of equations based on a given word problem.

Procedural Knowledge	**Conceptual Understanding**
What procedural knowledge will students develop during this lesson? - How to properly substitute an expression/value in for a variable.	What conceptual understanding will students develop during this lesson? - How to set up a system of equations when given a word problem. - Recognize what variable is easiest to isolate for when setting up for substitution.
Real-World Application	**Mathematical Practices**
What opportunities will students have to apply their knowledge to real-world problems during this lesson? - Word problems that create situations in which setting up a system of equations is plausible.	What mathematical practices will students engage in during this lesson? ● Model with mathematics ● Attend to precision ● Make sense of problems and persevere in solving them

Assessment

What informal and formal assessments will you include in **this lesson** that will evidence whether your students met your intended learning objectives?

1. Informal skill check questions as lesson progresses.
    - Skill check for simply setting up an equation.

- Skill check for finding the first variable of a system.

2. Walking around during independent practice and group work.
3. Ask students for a thumbs up/down/side at the beginning, middle, and end of lesson to check for student confidence.
4. Formal skill check question at the end to check if students can solve a system correctly at every step.

Instruction

Please give a detailed, step by step description of your lesson. This should be the BULK of your lesson plan. Be sure to list all materials needed for this lesson, including any links to slides, handouts, websites, etc.

Materials:

- TI-84 graphing calculator
- Unit packet
- Smartboard/iPad (Notability)
- Unit 5 WINK 8 Systems of Equations.docx
- Materials for lesson 2.docx (pages from the unit packet)
- Systems Of Equations (Substitution&Graphing)
- Mini whiteboards w/graph on back side
- Dry erase markers
- Erasers
- Unit Plan Frayer Model
- Vocab for Chinese ELLs

note: This lesson was conducted under a double period

Warm Up/Do Now: (10 minutes) How will you get your students excited about the lesson?

1. I'll spend time at the start of class recapping what we learned over the past two days (graphing systems).
2. I'll ask students to talk with those at their table to see if they can think about another way to solve a system.
3. As students discuss, I will listen to what they are saying and based on their ideas I will pivot that into a classwide discussion and then I will reveal the substitution method.
4. Afterwards, I will ask students to fill out another portion of their "What I Need To Know" (WIN2K) sheets. This is a sheet that acts as a cumulative study guide.

Presentation: (42 minutes)

1. Instruction begins following the discussion from the warm up. Now that I have talked about the substitution method, I will ask students to discuss with their peers again to see if they can get started on the problem on the board by working/brainstorming on mini whiteboards.
2. I will ask students how they feel so far by asking for a thumbs up/down/side and then move into direct instruction.
3. Via direct instruction, I will work through one to two low level questions (ex: x or y is already set to a constant value) then ask students to try on their own. I will check for understanding again with a thumbs up/down/side afterwards.
4. The above process will repeat as I introduce moderate level questions (system has two equations set up in slope-intercept form, only one variable is isolated to equal…ex: x=2y-5 ; 3y-4x=8) and high level questions (system has no variables isolated).
5. Instruction will conclude by completing a few word problems that are modeled after the Regents exam. Students will be asked to try the water tank question on their own.

Partner Work: (20 minutes)

1. Students are arranged in groups of 4-5 at tables during the whole two periods.
2. Students are encouraged to try problems with their group when I ask them to try a question without my support.
3. White board practice for higher moderate to higher level systems of linear equations questions.

Discussion: (10 minutes)

1. When the period started, I spent time connecting the substitution method to the graphing method.

2. As we moved into word problems, I pointed out keywords to look for and talked about how let statements can be helpful in setting up a system.
3. Multiple student discussions were led throughout the lesson to prompt student inquiry before teaching and assess for understanding after teaching.

Cool Down/Closure: (2 minutes) How will you summarize and close out the lesson?

1. Ask students how they feel about today's material and the whiteboard practice.
2. Briefly foreshadow the last method of solving a system, if time allows we can have another class discussion for this as it will be taught the next day.

Questioning and Higher Order Thinking

What essential questions will you ask during this lesson? What questions will you ask that will require students to engage in higher order thinking? Your questions should target different levels of Bloom's taxonomy.

- What could a system with parallel lines imply?
- Which variable do you suppose is the easiest to solve for first?
- What form is this line in?
- What can I do if my system has two equations in slope-intercept form?
- Yesterday we learned how to solve systems graphically. Does anybody think there is another way to solve a system?

Differentiation and Adaptations to Meet Individual Needs (IEPs/504s)

In what ways have you differentiated this lesson according to students' varied readiness levels, interests, and learning profiles? Be sure to describe **specific strategies** you have incorporated into **this lesson** for **this topic**. Strategies should specifically address students with IEPs/504s, ELLs, and other student groups.

- My fourth period class tends to grasp onto material a lot quicker than my other periods, so oftentimes I may utilize more of an inquiry-based instructional approach and less of a direct instruction approach, even though I bounce between both.
- Mobility is an important accommodation for my students with ADHD and Aspergers, so during whiteboard practice, I allow them to sit anywhere they'd like. Additionally, I have them pass out the materials at the start of class, which they enjoy doing.
- For fast finishers, I will ask them the option to help students at their table or to come up to me for a significantly harder question.
- I also have created a frayer model graphic organizer for SWD's so they can write down an example of each method we have learned so far.
- While I do not have any ELL's in my fourth period class, I do have two Chinese ELL's in my first period class. I provided them with a vocabulary support with pictures for common words in word problems and content words.

Academic Language

What reading, writing, and/or speaking tasks are included in this lesson? What key vocabulary terms and/or mathematical notation will students need to know and be able to use? What **supports** will you incorporate to help your students with the reading, writing, and/or speaking components of this lesson?

- System
- Linear System
- Standard form
- Slope-intercept form
- y=mx+b
- Point of intersection (POI)
- Solution
- Substitution

- Isolate

Cooperative Learning

When will students be asked to talk to one another during this lesson? How will you support your students in engaging in true cooperation and discussion?

- Students at each table will brainstorm and jot down any ideas about solving a system before I teach them anything.
- Students are encouraged to work together when I ask them to try an example without my support.
- During whiteboard practice, students work together to solve the given question.

Technology Component

What technology have you incorporated into this lesson? In what ways does the technology substitute, augment, modify, or redefine (SAMR) your instruction?

- SMART Notebook
- Google Slides
- Online TI-84 calculator
- Notability (on iPad)
- SMART Mirror

Reflection

Systems is one of my favorite topics to teach because it gives you the opportunity to show that there are multiple ways to solve the same problem. I think that leading this class with an inquiry-based learning model was a successful way to not only get students thinking critically before I teach, but also a great way to get students comfortable in the unknown. I should note that my cooperating teacher normally utilizes direct instruction, so taking a more student-led approach was a risk that I was happy to take. I noticed that more questions were raised, students that are not normally the first to speak were engaged with their table, and when I asked the class if they could think of any method to solve a system besides graphing, each table had an idea to contribute. Once I revealed the new method, I noticed that the students were more eager to learn and I'd like to think that is because they spent a chunk of time brainstorming and discussing with their peers. Direct instruction worked just fine as well, but I wonder if students would have struggled more or less if I did not take an inquiry-based approach at first. Another takeaway from this lesson is that I may move towards using my iPad to teach instead of the Smart Board. During whiteboard practice, I mirrored my iPad to the SmartBoard by using SmartMirror. This gave me the ability to navigate around the class while simultaneously writing on the board because whatever I wrote on my iPad would show up on the Smart Board. If I could have done anything differently, I would have utilized my iPad from the start of class. Generally speaking, I thought this lesson went quite well and I feel more confident taking an inquiry-based approach in the future. I think the lesson could have gone better if I found more ways to assess students outside of the thumbs up/down/side system, so moving forward I need to upgrade that aspect of my teaching arsenal.