Solving Systems of Equations by Graphing

By Carrie Wiederholz

Slide #2

Target Audience

- Lewis F. Cole Middle School, Fort Lee
- 8th Grade Algebra Class
- Systems of Equations Unit

I teach 8th grade math to students at Lewis F. Cole Middle School in Fort Lee. This lesson is targeted for my general education Algebra I class of 24 students. The students will have already had some practice on solving systems of equations by graphing during the previous day's lesson, but this lesson will help to provide more meaning by relating this topic to a situation in their lives. This lesson will cover one class period of 42 minutes and will reach the various learning styles and multiple intelligences of each of the students in my class.

Picture Citations: *http://i00.i.aliimg.com/wsphoto/v0/32237824262_1/Fort-lee-New-Jersey-the-font-b-George-b-font-font-b-Washington-b-font-font.jpg*
http://www.radixvideoclass.com/wp-content/uploads/2015/04/Algebra1.png

Slides #3-4

Goals/Content Objectives

Students will be able to…

- Graph linear equations on a coordinate plane (A.REI.10)
- Solve systems of linear equations exactly and approximately (eg with graphs), focusing on pairs of linear equations in two variables. (A.REI.6)

Desired Outcomes

- Recognize that the intersection of the two lines is the solution to both equations
- Interpret the graphs
- Increase student confidence in this topic

By the end of the lesson, I want students to be able to answer questions about all parts of the graph of a system of linear equations. They should feel confident in their answers and be able to describe what the graph is showing.

Picture Citation: *http://www.coolmath.com/sites/cmat/files/images/01-systems-03.gif*

Slide #5

Sensory Input & the Classroom Environment

- Safe, positive, & fun
- Desks in U-shape
- Music in the beginning

Creating a positive learning environment will greatly affect how much students learn. When a student feels positive about their learning environment, endorphins are released in the brain, which stimulate the frontal lobe and make the learning process successful (Sousa, 2011) Through the Limbic system many functions are carried out including the creation of emotions which effects learning and memory. As information enters the brain through the Reticular Activating System (RAS), it is important for the information to be interesting so that it passed on to the brain. Once the students feel comfortable in their environment, it is important to stimulate their brain using curiosity, which I do in the beginning of my lesson by playing music as the students enter the classroom. As the student's interests are peeked, the information should flow to the ***amygdala*** and into the thinking brain (Willis). This sets the stage to allow the new information

from the lesson to be processed in the brain and into long term memory. The ***hippocampus*** constantly is checking information with the working memory and comparing it to the stored experiences. It consolidates the learning and moves it to long-term storage (Sousa, 2011). All of the sensory information except smell that is input into the brain first stops in the ***thalamus*** before being sent to another part of the brain that is specific to the incoming information (Sousa, 2011). Throughout our lesson the thalamus was receiving information about graphing linear equations through the song, visual graphs, auditory information through class and group discussions and touch as they graph their answers. The ***hypothalamus*** regulates the internal systems to maintain the normal state of the body. In order for students to comprehend the material they need to be ready to learn and feel great (Sousa, 2011).
***Picture Citation*:** www.zo.utexas.edu

Slide #6

Primacy/Recency

I set up my lesson based upon the Primacy-Recency Effect in order to maximize the amount of learning and retention for my students (Sousa, 2011).

Slide #7

Lesson Activities Prime Time 1

- Students enter classroom with music playing
- We are going to have a Graduation party!
- Select which vendor suits our needs

One of the most important times during a lesson is the beginning during the Prime-Time I because the students will remember most of the information at this time. In order to take advantage of this, I plan to peek their interest as they enter the classroom by having graduation music playing. This will help stimulate curiosity and the Reticular Activating System (RAS) will allow the new information that is about to be presented into the brain. I will explain to the class that the student council would like to throw a Graduation party for all of the 8th grade students but that they need to figure out the most cost effective vendors for the amount of time of the party. By relating the problem to the students, the Amygdala will respond to the relevance of this topic and sent this new information further into the brain. I will then build on the lesson from the day before where students practiced graphing linear equations and finding their intersection points by discussing a scenario about deciding which DJ to pick for the party. I will model how to solve the word problem and discuss with the student what the graph represents (Sousa, 2011).
Picture Citation: *http://cbsnews1.cbsistatic.com/hub/i/r/2012/05/22/9f60c47e-a644-11e2-a3f0-029118418759/thumbnail/620x350/65508a910a758eb432d4fd4053306673/graduation.jpg*

Slide #8

Lesson Activities Down Time

- Break into groups to work on problem
- Students create their own graph
- Teacher walks around room to facilitate learning
- Differentiated learning

During this down time students review what was just presented to them as well as apply this knowledge to a new vendor. The students will work together to create a graph of the new problem and analyze their results. During this time, I will be walking around the room helping students practice and asking them questions about their work. I can differentiate the lesson by giving out problems of various degrees. At this point the information is no longer new and the practice helps the students further process the information to strength their understanding (Sousa, 2011).
Picture Citation: *http://cdn1.theodysseyonline.com/files/2015/07/23/635732924053603777-93632716_group.png*

Slide #9

Lesson Activities Prime Time 2

- Class discussion about the graphs
- YouTube Tortoise and Hare example to analyze for Edmodo Exit ticket

During the last 5-10 minutes of class known as Prime Time 2, closure of the lesson should take place where the students have an opportunity to make sense and meaning of the lesson. The groups will display the graphs that we created and explain which vendor is the cheapest at what time. I will then show the class a small YouTube clip about the Tortoise and Hare problem and ask them to fill out an exit ticket on Edmodo using their chrome books. This will help the students to analyze and interpret graphs with two linear equations (Sousa, 2011).

Picture Citation: *http://3.bp.blogspot.com/-RQfI8_f6gyk/UD60hnHL0gI/AAAAAAAABgA/jUyGJV4I70I/s1600/ticket.jpg*

Slide #11

Technology (General/Specific)

- Student Issued Chromebooks
- Computer with Easiteach Software
- Interactive White Board
- Projector
- Edmodo Class Website
- YouTube (MyWhyU)

I enjoy using appropriate technology in the classroom everyday with my students and find that it can really enhance the lesson. New this year, my district implemented a policy where all students from grades seven through twelfth grade were issued a chrome book to use inside and outside of the classroom which has made the incorporating the technology limitless. On a daily basis, I use the Easiteach program on my classroom computer along with the projector and Interactive White board to project my lessons and show students how to complete math problems. It is the chalkboard of the future. RM Easiteach is an excellent software for math classrooms because as an example I am able to easily pull up graph paper and demonstrate how to graph equations using lots of color. Our Edmodo class website allows my students in each class to collaborate with each other and myself in a safe environment that is not public for anyone outside of the class. I also like to use YouTube to show my students interesting and captivating videos to probe them to analyze the situation further. Through the use of all of these technologies, I am able to make the learning fun and interesting which in turn helps them to understand, learn and retain the information being presented (Sousa, 2011).

Picture Citations: *http://s3.amazonaws.com/digitaltrends-uploads-prod/2014/02/Chromebook.png, https://www.youtube.com/yt/brand/media/image/YouTube-logo-full_color.png http://www.edison.k12.nj.us/cms/lib2/NJ01001623/Centricity/Domain/58/Edmodo.gif*

Slide #12

Evaluation/Assessment Techniques

Formative: (Check for understanding)

- Teacher observations
- Practice Problem
- Discussions
- Exit Ticket

Summative: (Long Term Storage)

- Quiz
- Unit Test
- Quarterly Test

Slide #13

Sense & Meaning

- Making connections with previously learned information
- Relating to real-world situations

In order for the brain to move information to long term memory, sense and meaning need to be in place so that the hippocampus can encode that information and send it to long term storage. By connecting this lesson to the previous lesson on systems of equations and on lessons involving linear equations, students are able to make sense of the topic being covered. They find meaning for this lesson by applying this lesson to real-world examples of comparing vendors for a graduation party.

***Picture Citation*:** *weknowyourdreams.com*

Slide #15

Learning Styles

From the Gregorc Model of Learning Styles we have learned about four different ways in which people prefer to receive, organize and understand information. During this lesson, I have created activities to reach all styles of learning.

Abstract Sequential: These learners enjoy analyzing the problem and using facts to develop a solution. Although they prefer to work independently, these students will enjoy the portion of the lesson that allows them to logically work through the real-world problem and then independently analyze the Tortoise and Hare problem during the exit ticket.

Abstract Random: These learners work best in a group because they like to listen to others, bring harmony to group situations and enjoy being in a personalized learning environment. During my lesson, these learners will thrive during the group work part because they can interact with their peers as well as have math problem that is more individualized to their interests.

Concrete Sequential: These learners work best in an organized and structured environment and like to produce concrete ideas from the abstract. The guided examples part of my lesson and the similar structure of the class period from the beginning lesson to the end with the exit ticket will be preferred by these learners. In addition, as they take the abstract problem and create a concrete graph of the situation it will help them to make meaning of the information.

Concrete Random: These learners like to find their own way to a solution and enjoy solving real-world problems. Through this lesson these students can develop creative ways to solve the problem as well as analyze the solution. As a challenge I would ask these students how to solve the problem without a graph. (Gregorc, 1985)

Picture Citation: *www.incredibleart.org*

Slide #16

Multiple Intelligences (Gardner, 1983)

- **Linguistic:** Linguistic learners have a mastery of language and will enjoy the part of the lesson where they get to explain the parts of the graph through verbal or written language. In addition, these learners like discussing the information with their peers and find that speaking about a topic helps them to remember it.
- **Logic/Mathematical:** Logical or Mathematical learners will enjoy most of the lesson since it is a math topic and they find enjoyment in problem solving. They will be intrigued by the analysis of the graphs and detection of patterns among the graphs.
- **Visual:** These students will be continually stimulated through the whole class introduction and instruction on the white board as well as the graphs that are created for each world problem. The YouTube video at the end will also highlight the important parts of the lesson visually.
- **Musical:** Through the use of the graduation song playing in the beginning, the musical learner should be "hooked" into the lesson and be able to relate the song to the problems presented.
- **Bodily/Kinesthetic:** This learner performs better when they can move while learning the lesson. In this lesson, the students get to move around the room to find their group and through the use of touch they will learn as they create a graph of the word problem presented to them.
- **Interpersonal:** This learner enjoys socializing and working with others which is incorporated in most the lesson. In the beginning during Prime Time 1, the class works as a large group to understand the material being presented and then they work in smaller groups with other students to complete a problem as a team.
- **Intrapersonal:** This learner will enjoy time when they get to work independently which is during the exit ticket and independent practice after the lesson.
- **Naturalistic:** For this learner, the lesson can be expanded to include topics in nature such as comparing the rate a which two forest's trees grow.
- **Existential:** This learner looks at the big picture and will expand upon the idea of the graphs being used for life expectancy. (Gardner, 1983)

Slide #18

Neurons:

- functioning core of the brain
- gathers sensory information

In the brain there are billions of neurons that are the functioning core for the brain. They receive information and send it to other neurons through electrical impulses to specific parts of the brain. The neurons will detect lots of new information through the senses, which will cause the neurons to fire and send the information to parts of the brain.

***Picture Citation**: www.wileywitch.com*

Slide #19

Cerebral Lobes:

Each part of the brain specializes in certain functions that are stimulated throughout this lesson.

- Frontal Lobe: The frontal lobe acts as the command center and regulates higher order thinking as well as problem solving. The students throughout the lesson are continually thinking making decisions on the best way to graph the linear equations and then interpret what the graph tells them about the vendors in their problem.
- Temporal Lobe: The temporal lobe processes auditory information dealing with sound, music and face/object recognition. Along the left side of the temporal lobe, the speech center is housed. During the lesson the students will need to use this part of the brain to process the music playing as they enter the classroom, when listening to directions and working in a group as well as explaining their answers (speech) and listening to the YouTube video.

- Occipital Lobe: The occipital lobe processes the visual information. This lobe will be stimulated most of the lesson through the whole class introduction in the beginning, the group work as they create their own graphs, displayed group work results and the video at the end of the lesson. The graphs are continually referred to throughout the entire lesson (Soussa, 2011).
- Parietal Lobe: The parietal lobe processes spatial orientation and calculations. It also receives and processes information. As the students calculate the answer to their problem by creating their graphs and working together in a group, they will be stimulating their parietal lobe. ("Basic Parts of the Brain • Nervous System • AnatomyZone")

***Picture Citation*:** www.morphonix.com

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