Final Project Analysis

UDL

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Universal Design for Learning has developed a set of principles to guide curriculum development in an effort to give all students an equal opportunity to learn. This idea has stemmed from things such as NCLB and IDEA and is based on teacher feedback and research. "A UDL curriculum is designed to be innately flexible, enriched with multiple media so that alternatives can be accessed whenever appropriate. A UDL curriculum takes on the burden of adaptation so that the student doesn't have to, minimizing barriers and maximizing access to both information and learning." (NCAC, p. 7). The goal of UDL is for teachers to plan lessons and units while thinking about barriers that students may encounter instead of discovering the barriers after the lesson or unit is taught. The diversity of the student base is so extreme that a variety of options need to be available to reach all learners.

The universal design for learning focuses on three different principles derived from the three learning networks in the brain: recognition, strategy, and affect. These three networks can be translated into the what, how, and why of learning. The guidelines allow curriculum to be adapted for schools. The first principle suggests multiple representations for material presentation. The second principle suggests opportunities to choose a way for expressing knowledge and the third suggests multiple opportunities for engagement. "The way people learn is as diverse as their fingerprints" (National Center on UDL). The flexibility UDL presents in classroom curriculum breaks down these barriers and optimizes levels of challenge and support for all learners.

Teachers are not expected to provide all these opportunities in every lesson, but throughout units students need to be given the chance to explore and expand their knowledge in a way that benefits their learning. Simple things such as highlighting specific text, enlarging text, and using background knowledge allow a more substantial grasp of the presented material.

Support also needs to be given to students as they begin practicing ideas and concepts so that a level of frustration is not reached. The flexibility in levels of challenge allow all students to feel that they are capable of learning.

"Differentiated instruction is designed to keep the learner in mind when specifying the instructional episode" (NCAC p.9). UDL focuses on the diversity of learners and reaching all of these learners. If UDL wants the focus to be on what barriers may be hindering student learning, that is a similar idea of keeping specific learners in mind when differentiating instruction. Students that have learning disabilities are given the opportunity with UDL to show what they understand in a method they are comfortable using. It works towards their strengths allowing students to be successful. UDL also helps to better support the knowledge base that students already have and allows teachers the opportunity to scaffold instruction. Differentiated teaching uses these ideas before designing the lesson allowing ELL and LD students more opportunities for success. This plays into the flexible design of UDL.

To incorporate UDL into my middle school classroom, I created a concept map to help students understand specific mathematical terminology. This idea rose after grading quizzes where students struggled to answer some of the questions because they did not understand the difference between the math terms. This impacted their quiz grades negatively even though when specific in class students were able to solve both types of problems successfully. As an introduction we discussed the importance of being able to understand the language that math problems present so that answers may be given to the best of their ability. We also talked about how in this chapter of study more terms were being introduced that were unclear to the students. Students were informed that we were going to spend some time defining these terms in our own words to improve retention for future assessments and standardized tests.

I used an introductory power point to inform students about what I was looking for on their concept map since we had never completed one in math class before. Students were allowed to pick partners or groups of three to allow some discussions about the terms and ideas. Students were also told to use resources to help them create their definitions. These resources could include notes we had taken in class, their textbook, or looking up definitions on their phones. All of the terms that were being defined had already been introduced earlier in the week so students had heard and been doing some work with the terminology already.

Students were required to fill in three ovals under the headings of rates and scales with important terms we had been using this chapter. Under each term they were to write a definition in their own words and include a drawing or representation for each. This allows my students that are more visual learners to remember the terms as well. They were also asked to define and draw for the category ovals that already had the terms listed on the concept map for them. Students were given about twenty minutes to work. A few groups finished, but most needed some more time so we can back to the activity at the beginning of class the next day for about 5-10 more minutes. The complete lesson plan, concept map, and rubric for grading are found in appendix A, B, and C.

There were some great discussions going on in the groups about what these math terms were relating to and how the students could word it in their own way so they would be able to remember what the term meant. Students were on task for the majority of the allotted time. They were discussing different ways of representing these terms using drawings or examples and in turn understanding the material on a deeper level than they had been before the activity. It may be more beneficial to allow an entire class period for the completion of the concept map so that students do not have to stop their discussions and thinking but can finish all the terms in one

sitting. The question remains how to continue using this concept map throughout the study of the rest of the chapter. Will it be something that the students forget about or a useful tool to study for assessments and completing assignments?

It was surprising how easily some of my students began filling in this concept map and understanding why I was asking them to define terminology in math class. The instructional power point left little room for questions or concerns before the activity was started. Most of the questions that students asked throughout the two days of filling in the concept map were if they had the correct terms for each category. This included separating scale drawing and scale model into two different ovals. The students as a whole struggled with defining measurement (which was the beginning oval for the concept map, see appendix B). This was the first time I had asked them to try and define measurement. The act of defining terms in math class is uncomfortable for students so I was pushing them to do a lot of their own thinking within their group. Results of this caused some of the definitions to not be in their own language but taken straight from the notes or almost straight from the textbook.

The first day students were much more willing to work efficiently in their groups. Getting back into the discussion the second day was much harder. As always there were a few select groups that would tend to get off topic and need to be refocused. This could be maintained better by assigning the groups instead of allowing student chosen groups. The biggest difficulty for assigning this as a class activity was the timeline. For a couple groups even though their discussions did not stray from the topic of the activity, they were still not able to fully complete the activity within the given time. Other groups complete the activity extremely quickly and then needed to work on other material.

Since the concept map activity, students are able to discuss the meaning of these terms when the instructions are presented in math problems. There was a much higher understanding of the difference between scale and scale factor on the quiz after the concept map. Some students still did not understand the difference, but we can now discuss as a class the importance of reviewing the definitions on the concept map before quizzes or tests to help understand the math problems.

My tutoring student had some trouble following the instructions of the activity even though the directions remained projected up in the classroom throughout the time students were given to work on the concept map. He did not create any drawings or representations to go with the definitions. His group had difficulty determining which terminology went under the main topics. The term scale was repeated under the broader topic of scale, however it was defined correctly. The terms that were already given on the concept map we not defined at all (see appendix D). Using the rubric to grade his concept map he would receive a 10 out of 24 points for the definitions and models and his group remained on topic earning all 6 points given for that category. Overall he received a 53% on the activity (see appendix E). To help him and other students a copy of the instructions should have been distributed to each group. Tracking from the power point to following it in their groups can be difficult for students with ADD.

The goal of this activity was for the students to be able to clarify math terms on their quiz problems to help improve grades. This student still did not understand the difference between scale and scale factor on this quiz although they were defined correctly on his concept map. On his quiz the result was the same answer for both questions (see appendix F). No improvement was seen initially, but maybe if the concept map had been studied before the quiz, or the definitions had been studied before the quiz there would have been more of a correlation. The

common response of the student is “How do I study for math?” With the terminology concept maps, students may see more items for them to use as a resource for study. The only full question he got wrong on his quiz was the one relating to writing the scale factor and could have been fixed with simply knowing the definition.

I agree with the overlying idea of UDL. I found that I use a lot of the different representations in my power point presentations that aid the note taking within my classroom. Students always get excited about different animations being used and offer suggestions for designing some new ones. If anything it brings their attention back to where we are in the lesson. Trying out this concept map was a very positive experience for math terminology. I had been questioning which steps to take in trying to incorporate more academic language into my classroom so that students were able to understand problems not only within class and our assessments, but also on standardized tests.

I learned that my students are not opposed to dealing with terminology/vocabulary in math class, but they do need to be taught how to use it to better their understanding of questions. This concept map needs to be something that they refer to while working on assignments. Modeling the use of this may be an important next step in the classroom. It also needs to be something that is done regularly; otherwise students are not going to put in the required effort while working on an activity of this sort. I plan on using this lesson again, for this chapter especially, but also with some upcoming chapters that have a lot of new terminology for the students to learn. I have noticed an improvement in class discussions where students are able to use terms in their explanations and use these terms effectively.

From this project I have learned not only more about the theory of UDL and how I have already been implementing a few ideas, but I have also learned how to incorporate more literacy

related ideas into a math classroom. Allowing students the freedom to put things in their own language and creating examples not only helps them retain the information learned, but it also brings more engagement into the lesson.

UDL References and Tools:

National Center on Universal Design for Learning:

www.udlcenter.org

National Center on Accessing the General Curriculum – Graphic Organizers

http://aim.cast.org/learn/historyarchive/backgroundpapers/graphic_organizers

"Differentiated Instruction and Implications for UDL Implementation" *Effective classroom Practices Report*

Institute of Human and Machine Cognition: *The Theory Underlying Concept Maps and How to Construct them and Use Them:*

http://cmap.ihmc.us/publications/researchpapers/theorycmaps/theoryunderlyingconceptmaps.htm

www.wordle.net – word clouds

www.tagxedo.com – word clouds

Appendix A:

Lesson Plan UDL

Date: Tuesday 11/14/11

Lesson: Chapter 6 Vocabulary: related to rates and scales

Objectives:

Students will be able to identify important terminology involved in the mathematical concepts of rates and scales.

Students will be able to visually represent this mathematical terminology

Students will be able to create definitions for this important terminology in their own words.

Procedure:

1) Discuss the importance of mathematical terminology with students. Why is it important to know mathematical terminology? How is it useful in class?

*Desired responses: Needed in order to answer the questions correctly, also needed to determine the difference between the questions that are being asked on a quiz or test.

2) One way to understand vocabulary is to use it more frequently and be aware of the terminology that is important. Goal is for students to feel comfortable using this terminology in class.

3) Introduce activity that will be done in class with a partner or in groups of three.
- Hand out a concept map to each student. The main topics are already filled in the concept map for the students to get an idea of what type of terminology I am looking for.
- Students in pairs are to fill in the 6 vocabulary words that fit each of the main concepts of rates or scales. Students may use their textbook and notes from chapter 6 to look for vocabulary words.
- Once the words are chosen students must create their own definition for each term including the 3 main terms already given to them.
- After writing the definition in the oval students need to include a drawing or representation to help them remember what the term means. For some this could simplify be an example if they are not able to come up with a drawing.
- Allow students 20 minutes to work on this in class today, not all groups may finish. Tomorrow take out and look at again and have students complete their concept map.

4) Partners are chosen by the students. Double check to make sure that each pair or group of 3 has a student that fully understands the terminology and is able to work

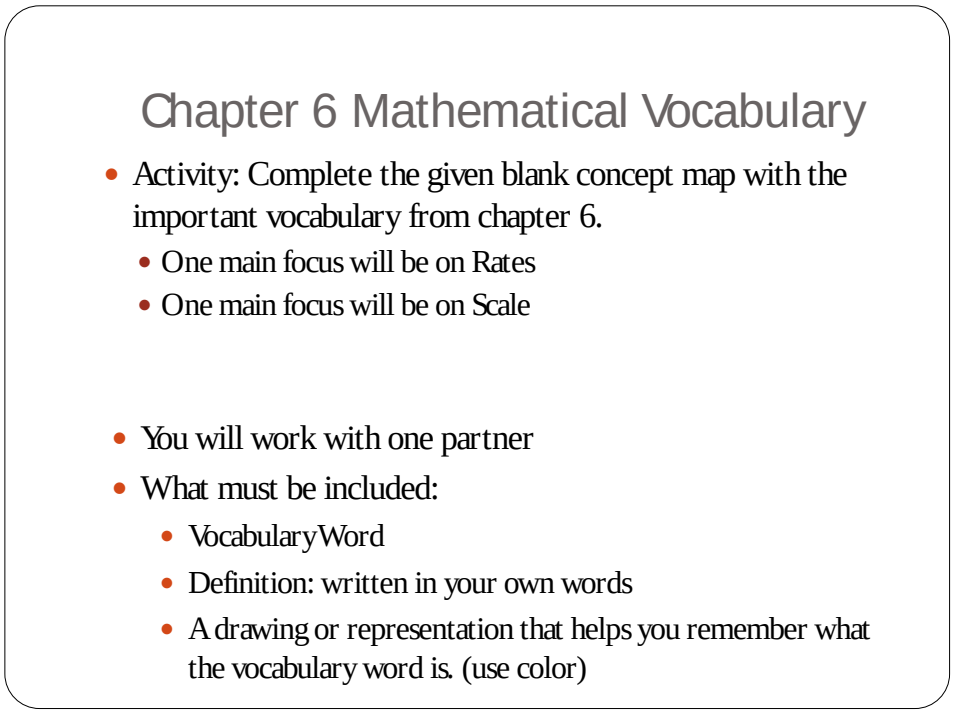
with other students that may have not taken very detailed notes. Offers an opportunity for some peer learning.

5) Accommodations: Students that have difficulty with writing or ELL students are not required to write their definitions in complete sentences. Ideas need to be down in a way they can understand what the terminology means. Students could also be allowed to just create a drawing or representation without a definition.

Assessment:

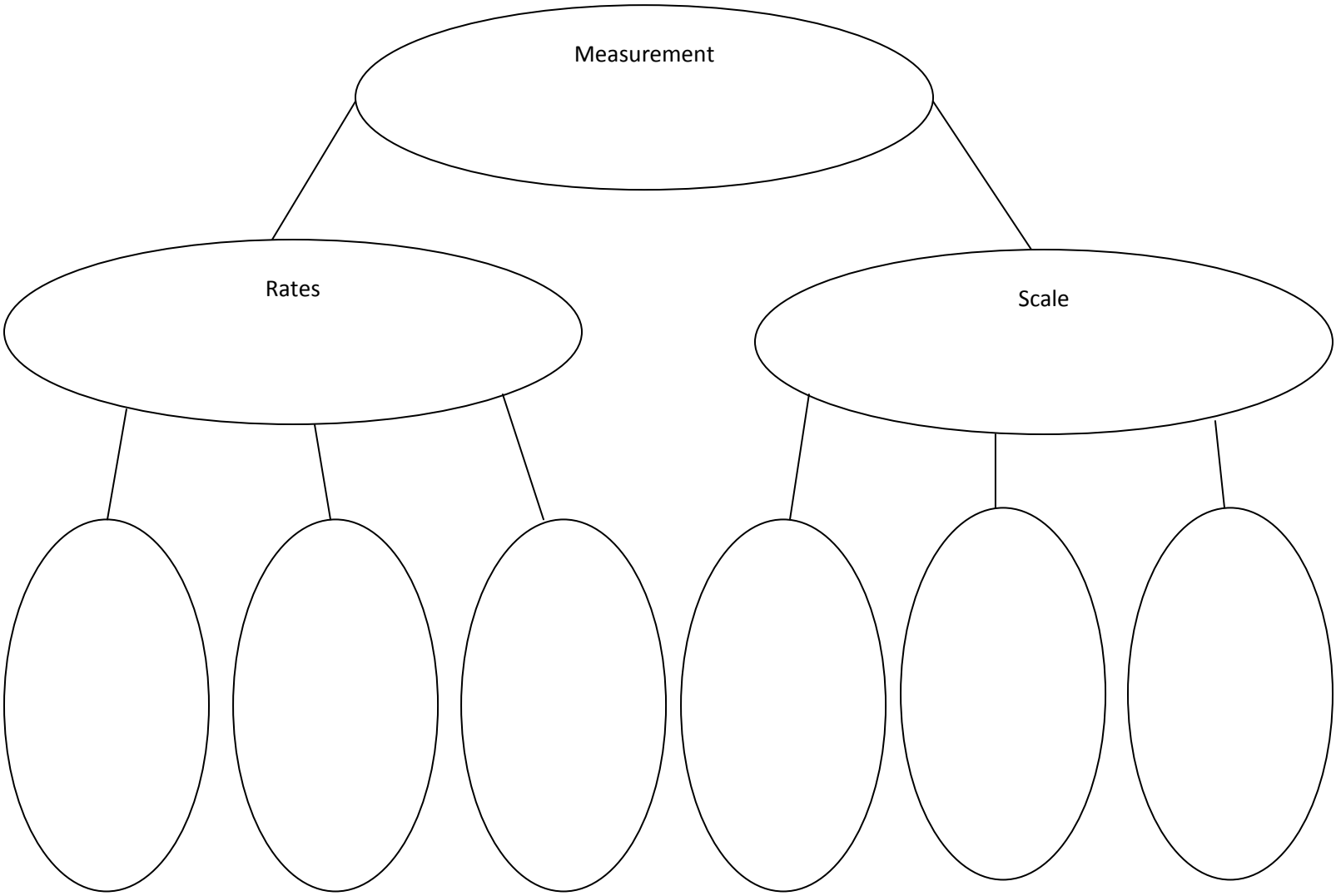
- Turned in concept map with all definitions and drawings/representations.
- Grade using rubric

Power point instructions slide:



Appendix B: Concept Map handed out to students

Chapter 6 Mathematical Vocabulary



Appendix C: Rubric for Grading Concept Map

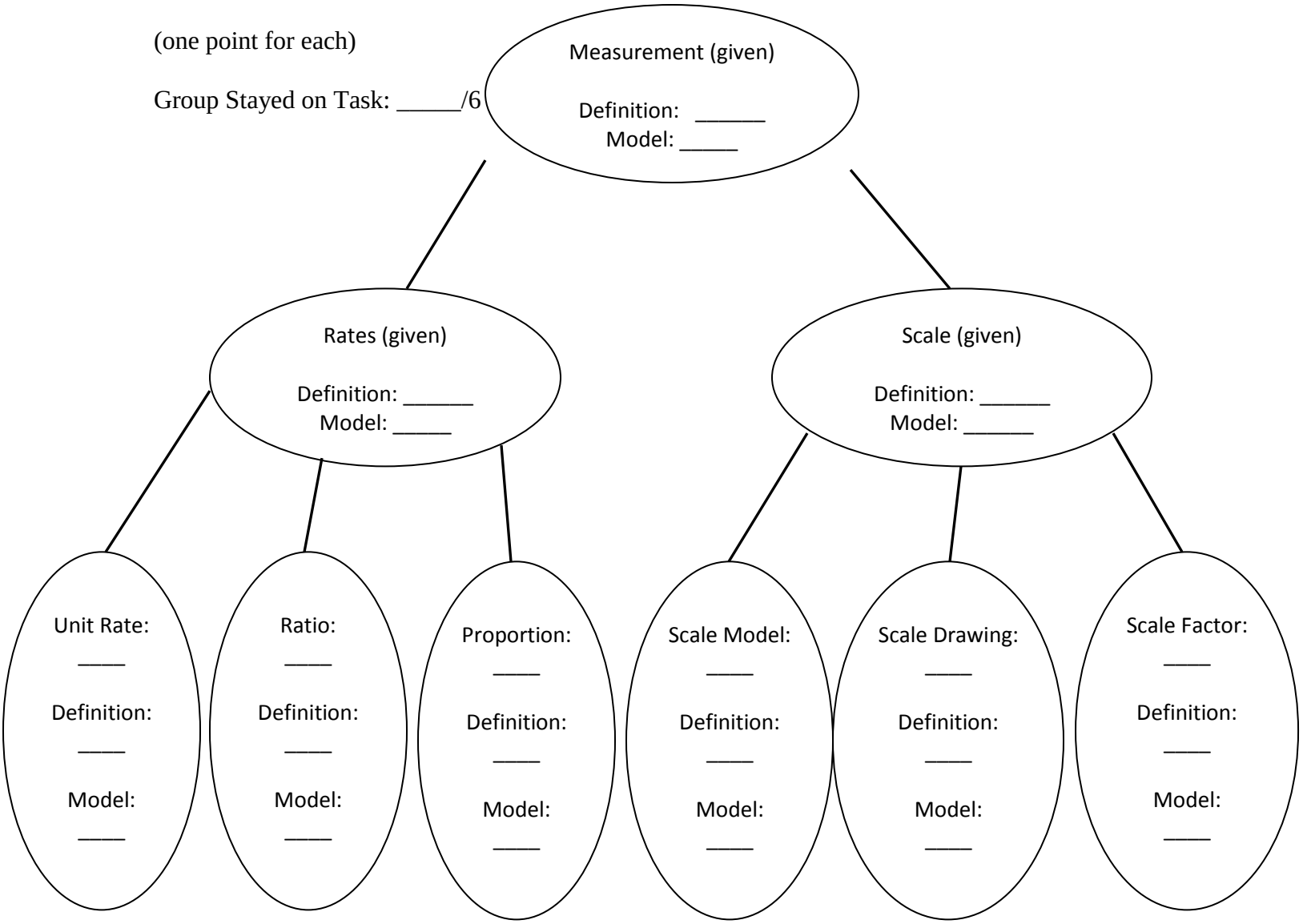
Chapter 6 Mathematical Vocabulary

Grading Rubric Total: ___/30

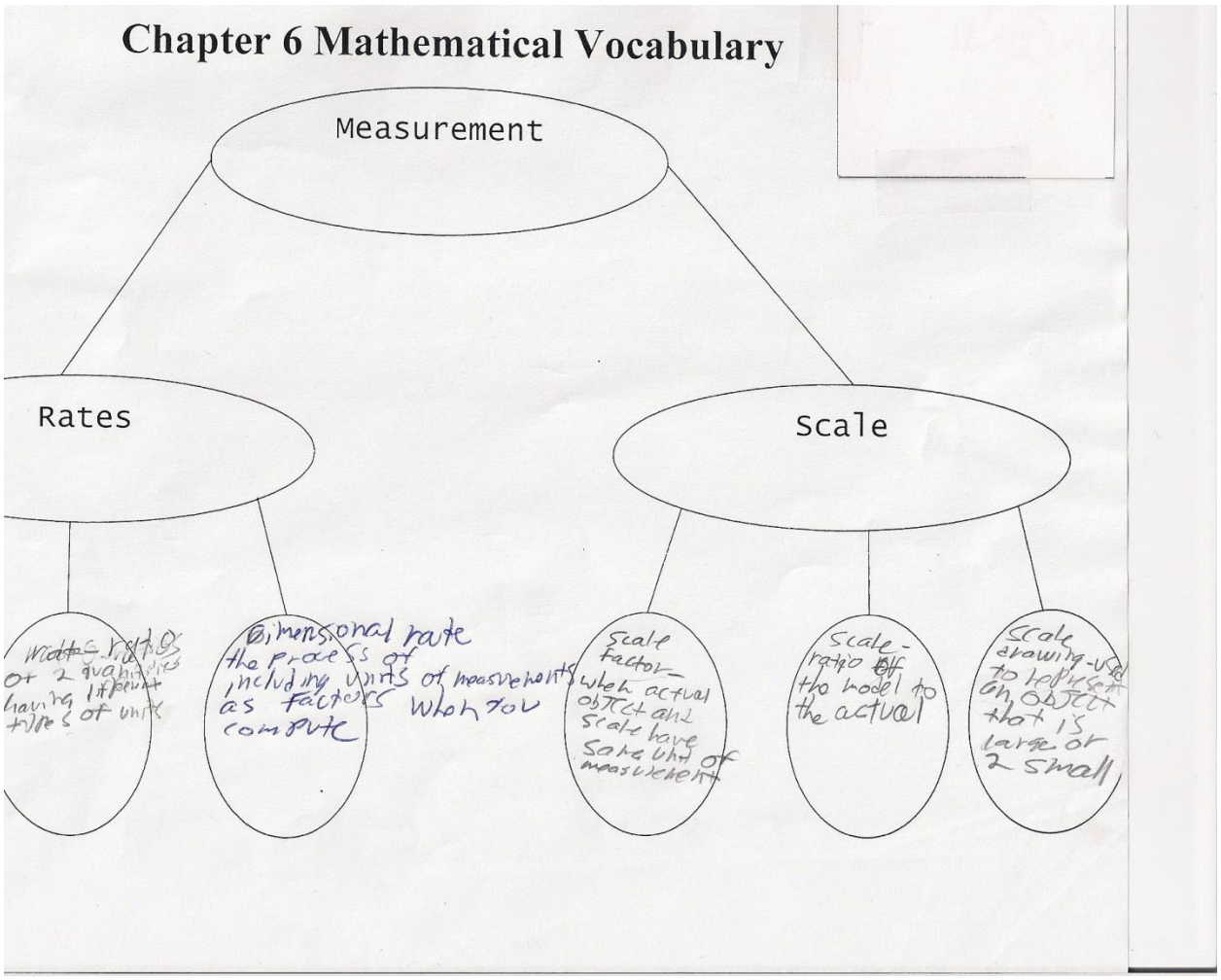
Filled in Concept Map: _____/24

(one point for each)

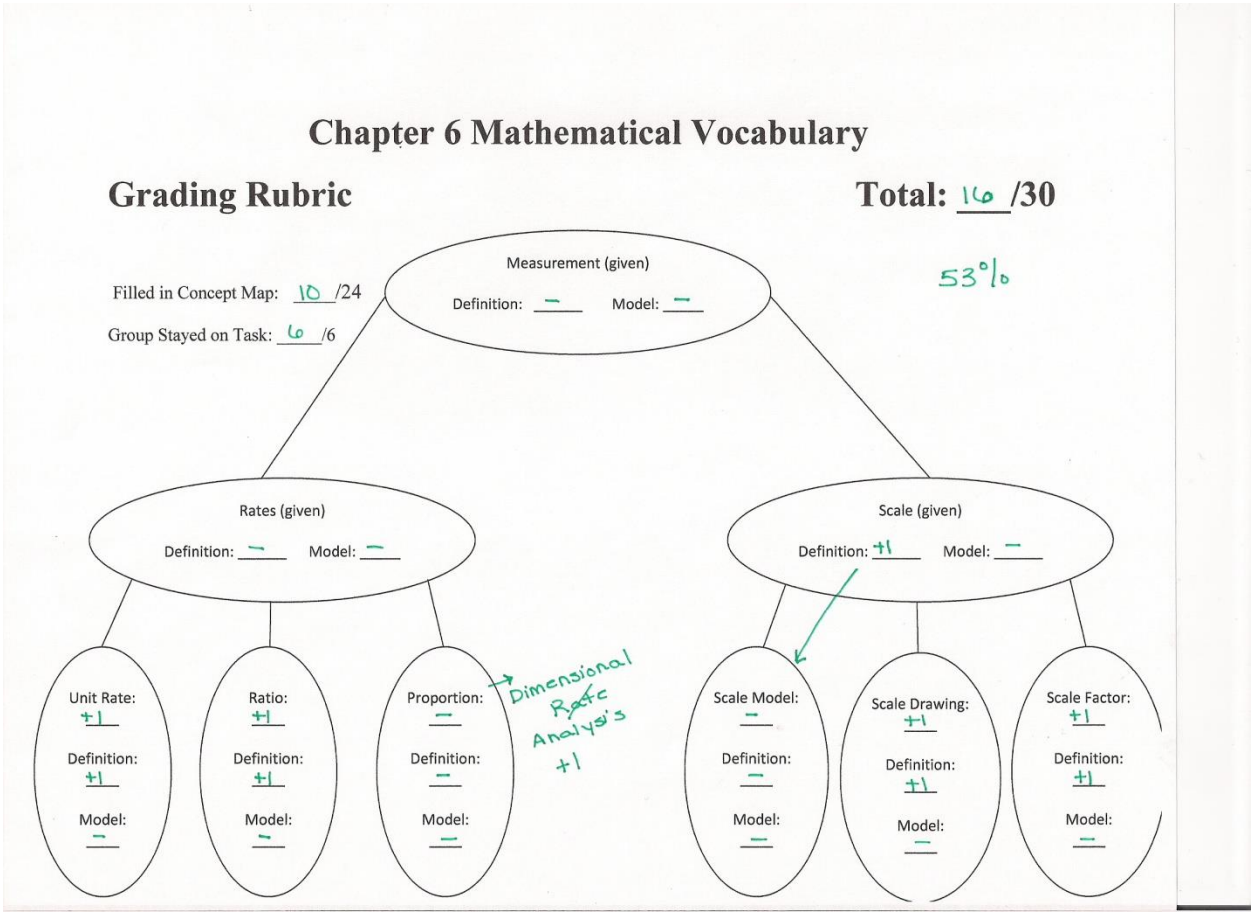
Group Stayed on Task: _____/6



Appendix D: (student work)



Appendix E: (rubric showing grade for student work)



Chapter 6 Mathematical Vocabulary

Grading Rubric **Total: 16 /30**

53%

Filled in Concept Map: 10 /24

Group Stayed on Task: 6 /6

Measurement (given)
Definition: — Model: —

Rates (given)
Definition: — Model: —

Scale (given)
Definition: +1 Model: —

Unit Rate: +1
Definition: +1
Model: —

Ratio: +1
Definition: +1
Model: —

Proportion: —
Definition: —
Model: —

Dimensional Rate Analysis +1

Scale Model: —
Definition: —
Model: —

Scale Drawing: +1
Definition: +1
Model: —

Scale Factor: +1
Definition: +1
Model: —

Appendix F: Student's Quiz: (Look at questions 5 and 6 for scale and scale factor)

-3 $\frac{27}{30}$ 90%

Name: _____

Pre-Algebra Quiz 6.5 - 6.7

Short Answer

write equation

1. Bill bought 2 pens for $9.00. Which of the following equation shows the relation between the cost of pens, c, and the number of pens, x, bought? What will the cost of 10 pens be?

2 pen / 10
is 9.00 / x

$2x = 9.00(10)$ $x = 45$

$2x = \$90$

Solve each proportion.

2. $\frac{8}{3} = \frac{d}{21}$ $21 \cdot 8 = 3d$ $168 = 3d$ $d = 56$

3. $\frac{12}{b} = \frac{6}{9}$ $108 = 6b$ $b = 18$

Write a proportion that could be used to solve for each variable. Then solve.

4. 12 balls in 2 boxes
78 balls in x boxes

$\frac{12}{2}$ $\frac{78}{x}$ $12x = 78 \cdot 2$ $12x = 156$ $x = 13$ boxes

The Empire State Building in New York City is 1250 feet tall. It took 30,000 workers only 1 year and 45 days to build, which is a record for a skyscraper. On a scale model of the building, the height is 25 inches.

5. What is the scale of the Empire State Building model?

1 inch = 50 ft

6. What is the scale factor of the Empire State Building model?

1 inch = 50 ft

-2