What do you think?
Helping bridge conceptual learning with words.

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This curriculum unit is recommended for Math 1-3, grades 8-12

Keywords: Math 1, High School Math

Teaching Standards: See Appendix 1 for teaching standards addressed in this unit.

Synopsis: Students are often taught basic math with only a computational focus math and then criticized for not knowing the concept or for being below grade level. This unit is designed as a starting point to infuse vocabulary and writing within the structure of the math classroom. Assignments will be crafted with a focus on technical and subtechnical words[i], concept exploration and short writing prompts.

I plan to teach this unit during the coming year to 80 students in Math 1.

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Introduction

The phrase "students should be able to" seems to get tossed around in math classrooms to describe the content that is being taught. From my experience in math professional learning communities (PLC's) the conversation is often about how students are falling short of "what they should be able to do". Math teachers are experts at identifying where students are in their math journey and trying to navigate how to take them to the next step. This is often very difficult when a large majority of your student population is below grade level proficient. At Independence High School, for the 2018-2019 school year, students who took the EOC were 50.8% proficient and considered to be at grade level. When looking at the district as a whole for the same school year and test, students were 16% proficient and considered to be at grade level. I realize that there is inherent bias based on my experiences and the cohorts I have worked with which affects how I perceive this data and the importance of it. Through the use of EVAAs data we (teachers) have been conditioned to focus on individual growth of students and overall school growth. The question that I often sit with is how we can push students to grow while increasing their proficiency in a manner that is effective and long lasting. The reality of our profession is that we have a limited time and a large set of standards to cover (46 standards in the NC Math 1 curriculum[ii]). This unit has allowed me to find something concrete to focus on that will help my student reach grade level proficiency by focusing on vocabulary. I believe that focusing on vocabulary can help students understand concepts more fully and will allow them to approach problems with more confidence. This will be done through the use of vocabulary assignments designed to focus on technical words (content specific words) and sub-technical words (words that have common meanings)[iii].

Often, I feel like the pressure is there to not only know and understand your current math standards but also the standards for the years prior. As an example, the Math 1 pacing used at Independence High School mostly uses 7th and 8th grade standards for the first two units. Due to the lack of student proficiency, it is often said that students should know "insert math topic here" because they were taught it in "insert grade here". The blame is often placed on students and their inability to remember or to focus enough in class. Sometimes the blame is placed on teachers and their lack of knowledge of the standards they are teaching. From my experience I perceive that the blame placed on both students and teachers comes from the school that they serve. Other teachers and administration can often direct the blame on students and other teachers to find a justification for the low proficiency scores. I do not think that students are to blame for this dilemma. They have no control over the school, class, teachers or peers that they

are placed with. They also have no control over their home environment, their socioeconomic status, or the circumstance they were born into. I also don't think the blame is correctly placed on teachers, who are trying everything they can think of to close the achievement gap and to cover grade level content. Teachers strive to be experts in their content, their standards, and the pedagogy needed to engage and push students to be successful. This blame can often feel like you are plated with double the work and can often be defeating. This frustration has led me to wonder, what are the things that math teachers could focus on to help students understand math rather than relying on memorization.

I want to sway the focus away from computational math towards conceptual math. My hopes are that students will be able to remember the computational process better when they can remember why we are able to follow certain rules. Moving away from computation will allow students to focus more on Procedural fluency. The National Council of Teachers of Mathematics (NCTM) states, "Procedural fluency is more than memorizing facts or procedures, and it is more than understanding and being able to use one procedure for a given situation. Procedural fluency builds on a foundation of conceptual understanding, strategic reasoning, and problem solving" [iv]. To push class discussions to be more concept focused it is important to integrate concepts and procedures by building on prior knowledge. Using more writing in class with assignments like guided notes can increase student listening, active participation and discussions[v]. Some teachers, myself included, change how the information is given but never consider what the students are doing during our lesson. It is my default when I am teaching to focus my lesson on example problems instead of using guided notes in my instruction. Guided notes can give the teacher the opportunity to incorporate vocabulary, example problems, and conceptual questions. I constantly think about how I am giving my lesson but not how my students are receiving that information. Students struggle with learning mathematical content and struggle taking effective notes [vi]. This is why it is very important to think hard about how students receive the content. I believe that increasing classroom discussions and writing through the use of guided notes, vocabulary, and conceptual questions will help improve student understanding.

Background and Educational Setting

Independence serves 2,450 students, of which 675 are freshmen. We offer 14-year long Math 1 classes which are mostly composed of students that scored a 1 or 2 on their 8th grade EOG. Math grade level proficiency is 50.8% for the entire school with varied achievement within its subgroups (Black- 48.3%, Hisp- 58.7%, White- 86.1%, Els- 45.2%). Although White students have the highest achievement they make up 11.6% of my classroom students. African American students make up 35.8% and Hispanic Students make up 44.2% of my students. These two subgroups tend to score lower on the end of year assessments and historically not do well on classroom tests. I believe that one of the reasons these two subgroups normally perform below the other subgroups is connected to their performance on the English exam. In the 2017-2018

school year the overall grade level proficiency for Math 1 & 3 was 62.2% while the grade level proficiency for English 2 was 60% (Independence School Improvement Plan 2018-19). Although these are different tests and different grade levels, it is still easy to see a connection between the two scores. The connection between the two lies in the use of vocabulary, especially in the context of two different uses.

Instructional Implementation and Assessment:

All assignments presented below can be adapted and modified to fit into various units and courses. The assignments below are created as starting points to give an idea of their purpose. Information can be added or taken away to create a scaffolding process so you can use these assignments throughout the school year. 5 assignments will be outlined below that will have vocabulary focus. The first assignment will be an example of guided notes to help students write content relevant notes that they can use for reference. Two vocabulary assignments are provided to help students grasp concepts better and to engage in academic conversations. A short answer assignment will be given to push students to make connections using the vocabulary learned. Finally, a template is provided to help students annotate word problems using the vocabulary. The purpose and scaffolding ideas will be given for each assignment. An example template of guided notes, vocabulary assignments and short answer questions will be provided for an Equations and Inequalities Math 1 unit.

The vocabulary used will be broken down into two categories: technical and sub-technical. Technical words are content specific words with one meaning rooted a concept that needs to be explicitly taught to students (e.g., perimeter, integer, decimal)[vii]. These words are often highlighted in the lesson or might be the focus of an activity. Sub-technical words have less of a connection to mathematical concepts and have more than one meaning (e.g. mean, table, and increase)[viii]. Students often know these words already and might have a different meaning connected to it. “Research has shown that test questions that include unusual, specific math words or words with ambiguous meanings were more difficult for students to answer” [ix]. For this reason, it is important to incorporate all sub-technical words into a lesson and define their context without assuming that students know the mathematical definition. These words will then also be applied to a short answer assignment that will pull questions from the unit pace guides. These assignments will be used to informally assess student understanding of concepts. A rubric may be created to grade these assignments in a more formal manner. However, the use of vocabulary can also be extended to annotating word problems to increase proficiency at the end of the unit as will be shown in the last assignment.

Teaching Strategies

Part 1- Guided Notes

Objective:
Providing students with a set of guided notes will give students a structured way of note taking while allowing the teacher to go over all information they want to give. It will give students the ability to focus on what is being said and spend less time trying to filter all the information to figure out what to write down.

Ideas to scaffold the assignment:
Parts for the notes can be as filled in or as empty as is needed for the specific class. Higher level students may do well with more blank spaces for students to actively fill in while lower functioning students may require more words filled in.

Template:
This is an example of a guided notes template for solving one step equations leading into solving two step equations.

Solving Equations Guided Notes

Vocabulary:
Technical words:

- Coefficient: a _____ placed before the _____. It also multiplies the _____ in an algebraic expression/equation.
- Variable: an _____ quantity that is represented by a _____.
- Constant: are the terms in an _____ that only contain _____.
- Expression: made of terms consisting of _____, _____, and _____ but has no equal sign.
- Equation: two _____ that have an _____ sign in between.
- Inverse Operation: an operation that _____ what was done by the previous _____

Notes/Rules/Steps/Procedures:

One Step Equations	Inverse Operation Used	Solve
$x + 3 = 11$ **or** $3 + x = 11$		
$x - 4 = 15$ **or** $-4 + x = 15$		
$3x = 15$		
$\frac{x}{4} = 6$		

Hints

Equations must stay _____

perform

Do it to both _____

_____ 1st

You want the variable _____

Two Step Equations

2 or more operations to

Do

Do _____ 2nd

Two-Step Equation

6x + 5 = 53

Identify _____ operations first

Take the addition/subtraction _____ on both sides

Identify _____ operations second

Take the multiplication/division _____ on both sides

Solve for x (or any variable)

Part 2- Sub-technical Context Words

Objective:
In 2-3 words students will describe what the word represents when you find it in a word problem and what operation or symbol goes with it. Since sub-technical words have multiple meanings, multiple symbols might be needed depending on the context. This assignment will serve as a base level and intro to defining technical words. Although students might perceive this as an "easy assignment", rich conversation over the proper use of the words in a mathematical context can come up if facilitated correctly. This is a good place to correct misconceptions on the use of certain words and their double meanings. This assignment will give momentum to increase writing in the next assignments.

Ideas to scaffold the assignment:
The first unit provides students will all possible sub-technical words that might arise in word problems or directions. This will give students a reference tool to use in upcoming assignments. In subsequent units, students can create a list of sub-technical words as they appear in various assignments. This assignment can be given at the start of the unit so students can fill it out as guided notes are given or as a stand-alone assignment. As a whole class, the teacher can add words while reviewing questions based on informal assessment of students during assignments. The teacher can also have students individually create a list of words based on a word quota during assignments.

Template:

The words are examples of what can be used and can be changed to fit the current unit.

Sub-technical Context Words

Word:	**Explain what it means** (in 2-3 words)	**Operation / Symbol**
Decrease		
Increase		
Take Away		
Double		
Triple		
One Half		
One Third		

Word:	**Explain what it means** (in 2-3 words)	**Operation / Symbol**
Is/Was		
Split Into		
Total		
Altogether		
Combined		
Share Equally		
How much less		

One Fourth		
Difference		
Product		
Sum		
Earn/Earned		
Spend/Spent		
Withdraw		
Deposit		
Profit		
Expense		
Input		
Output		

Area		
Perimeter		
Greater Than		
Less Than		
At most		
At least		
No more than		
No less than		
Exceeds		
Evaluate		
Justify		
Simplify		

Part 3- Technical Vocabulary

Objective:
These are content specific words from the current unit. These words are based on each lesson and require students to either look up each definition or require the teacher to teach them in a daily lesson. Using these words will encourage students to use content vocabulary in classroom discussions and can be brought up in later writing assignments. It is also important to note that all vocabulary used should also be introduced and talked about throughout the unit to ensure that students who fail to complete this assignment are still being exposed to the definitions.

Ideas to scaffold the assignment:
In the initial unit the teacher can give students a list of words to define specifically from the current unit. The definitions can be looked up as a class with each student creating their own examples of the word. In subsequent units, words can be added as the unit progresses and the assignment can be done by students completely independently by having them look them up on their own.

Template:

The words are examples of what can be used and can be changed to fit the current unit. An appropriate number of words should be created to be give students a well-rounded understanding of the concepts needed in the unit. It might not be necessary to include every possible word in order to make this assignment too long.

Technical Vocabulary Words

Word:	**Definition:**	**Example**
Coefficient		
Variable		
Constant		
Equation		
Numeric Expression		

Word:	Definition:	Example
Algebraic Expression		
Inverse Operation		
Literal Equation		
Property of Equality		
Inequality		
Unit Rate		
Linear Function		
Dependent Variable		
Independent Variable		
Associative Property		
Distributive Property		
Consecutive Integers		
Coordinate Graph		
Domain		
Range		

Part 4- Short Answer Concept Questions

Objective:
Students will answer each question in about 2-3 sentences. It may be necessary to provide enough space to allow students to answer the question with a picture or through a procedural example. The focus is to get thoughts down on paper and to increase the level of independent writing. The talk frame [x] could be used for every single question and should be used to help students understand how to answer them correctly. These questions are directly pulled from the essential questions from the district unit guides. Using these questions give a good reference point to what students not only should be able to do but what they should be able to understand and explain. Using the district unit guides also gives the teacher a go to resource for conceptual questions that are aligned to the curriculum standards.

Ideas to scaffold the assignment:
These questions can be used in various methods. This assignment will help bridge the gap between procedural math and conceptual math. The use of technical and sub-technical vocabulary is highly encouraged and a rubric may be created to give students clarity on how to answer them. The questions can be given as a single assignment for students to work on independently which can be used to assess the individual student. The questions can be done in small groups to promote classroom talk surrounding mathematics and encourage students to share ideas. The questions can also be done as a whole class activity to go over specific ideas. Using a talk frame (Appendix A) with small groups or whole class will help encourage classroom discussions and will give the teacher a template to help guide the discussion. [xi]

Template:
Having a list of conceptual questions on what students should know by the end of the unit can help guide instruction throughout the unit. Not all questions have to be given or used and in fact it might be beneficial to have more questions ready for when a teachable moment arises.

Short Answer Questions

Answer the questions below using technical and sub-technical vocabulary in 2-3 sentences. A supplemental example or picture may be given to help clarify your answer.

1. In a word problem describe what the constant and the coefficient represents.

2. Describe the process of answering a two-step equation.

3. How are inverse operations used to solve equations?

4. How do you know which variable to solve for within a literal equation?

5. Using a picture, explain the process of solving a literal equation.

6. Describe the major difference between equations and inequalities.

7. What are the similarities and differences in solving and graphing linear equations?

8. Distinguish the differences between the meaning of $>$, $<$, $\leq$, and $\geq$.

Part 5- Word Problem Annotation

Objective:
The template will give students the tools to annotate or pull information from a word problem to effectively help them solve a problem. The template can be used to go over high rigor word problems that are heavy with sub-technical words which has been proved to be more challenging for students [xii]. Students will initially look for keywords in a word problem and pull all technical and sub-technical words that will help them understand the problem. They will then use those words to help them set up the problem using an equation, expression, or inequality.

Ideas to scaffold the assignment:
A specific problem can be copied into the template for students to work on or multiple templates can be printed for students to use on a worksheet. Students can solve a problem in their small groups or as a whole class depending on the level of rigor. Once students are familiar with the use of the template they can be given access to the template throughout various assignments including a unit test.

Template:

Word Problem Annotation

Sub-technical words: (non-math words that have a math meaning)	Important mathematical information: (numbers, units, etc.)
Technical words: (specific math words that tell you something important including formulas)	Solve: (Work out the problem here)

Chip earns a base salary of $500 per month as a salesman. In addition to the salary, he earns $90 per product that he sells. If his goal is to earn $5000 per month, how many products does he need to sell?

Appendix A: Talk Frame (Casa 2013)

Classroom Talk Frame

Topic:

Rephrase the question in your own words:

Talk Ideas

What are some things that you or a classmate said?

Talk Ideas

We Understand: Summarize in one sentence the classroom discussion:

Appendix 1: Teaching Standards

- **6.EE.5-** Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true.
- **6.EE.6-** Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.
- **6.EE.7-** Solve real-world and mathematical problems by writing and solving equations of the form x + p = q and px = q for cases in which p, q and x are all nonnegative rational numbers.
- **6.EE.8-** Write an inequality of the form x > c or x < c to represent a constraint or condition in a real-world or mathematical problem. Recognize that inequalities of the form x > c or x < c have infinitely many solutions; represent solutions of such inequalities on number line diagrams.
- **7.EE.3-** Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.
- **7.EE.4-** Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
- **8.EE.2-** Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that √2 is irrational.
- **8.EE.7-** Solve linear equations in one variable.
- **A.SSE.1-** Interpret expressions that represent a quantity in terms of its context:
- **A.CED.1-** Create equations and inequalities in one variable and use them to solve problems. *Include equations arising from linear and quadratic functions, and simple rational and exponential functions.*
- **A.CED.2-** Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
- **A.CED.4-** Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. *For example, rearrange Ohm's law V = IR to highlight resistance R.*
- **A.REI.1-** Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.
- **A.REI.3-** Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

Teacher Resources

Charlotte Mecklenburg Schools Unit 2 Pacing Guides

These are given by the school district, ask your academic facilitator or your math specialist to see if your district offers teachers this support. These are a great place to pull vocabulary for each unit, essential questions to use in the short answer question assignment, and "I can" statements.

Unit 2 a

Unit Title	Solving Equations		**Length of Unit**	10 days
Focusing Lens(es)	Students will understand that equations can describe, explain, and predict various aspects of the real world.	**North Carolina State Standards**	**6. EE.5, 6.EE.6, 6.EE.7, 6.EE.8, 7.EE.3, 7.EE.4, 8.EE.7**	
Inquiry Questions (Engaging-Debatable):	1. How are equations used in the real world? 2. How can you increase the likelihood that the process you use to solve linear equations will result in the correct answer?			
Unit Strands	Equations and Inequalities in one variable			
Concepts	Solving Equations in one variable and real world problem solving			

Generalizations **My students will Understand that...**	**Guiding Questions** **Factual**	**Conceptual**
Lesson 1: Using equality properties are important to solving equations in one-variable **6.EE.5, 7.EE.3, 7.EE.4, 8.EE.7**	1. Solve one- and two- step equations using properties. 2. Solve multi-step equations 3. Solve equations with variables on both sides	1. What role does the equality property play in balancing an equation?
Lesson 2: Solve and graph linear equations and inequalities in one variable. **7.EE.4, 8.EE.7**	1. Solve linear equations and inequalities involving integers and rational coefficient. 2. Graph linear inequalities a. Distinguish the differences between the meaning of >, <, ≤, and ≥.	1. What are the similarities and differences in solving and graphing linear equations and inequalities?

Lesson 3: Solve real-life word problems in equations and inequalities **6.EE.6, 6.EE.7, 6.EE.8**	1. Translate consecutive integers expressions 2. Solve consecutive integers word problems 3. Explain the parts of the Distance Formula (Rate, Time, and Distance) 4. Solve word problems with the distance formula	1. What are the similarities when solving different types of real-world problems.

Key Knowledge and Skills: **My students will…**	*What students will know and be able to do are so closely linked in the concept-based discipline of mathematics. Therefore, in the mathematics samples what students should know and do are combined.*

6.EE.5
I can understand solving an equation or inequality as a process of answering a question.
I can recognize that the correct answer to an equation or inequality makes it true.
I can use substitution to check the answer or determine if a given number is a solution.
6.EE.6
I can write an expression to represent a real-world or mathematical situation.
I can represent a number with a variable.
I can justify that a variable can represent an unknown number or any number in a specified set.
6.EE.7
I can write an equation from real-world situations and then use inverse operations to solve the equation.
I can write and solve equations of the form x+p and px=q (in which p,q, and x are non-negative rational numbers).
6.EE.8
I can write an inequality to represent a constraint or condition in a real-world or mathematical situation.
I can recognize and justify that inequalities have infinitely many solutions.
I can represent solutions of inequalities on a number line (graph).
7.EE.3
I can convert rational numbers among and between fractions, decimals, percents, and whole numbers.
I can solve multi-step numeric algebraic expressions and equations.
I can solve real-world problems that involve positive and negative rational numbers using a variety of tools.
I can calculate and/or convert between the various forms of rational numbers.
I can solve multi-step algebraic expressions and equations.
I can use estimation to justify my answers.
7.EE.4
I can solve multi-step one-variable equations involving parentheses.
I can represent problems in real-world context with linear equations.
I can accurately solve linear equations.
I can compare the algebraic solution to a problem with an arithmetic solution.
I can solve a one-variable equation with a single solution and check the answer.
I can represent problems in real-world context with an inequality.
I can graph the solution set of an inequality.

Unit 2b

Unit Title	Solving Equations and Inequalities		**Length of Unit**	10 days
Focusing Lens(es)	Students will understand that quantities are used to form expressions, equations and inequalities that represent real-world situations.	**North Carolina State Standards**	***Cluster**: Create equations that describe numbers or relationships* **8.EE.2** **A.SSE.1a, A.SSE.1b** **Cluster**: *Understand solving equations as a process of reasoning and explain the reasoning* **A.CED.1, A.CED.4, A.REI.1, A.REI.3** **Cluster**: *Solve equations and inequalities in one variable* **A.CED.1, A.REI.3, A.REI.12, A.SSE.1a** ***Cluster**: Understand the concept of a function and use function notation*	
Inquiry Questions (Engaging-Debatable):	1. How might equations and inequalities be used to model real-world situations? 2. How can you interpret and justify equations and inequalities? 3. What forms of literal equations can represent mathematics and science?			
Unit Strands	Expressions, Equations, and Inequalities			
Concepts	Multistep equations and inequalities, expressions, literal equations, function notation, function substitution, function operations, domain and range **(ALL IN CONTEXT)**			

Generalizations **My students will Understand that...**	**Guiding Questions** **Factual**	**Conceptual**
Lesson 1: Perfect Square and Cube Roots (NC.8.EE.2)	• I can recognize perfect squares and cubes • I can solve equations containing cube and square roots • I can identify the relationship between square and cube roots	Discover and explain relationship between squares and cubes and the sides of a square and the edges of a cube. Reason that non-perfect squares and cubes are irrational.
Lesson 2: Multi Step equations are used for real world situations; some examples are: 1. Same amount 2. Perimeter 3. Consecutive integers 4. Profit 5. Age 6. Distance. **A.SSE.1a, A.SSE.1b, A.CED.1, A.REI.1, A.REI.3**	• I can write equations in one variable and apply them to the real world. • I can identify the different parts of the expression and explain their meaning within the context of a problem. • I can solve equations with one variable, including equations with coefficients.	How are profit and perimeter similar? How are they different? How are inverse operations used to solve equations?

Lesson 3: Literal equations are interpreted in math and science formulas. **A.CED.4, A.REI.1, A.REI.3**	• I can rearrange/rewrite formulas to solve for a given variable, using the same steps to solve equations. • I can explain each step in solving equations using properties of equality. • I can give (provide) a reasonable (viable) explanation for each step.	What circumstances create a literal equation? How do you know which variable to solve for within a literal equation?
Lesson 4: Multi-step inequalities represent linear functions. **A.CED.1, A.REI.1, A.REI.3**	• I can write inequalities in one variable and apply them to the real world. • I can identify the different parts of the expression and explain their meaning within the context of a problem. • I can solve inequalities with one variable, including inequalities with coefficients.	Describe the major difference between equations and inequalities. Create a sample problem to justify your reasoning. What are the four types of inequalities?

Key Knowledge and Skills: **My students will…**	*What students will know and be able to do are so closely linked in the concept-based discipline of mathematics. Therefore, in the mathematics samples what students should know and do are combined.*

8.EE.2
I can recognize perfect squares and perfect cubes.
I can solve equations containing cubes and square roots.
A.SSE.1:
I can identify the structure of a quadratic expression in order to rewrite it.
I can create and interpret quadratic and exponential algebraic expressions to describe real-world scenarios.
A.CED.1:
I can write equations in one variable and apply them to the real world.
I can write inequalities in one variable and apply them to the real world.
A.CED.4:
I can rearrange/rewrite formulas to solve for a given variable, using the same steps to solve equations.
A.REI.1:
I can explain each step in solving equations using properties of equality.
I can give (provide) a reasonable (viable) explanation for each step.
A.REI.3:
I can solve equations with one variable, including equations with coefficients.

I can solve inequalities with one variable, including inequalities with coefficients.
A.CED.2:
I can write/create an equation with 2 or more variables.
I can create a coordinate plane using appropriate labels and scales.
I can graph an equation on a coordinate plane with 2 or more variables.
I can represent/ interpret/ identify relationships between quantities from equations and graphs.

A student in _____ can demonstrate the ability to apply and comprehend critical language through the following statement(s):	1. Interpret and solve various multi step equations and inequalities given multiple representations 2. Manipulate and justify literal equations to isolate an unknown 3. Evaluate and solve function given an expression, equation, or multiple representations
Academic Vocabulary:	Same amount, same base, catch-up, perimeter, consecutive integers, odd/even integers, profit, revenue, expense, break even, miles apart, first term, common difference, variable, dependent variable, independent variable, domain, range, scale, constant, formula, literal equation, coefficient, properties of operations and properties of equality, greater than, less than, at most, at least, =, <,>, ≤, ≥, no more than, no less than, evaluate, justify, viable, function, explicit expression, recursive, input, output, sequence, arithmetic

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This article explains the purpose of the talk frame and how to effectively use it in the classroom. The talk frame serves as a tool that can be used to expand or dig into knowledge to get students to write without feeling overwhelmed.

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Pierce, Margaret E., and Fontaine, L. Melena. "Designing Vocabulary Instruction in Mathematics." *The Reading Teacher* 63, no. 3 (November 1, 2009): 239–243.
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Williams, Madelyn M., Casa, Tutita M. "Connecting Class Talk with Individual Student Writing." *Teaching Children's Mathematics* 18, no. 5 (January 1, 2012): 314–321.
This article expands on content discourse and how it leads to effective writing in the classroom.

Notes

[i] (Pierce 2009)
[ii] (NCDPI 2017)
[iii] (Pierce 2009)
[iv] (Mathematics 2014)
[v] (Haydon 2011)
[vi] (Haydon 2011)
[vii] (Pierce 2009)
[viii] (Pierce 2009)

[ix] (Pierce 2009)
[x] (Williams 2012)
[xi] (Williams 2012)
[xii] (Pierce 2009)