"Transformations" – MediaCast Lesson by Stacy Harkness
Broomfield High School

Desired Results

BVSD Standard(s)/Essential Learnings

Standards

Mathematics Standard 2 (Algebra)
Students use algebraic methods to solve problems by exploring, modeling, and describing patterns and relations involving numbers, shapes, data, and graphs. They communicate their reasoning used to solve these problems.

Essential Learnings A2M2

Recognizes classes of functions including linear, polynomial, absolute value, step, rational, and exponential from multiple representations such as graphical, tabular, and symbolic and converts between these representations.
*Distinguishes between relations and functions that are expressed symbolically and graphically
*Finds the domain, range and inverse where possible for each class of function both graphically and symbolically and describes the importance of a one to one function when finding the inverse of a function (e.g., restricted and discontinuous domains and ranges)
*Describes the characteristics of the graphs for each class of function including when appropriate the intercepts, symmetries, asymptotes, vertices, number and location of turning points, and end behaviors
*Using the general shape of a graph of a function, identifies the family of graphs to which a particular graph belongs including polynomial, rational, exponential and functions
Data Connection: Analyzes data to determine if patterns exist, identifies patterns, finds equations for curves of best fit using technology and uses the equations to make predictions about practical problems
*Investigates and describes, through the use of graphs, the relationships between the solution of an equation, zero of a function, x-intercept of a graph, and factors of a polynomial expression
*Writes the equation of a linear, quadratic ([*h*, *k*] form), or absolute value function given the graph of the parent function or an integral translation of a parent function and vice versa

Unit Enduring Understandings	**Unit Essential Questions**
*Functions are used to quantify trends and relationships between two variables. *Write, graph, and apply transformations to functions. *Identify the transformation(s) from one function to another. *Change is fundamental to understanding functions.	*How does the change of the independent variable influence the table, graph and expression? *How does the appearance of a function change the appearance of the graph? *What are the different types of transformation(s) that can be applied to a function? *How do the transformation(s) affect the function? *How can change be described mathematical?

Students will know……	**Students will be able to……**
*the different types of transformations that can be applied to a function.	*represent a parent function with a table or graph. *graph a function when transformation(s) are applied to a parent function. *graph several functions on the same coordinate plane. * Write a function from a given real world application problem.

Academic Vocabulary

transformations, function, horizontal compression, horizontal stretch, horizontal translation, reflection, vertical compression, vertical stretch, vertical translation

Language Objectives

Make a chart comparing and contrasting the following vocabulary terms along with pictures to represent each term:

horizontal compression, horizontal stretch, horizontal translation, reflection, vertical compression, vertical stretch, vertical translation

Assessment Evidence

Performance/Transfer Tasks	**Other Evidence** **Suggested activities to demonstrate understanding.**
*Math Aerobics – A timed power point will be shown to the students. From a standing position the students will use their arms to demonstrate what the graph of each parent function would look like. *Transformation Aerobics – A parent function along with transformation(s) will be shown to the student. The student must use their arms to show what the parent function would look like. Next they will move their body up/down and /or left/right to demonstrate their knowledge of translations. They will also have to move their arms to demonstrate their knowledge of a reflection and/or stretch/compression. *Picture on their graphing calculator. Students will have to design a picture using the parent functions along with transformations. They will then be required to graph the picture on both their calculator and graph paper. Student pictures will be displayed on the wall in the classroom.	*Students create a web page to teach others about transformations. The web page would include formal notes, example problems with work and solutions, links to other webpages that support their web page and a creative video in which they teach or enhance the topic. *Have students write ACT type questions with multiple choice answers. *Play Green Globs using transformations to try to win the game. *Practice Problems from the textbook. *A formal written summative assessment.

Rubric (please attach if applicable)	**Student Self-Assessment and Reflection** *Student written reflection discussing the effects of transformations on a parent function. How does the complexity of their picture compare to other students' pictures? How could they improve their picture using transformations?

Unit Design Template (continued)

Learning Plans

Learning Activities

1. **Introduction –**
   a. Students will already have used T-tables to know the basic graphs of the main parent functions: $f(x) = x^2, x^3, \sqrt{x}, |x|$.
   b. Students will also know about domain and range as well as restrictions that can be placed on the domain. After this unit students will know the transformations that can be applied to the parent functions and then will draw upon this knowledge later when graphing conics and trigonometric functions.

2. **Pre-teaching –**
   a. In a warm-up, students will be given the six parent functions and asked to draw a sketch of what each graph would look like. Students will then be selected to show their work on the document camera. There will be a class discussion on how the change of the independent variable influences the table and graph.
   b. Students will then be asked to stand-up and participate in math aerobics**.**

3. **Pre-viewing of film clips-**
   a. Show examples of several functions that students have already seen in class in which there are added variables and numbers attached to the parent functions. The examples need to be in vertex form.
   b. Have students graph a few of the examples on their calculator. Talk about what has happened to the graph and hypothesize what is possibly causing the graph to change its appearance. Also see if students can identify the parent function hidden within the transformed function.

4. **View film clips-**
   a. Instruct students to watch the video clip and be prepared to summarize orally what the video clip demonstrated.
   b. Show the first video clip: Alg & Trig: Functions and Graphs. Start with the segment titled Method of Graphing Functions. Time: 28:16-30:09
   c. At the end of the clip, have students share orally with their shoulder partner what they viewed and discovered. Then select a few students to share with the class.
   d. Have students stand up at their desk. Give students a function with a vertical translation, and ask students to physically demonstrate with their bodies the transformation.
   e. Repeat this same procedure for the other video clips. (Alg & Trig: Functions and Graphs – Segment: Translation, Stretches, Flips,Time: 30:10-31:34; Alg & Trig: Functions and Graphs – Segment: Translation, Stretches, Flips Time: 31:35-32:10; Alg & Trig: Functions and Graphs – Segment: Translation, Stretches, Flips Time: 32:11-33:08; Alg & Trig: Functions and Graphs – Segment: Translation, Stretches, Flips Time: 33:10-34:54)

5. Post-viewing-

a. Solicit observations on what causes graphs to move throughout a coordinate plane.
b. Help students make a reference note card with vocabulary, pictures and examples for each type of transformation.
c. Have several examples of functions with transformation(s) posted throughout the room in gallery style.
    i. Divide students into groups of 2-3 students.
    ii. Instruct each group to go around to each function and list the transformation(s) that is applied to each parent function.
    iii. Partner each group with another group to discuss their answers. Students need to discuss and come to a consensus on what they believe is the correct answer.
    iv. Select different students to present their answer to the various problems to the class. Students could present their problems orally, on the board or by using the document camera.

Materials

1. Computer with projector to project video clips.
2. Video clips either downloaded onto computer or accessible via the web
    f. Alg & Trig: Functions and Graphs – Segment: Methods of Graphing Functions Time: 28:16-30:09
    g. Alg & Trig: Functions and Graphs – Segment: Translation, Stretches, Flips Time: 30:10-31:34
    h. Alg & Trig: Functions and Graphs – Segment: Translation, Stretches, Flips Time: 31:35-32:10
    i. Alg & Trig: Functions and Graphs – Segment: Translation, Stretches, Flips Time: 32:11-33:08
    j. Alg & Trig: Functions and Graphs – Segment: Translation, Stretches, Flips Time: 33:10-34:54
3. Graph paper
4. Gallery Note cards with functions
5. Aerobic Power point
6. Formal Notes Power point
7. Transformation Lab
8. Computer Lab

Differentiation Strategies (including specific accommodations)

*Students with visual problems will need accommodations according to their IEP or 504.
*Students that are advanced could be asked to add step, conic and/or trigonometry graphs with transformations.
*Students that need re-teaching or further demonstration for better understanding could use a graphing calculator lab. With the lab the students would be asked to graph several functions with the same transformation. They would then be asked to generalize the pattern shown both on the graph and the table.
*The note card is key for ELL learners.

Technology and Information Literacy Integration

*****MediaCast used to teach major concepts of lesson

*Graphing Calculators

*Document Camera

*Choice of several forms of technology to produce student webpages

1. Word
2. Production software – iMovie, Windows Movie Maker, Power Point, You Tube
3. Weebly webpage template
4. Tools – iPod, Video camera, Computer, Camera, iPad