Grade 12, High School, Functions

Overview

This unit plan is being designed for the EXCEL students. These students are all seniors and are all working on their Collection of Evidence. The Collection of Evidence classroom in the EXCEL High School does not use a textbook. The resources for this class are Collection of Evidence packets provided by the Ellensburg High School Collection of Evidence teacher. In the classroom the teacher candidates must create the lessons that will align with the Collection of Evidence test the students are taking. These students have not passed the EOC for Algebra and they have been placed in this course to practice for the Collection of Evidence tests. All of the students are at different learning levels therefore the teacher candidate has to create lessons that are going to benefit all the student’s needs. Some students need more time to complete assignments, others need to have group work in order to understand the concept and some just need to get more visual practice by having the teacher model more examples on the board. Regardless of the students’ needs, the teacher always walks around to check for understanding.

This unit is aligned with the Common Core State Standards Math domain High School Functions, the cluster is HSF-LE: Linear, Quadratic, and Exponential Models, the cluster is construct and compare linear, quadratic, and exponential models and solve problems. The standards for this unit are [CCSS.Math.Content.HSF.LE.A.1](http://www.corestandards.org/Math/Content/HSF/LE/A/1/) Distinguish between situations that can be modeled with linear functions and with exponential functions, [CCSS.Math.Content.HSF.LE.A.1.b](http://www.corestandards.org/Math/Content/HSF/LE/A/1/b/) Recognize situations in which one quantity changes at a constant rate per unit interval relative to another, and [CCSS.Math.Content.HSF.LE.A.1.c](http://www.corestandards.org/Math/Content/HSF/LE/A/1/c/) Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.

Each of the lessons will be aligned to at least one CCSS and will be assessed individually in order to prepare the students for the formative benchmark assessment. In the first lesson the students will first learn the differences between a linear and exponential function. The students will get sufficient practice with solving linear and exponential functions from practice on the board and a worksheet for assessment. It’s important for the students to first learn and become familiar with these functions in order for them to be able to create their own function. In the second lesson the students will be able to create functions from story problems. The importance of having the students learn to create their own function is because in the formative assessment the students will be asked to create functions from story problems and identify what kind of function they are. In the third lesson the students will be formatively assessed in a mock test that will involve a combination of the two previous lessons. All of these lessons will work together because they build on each other to help the students reach the next step. The purpose of this unit is to help students understand what functions are and help students distinguish between linear and exponential functions.

Lesson 1

The Common Core Standard for Lesson 1 is:

[CCSS.Math.Content.HSF.LE.A.1](http://www.corestandards.org/Math/Content/HSF/LE/A/1/) Distinguish between situations that can be modeled with linear functions and with exponential functions.

The underlying concept of the first lesson is to introduce linear and exponential functions. Students will first be exposed to the functions during the lecture and as the teacher works out examples on the board. In this lesson students will also get to work out problems on their own. Students will get to see the difference between a linear and exponential function and they will be able to distinguish the two by the end of the lesson.

Learning Target: I can distinguish between situations that can be modeled with linear and an exponential functions. I can solve linear and exponential functions. The learning targets will be reached through activity 1 and activity 2.

Activity 1: As a whole class the teacher will introduce linear and exponential forms. The teacher will model how to solve both a linear and exponential function. As the activity progresses the teacher will point out what the key terms are to determining whether the equation is linear or exponential. The students will be able to jump in and give ideas to what they think is making the function linear or exponential. During this activity students will understand the difference between linear and exponential functions and will be able to apply [CCSS.Math.Practice.MP1](http://www.corestandards.org/Math/Practice/MP1/). During activity 1 is when the students will be exposed and elicited to use the vocab for the lesson. This activity is created for all the students to have a visual of what the lesson is about.

Activity 2: Students will work as a group to complete a worksheet that will assess their conceptual understanding of the lesson. The teacher will hand out a worksheet where students will be given several word problems where they will have to write either a linear or exponential equation. By having the students work alone or with their partner they will be able to apply the knowledge and skills from the previous activity to this one. The worksheet will also have several problems that the students will have to solve. The students are being asked to solve both linear and exponential functions because they need to understand the order of operations for different functions. During activity two the students will show their problem solving skills, conceptual understanding as well as their mathematical thinking and reasoning. Students will also be applying [CCSS.Math.Practice.MP4](http://www.corestandards.org/Math/Practice/MP4/).

Assessment: As an assessment the students will be asked a series of questions during both activities. The questions will help the teacher understand where the students stand and how of the concept they have actually grasped. During activity 1 the teacher will ask questions such as “how do we know this is a linear function and not an exponential function?”, “what is the first step to solving this function?” and “what information from the problem indicated that this is a linear/exponential function?” These questions will prepare the students for activity 2 which is where they will be working on their own worksheet. The worksheet will serve as an assessment because the questions will elicit students to think about the concepts and procedures to solving the problems and creating functions. While the students are working with partners the students will also be asked questions by the teacher similar to the questions that were asked during activity 1. The feedback the teacher gives the students during both activities will better prepare the students for the next lesson.

In the next lesson students will be working with recognizing situations that have a ratio and situations that have a growth and decay. The students will get more practice with creating functions out of story problems and solving the functions. The main concept of the following lesson is for students to recognize the differences between a constant rate of change and a constant growth and decay.

In lesson 1, students employed several of the Common Core Standards for Mathematical Practice. For instance, students made sense of what the teacher was doing on the board in activity 1 and were able to convey that towards activity 2 to address this standard: [*CCSS.Math.Practice.MP1*](http://www.corestandards.org/Math/Practice/MP1/) *Make sense of problems and persevere in solving them.* When students worked on their worksheet they addressed this standard: [*CCSS.Math.Practice.MP4*](http://www.corestandards.org/Math/Practice/MP4/) *Model with mathematics.*

Lesson 2

The Common Core State Standards for Lesson 2 are:

[CCSS.Math.Content.HSF.LE.A.1.b](http://www.corestandards.org/Math/Content/HSF/LE/A/1/b/) Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.

[CCSS.Math.Content.HSF.LE.A.1.c](http://www.corestandards.org/Math/Content/HSF/LE/A/1/c/) Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.

In this lesson students will be able to recognize situations in which the equation is either linear or exponential. Students will be asked to identify the constant rate of change compared to others and they will also be able to identify a decay or growth related to others. Students will be completing a worksheet that is going to elicit their conceptual understanding, problem solving skills and mathematical reasoning.

Learning Target: I can recognize situations in which I have a constant rate or a growth or decay.

Activity 1: First, examples of linear and exponential functions will be modeled on the board with the help of the students. The students will be asked questions to check for understanding. Questions such as “what does rate of change mean?”, “what is growth and what is decay?” and “what in the story produces the function?” The problems to be modeled are story problems that we see on a day to day basis so that students are able to see how we use this in the real world. During this activity students will be applying [CCSS.Math.Practice.MP1](http://www.corestandards.org/Math/Practice/MP1/).

Activity 2: During the second part of the class the students will be broken up into groups where they will have to use the tools that were given to them during the previous activity as well as the knowledge from the previous lesson to complete a worksheet. The reason the students are being broken up into groups is to help them learn from each other and cooperate with their classmates. Some students learn better from each other than they do from the teacher. The worksheet will be a way for the teacher to assess if the students are understanding the concepts and reasoning. During this activity students will be applying [CCSS.Math.Practice.MP5](http://www.corestandards.org/Math/Practice/MP5/).

Assessment: In order to assess the students the teacher will ask questions to promote critical thinking as well as check for understanding. During activity 1 the students are going to be assessed when the teacher is working problems on the board and the students are being asked to volunteer to answer questions or solve the next step. During activity 2 the students are being assessed with the worksheet. The worksheet will give the teacher evidence of where the students stand in the conceptual understanding. The teacher will also assess the students by walking around and asking questions and clarifying misconceptions.

In the next lesson the students will be able to combine all their knowledge from the two previous lessons to take a mock test similar to the COE test they will be taking. The next lesson is asking students to distinguish between linear and exponential functions, identify constant rate, constant growth and decay and be able to create their own function from a story problem.

In lesson 2, students employed several of the Common Core Standards for Mathematical Practices. When the teacher modeled the examples on the board and the students were able to use that knowledge for their worksheet they addressed this standard: [*CCSS.Math.Practice.MP1*](http://www.corestandards.org/Math/Practice/MP1/) *Make sense of problems and persevere in solving them.* When students used the skills and tools given to them by the teacher in activity 1 they addressed this standard:[*CCSS.Math.Practice.MP5*](http://www.corestandards.org/Math/Practice/MP5/) *Use appropriate tools strategically.*

Lesson 3

The Common Core State Standards for Lesson 3 are:

[CCSS.Math.Content.HSF.LE.A.1](http://www.corestandards.org/Math/Content/HSF/LE/A/1/) Distinguish between situations that can be modeled with linear functions and with exponential functions.

[CCSS.Math.Content.HSF.LE.A.1.b](http://www.corestandards.org/Math/Content/HSF/LE/A/1/b/) Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.

[CCSS.Math.Content.HSF.LE.A.1.c](http://www.corestandards.org/Math/Content/HSF/LE/A/1/c/) Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.

For this third lesson students will practice all three CCSS. During this lesson the students will be given a benchmark mock assessment similar to the actual COE assessment the students are being prepared for to assess where they are at in the unit. This will allow the teacher to see if the students must go over some topics or if the students are ready to move on to more challenging concepts.

Learning Target: I can distinguish what situations require a linear equation and what situations require an exponential equation. I can identify the rate of change in a linear equation. I can identify the growth or decay in an exponential equation.

Activity 1: Students will all work together in a group and explain to each other what we have done for the last couple of days. This will help the students review the main ideas and concepts of the lessons. The students’ purpose in this activity is to teach their peers what they have learned in the last couple of lessons. This is a great way to get all students to communicate and express their student voice while the teacher is walking around and assessing their knowledge before the mock test. By having the students work in pairs it makes it easier for the teacher to listen to the students and catch misconceptions easier than if it was in writing one by one. During this activity students are aligning [CCSS.Math.Practice.MP6](http://www.corestandards.org/Math/Practice/MP6/).

Activity 2: Students will be given a practice made up mock formative assessment similar to the Collection of Evidence they will be taking. During this activity students will be evaluated in their mathematical thinking and reasoning, conceptual understanding and procedural fluency. This activity will let the teacher know if there is anything that needs to be re-taught. During this activity the teacher will make it clear that students cannot use their notes at least for the first half of the test just to see how much the students actually know and how much they still need help with. The teacher will mark on the test the questions the students needed to look at their notes for just to have that as an indication of where the students stand. Part of activity 2 will be to correct the mock test as a class. The teacher will collect the tests and provide feedback for the students so they know what to practice more and what to work on for the actual test.

Assessment: Before the lesson starts the teacher will read the learning targets to the students and check for understanding of the outcomes. The teacher will explain what is going to happen during the lesson. To begin the day’s activities the teacher will group the students and give them an opportunity to assess each other’s’ knowledge. By having the students paired up at the beginning the teacher is giving the students an opportunity to review what has happened in the last two lessons. Once the students are together the teacher will keep asking questions in regards the learning outcomes and how to meet them. The students will be formally assessed after they have reviewed with their group members. The students will then go back to their own seats and the teacher will hand out the mock test. While the students are taking the mock test the teacher will still walk around and answer questions of any misconceptions the students might still have.

In lesson 3, students employ one of the Common Core Standards for Mathematical Practices. When the students are asked to get into pairs at the beginning of the lesson they are asked to communicate with their partners and assess each other’s knowledge which addresses this standard: [*CCSS.Math.Practice.MP6*](http://www.corestandards.org/Math/Practice/MP6/) *Attend to precision.*

Conclusion

 Through the completion of this unit the students will have a better understanding of functions. The students will have learned how to distinguish linear and exponential functions. They will have already been able to recognize the difference between a rate of change and a growth or decay according to the story problem and the set-up of the function. By completing this unit the students will be well on their way to their summative assessment which is the Collection of Evidence exam that aligned with this unit.