**Lesson Plan**

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| **Name:** | 308 |  | **Course:** | Algebra 2 |  | **Grade:** | 10-12 |
| **Unit:** | Exponential and Logarithmic Functions |
| **Big Idea:** | Point plotting and translations are a versatile skill and can be used to graph exponential functions where its exponent will determine the general shape of the function.  |
| **Subconcept:** | First point plot an exponential function without the translations, then pick a point (usually on the y-axis), and apply the translations from the general form.  |
| **Literacy Strategy(s):** | Reading, Discussing, and Using the Textbook as a Tool for Self Evaluation |
| **Lesson:** | Graphing Exponential Functions |  | **Date Taught:** | 05/03-05/04 |
| **Learning Objective(s):** |
|  |  Students will be able to | Identify and graph an exponential growth function with and without translations. |
|  | Students will be able to | Identify and graph an exponential decay function with and without translations. |
| **Idaho Standards (or National Standards if no Idaho Standards exist):** |
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**Detailed Description of Lesson:**

I began class with having them open their books. I introduced the number *e* with a ridiculous intro of “repeat after me.” I didn’t want them turned off because it wasn’t a familiar letter. I equated it with pi. We spent some time remembering some of the different types of functions they had already “learned” to graph and some of their key elements. Then, I asked them to begin reading the Key Concepts on P.478 and P.486. At this point they stopped, we added the sketches of each type of graph to our list and they developed a list of some of the different types of situations they might see. They then graphed these. I emphasized showing their work in their tables. I graphed Ex. 1 P.478 as an example, then asked them to graph both functions in Ex. 2 P.479. When they were finished, I asked them where they could check their work. I emphasized how self-evaluation is the difference between a good math student and a struggling math student. I sent them to Ex. 1 and 2 on P.486. At this point, I was able to walk around the room monitoring students’ work and make suggestions, catch any mistakes they were making, and emphasize showing their work so I could catch their mistakes. I again emphasized how wonderful it would be to be able to check their work and catch any mistakes before they began their assignment. Students utilized the examples, often without my reminding them where to look to see if they had done it correctly. They began their independent practice on P.482 7, 9, 13; P.489 7, 9, 11 and, again, before they left pointed out that solutions could be checked in the back of their textbook so they could monitor whether or not they understood how to graph exponential functions.

When students came in the next day, I had them take out their previous independent practice and open their books to P.478 again. This time I spent time talking about different forms. I used an analogy of motorcycle jumps. (One of the students is a motorcycle racer.) I talked about how there are different forms of jumps, but, in the end, it’s still a jump. Then I had them read about Translations on P.479. (I know it seems a little late in the year to be discussing translations, but it is where we are. And, I haven’t even entertained the thought of discussing vertical stretch.) During our discussion of breaking down the steps, I botched the horizontal translation. In an attempt to provide continuity with rational functions and asymptotes, I told them to change the sign on the h and move point they chose that many units. This confused the students, because, after reading the text and some of the example, they thought it was opposite. I went back over it and explained my decision, then suggested they should make a conscience decision about how they were going to approach their graphing translations. While some students were not fazed, this confused others for some period of time. We made a list of steps to follow, and then I did Ex. 3 on P.479, following each step, showing my work, and checking my work as an example. Then I directed them to do the same with Ex. 3 on P.487. Students checked their own work at this point, raising their hand if they made a mistake to find out what they did wrong, and some students were even checking their work and fixing their own mistakes! SUCCESS! The did more independent practice on P.482 6, 8, 11, 15, 17, 19; P.489 8, 10, 13, 17, 19, 21. This was a mix of exponential functions (decay and growth) with and without translations. I wanted them to recognize when to use the translations and when not to.

**Handouts:**

 See attached copies.

**Student Work:**

 See attached copies.

**LIMSST Project Literacy Lesson Reflection Form**

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| **Name:** | 308 |  | **Date lesson was taught:** | **05/03-05/04** |
| **Lesson Title/Topic Areas:** |
| **Graphing Exponential Functions** |

**Literacy Strategies Used:**

(Please discuss what literacy strategies you embedded in this lesson. What were your goals in using these strategies? Be specific and use as much detail as possible.)

Graphing rational functions was a nightmare. After their success with graphing polynomials, I was very excited to give it a go, building on what they had already learned. After reflecting on the classes’ performance and understanding, I saw how little self-evaluation students were using on their assignments. Very few students were checking their work, let alone utilizing their textbook. Also students were not showing their work. I had a difficult time finding where they were making mistakes in finding the numbers to plot because they were doing them on their calculators (and incorrectly most of the time). We have worked with the textbook throughout the year, and students were familiar with it, but I thought they could learn how to utilize it even more.

I utilized having students read sections of the text, discuss and review it as a class, clarify any misunderstandings, do an example from the book to show how it is used, then asked them to do the same with an example in the book. After they finished, I asked them to self-evaluate from the example in the book and correct any mistakes.

**Student Response to the Lesson:**

(Was the strategy effective? Were students able to read/write as needed in this lesson? What attitudes were displayed? How did specific

 students and/or the class do? How did the literacy strategy aid in developing student understanding of the topic? Cite specific evidence from the samples of student work)

Yes this strategy was effective. Students that were unable to comprehend the text were still trying, and they didn’t miss out because we talked about it afterwards and I talked about it some more. As a whole, I thought the class did much better. They were more engaged in their assignment and not talking as much (a sure sign of success), there were also fewer clarification questions during their independent practice. I am very proud of the students that utilized the examples in their text. I have found that if I write the problem on the board (without telling them that it’s in their book) more of them are trying the problem. After I tell them where to look for the solution, they are able to see if they did it correctly.

Some of the work that I saw was very well done and showed a thorough understanding of the concepts (see high example). However, some work showed a misunderstanding from day one to day two (see middle example). I am not sure if it was misunderstanding or not recalling what she had previously used. Then there is the low example. She mistook the exponential function for a linear function, and continued making this mistake (though less often) after I reviewed it with her the second day. I had more examples of high work (not always neat, but high), and I struggled with finding a middle and low sample of any substantial worth.

**Lesson Reflection:**

(What worked well with this lesson? What challenges did you encounter in this lesson? Would you change certain aspects of the lesson or the questions that you asked? How does this influence future lesson planning?)

The component that was missing was self-evaluation. I wasn’t able to grade and evaluate them in a timely manner (especially if work was turned in late due to absences—an there are a lot of them). The only real problem I had with this lesson was my mistake in not following the text they were reading and students not turning in work. The only challenge I can think of is that botching I did. I liked the lesson as it was. I am glad I grouped it the way I did for these students. Drawing on the similarities between growth and decay functions instead of treating them as completely separate functions. Since this success with self-evaluation I have been using this method in class. Having them read, discuss it, and talk about it, then practice and evaluate. Classic mathematical education with a twist.

**Relationship to Previous Instruction:**

(Have you taught this lesson/topic prior to the LIMSST project? If so, how did your teaching of this lesson differ from what you taught before? How did students’ reactions to this lesson differ?)

I have not taught this lesson prior to the LIMSST project.