

Lesson Study Report

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Unit: Exponents

Lesson Study Topic: Exponential Growth

GOAL SELECTION: The lesson study goal was established through a series of meetings and discussions. The group analyzed what the “Big Ideas” were for this topic of study to create a goal.

Lesson Study Goals: The students will recognize mathematical relationships in different contexts through investigation. The students will make connections by drawing on prior knowledge to form conclusions. The students use recognition to relate mathematical situations to real world situation.

Program of Study Goals:

DAP-U-3 Student will understand that graphical and numerical techniques can be used to study patterns and analyze data.

DAP –S-DR3 Students will display the distribution, analyze patterns and describe relationships in paired data for univariate measurement data.

DAP – S- DR4 Students will display a scatter plot and describe its shape for bivariate data.

AT – U – 1 Students will understand that patterns, relations and functions are tools that help explain or predict real-world phenomena.

AT – S – PRF-1 Students will use explicitly defined functions to generalize patterns.

AT – U- 2 Students will understand that there are relationships between and among patterns and functions, their representations and their properties.

AT – S – PRF2 Students will understand relations and functions and use various representations for them.

AT – S – PRF6 Students will interpret representations of functions of two variables.

AT – S – PRF13 Students will see the patterns in arithmetic and geometric sequences using recursion.

AT – S – PRF17 Students will see patterns in other sequences (e.g., arithmetic, quadratic, exponential).

AT – S- PRF19 Students will relate the patterns in geometric sequences to exponential functions.

Core Content Goals:

MA – HS- 4.1.1 Students will analyze and make inferences from a set of data with no more than two variables, and will analyze problems for the use and misuse of data representations. DOK3

MA – HS – 4.1.2 Students will construct data displays for data with no more than two variables. DOK2

MA- HS – 4.2.3 Students will identify an appropriate curve of best fit (linear, quadratic, exponential) for a set of two-variable data.

MA – HS- 5.1.1 Students will identify multiple representations (tables, graphs, equations) of functions (linear, quadratic, exponential) in real world or mathematical problems. DOK2

MA – HS- 5.1.4 Students will recognize and solve problems that can be modeled using an exponential function, such as compound interest problems.

Planning 1

The lesson study was conducted for the Algebra 1 B students at Conner High School. The lesson study was to help students understand there is a visual representation and purpose behind the problems they are asked to solve in class. The lesson study should promote the recognition of different types of algebraic relationships and the development of better inductive reasoning skill. Students need to be exposed to lessons that promote real world solving skills.

Concerns the group wanted to address:

Lack of connections, can't draw from the knowledge they have without step by step process, lack of confidence to venture out on their own, lack of reading comprehension.

The lesson study group decided to focus on how to get students to draw conclusions and use prior knowledge to develop real world connections.

Concerns addressed of the actual lesson:

Materials available to students, use of graphing calculators in one class vs. another, individual assessment vs. group assessment, type of grouping used, time constraints, freedom of student thought and presentation.

The lesson study group used the TTLP and other lesson study tools created by the Lesson Study Research Group to obtain focus throughout the meetings.

Time	Student's main learning activities	Important points relating to instruction
10 min Bell Ringer	Students are given two scenarios. Students are asked to decide between choosing a linear function vs. an exponential function dealing with a real world application problem.	Students have the opportunity for individual reflection before group work. This would eliminate one student in the group taking over and doing the problem alone before each student had an opportunity to analyze the situation.
20 min	Group Work Students are asked to compare results and come to an agreement on how to present this problem to the class. Presentations are expected to be in the form of verbal, tables, graphing, and equations.	Students are given the freedom to show different types of representations for their results. Students can see that there are different ways to model real world problems.
10 min	Presentations: Each group presents. Students can compare results and have the opportunity to reanalyze their own predictions if needed.	Allows for evaluation of peers work, which is very important to students.
10 min	Teacher Commentary and Reflection on the two scenarios. Teacher reflects on each groups presentation. Teacher shows an actual table. Students are able to see an accurate break down of the table and graph of the two scenarios.	Students can see how tables and graphs give a better understanding of the two scenarios. They can also examine each to write an equation.

20 min	Group work. Students are given one of five scenarios. Students are asked to determine if the scenario is linear or exponential.	Students can help each other decide on the correct representation. Students are asked to make another representation.
10 min	Wrap up. Students discuss and display their scenarios.	Students can compare real life linear and exponential situations.

Debriefing 1

The group thought the first run went well. The students were engaged in learning. The students seemed very interested in each process of the lesson. The students ran out of time at the end and were not able to do the final presentations. The students had various representations of the two scenarios. During the last stage of group work, most of the groups were able to differentiate between linear and exponential scenarios.

During the debriefing we discussed the issue of time constraints. Should the lesson be one or two class periods? We discussed some prompting and timing might help with timing issues.

The last of the five scenarios was changed due to the level of difficulty the students were having with the original scenario.

The groups were each given a different scenario. The students may not have been listening to the other presentations or have a full understanding of the other problems. This would only allow them to look at their own scenario and not determine if they knew the difference between exponential and linear. It was discussed to give all 5 scenarios to all groups to make sure they would have the opportunity to distinguish between exponential and linear.

Lesson 2

The excel sheet that projected the bell ringer results was changed so the students were able to see the difference in comparing a weekly salary to a sum of salaries. The students were timed with a visual timer. Table comparisons were used to distinguish between types of functions as well as the graph. Students were asked to compare all 5 scenarios.

See Lesson 2

Debriefing 2

The timer seemed to fix part of the time issue. All students appeared to be on task. Students were able to generate formulas. Students were able to look at all the scenarios.

It was suggested to let the students compare the salary pattern as well as the sum of the salary pattern for the next lesson.