


Narrative of a patterns-seeking activity in a Rhode Island ESL NRS Low/High Classroom

Resource: EMPower's *Seeking Patterns, Building Rules*: Lesson 2—Banquet Table



How many tables will I need for a crowd of any specific size?

Men and women in the catering business need to be masters at planning and predicting. A good caterer can accurately forecast how much food to cook, how much time to plan for preparation, and how many banquet tables to set up, depending on the number of people expected.

In this lesson, you will build some banquet table arrangements to help you look for patterns. You will also use diagrams and a well-organized table of numbers to help you see the relationships between the variables in a problem—in the first case, the number of square tables and the number of people seated at them. You will describe the pattern and write a rule for it. You will discover that no matter how big the crowd, you can figure out how many banquet tables will be needed, once you have developed a rule.

The education level among these students varies greatly:

- One student just took the GMAT exams for graduate school.
- Two students have some post-secondary education, meaning some university education in their native country, but did not complete their studies or obtain a degree.
- Four students completed secondary school (12 years or high school) in their native countries.
- Two students had only 6 years of formal education in their native country of China.

Of the 9 learners, 6 are native Spanish speakers, 2 are native Chinese speakers, and 1 is a native Korean speaker. All but the two Chinese students had studied algebra in school in their native countries. This class spent a total of 6 hours in 3 different classes working on a few algebra lessons. In the second and third class, I worked with the two Chinese students on one algebra lesson, Guess My Rule from Lesson 1 in EMPower, while those students who had some background in algebra worked on activities from Lesson 2

What was planned and why

1. Students will be able to identify a real life situation where math is needed.
2. Students will be able to identify a pattern, describe it in words, as a diagram and as an equation.
3. Students will be able to articulate their pattern as a rule and apply it to solve a problem.

Integrating math into our ESOL lessons helps students reach the following objectives:

- One student is preparing for her External Diploma and although algebra is not yet a requirement, it will be in the future and she will be ready.
- Several students have the goal of being able to help their children with their homework and any math we do in class serves as a revision to what these parents might have learned in school, but haven't used for many years. A few parents had never studied algebra and now they will hopefully be able to understand some of their children's homework and not feel "in the dark". In both cases, these parents will have more knowledge and confidence in helping their children.
- Lastly, for all students, learning and talking about math gives them a new vocabulary and allows them to talk about learning and get a lot of practice using English in a real life situation as they collaborate in the learning process, talk through the tasks, the rationale for their answers, and describe what they know.

In relation to our state's new math standards for adults, all the math we did addressed the components of the standard as follows:

- Learners first needed to identify a situation that necessitated a math approach. We had done a lot of math throughout the year as we worked on real life situations that required math skills such as calculating area to buy a carpet for a room in their house. In this lesson, we talked about planning a seating arrangement at a restaurant because four students work in restaurants and three others regularly have big family parties at their homes.
- Learners were able to build on their prior knowledge of algebra and liked being able to use their math knowledge in the language class. The language to talk about math was new, but the math concepts were not making it easy to fully engage them.
- Learners were able to manipulate data and represent it in different ways such as in a table and a drawing.
- Learners selected different strategies to approaching the task. Some began with numbers, others with drawings, and others with an equation. They all worked according to their strengths.
- Learners worked collaboratively and communicated their reasoning and their approach to the various tasks.
- Learners were able to work on reading to understand, and speaking and writing to communicate their reasoning. This really engaged them as co-learners.
- Learners worked on patterns in their own lives that involved numbers and applied this knowledge to algebra once we began working on In/out tables.

For this activity, I allowed learners to decide whether they wanted to work individually, in pairs, or in small groups. Some worked individually, others in pairs and others in a group of three. As they completed different parts of the lesson, they checked in with one another and compared answers. I had observed in our previous math lessons, that some students' strengths were articulating math in words, others in numbers/equations, and others in diagrams. I wanted them to work with their own strengths and at their own pace and ask for help when needed from one another and from me.

I did not tweak the lesson because in doing the Intro lesson and Lesson 1 of EMPower, I was able to target the following benchmark, which was my focus: **Write a simple math sentence or expression that represents a verbal situation and vice versa.**

The class begins...

I particularly chose this lesson because 4 of my students work in food service and I wanted all learners to first identify that we had a real life problem that needed math. I presented this scenario: you work in a restaurant and are used to seating people in tables of 2 to 8. Now you have a large party of x number of people coming and you need to figure out how to configure the tables and how many can be seated.

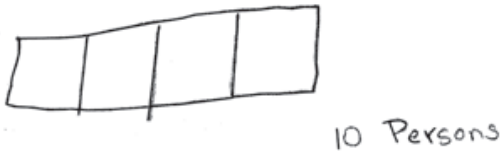
I had previously talked to my Chinese students, who own and work in a Chinese restaurant and who were having a very difficult time understanding the concept of algebra. I asked them how they use math in their jobs. One talked about how he calculates the pounds of vegetables per person for large groups and we put it in a table to show how he could take HIS rule, that he showed me, and use it to predict the amount for any number of people. His rule was 1 pound of vegetables for every 10 people.

I drew students' attention of the introduction to Lesson 2 (student book page 21), and let them read it silently as well as the opening paragraph on page 22.

Task 1
Given the number of square tables, find the number of people who could be seated around them.

1. How many people would fit around each arrangement of banquet tables?
Arrangement 2 6 Arrangement 3 8

2. Draw the next table arrangement in this pattern, and write down how many people could be seated at it.



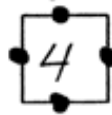
10 Persons

Students seemed to be struggling with how to get started with #1 of Task 1, page 22. I needed to point out that it is assumed that 1 person is seated in each table length. From our first algebra lesson, most students had the tendency to look for an answer that was much more complex than what was being asked of them. Once they understood that one person is on each side of a table, they breezed through #1 and #2.

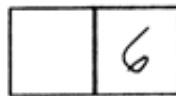


Activity: Banquet Tables

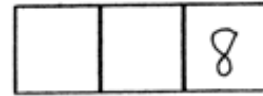
Arrangement 1



Arrangement 2



Arrangement 3



For #3, I reminded students that they could figure this out by drawing the arrangement, doing an In/Out table or thinking of a rule and applying it. This is where I wanted them to use their own strengths/preference to figure it out. Some students drew, others created an in/out table, and others had already figured out the rule and applied it immediately as an equation and got the answer.

4. Explain how you would figure out the number of people who could fit around an arrangement of 100 tables pushed together.

$$\begin{aligned}y &= 2x + 2 \\y &= 2(100) + 2 \\y &= 202\end{aligned}$$

5. Make a table to keep track of the number of banquet table arrangements and the number of people who could be seated for each arrangement. Record the information you have gathered so far.

1	4
2	6
3	8
4	10
10	22
20	42
30	62
40	82

6. What is the rule for finding out how many people you would be able to seat at *any* number of square table arrangements?

In words: For each table to add we have 2 places more

As an equation: $y = 2x + 2$

For the rest of the lesson, students continued to work through the tasks, ask one another questions and check their answers with one another. They could do the tasks quite easily from here, although they struggled more with the language, meaning what was the task requiring and how to write the answer. I simply facilitated as students needed help, which was generally with the language.

I hadn't planned on students needing help articulating the rules in words because they were able to do so in Guess My Rule in Lesson 1.

For ESOL learners who demonstrate little gain, it is important to assess, beforehand, their level of education and their previous experience with math. If students cannot do simple operations of addition, multiplication, etc. I would want to start with some lessons in simple computation and then concentrate on finding patterns and applying the calculations. To jump right into finding patterns that requires them to use simple operations before giving them practice with operations would make these lessons too difficult for them. A slow, integrated approach with lots of practice and application to real life should be considered.

The Teacher's Reflection

My biggest challenge was thinking about each student individually and judging, in advance, whether or not the lesson would be too easy or too difficult for each student. Because this is an ESOL class and I have only begun to introduce math concepts this past year, I didn't know how strong or weak their math was, but I knew there were many different levels of math learners. I also wanted to make sure that learners deemed what they were learning to be relevant in their lives.

Another big challenge was judging the language level. Although in my planning, I picked out vocabulary to pre-teach, I was surprised that students often had difficulty in understanding what was being asked of them more than doing the math itself. I was also surprised how difficult they found writing an explanation or the rule because they could articulate this verbally quite well.

I was very surprised at what my class came up with when we did the Algebra mind map.



Their thinking was broad, their vocabulary was specific and they had a lot of ideas that I wouldn't have thought of. However, I was surprised that many of them did not remember words such as *divided by*, *times*, *plus*, *equal*, and *minus*. I assumed they could easily use these expressions. I also assumed that students could add, divide, multiple, and subtract very well, and they could.

The knowledge that learners brought to the activity on the whole was an understanding of variables, understanding information organized in tables, and the need to look for patterns, although the word *pattern* was new to them.

In thinking about algebra, the only thing I had remembered from school was variables and what they looked like in equations. I never understood how to apply algebra in my life and I did not think of algebra as looking for patterns in order to predict future outcomes, make decisions, and solve problems. I was very hesitant to teach algebra because I was worried that my own understanding was not strong enough; however, once I taught these lessons, I realized that my knowledge was strong enough to facilitate the learning. I learned from my students that understanding the application was not abstract or difficult and it was easy to come up with concrete examples, just as they found in the process of finding their own pattern in the introductory lesson.

My Pattern
 I wake up at 1:15 AM every after
 I leave from my home at 1:30 AM get
 to work at 1:45 AM take my papers
 and start to deliver ^{the journal} at 2:30 AM and finish
 at 6:00 AM every day

SCHEDULE

	Wake up	Leave Home	Get to Office	Leave Office	Start Delivery	Finish delivery
Monday	1:15	1:30	1:45	2:15	2:30	6:00
Tuesday	1:15	1:30	1:45	2:15	2:30	6:00
Wednesday	1:15	1:30	1:45	2:15	2:30	6:00
Thursday	1:15	1:30	1:45	2:15	2:30	6:00
Friday	1:15	1:30	1:45	2:15	2:30	6:00
Saturday	1:15	1:30	1:45	2:15	2:30	6:00
Sunday	12:45	1:00	1:45	2:00	2:15	8:00

I also have a better handle on how to integrate different math concepts, such as reading graphs with algebraic reasoning, and working on fractions and percents when working with graphs and charts.

I wanted to do TIAN because I saw the need and have the desire to integrate math into the ESOL class. Students like it, need it, and learn both math and language and how to apply both in their lives. It's been a great learning experience and I look forward to continuing to improve my own knowledge and ability to teach and facilitate math.