

Lesson Plan 2

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Grade Level:	6	Mentor:	Natalie Spengler
Course:	Mathematics	Unit Title:	Introduction to Algebra
Lesson Number:	---	Lesson Title:	Patterns and Algebra
Reference Code(s) for Standard(s):	CCSS.Math.Content.6.EE.A.1, A.2.a, A.2.b	Time Segment of Lesson:	45 minutes (one class period)
Text of Standard(s) to be Addressed in Lesson:	<p><i>A.1: Write and evaluate numerical expressions involving whole-number exponents.</i></p> <p><i>A.2.a: Write expressions that record operations with numbers and with letters standing for numbers. For example, express the calculation "Subtract y from 5" as $5 - y$.</i></p> <p><i>A.2.b: Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity. For example, describe the expression $2(8 + 7)$ as a product of two factors; view $(8 + 7)$ as both a single entity and a sum of two terms.</i></p>		
Notes:	<ol style="list-style-type: none"> <i>This lesson is designed for students in an educational language immersion setting. Thus, it is not accurate to characterize them as typical English Second Language pupils, although, neither do they have the same command of English as expected of Native English Speakers in a monolingual linguistic majority environment.</i> <i>'Teacher candidate' and 'teacher' both refer to the teacher candidate.</i> 		

Big Ideas to be Addressed in the Lesson

1. Realize that shapes can be represented in many ways.
2. Understand the relationship between a series of shapes and a table.
3. Understand the relationship between a series of shapes and a graph.

Objectives and Assessments

Measurable Objectives to be Addressed	Formative and Summative Assessments
1. Figure out the next shape in a sequence.	<p><u>Formative:</u> Use manipulatives to figure out the next shape.</p> <p><u>Summative:</u> Exercise from textbook at end of lesson.</p>
2. Figure out the operation that transforms a shape into the next shape in the series.	<p><u>Formative:</u> Oral questioning.</p> <p><u>Summative:</u> Exercise from textbook at end of lesson.</p>
3. Learn the conventions of drawing a graph table.	<p><u>Formative:</u> Example on board.</p> <p><u>Summative:</u> Exercise from textbook at end of lesson.</p>
4. Learn the conventions of drawing a graph (with 'x' and 'y' axes only).	<p><u>Formative:</u> Example on board and exercise in textbook.</p> <p><u>Summative:</u> End of unit test.</p>

Teaching Strategies and Related Student Activities

Teaching Strategies and Activities: What are the teaching strategies and activities that you plan to use to help students meet the lesson's objectives? What are the steps that you will take to deliver this lesson (e.g., introduce the author, read the poem, ask students to...)? (Include Web 2.0 activities as appropriate.)

- The teacher will provide immediate oral positive and negative **feedback** to pupils on the correctness of their answer. E.g. "No, that is incorrect, but good try / nice effort." "Good point / observation." "Yes, that is an excellent example." Note that I will purposely avoid saying pupils' names because not all pupils were given permission to participate in videos and some parents even went so far as to request that I do not mention a student's name even if they are not in the video. I have been volunteering with these students for almost two months now, and as a result of this I know all their names quite well and have established a tentative relationship with them. I will also employ the '**Right is Right**' strategy, i.e. I will not say "okay" or "yes", unless the pupil has provided a completely correct answer. I will also employ the '**Stretch It**' strategy, where I encourage the student to elaborate on their answer through prompting and hints.
 - Use **attention grabbing litanies** such as: "One, two, three; eyes on me.", "Notebooks closed, pens down, eyes on me please.", etc. to ensure students do not start doing before I tell them to. E.g. Students tend to start writing down what is on the board rather than paying attention to what is being taught.
 - Vary students chosen to answer questions in class, so that everyone gets a chance to answer.
 - **Highlight technical vocabulary** to students. E.g. 'operation', 'sequence', 'series', 'axis' and 'axes', etc. It might be a good idea to write such words on the board for students to see them and see their spelling.
 - Emphasize that students have learned four different ways to think about a series of shapes.
- 1) Request that students write the title and draw two graphs in their notebooks prior to starting the lesson. One graph will have axes 'x' [up to 10] and 'y' [up to 80] and the other will have axes 'x' [up to 10] and 'y' [up to 40]. Guide the children through correct graphing conventions by going around and inspecting each notebook. **This activity will last 5 – 8 minutes.**
 - 2) All students should have their textbooks open to the page indicated. A volunteer will come to the board to complete the next shape in the sequence. I will ask the class how many more sticks each shape has. We will fill this into the table. **This activity will last 8 – 10 minutes.**
 - 3) I will now plot the graph of the points on the board, with students supplying the coordinates. If there is enough time, I will have students plot the points and line on the graph. At the end I make sure to enumerate the four different ways we have now represented the series of shapes. **This activity will last 2 – 5 minutes.**
 - 4) Students may now copy the worked examples on the board and then do the rest of the exercise from the textbook in their notebooks. **This activity will last 10 – 15 minutes.**
 - 5) Once this has been completed. I will repeat steps 1 through 4 with another **guided or worked example**.

Teacher and Student Input: Write a note on what you expect the teacher and students to do as a part of this activity. Include a note on whether this is an "I do it", "We do it" or "You do it" type of activity.

- The teacher should **manage class time efficiently** and **ask both closed and open-ended questions**.
- This lesson will be accomplished using the "I Do – We Do" method of teaching. The examples on the board drawn by me (viz. shapes, table, graph) ["I Do"] will be followed by having students pin up colored popsicle sticks on the board and figure out what the mathematical operation and rule are for the series ["We Do It Together"]. Finally, the students are asked to do exercises from the textbook on their own ["You Do"]. This whole process is repeated again when the lesson is re-taught using a different kind of shape series.
- By the end of the lesson I will have twice **modeled** for students correct table drawing and graphing conventions.

- Students will be expected to participate fully in all activities, pay close attention to their peers' answers and statements, and copy the material from the board using the school's writing conventions.

Review: Write down ideas on how you will review the topic, including notes on types of formative assessments that you will use during the lesson.

- This topic (patterns and algebra) is actually a review lesson because it is the second time it is being taught to these pupils.
- The formative assessment for this lesson is mainly **oral questioning** as a whole class.

Discussion Topics

Write out topics that you would like students to discuss in class, before class or after class because they are interesting, difficult to grasp or for any other reason that would make for a lively and engaging discussion. If discussions must happen outside class, what tool will you use to facilitate the discussion (e.g. Twitter)?

- Arranging and drawing popsicle sticks, drawing tables and graphs are all time-consuming activities. It is unlikely we will have time in this class for any type of discussion. Nevertheless, a good discussion topic could be to ask students what the graph would look like if we started from the last shape and instead went to the first shape in the series (i.e. a shrinking pattern rather than an additive pattern).

Student Accommodations

Student Diversity	Differentiation of Instruction
1. For gender	None necessary.
2. For ethnicity and culture	I do not feel that culture is particularly relevant in teaching simple mathematics. Students in this class are from various cultures, though mostly of Hispanic or European origin.
3. For high-achieving students	To differentiate instruction <u>if pupils finish activities early</u> , they can move onto the next exercise in the textbook, or they can draw the tables in reverse and graph the shapes as they would be if we were subtracting sticks rather than adding them.
4. For low-achieving students	For low-achieving students, the teacher should go around and personally check each student's understanding of the material (via oral questioning). We have one student in the class who was diagnosed with ADHD, but has been taken off his medication (no reason for this was supplied to me). This child works very slowly, is <u>not</u> hyperactive, does not seem interested in schoolwork and is low-achieving, i.e. at risk of failing this grade (Alejandro V.). Another pupil is also low-achieving, struggles to grasp academic concepts and has poor English, which as a result affects her acquisition of content and skills in all subjects (Emma). To avoid these pupils falling behind, I would walk to their desks and recommend they: (i) skip copying the example from the board (and give them a printed copy of this worked example on a spare piece of paper), and (ii) plot all points and lines on the same graph axes, rather than the two stated in the instructions. If they finish early, then they can start copying the worked example from a classmate's notebook.
5. For audiovisual learners	I think this lesson already caters sufficiently to audiovisual learners. Everything is shown both visually and with numbers.

6. For tactile-kinesthetic learners	This lesson already caters to tactile-kinesthetic learners by having the entire class manipulate popsicle sticks to come up with the answers and by having volunteers come up to the board to write in the answers.
7. For English language learners	I think this lesson has already been sufficiently scaffolded by using the “I Do – You Do” method of teaching. Now, when the ELL pupil stumbles over the reading of the directions in the textbook, they will already know what to do. (ii) Another option could be for challenged ELLs to work in pairs , provided their partner has a similar ELL or achievement level (to avoid one student doing the entire assignment without significant input from their partner). (iii) Furthermore, many ELLs may shy away from asking public questions. To this end, all students could be provided with electronic mini whiteboards (connected to the teacher’s electronic tablet) so that the student can either take temporary notes, or, more importantly ask questions to the teacher in a discreet manner. The mini whiteboards will serve the multiple purposes of (a) enabling the teacher to answer the question for the whole class’ benefit (b) without singling out a student and (c) it will empower the ELLs to question the material and (d) help them practice formulating and writing questions in class. If whiteboards are not available, a thrice folded piece of paper can be used. (iv) Yet another option for scaffolding and forcing participation is employing the strategy of ‘No Opt Out’ to thwart students who do not wish to participate. (i.e. I will allow another student to answer and then come back to them asking what the answer is or at least having them repeat the other student’s answer.)
8. Students with minor learning disabilities	There is a student who appears to be very smart and competent, but is a perfectionist and as a result rarely finishes class assignments on time (Adriana). It is possible that she may have an undiagnosed learning disability. As far as we are aware, there are no students with confirmed learning disabilities in the class. To avoid this pupil falling behind, I would walk to her desk and recommend she: (i) skip copying the worked example on the board (and give her a printed copy of this on a spare piece of paper), and (ii) plot all points and lines on the same graph, rather than the two stated in the instructions. If she finishes early, then she can start copying the worked example from a classmate’s notebook. If we did have <u>pupils with (say) ADHD, dyslexia or dyscalculia</u> , an accommodation for them could be to use a carrel desk to block out extraneous noise and distractions and help them concentrate on completing assignments.
9. For students with physical disabilities	There are no such students in this class; but in any case, it is unlikely this lesson would need to be modified in any significant way for such students. Some minor adaptations <u>for students with visual issues</u> could be to: (i) provide them with a handout in large print of the material written on the board. Since students are following along with the lesson from the textbook, I doubt any other accommodations would be necessary. <u>Students with hearing deficiencies</u> would probably already have electronic devices to increase their auditory abilities, but the teacher could also use a microphone , if necessary.
10. For students with mental challenges	So far as the teacher and school are aware, there are no such students in this class. Nevertheless, it is known that <u>children with autism</u> think very literally and have difficulty understanding abstract ideas. This predisposition could actually assist this student in acquiring the underlying concepts of a math manipulatives class.

Materials and Resources for Lesson

Materials and Technology	Required Preparation and Websites
1. Mathematics textbooks	Mathematics textbook, Exercise 8.01, “Patterns and Algebra”, section 5, page 217.
2. Popsicle sticks	200 popsicle sticks; put 20 popsicle sticks on each pair of desks.
3. Whiteboard materials	Check that colored erasable markers are working, have meter ruler handy, masking tape (to tape sticks to board).
4. Prepare board with parts of lesson.	Write title, question numbers, draw series of shapes, and partially completed table and graph axes on the board prior to the lesson.