"That's Where I Sit!": A Slow Reveal of the Coordinate Plane

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Abstract

Slow Reveal Graphs are an instructional routine designed to promote sense making by gradually unveiling components of a graph and inviting students to notice, wonder, hypothesize, and revise their thinking. While typically used to support data literacy, this paper describes how a middle school mathematics teacher adapted the routine to deepen students' conceptual understanding of the coordinate plane. In "That's Where I Sit!" the teacher transformed her classroom seating arrangement into a coordinate grid and used a slow reveal sequence to introduce coordinate points incrementally. As students engaged with the unfolding image, they reasoned about the meaning of the dots, identified axes and quadrants, and connected abstract coordinates to their physical locations in the classroom. Classroom dialogue illustrates how the routine supported mathematical discourse, normalized conjecture and error, and strengthened connections between mathematical representations and students' lived experiences. The activity positioned students as active sense makers while supporting the Standards for Mathematical Practice, particularly reasoning abstractly and quantitatively and constructing and critiquing arguments. The paper concludes with practical guidance for designing and implementing slow reveal routines beyond data analysis, offering teachers concrete strategies for adapting the routine to other mathematical topics to foster engagement, discussion, and conceptual understanding.

Keywords: coordinate plane, instructional routines

1 Slow Reveal Graphs

"Slow Reveal Graphs are a sense-making instructional routine that slowly unfolds crucial elements of a graph sequentially" (Berrigan, 2022, p. 14). In this activity, teachers gradually uncover parts of a graph, inviting students to observe, hypothesize, and refine their thinking at each step (Berrigan, 2022; Hunter, 2020). The process typically starts with a partial graph—such as data without axes or values—and prompting students to notice and wonder. Jenna Laib gives an example of the routine for a histogram titled *How many calories do people really eat at Chipotle?* (Laib, n.d.). At the beginning, only the bars of the histogram are shown—the title, axes labels, scales, and values are all hidden. As the slides advance additional information is added: the recommended daily calorie allowance, a scale for the x-axis, a title and graphic of two Chipotle meals, annotations of key data points, and a headline from the *New York Times*. At each step, students are prompted with questions like, *What do you notice? What do you wonder? What more do we know? What could this axis be measuring? Does this surprise you?*

The slow reveal graph routine helps children engage in meaningful reasoning and discourse about data. Students work together to unpack the data presented, understanding what it represents and what it reveals about the real-world context. In addition to the focus on reasoning about data, the slow reveal

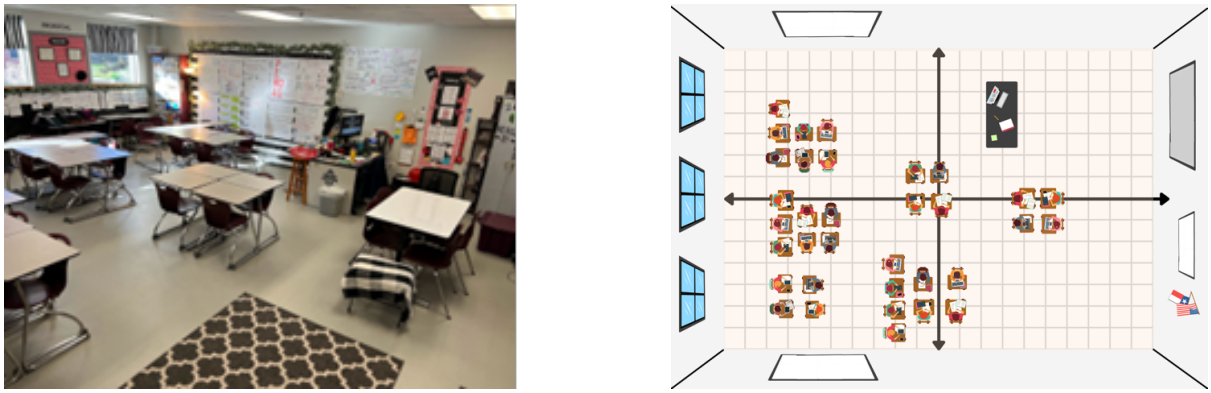
routine also helps students do such things as "slow down, ask questions, make observations, … [and] make predictions" (Berrigan, 2022, p. 14). Finally, because information is slowly revealed, students inevitably will make mistakes in their guess about what is being represented, which normalizes mistakes as a regular part of learning (Berrigan, 2022).

Slow reveal graphs, therefore, support students in engaging in the Standards for Mathematical Practice (SMPs). In grappling with slow reveal graphs, students must reason about what quantities are represented by the graph, often considering how and why they are changing and must consider what this tells them about the real-world context, which supports SMP 2: reason abstractly and quantitatively. They also have to "listen [to the] arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments" as described in SMP 3: construct viable arguments and critique the reasoning of others (NGA Center & CCSSO, 2010, p. 10).

2 Modifying the Routine

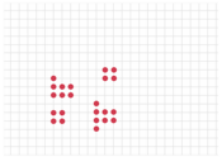
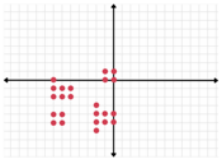
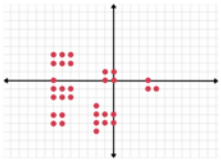
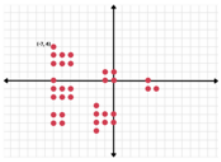
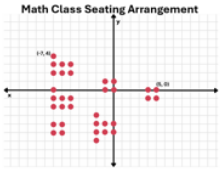
While slow reveal graphs emphasize data literacy, Linda modified the routine so it could connect with the mathematics she was teaching. Linda was teaching a 6th grade Beginning Algebra course in Texas. During this time she was teaching and reviewing the coordinate plane, which the students would have first learned about in 5th grade (e.g., standards 5.G.1, 5.G.2, 6.NS.6; NGA Center & CCSSO, 2010). Therefore, she switched from using a typical graph to instead displaying her students' seating chart on a coordinate plane. Figure 1 shows her thinking; the specific coordinates were marked by masking tape on the ceiling based on a grid created by the existing ceiling tiles. Her modified version of the routine allowed her to keep many of the same features that support student reasoning—students were able to slow down, share guesses, and ultimately connect the coordinate plane with their context—but in the context of a coordinate plane as opposed to data analysis. To maintain suspense, she introduced the coordinates (desk locations) in parts to avoid students instantly recognizing their classroom seating arrangement.

Figure 1
Photo and Graphic Illustration of Linda's Classroom Seating Arrangement



Once the students were seated, Linda began with a slow reveal slideshow showing seven dots (Figure 2a). In discussing this with her students, Linda used the term "graph" in the general sense of a graphical representation of information, but in retrospect using the term "graphic" or "image," and later "coordinate plane" would have been more mathematically accurate.

Figure 2
"That's Where I Sit!" Slow Reveal Graph Slides

	*Figure 2a.* First 7 coordinate points
	*Figure 2b.* Previous figure with clusters of 4, 4, and 8 coordinate points added
	*Figure 2c.* Previous figure with grid overlay added
	*Figure 2d.* Previous figure with axes added
	*Figure 2e.* Previous figure with additional coordinate points added
	*Figure 2f.* Previous figure with coordinate point labeled
	*Figure 2g.* Previous figures with more details and title added

Linda: What do you notice? What do you wonder?

Lev: I notice seven dots.

Dan: I wonder if there is any meaning. I think it's just random dots.

Linda: Next slide [Figure 2b]. What do you notice or wonder now?

Grace: There are more dots, not in the same place as the others.

Molly: The same 7 dots are still there, plus more dots.

Oscar: Is it adding a certain number of dots each time, like a repeating pattern?

Linda: Thank you, Oscar. Here's the next slide [Figure 2c]. What new information did we learn?

A.J.: I know! You connect the dots, and it makes a picture!

Linda: I like your thinking about the dots having a purpose.

Molly: The same 7 dots and then 16 more, and now it's on a grid.

Oscar: I'm wondering how many more dots will be next.

Linda: Here's the next slide [Figure 2d]. Does this new information change your thinking?

Oscar: Some of the dots are on the lines and lots of dots are in the bottom part.

Molly: It's like a coordinate grid.

A.J.: It's us! We are the dots!

Quincy: OH! I get it. Each dot is a desk [location].

Dan: I'm the dot at the bottom right [out of his seat and pointing to the board now near $(0, -4)$]. *That's where I sit!*

At the beginning of this slow reveal routine (illustrated above), each slide Linda presented revealed more of the coordinate points associated with students' desk locations in the classroom (Figure 2). Once Dan was out of his seat identifying his coordinate point, students were eager to test the conjecture and come up to the board to point out their desk locations, so Linda continued the instructional routine. Slides were advanced only after multiple students had time to discuss and revise their thinking.

Linda: I hear many of you saying this graph represents desk locations. Grace, you mentioned your desk location isn't a coordinate point on the graph. How do you know?

Grace: I should be way over to the right [points towards $(4, 0)$].

Molly: You and me, we should be on the line, the axis. Isn't it the x-axis?

Linda: [Advances to Figure 2e] Are you on the graph now?

Grace: I am.

Molly: I'm not! Hey, where am I? [Linda advances to the next slide, Figure 2f; Molly at $(5, 0)$ is still missing.]

Dan: Am I the $(-7, 4)$? I kinda remember this from last year.

Linda: Good questions. If Dan is the coordinate point $(-7, 4)$, what might we anticipate Molly will be?

Linda finished the slow reveal activity with her students, showing Figure 2g, which helped Molly confirm that her seat is the coordinate point $(5, 0)$. The activity ended with Figure 2g, which included all labels for the points, confirming students' thinking that the coordinate plane represented the classroom seating arrangement.

Linda followed this routine with an activity where students constructed their own coordinate grids, finding the coordinates of landmarks of interest, and reviewing additional language (e.g., quadrants, y-axis) and concepts.

3 Implementing Your Own Slow Reveal Routine

When implementing a slow reveal graph or other image, encourage noticings and wonderings. Allow all students to share their observations and questions. Their thinking should not be fixed and may evolve as the graph unfolds, so there's no need to record every response on the board unless it supports your instructional goals. Students should feel free to refine and adjust their ideas. You can incorporate turn-and-talks by pairing students to discuss what they notice and wonder before sharing with the class, giving everyone a voice, and encouraging peer-to-peer learning. While only a subset of student comments from "That's Where I Sit!" are included here for readability, Linda regularly used turn-and-talks and whole-class invitations to ensure broad participation.

Slow reveal graphs are a good instructional routine for practicing classroom collaborative interaction norms. Ask students if they agree with one another, would like to add on to each other's ideas, or would like to ask each other questions about what was said. Slow reveal graph conversations are also good practice of important social and emotional skills like self-management (including turn-taking and listening to others' ideas), relationship skills (including asking questions and sharing ideas), and responsible decision-making (including following expectations and using critical thinking) (Joswick, 2022).

3.1 Designing a Slow Reveal Routine

There are many readily available slow-reveal graphs found on the internet that apply to middle school mathematics curricula and appeal to students' interests and real-world experiences. Jenna Laib's website slowrevealgraphs.com provides numerous examples, many of which include ready-to-use slides and suggested questions. These graphs come in many forms (e.g., bar, line, scatterplots) and topics (e.g., fast food, sports statistics) and cover different types of data (e.g., observational, survey). Content spans across standards (e.g., graphing data, interpreting relationships, and understanding coordinate systems). The instructional routine may be used as a bellringer, hook, or introduction to a lesson or a transition between activities. You can also design your own routine as Linda did or you can adapt graphs you find in the news.

3.2 Slides

After selecting the context and choosing an appropriate graph or visual for the data and mathematical concept you want to emphasize, planning the slow reveal graph entails making slides that progress from an initial set-up, unveil additional elements of the graph and data gradually, and end with the full graph. We recommend starting with the final graph that includes all data, labels, and information you would share with the class (like Figure 2g), and then creating the progression of slides that lead up to the full graph (like Figures 2a–f). While the total number of slides can vary, we recommend using between 5 and 10 slides total to keep students' interest. There is no set routine for how much information to reveal and in what order. We encourage you to experiment based on your understanding of your students and how they are likely to reason about the graph. In "That's Where I Sit!," Linda chose to reveal the data (the coordinate points) in steps because she wanted to avoid students figuring out what was represented too quickly.

3.3 Questions

In addition to creating slides, teachers may want to prepare questions that help students think about what they are observing. To guide student thinking and deepen understanding, use open-ended questions such as: "What do you notice? What do you wonder?", "How does this new information change your thinking?", "What patterns or relationships do you see in the data so far?", and "Can you predict what might be revealed next?". These prompts encourage exploration and connection-making while also fostering student ownership of their learning. Linda found that varying the questions asked on each slide helped students become interested. In addition she adjusted her pace to help students stay engaged, progressing quickly when students did not have a lot to say and staying longer on a slide where there were lots of ideas and discussion. "That's Where I Sit!" also illustrates how slow reveals can support students' formal mathematical language; for instance, Linda revoiced students' statements to say "coordinate point" instead of "dot."

As additional information about the graph or visual are revealed, the teacher may want to probe students with more context-specific questions. For instance, in the Chipotle example described earlier (Laib, n.d.), after the recommended daily calorie allowance comes up you may choose to ask students about what they know about calories and a healthy diet and what it might mean that most of the data are to the left of this point on the graph. In "That's Where I Sit!" the students guessed the meaning of the dots on the coordinate plane. Had they not, Linda could have waited until the last two slides (Figure 2f and 2g), where a name and then the title is revealed, and asked about what they recognize and how it relates to their classroom. Alternatively, she might have asked questions like *What do you know about the coordinate plane? What is it used for? Have you ever seen it used for locations?* to help advance the students' thinking. However, the power of the slow reveal routine is that it is okay for students to be incorrect in their assumptions until the end, at which point they have an opportunity to reevaluate their thinking and discuss their understanding once they have all the information.

4 Final Thoughts

Slow reveal graphs are an excellent tool for building reasoning about data, but also for students' joy of mathematics and willingness to engage in reasoning and discussion. As we've seen here, slow reveal routines can be adapted to other areas of mathematics and also support students in slowing down and engaging in mathematical practices. Linda has found that her students really like slow reveal activities and find great joy in seeing different ideas about what the graph or image represents. We encourage you to find a graph you think will interest your students on slowrevealgraphs.com and give it a try! We've found it's a great way to grab students' attention and to get them excited for mathematics.

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