

Slide 1: Supporting Students to Build Skills to Access and Interpret Information in Graphs and Maps at the Middle School Level: Lessons Learned from AnimalWatch

Dr. L. Penny Rosenblum

University of Arizona

rosenblu@email.Arizona.edu

Kim T. Zebehazy

University of British Columbia

kim.zebehazy@ubc.ca

Slide 2: AnimalWatch Vi: Building Graphics Literacy

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Slide 3: Overriding Questions

- How can we support students at the pre-algebra level in building their efficiency and accuracy in gathering information from material presented in graphs and maps?
- What strategies and techniques can TSVIs use to increase their students' accuracy and efficiency in getting information from graphs and maps?

Slide 4: At the End of the Research Study a TSVI Shared...

"I got the student [in this study] as a 3rd grader. Our brailist would often omit graphs and I didn't know any better. Looking back, [I realize] what a disservice I did to him. Now that I know better I will start with my young students. If we teach those kids to read graphs in 2nd to 5th grade, they will be ready for middle school."

Slide 5: Through 10 Units Students Build Skills with...

- Bar graphs (single & double bars)
- Line graphs
- Circle graphs
- Venn diagrams
- Coordinate planes (quadrant 1 & all 4 quadrants)
- Box plots
- Maps
- Data tables

Slide 6: Materials

- Accessible iPad app presents and collects data
- Booklet of graphs and maps in student's literacy medium
- Teacher curriculum with objectives; vocabulary; text of units including graphs & maps; and follow-up activities.

Content of each unit uses authentic science data about an endangered or invasive species in Australia or Africa.

Slide 7: Pilot Study

- Recruitment and teacher training
- Pre-test: Establish baseline skills
- Student completes 10 units with TSVI
- Post-test: Document change in skills

Slide 8: Student Demographic Data (n=41)

Reading Medium

- Braille = 33, Print = 8

Gender

- Female = 21, Male = 20

Grade

- 5th = 11, 6th = 8, 7th = 13, 8th = 4, 9th = 2, 10th = 3

Ethnicity

- African American = 3, Asian = 1, Caucasian = 24, Hispanic = 4, multi-racial = 3, other = 5

Slide 9: Teacher Demographic Data (n=38)

16 states / 1 province

- TX = 7, FL = 3, LA = 3, OH = 3, SC = 3

Setting

- Itinerant = 33, Specialized = 4, Resource = 1

Ethnicity

- Caucasian = 32, African American = 3, multi-racial = 2, other = 1

Years as TSVI

- Range = 2 to 40 years, mean = 13.5, SD = 9.5

Slide 10: Features of the App

- Works with VoiceOver
- Read aloud for text and image descriptions
- Built in zoom
- Built in scratch pad
- Check if answer is correct
- Data is sent via Wi-Fi to the server
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Slide 11: Structure of the Units

- Meet the Animal (includes animal sound)
- Getting Started (Sheet 1)
 - 2 open ended questions
- Warm-Up (Sheets 1 & 2)
 - 10 Introduction/Review (MC)

Slide 12: Picture of a bar graph

Slide 13: Getting Started

Getting Started 1

- Describe this bar graph and tell what each part is. If you are unsure, please try your best. It's ok if you don't know the answer. Record your answer.

Getting Started 2

- What is one thing you know about the Tasmanian Devil from this bar graph? If you are unsure, please try your best. It's ok if you don't know the answer. Record your answer.

Slide 14: Thoughts On Getting Started from a TSVI

“The only thing he didn't respond to well was the Getting Started where he had to look at the whole graph and then tell what he knew. He is not one to respond to a prompt and be able to spit it out. It took maybe 15 minutes for him to think about what he was going to say. He could find things in the graph, but to come up with an answer for the open ended question was something hard for him. This is a skill he should learn.”

Slide 15: Thoughts on Getting Started from Students

“Hearing myself talking about the graph out loud made me focus and think about what I am doing.” (7th grade, female, braille)

“It was hard to come up with things to say at the beginning. I got more confidence for each unit.” (9th grade, female, braille, ELL)

“it sort of prepared me for the questions. It made you think about obvious parts of the graphic that I would have probably have missed without the questions.” (7th grade, female, braille)

Slides 16, 17, & 18

Images of screens from the app and a video.

Slide 19: Warm Up Questions

[TSVI] “I really like the explicit instruction in the warm up and errorless teaching and then he gets to branch on his own.”

[Student] “The warm ups...helped me get ready for the questions. and get familiar with the graphs.” (6th grade, female, braille)

Slide 20: Structure of the Unit (cont.)

- Select Difficulty – Self rating (MC)
- Application Set A (Sheet 3) and Application Set B (Sheet 4)
 - 4 questions: locate information (MC)
 - 1 Math question (MC)
 - 1 Prediction question (open-ended)
- Check in – Self rating (MC)
- What I Learned (open-ended)
- Conclusion

Slides 21, 22, 23 and 24

Images of screens from the app and a video.

Slide 25: Materials Promote Independence

[TSVI] "He really liked the feature where he could check his answer. I liked at the end he had to put into words what he was thinking."

Slide 26: Pre-Test: Establish Base Level / Post-Test: Document Change

- For the pre-test as a "warm up" students were asked to find the fourth shape in the fourth row and complete a maze.
- Teachers were not allowed to help during the pre- and post-tests.
- Sessions were video recorded for analysis.
- A script was used to maintain consistency.

Slide 27: Pre-Post Test Sheets

- Bar graph
- Line graph
- Venn diagram
- Coordinate plane
- Box and whisker plot
- Map

Slide 28: Questions

Image of a double bar graph

- Have you ever seen a graph like this before? Tell me what kind of graph it is.
- Tell me as much as you can about this graph.
- On the bar graph, what is the value of the highest bar?
- How many cookies did Jasmine sell?
- On the bar graph, which student sold 10 fruit snacks?
- On the bar graph, what is the difference between the number of cookies and fruit snacks Andrea sold?

Slide 29: Questions

Image of a map

- Have you ever seen a page like this before? Tell me what is on the page.
- Tell me as much as you can about what's on the page.
- Use your finger to trace the railroad for me starting at Leaftown.
- On the map, show me where the Lodge is located.
- On the map, which is farther: Leaftown to Treeburg or Branchford to Treeburg?
- On the map, what town is farthest to the east?

Slide 30: Observing the Pre-Test is Insightful for TSVIs

I realized during the pre-test that I talk too much. I learned I need to give [student name] time to explore and process. I need to let him ask questions.”

Slide 31: Process for Examining Pre-Post Tests

Pre-test and post-test scored using an instrument developed by the research team.

- Name the item on the page (e.g., line graph, map)
- Provide information about the item
- Use terms demonstrating knowledge of the item
- Locate specific information on the item
- Efficiency with which the answer was located
 - Time it took to answer the question
 - Overall rating of skill with the type of graph or map

Slide 32: Changes in Students from Pre-Post Test

Descriptors (n=49)

- Pre-test: M = 15.38, SD = 7.44, range = 2-27
- Post-test: M = 21.63, SD = 6.78, range = 7-33

Mathematical Terms (n=49)

- Pre-test: M = 3.45, SD = 2.40, range = 0-8
- Post-test: M = 8.60, SD = 3.77, range = 3-22

Correct Answers (n=30)

- Pre-test: M = 11.53, SD = 5.80, range = 1-22
- Post-test: M = 15.68, SD = 5.16, range = 5-23

Slides 33 and 34: Effective Strategies: Systematic Overview

[TSVI] "At the beginning of the study I'd have to remind her to take her time and examine before you answer. I'd ask her "What do you think you can do differently?" if she got it wrong. I saw her spend more time slowing down and looking over the graphic. I hope she realizes that she needs to take time."

[Student] "In history I had to navigate a map of South of Africa. I knew I had to go with a system to find each country. It was easier to navigate [after doing the units]." (8th grade, female, braille)

[TSVI] "I liked at the end he was really exploring the whole page before he went to answer questions. He was looking for a title, key, and exploring the tactile graphic."

[Student] "I learned to scan left to right and look at every detail. I learned that you have to follow the lines to find things. It taught me to pay attention to everything on the paper." (5th grade, male, braille)

Slides 35: Effective Strategies: Students Share Why it is Important to Use the Key

I sometimes had a hard time differentiating the textures. The key really helped me practice telling them apart." (7th grade, female, braille)

"I learned to look at the key of the graphs or maps because it gives you a lot of information." (6th grade, female, print)

"Start at the key and familiarize yourself with the symbols and then do a light scan to orient myself and then after that I can go back in and look for specific things." (7th grade, male, braille)

Slide 36: Effective Strategies: Students Share Knowing What to Expect

"Especially in coordinate planes, we have to make graphs. It is helpful to know about the x and y axis and which quadrants are positive and negative. General idea of previewing is good to help me in my classes. I preview now." (8th grade, Caucasian, braille)

Slide 37: Effective Strategies: Students Share the Importance of Taking it Slow and Thinking it Through

"[Now] I know you have to pay attention. You have to pay attention to how [graph or map] is laid out and what the question is asking you. You have to know if there are data points and if you have to go to the left and look slowly to find [the value]." (7th grade, male, braille)

"Hearing myself talking about the graph out loud made me focus and think about what I am doing." (7th grade, male, braille)

Slide 38: Through the Project Students Increased Their Confidence [TSVI] [In math class] she was able to push herself to read the tactile graphics and be methodical."

[Student] "[Now I] feel more successful in the math class because I can do math more fluently. I can work with graphs more fluently. I think if I had gone in math class before with a bar graph [I wouldn't know what to do.] and now I really can see the difference." (5th grade, male, braille)

[Student] "On state testing this year I felt a lot better. Last year there was a bar graph with 2 different bars and I was "how does this work" and this year I got it." (7th grade, male, braille)

Slide 39:

"I believe the app and graphics are an interesting, motivating way for a student to learn to read graphics. The vocabulary and concepts needed for each graph are included so that the student is ready for what they may encounter in math, science, or any of the other content subjects. I feel that this is an important skill for students to learn, and this is the best program I have seen to concentrate on introducing the necessary skills for reading tactile graphics and giving adequate practice in using the skills."

Slide 40:

We are excited about the materials we have developed to support graphic literacy for our students and their TSVIs!