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**Reverse Engineering Instructional
Design to Teach Science Paragraph
Writing**

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Alamo EcoSTEM Conference

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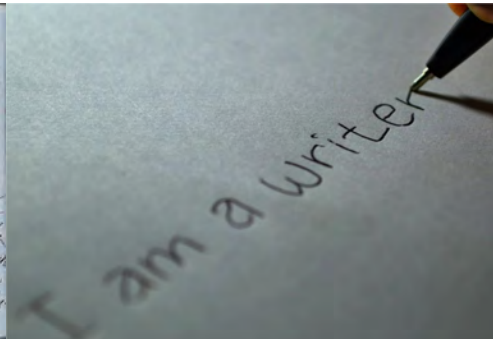
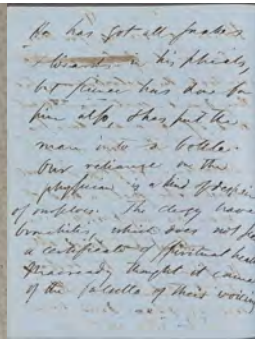
A young boy with glasses, wearing a white shirt and a red tie, is sitting at a desk in a classroom. He is focused on writing in a science notebook. The notebook is open, showing diagrams of scientific equipment like a microscope and a telescope. Other students in white uniforms are visible in the background, some sitting at desks and others standing. The classroom has posters on the wall and a window in the background.

Writing Science Paragraphs

Who's here?



What are the most common problems you encounter with student writing and/or teaching students to write? (Add a post-it!)



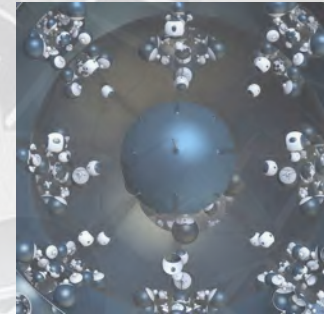
Applying principles of reverse engineering to instructional design teaching students with LD expository paragraph writing using a color-cued, graphic organizer.

Reverse engineering is the process of analyzing a subject system to (i) identify the system's components and their interrelationships and (ii) create representations of the system in another form or a higher level of abstraction” (Rekoff, 1985). Different from backward chaining and ‘beginning with the end in mind’.

Detective-like : How and why?



Requires deep understanding.

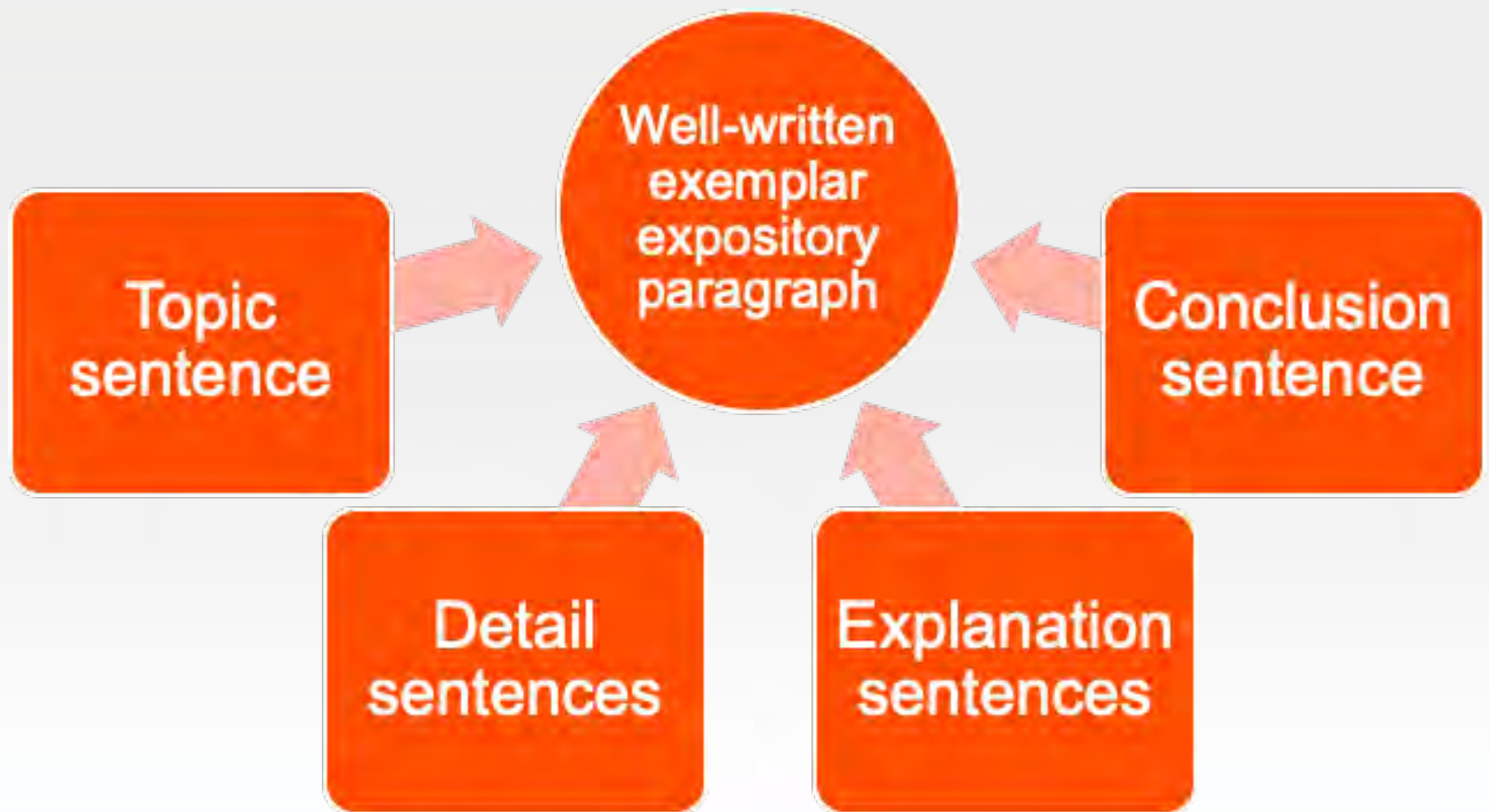


Prompt: The third week in October is school lunch week. If you could create the perfect school lunch, what would it be? Write a paragraph that describes your perfect lunch. (3.3)



- “My perfect lunch would be pizza from Mystic Pizza, with Jello and fresh-baked cookies.”
- “My perfect lunch would be thin, soft crust, pepperoni pizza. Right from the oven.”
- “My perfect school lunch is like this. In my perfect school lunch, we’ll have duck. Duck is super tasty. Another reason duck would be in my perfect lunch is because it is juicy. Another thing in my perfect school lunch would be green beans. Green beans would be in my lunch because they are super good to eat, tasty. Also, chocolate mousse would be in my perfect school lunch is because it is so light it melts in your mouth. It tastes like heaven. And that is my favorite lunch for school lunch week.”

Reverse Engineering a Paragraph





tempus

Lorem ipsum dolor sit
amet, consectetur
adipiscing elit, sed do
eiusmod tempor.



*Highlighting function of
each sentence*

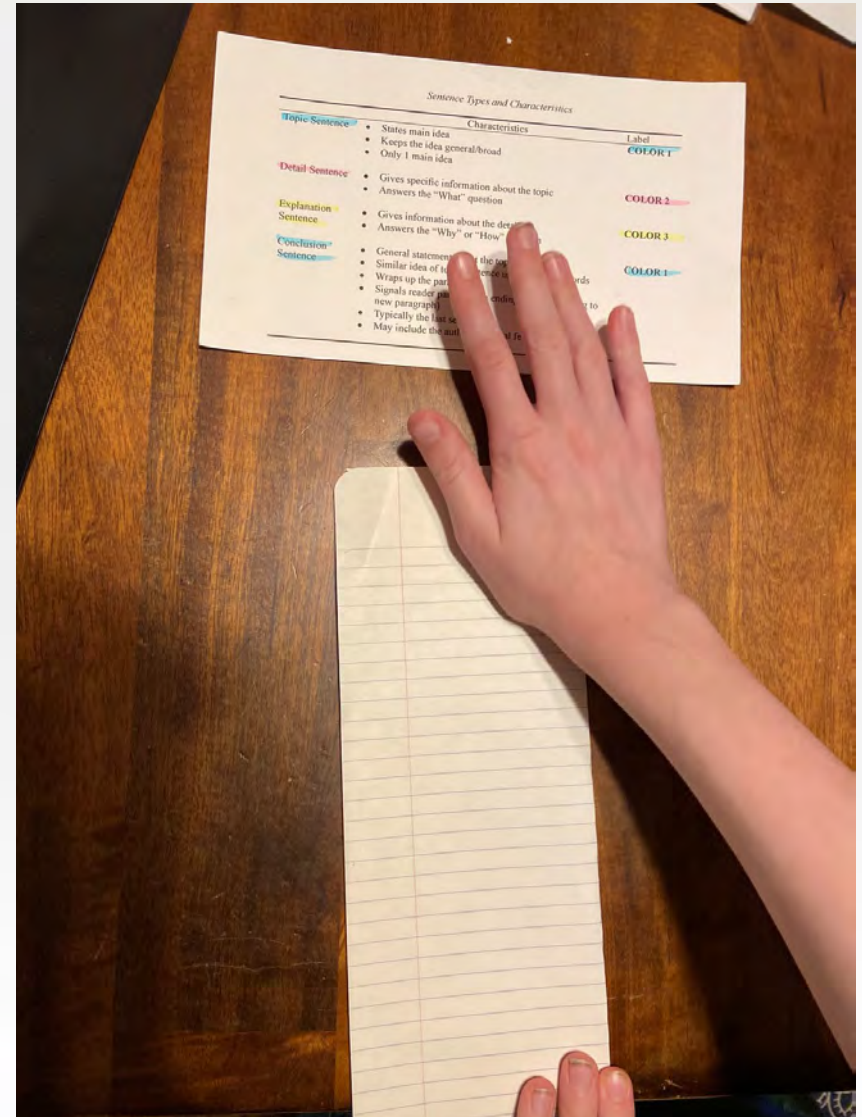
*Cued similar locations
across graphic organizer
& exemplar paragraph*

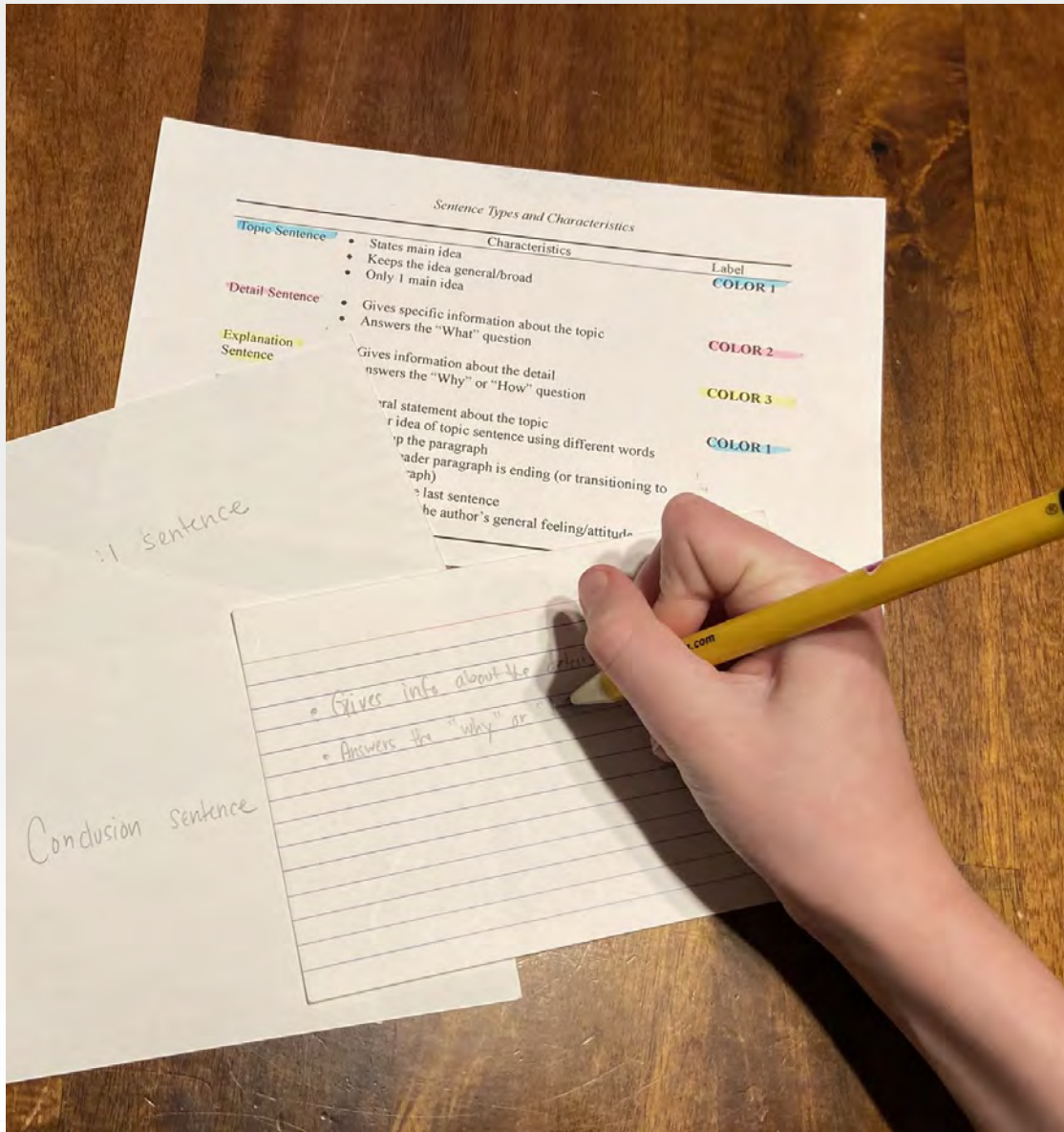
*Cueing has a greater
effectiveness for students
with LD than typical peers
(Swanson et al., 2010)*

*Color cuing assists with
spatial reasoning and
differentiation (Joh &
Spivey, 2012)*

Step 1: Notes to learn the sentence types and functions.

(Identifying the components and functions)





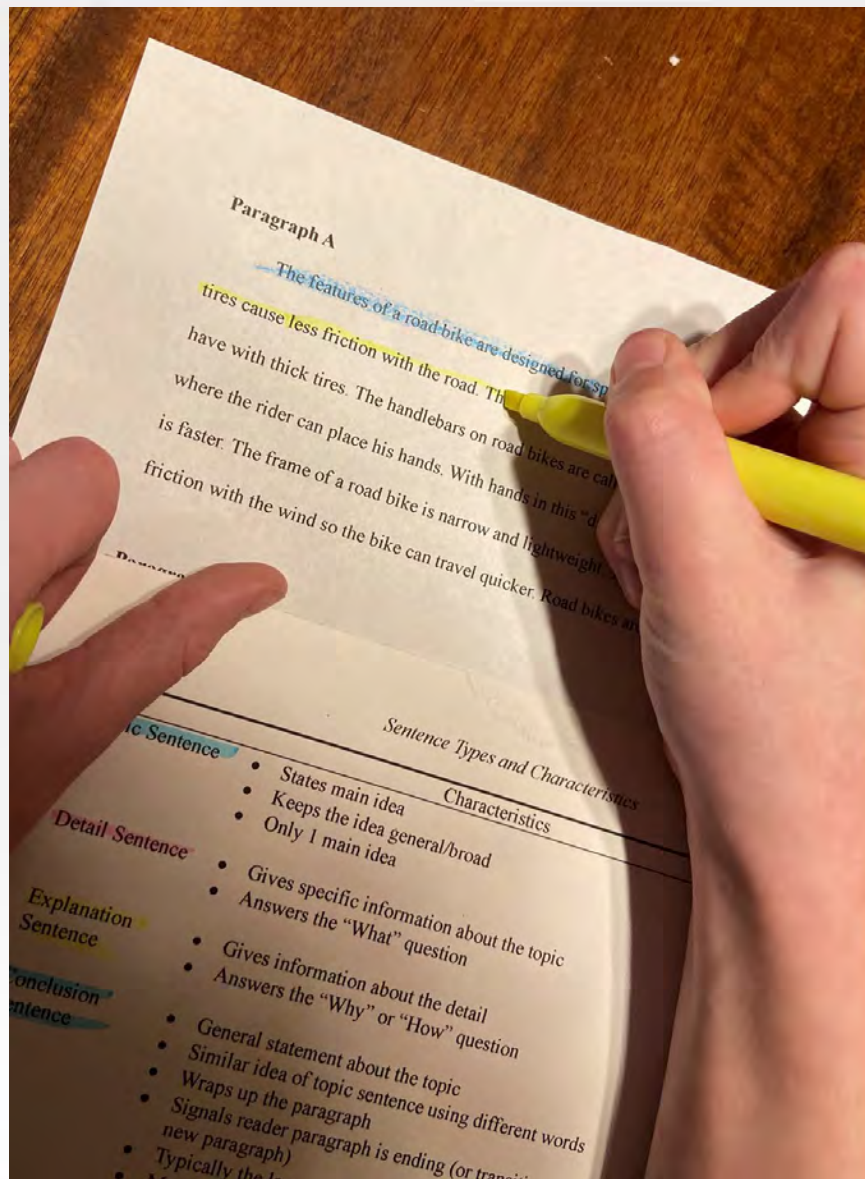
Step 2: Flashcards to practice the sentence types and characteristics.

(Practice & fluency)

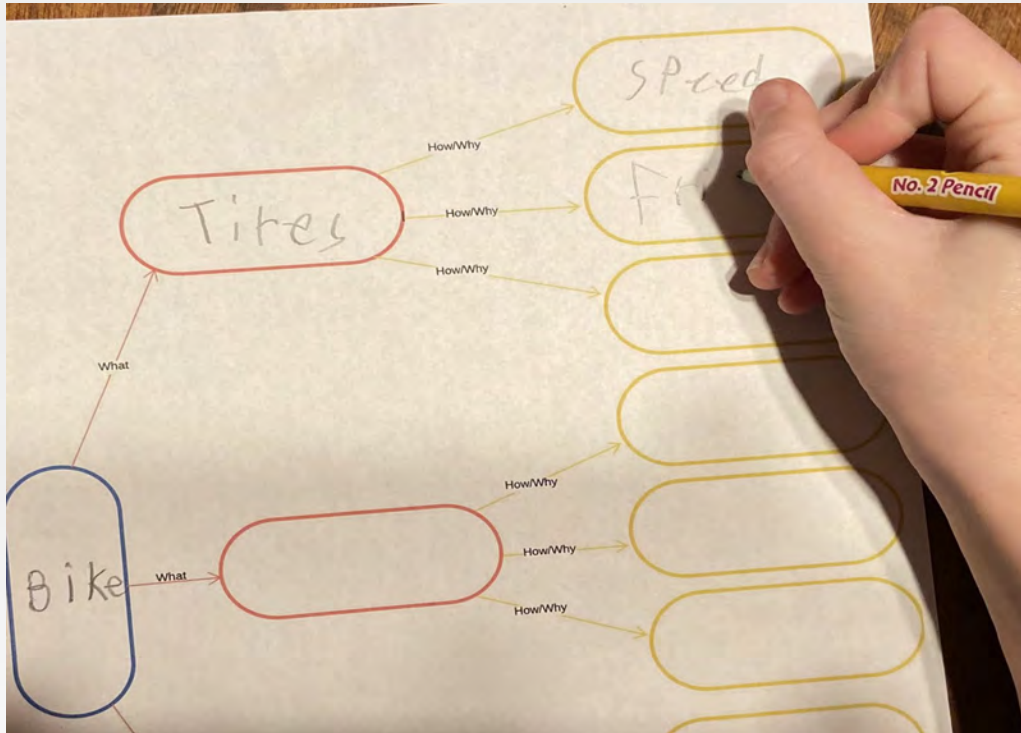
<i>Sentence Types and Characteristics</i>		
	Characteristics	Label
Topic Sentence	<ul style="list-style-type: none"> · States main idea · Keeps the idea general/broad · Only 1 main idea 	Blue
Detail Sentence	<ul style="list-style-type: none"> · Gives specific information about the topic · Answers the “What” question 	Pink
Explanation Sentence	<ul style="list-style-type: none"> · Gives information about the detail · Answers the “Why” or “How” question 	Yellow
Conclusion Sentence	<ul style="list-style-type: none"> · General statement about the topic · Similar idea of topic sentence using different words · Wraps up the paragraph · Signals reader paragraph is ending (or transitioning to new paragraph) · Typically the last sentence · May include the author’s general feeling/attitude 	Blue

Step 3: Analyzing sentence characteristics in a model paragraph and highlighting by sentence type.

(Identifying the components in an applied example.)

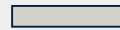


<i>Sentence Types and Characteristics</i>		
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Topic Sentence	<ul style="list-style-type: none"> States main idea Keeps the idea general/broad Only 1 main idea 	Blue
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Conclusion Sentence	<ul style="list-style-type: none"> General statement about the topic Similar idea of topic sentence using different words Wraps up the paragraph Signals reader paragraph is ending (or transition to new paragraph) Typically the last sentence in a paragraph 	



Step 4: Create a graphic organizer from the model paragraph.

(Creating a "representation of the system".)



Groupwork - Part 1

1. Use the Jamboard slide that has your breakout room number at the top.
2. Discuss each sentence with those in your group and decide which type of sentence it is. (Consult the sentence types and characteristics chart on Jamboard-slide 4.)
3. Highlight each sentence according to the type you decided.
4. Questions? Don't worry! Dr. Ewoldt will pop in to see how its going.

How did it go?

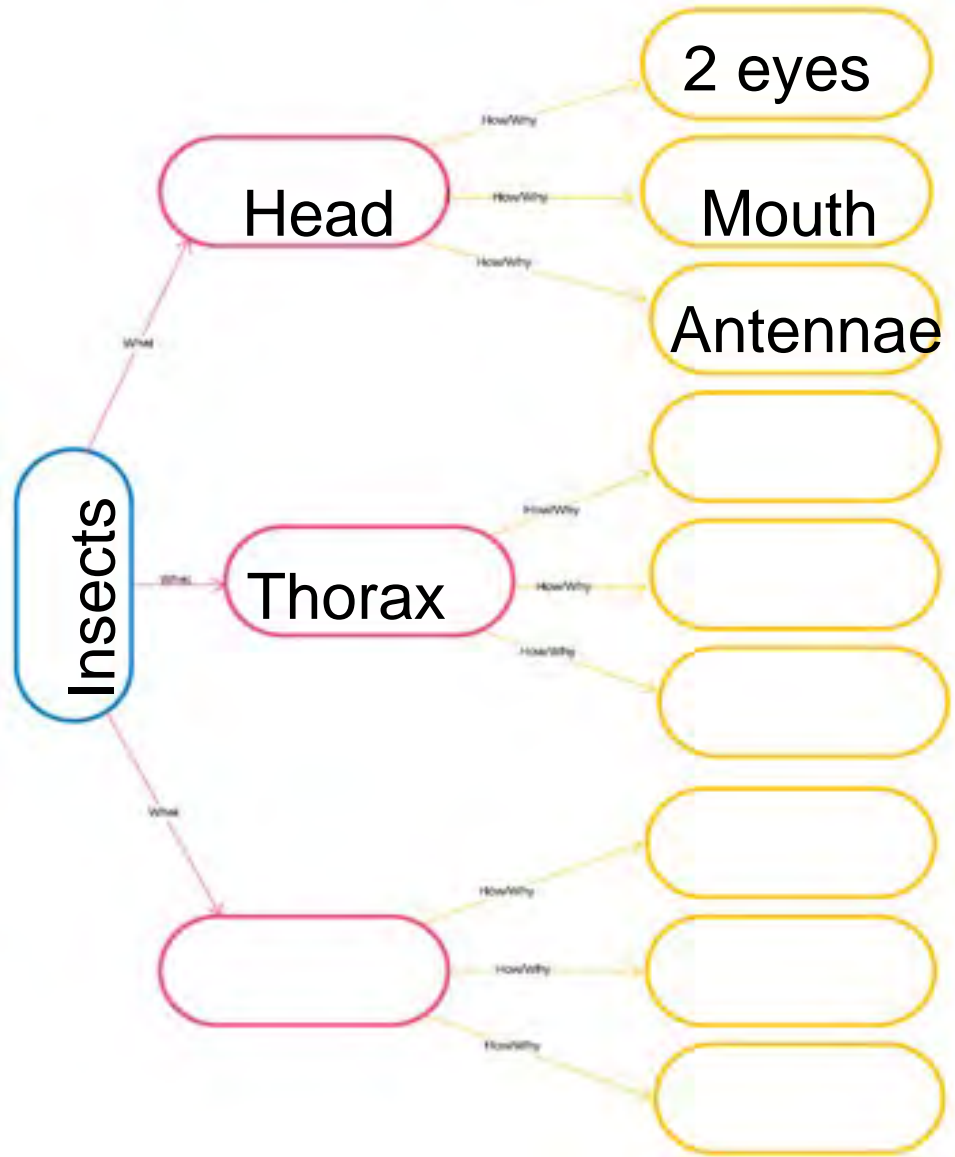
Groupwork - Part 2

1. Find the Jamboard slide that has a graphic organizer with your breakout room number at the top.
2. Have one member in your group go to the slide with your highlighted paragraph.
3. Read each sentence and choose 1-2 words that capture the keywords in the sentence.
4. Write the keywords onto the graphic organizer in the corresponding bubbles. The colors should correspond to your highlighting.
5. Questions? Don't worry! Dr. Ewoldt will pop in to see how its going.

For a bug to be an insect, it has to have three body parts. The head is the first part. It has two eyes. The mouth is part of the head. The two antennae are there also. The thorax is the middle of the insect. It has three pairs of legs. The abdomen. When an insect has wings, they are attached to the thorax. The abdomen is the last part. It is the largest part of the insect's body. It is where the insect's organs are. To be an insect, it takes all three of these body parts.

STEPS:

1. Read the sentence.
2. Decide on 1-2 word main idea.
3. Write the main idea into the graphic organizer.



Questions?

Please share your thoughts with a post it! Do you think you could use this intervention in your class? Why or why not?



Ewoldt, K. B., & Morgan, J. J. (2017). Color-coded graphic organizers for teaching writing to students with learning disabilities. *Teaching Exceptional Children*, 49(3), 175-184. <https://eric.ed.gov/?id=EJ1140173>

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Breakout room 1

Use your highlighted paragraph and the steps below to build the graphic organizer the author of your paragraph might have created.

STEPS:

1. *Read the sentence.*
2. *Decide on 1-2 keywords*
3. *Write the keywords into the graphic organizer.*

