

# **“It’s a Sticky Situation”**

*“A white glue and glue stick experiment”*

**Content Standard 3.1, 3.2 or 3.4**



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**"It's a Sticky Situation"**  
*"A white glue and glue stick experiment"*

**Purpose/Objective**

There were two purposes behind this best buy experiment.

Purpose One: To determine which brand of white school glue and which brand of glue stick was the best buy.

Purpose Two: To determine which type of glue (white glue vs. glue stick) is the overall best buy.

The lab was composed of three different brands of white glue and three different brands of glue stick: Elmer's, Rose Art and Crazy Art.

**Rationale**

I wanted to conduct a best buy experiment on an item or items that are most popular among school supply lists of students in grades K through 6<sup>th</sup>. I obtained a number of different lists from various sources and noticed that school (white) glue or glue sticks were an item listed in the different lists I compared. Personally, I have tried many different types of glue but never engaged in an experiment to find which is the best overall buy. There are many back to school sales and as a parent I tend to purchase the items based on sale price without giving a second thought as to whether I am actually getting a good deal or purchasing the best buy. Glue sticks and white glue is an item that I know I will be using with my future students. I want their projects and activities to last them for a very long time. As such I chose glue sticks and school (white) glue for this best buy experiment.

**Variables**

In order to determine the best buy of each, the following variables were tested for this lab: application, adhesion/cohesion, drying time and preference.

During the lab, we tested for each of the above variables. The first test was conducted in order to determine the ease of application of the white glue and glue sticks. In determined the ease of applications students considered the strokes in application and the mess of each container of white glue and each glue stick.

The second test was to determine the glue's ability to stick to a surface (adhesion) and its ability to stick to itself (cohesion). This test helped in determining the strength of the glue and which brand of white glue and glue stick adhered best when gluing cut out shapes of the same size two different types of paper; construction paper and regular colored copy paper. In order to test each container of white glue and each glue stick and determine the overall best buy, it was very important that the cut out shapes used for this test were exact in measurement and size. A total of twenty-four paper shapes were used for this test; Three Circles (3" diameter), Three Squares (3x3x3x3), Three Triangles (3x3x3) and Three Rectangles (1" x 4") were cut out using construction paper and regular colored copy paper.

The third test was to determine the drying time of each brand of white glue and each brand of glue stick. After cutting out the shapes and applying them to construction and regular colored copy paper the product was left to dry at the same room temperature for approximately 10 – 12 minutes. In order to determine which brand of white glue and glue stick had the best drying time students used the following variables: (1) they observed their product (shapes glued) to try to determine which ones looked dried; (2) they felt their product (shapes glued) to determine if they felt dry or still wet or soaked from being glued; and (3) they tore apart the shapes from their paper to determine which were dry and which came apart the fastest. This latter variable also allowed students to analyze the strength of the different brands of glue.

Finally, the above tests helped students decide which brand of white glue and which brand of glue stick they personally preferred.

After students tested the three different brands of white glue and the three different brands of glue sticks using the above variables, they then engaged in an additional test to compare the best brand (buy) of white glue and the best brand (buy) of glue stick. Students tested the best brand (buy) of each for adhesion/cohesion; application, drying time and preference. After each test was completed students determine which brand of glue and which type of glue was the overall best buy (white glue vs. glue stick).

### **Hypothesis**

#### **White Glue Containers**

- Elmer's Brand will be the strongest in adhesion/cohesion. Students based this prediction based on price. The Elmer's Brand White Glue was \$1.15 as opposed to Rose Art being \$.99 cents and Crazy Art \$.79 Cents. They predicted that Rose Art will be the second strongest in adhesion/cohesion followed by Crazy Art.
- Rose Art will be the easiest to apply. Students based this prediction based on the "toughness" of the container. Students squeezed each of the white glue containers and felt that the Rose Art container was the "easiest" to squeeze and as such it will be the easiest to apply. They predicted that Crazy Art would follow as the second best in application followed by the Elmer's brand, which was the harder to squeeze out of the three.
- Rose Art will be the best and fastest in drying time. Students based their prediction upon the same elements referenced above. They predicted that because Rose Art will be the

easiest to apply that it would be the fastest to dry. They predicted that Crazy Art would follow as the second best drying brand and Elmer's as the last.

### Glue Sticks

- Elmer's Brand will be the strongest in adhesion/cohesion. Students based this prediction based on price. The Elmer's Brand Glue Stick was \$.75 Cents; Rose Art was \$.50 Cents and Crazy Art was \$.25 Cents. They predicted that Rose Art will be the second strongest in adhesion/cohesion followed by Crazy Art.
- Crazy Art will be the easiest to apply. Students based this prediction based on the fact that Crazy Art's glue stick cap was the longest cap out of the three glue sticks. They felt that a longer cap would ease the ease of application. They predicted that Elmer's Glue will be the second easiest to apply followed by Rose Art.
- Crazy Art will be the fastest in drying time. Students based this prediction using the above variables. They felt that if Crazy Art was the easiest brand to apply, it would also dry the fastest. They predicted Elmer's would be the second brand to dry fastest followed by Rose Art.

### White Glue Container vs. Glue Stick

- White Glue is the strongest in adhesion/cohesion. Students based this prediction on the fact that more glue comes out of a white glue container versus a glue stick.
- Glue Stick is the easiest to apply. Students based this prediction on the idea/fact that you a glue stick is easier to apply as you don't have to constantly put pressure on a container and squeeze it.

- Glue stick will have the best drying time. Student's prediction was based upon the ease of application of a glue stick versus white glue container and the glue stick is "drier" than the glue that comes out of a white glue container.

### **Materials**

- *White Glue (x3 different brands numbered 1 through 3)*
- *Glue Sticks (x3 different brands numbered 1 through 3)*
- *Magnifying Glasses*
- *Aprons*
- *Pencils*
- *Paper (to record data)*
- *Scissors*
- *Construction Paper*
- *Regular Colored Copy Paper*
- *Cotton Balls*
- *Ruler*

### **Procedure**

#### **Procedure I: Observations**

*Introduction:* Look around the room. There are many things you would use glue for. How many things can you find that you would use glue for or that you would glue together? Is all glue the same? What are some of the differences you notice about the glues on the table? In this activity you will explore the different properties of glue.

1. Grab the different containers of white glue and different glue sticks.

2. Observe the properties of the different white glue containers and different glue sticks with and without a magnifying glass. Record your observations.
3. List the properties that might lead you to believe which white/glue container or glue stick is the best in adhesion/cohesion, application and drying time.

***Note: The above steps should be repeated using each container of white glue (1, 2 and 3 and each glue stick (1, 2 and 3).***

#### Procedure II: Application

*Introduction:* In this lab, you are all going to use three different brands of white glue each labeled 1, 2 and 3 and three different brands of glue sticks also labeled 1, 2 and 3)

1. First you will take off the cap of each glue stick and unlock/unscrew the cap of each white glue container.
2. Second, grab six of the same paper cut out shapes (for example: one student will use all circle shapes, another student all square shapes, another all triangle shapes and another all rectangle shapes).
3. Next, you will label each one of your shapes with the numbers 1, 2 and 3 (to correspond with each white glue container and glue stick).
4. Apply the white glue and/or glue stick to your cut out shapes and paste them onto the piece of construction paper or regular colored copy paper. Count the times you stroked each glue stick for application or the times you had to squeeze the white glue container to apply enough glue to your shape.
5. Students answered the following questions. Which of the three glue sticks was easier to apply? Which one went through the paper? Which one made the bigger mess? Which one left streaks?

***Note: The above steps should be repeated using each container of white glue (1, 2 and 3 and each glue stick (1, 2 and 3).***

### Procedure III – Adhesion/Cohesion

*Introduction:* As you applied the glue to the corresponding shapes and recorded data based on the strokes and squeezes used for the application of each container and each glue stick, you also observed to see which container and which glue stick was strongest in adhesion/cohesion.

Meaning which number of container and/or which number of glue stick was the stickiest to the paper and which felt sticker on your fingers.

1. Students use the three different brands of white glue containers labeled with numbers 1, 2 and 3 and apply glue to three cut out shapes of the same size and same brand of paper. (For example: one student applies the glue to three different 3x3x3 Triangle Shapes cutouts made from construction paper).

2. Students then observe and record data based on the glue's ability to stick to the surface (adhesion). Students analyze and observe this data based on the ability of the cut out shapes to stick to construction paper.

3. Students observed and record data based on the glue's ability to stick to itself (cohesion). Students analyze and observe the "stickiness" of the glue as it applies to texture (their hands, their fingers, etc.).

The above tests helped in determining the strength of the glue.

***Note: The above steps were repeated using the three different brands of glue sticks.***

### Procedure IV – Drying Time

*Introduction:* You will now leave your product (glued work) to dry for about 10 – 12 minutes.

We will then analyze and observe the product to conduct a drying time test.



1. After leaving the product (work) to dry for approximately 10 – 12 minutes, students observed their product and based on observation only determined whether the shapes glued looked dry or wet.

2. Students then felt the shapes they glued to analyze whether they felt dry or wet.

3. Students then pulled apart each shape they glued to the piece of paper to analyze and determine which shape tore apart the easiest and which shape came apart the hardest. This test not only determined which glue (used in corresponding shapes) dried the fastest but also helped in further assessing the adhesion/cohesion of the glue.

Additional Procedure – Comparison (White Glue Container vs. Glue Stick)

*Introduction:* Now that you have determined which brand of White (School) Glue and which brand of Glue Stick is the best buy, we are now going to compare the best brand of each to find of the two is the overall best buy and which of the two is the best in preference.

1. Students compare the best brand of White (School) Glue and the best brand of Glue Stick for ease of application; adhesion/cohesion; drying time and preference.

2. Students use the White (School) Glue and Glue Stick and apply glue to the same exact paper cut out shape. They observe and analyze the ease of application of each.

3. Students compare the Adhesion/Cohesion of White (School) Glue and Glue Stick. (They analyze which of the two stuck better to surface and which was the stickiest).

4. Students leave their product to dry for approximately 10- 12 minutes and then compare which of the two dried the fastest and tore apart the easiest.

5. Students then determine the best overall best buy and their preference of choice of glue stick versus white (school glue).

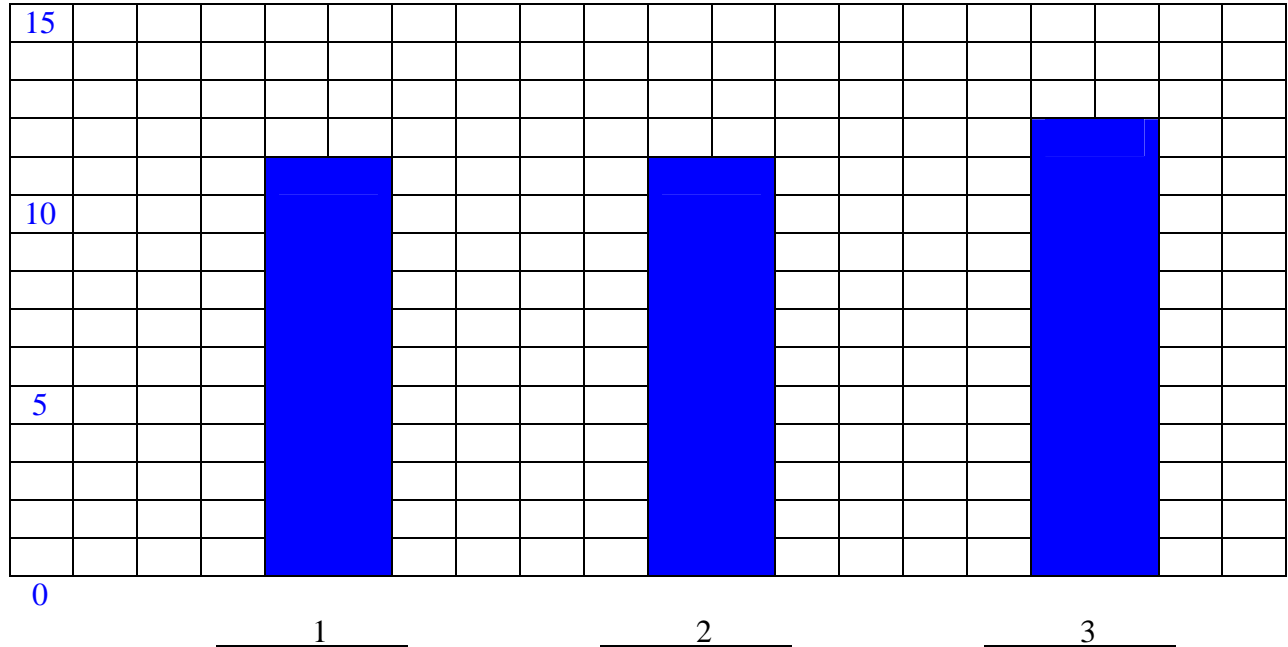
**Data/Observations****Procedure I Observation – Data:**

<b>WHITE GLUE CONTAINER</b>	<b>Properties Observed Without Magnifying Glass</b>	<b>Properties Observed With Magnifying Glass</b>
<b>Glue No.: 1</b>	<ul style="list-style-type: none"> <li>➤ <i>Has an orange cap</i></li> <li>➤ <i>It is soft</i></li> </ul>	<ul style="list-style-type: none"> <li>➤ <i>Lines on the top</i></li> </ul>
<b>Glue No.: 2</b>	<ul style="list-style-type: none"> <li>➤ <i>White point sticking out of the red top</i></li> <li>➤ <i>Sharp top</i></li> <li>➤ <i>Soft bottle</i></li> </ul>	<ul style="list-style-type: none"> <li>➤ <i>It is white</i></li> <li>➤ <i>Red cap with little lines</i></li> </ul>
<b>Glue No.: 3</b>	<ul style="list-style-type: none"> <li>➤ <i>Lines on the top</i></li> <li>➤ <i>A hole on the top</i></li> </ul>	<ul style="list-style-type: none"> <li>➤ <i>It is white with a red cap</i></li> </ul>
<b>GLUE STICK</b>	<b>Properties Observed Without Magnifying Glass</b>	<b>Properties Observed With Magnifying Glass</b>
<b>Glue Stick 1</b>	<ul style="list-style-type: none"> <li>➤ <i>It has lines on the top</i></li> <li>➤ <i>Has an orange top</i></li> <li>➤ <i>Has a #1 on it</i></li> </ul>	<ul style="list-style-type: none"> <li>➤ <i>It has lines on the top</i></li> <li>➤ <i>Lines are skinny</i></li> </ul>
<b>Glue Stick 2</b>	<ul style="list-style-type: none"> <li>➤ <i>Has lines on the top</i></li> <li>➤ <i>A hole in the bottom</i></li> <li>➤ <i>Circle (its around a shape)</i></li> <li>➤ <i>It has a # 2 on it.</i></li> </ul>	<ul style="list-style-type: none"> <li>➤ <i>Has 3 lines on the top of the cap</i></li> </ul>
<b>Glue Stick 3</b>	<ul style="list-style-type: none"> <li>➤ <i>Red top</i></li> <li>➤ <i>Has a # 3 on it</i></li> <li>➤ <i>It's hard</i></li> </ul>	<ul style="list-style-type: none"> <li>➤ <i>It has little lines on the top of the cap</i></li> </ul>

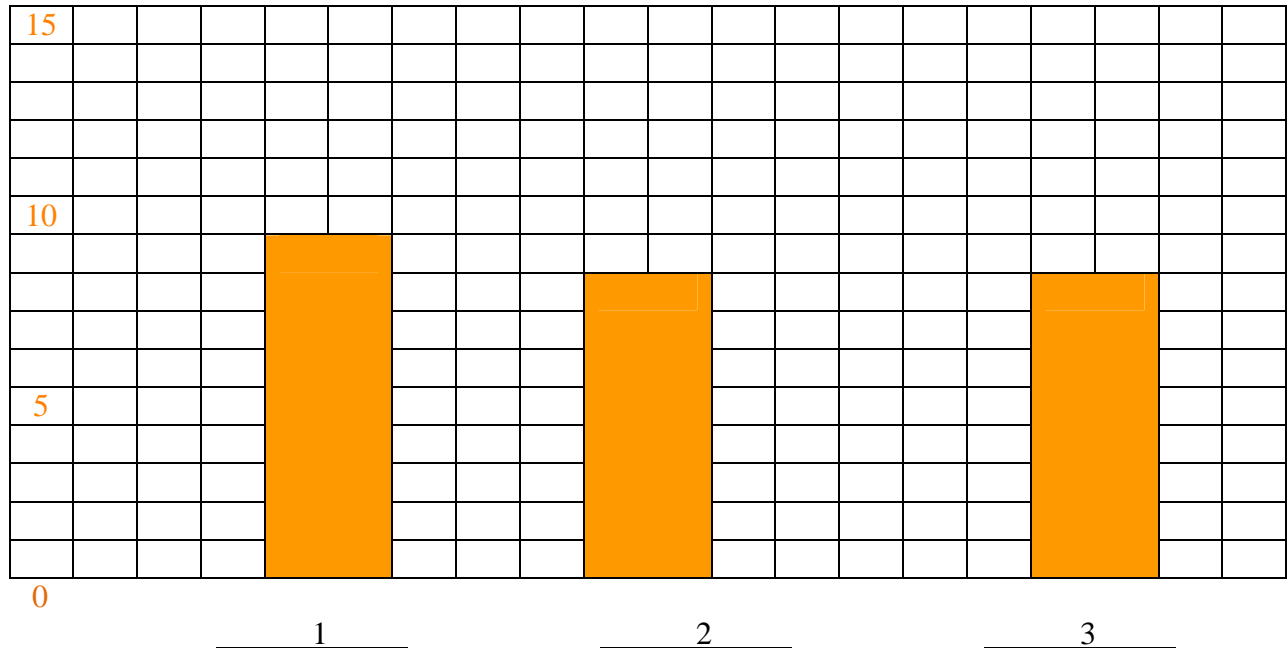
Observation: Students enjoyed this test very much because they got to use a magnifying glass. It made them feel like detectives and scientists. This test allowed students to enhance their observation skills by making simple observations to the different containers of glue and the different glue sticks. Students recorded their data in a similar chart as noted above.

Procedure II: Application – Data

**GLUE STICKS**



**WHITE GLUE CONTAINER**



Observations: This test allowed for students to engage in some mathematics as well as science. Students counted aloud the number of times they squeezed the white glue container to get enough glue on their cut out paper shape and so that it will glue to their construction paper. Students counted aloud number of times the stroked the glue stick in order to apply enough glue for their cut out shape to glue to the construction paper. Students recorded their data in a bar graph as shown above.

## Glue Sticks Application Data Continue....

Application Data	Glue Stick 1	Glue Stick 2	Glue Stick 3
Which was easiest to apply?	1	3	2
Which one made a bigger mess?	3	2	1
Which one went through the paper?	N/A	N/A	N/A
Which one left streaks?	3	2	1

## White (School) Glue Container Data Continue....

Application Data	Container 1	Container 2	Container 3
Which was easiest to apply?	1	2	3
Which one made a bigger mess?	3	2	1
Which one went through the paper?	3	2	1
Which one left streaks?	3	2	1

Observation: Based on the above application test, Glue stick number 1 proved to be the easiest to apply and the one that made the least amount of mess when gluing as well as the one that left the least amount of streaks on the paper. Glue stick number 3 proved to be the one that left most streaks and a bigger mess. However, Glue stick number 2 resulted in the easiest to apply.

Based on the above data, the White (school) glue container number 1 was the easiest to apply. Glue container number 3 proved to be the messiest, the one that went through the paper and the one that left the most streaks.

Procedure III: Adhesion/Cohesion – Data and

Procedure IV: Drying Time

## Glue Sticks Adhesion/Cohesion and Drying Time Data Chart

Application Data	Glue Stick 1	Glue Stick 2	Glue Stick 3
Which glue stick dried the fastest?	1	2	3
Which one came apart the easiest?	3	2	1
Which one came apart the hardest?	1	2	3

## White (School) Glue Adhesion/Cohesion and Drying Time Data Chart

Application Data	Container 1	Container 2	Container 3
Which glue dried the fastest?	1	2	3
Which one came apart the easiest?	3	2	1
Which one came apart the hardest?	1	2	3

Observation: The above data reflects the results of the adhesion/cohesion test students performed. As we can see Glue Stick Brand No.: 1 dried the fastest and tore apart the hardest. Leaving Glue Stick number 3 to as the easiest to tear apart and the one that requires the most amount of drying time.

The results further determined that White (School) glue container number 1 was the fastest in drying time and the hardest to tear apart. White (school) glue container number 3 was the last to dry and the easiest to tear apart.

Comparison Test Data – White (School Glue vs. Glue Stick)

Type of Glue	East of Application	Adhesion/Cohesion	Drying Time	Preference
Glue Stick	<ul style="list-style-type: none"> <li>➤ <i>Better in Applying.</i></li> <li>➤ <i>Makes less mess.</i></li> <li>➤ <i>Easier to grab and apply.</i></li> </ul>		<ul style="list-style-type: none"> <li>➤ <i>Dries Fastest.</i></li> </ul>	
White (School) Glue Container		<ul style="list-style-type: none"> <li>➤ <i>Is stronger after it has dried.</i></li> <li>➤ <i>Shapes stick better to the piece of paper.</i></li> <li>➤ <i>Shapes don't come apart as easy as with a glue stick.</i></li> </ul>	<ul style="list-style-type: none"> <li>➤ <i>Takes more time to dry but after it is dry it is better and stronger.</i></li> </ul>	<ul style="list-style-type: none"> <li>➤ <i>Prefer this one because the container has more glue than the glue stick.</i></li> <li>➤ <i>The glue stick dries out too fast.</i></li> <li>➤ <i>It is the stronger glue.</i></li> </ul>

Observation: After the best (brand) buy of glue stick and the best (brand) buy of white (school) glue was determined. Students compared the two to determine the overall best buy. As we may see, using a glue stick ensures easier application and fastest dry time. However, the white (school) glue results in being the strongest in tearing apart the work or product. Students preferred the white (school glue) as it resulted in being stronger in adhesion/cohesion.

**Calculations/Results****Overall Ease of Application (including strokes, mess, streaks, etc.)**

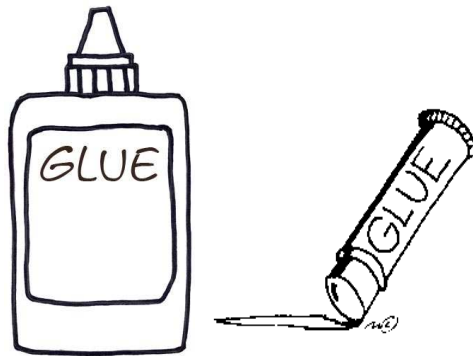
Glue Stick 1 = Elmer's Brand \$0.75 (Winner)	11 Strokes Easiest to apply Least Amount of Streaks Least is Mess	White (School) Glue Container 1 = Elmer's \$1.15 (Winner)	9 Strokes Easiest to apply Least Amount of Streaks Least is Mess
Glue Stick 2 = Rose Art Brand \$0.50 (2 <sup>nd</sup> Place)	11 Strokes Second easiest to apply Second in least amount of streaks Second is less mess	White (School) Glue Container 2 = Rose Art \$0.99 (2 <sup>nd</sup> Place)	8 Strokes Second easiest to apply Second in least amount of streaks Second is less mess
Glue Stick 3 = Crazy Art Brand \$0.25 (3 <sup>rd</sup> Place)	12 Strokes Most difficult to apply Most Amount of Streaks Messiest of all	White (School) Glue Container 3 = Crazy Art \$0.79 (3 <sup>rd</sup> Place)	8 Strokes Most difficult to apply Most Amount of Streaks Messiest of all

Results: Our hypothesis regarding the best brand of application for both white glue containers and glue sticks proved incorrect. We predicted that Rose Art White Glue Brand (Container # 2) will be the easiest to apply and Crazy Art Brand Glue Stick will be easiest to apply. However, Elmer's Brand White (School) Glue and Glue Sticks proved to be the best for application. Rose Art Brand for both White (School) Glue and Glue Sticks came in second and Crazy Art brand followed in last place.

**Adhesion/Cohesion – Drying Time**

Glue Stick 1 = Elmer's Brand \$0.75 (Winner)	Dried fastest Tore apart the hardest	White (School) Glue Container 1 = Elmer's \$1.15 (Winner)	Dried fastest Tore apart the hardest
Glue Stick 2 = Rose Art Brand \$0.50 (2 <sup>nd</sup> Place)	Second to dry Second to tear apart	White (School) Glue Container 2 = Rose Art \$0.99 (2 <sup>nd</sup> Place)	Second to dry Second to tear apart
Glue Stick 3 = Crazy Art Brand \$0.25 (3 <sup>rd</sup> Place)	Didn't dry as fast as the other two brands Came apart easiest	White (School) Glue Container 3 = Crazy Art \$0.79 (3 <sup>rd</sup> Place)	Didn't dry as fast as the other two brands Came apart easiest

Results: Our hypothesis proved correct that the Elmer's brand will be the strongest in adhesion/cohesion. We based our hypothesis on the fact that Elmer's glue brand was the most expensive and as such should be the strongest. However, our hypothesis for drying time for both the glue sticks and white (school) glue proved incorrect. We predicted that Rose Art brand white (school) glue will be the fastest in drying and that Crazy Art glue stick brand will be the fastest in drying. However, Elmer's Glue brand for both white (school) glue and glue sticks proved to be the fastest in drying and the strongest brand overall.

**Comparison (Elmer's White (school) Glue vs. Elmer's Glue Stick**

Results: After determining the best brand of white (school) glue and the best brand of glue sticks, students compared the two using the same labs they used to determine the best buy of each. Students determined that although the white (school) glue container created a bigger mess and took longer to dry and resulted in the strongest in adhesion/cohesion. Their hypothesis proved correct in that the white (school) glue was the strongest in adhesion/cohesion but the glue stick was the easiest to apply.

**Conclusions**

Students tested their hypothesis, carefully observed and collected data and ultimately concluded that Elmer's brand, although the most expensive out of the three brands, is the overall best buy. Students tested their theories further and compared the Elmer's brand white (school) glue and the Elmer's brand glue stick and found that when it comes to glue, Elmer's White School Glue is the overall best buy. Rose Art brand for both glue sticks and white school glue came in second and the Crazy Art brand, which was also the least expensive of the three, came in last.

Students really enjoyed this best buy experiment. They found it interesting and engaging. A student commented that his favorite part was ripping out the shapes after they were glued to see which glue was the strongest in adhesion. Another student commented that she will definitely do an experiment like this again.

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