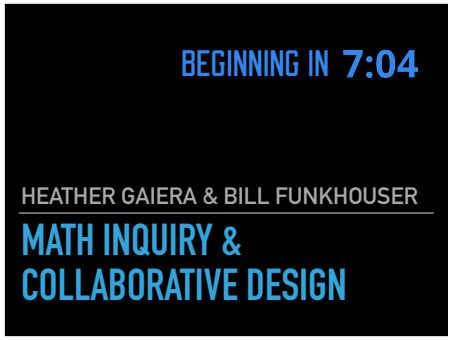
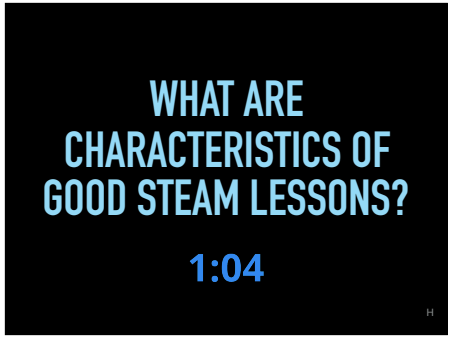


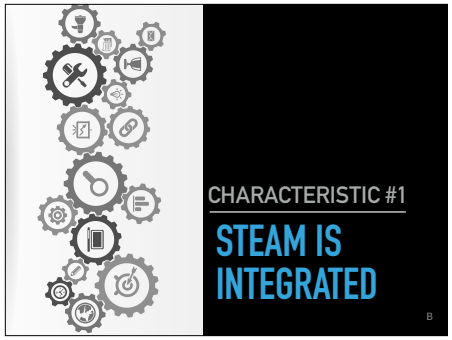
B:

B: We are the past coordinators of the NCAIP and current coordinators of Create Humboldt, 2 federal Arts in Education grants. We are currently in 38 classrooms, modeling lessons and coaching teachers.

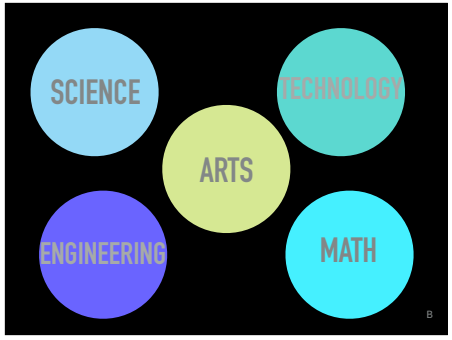


H: So what are the characteristics of exemplary STEAM lessons? Introduce yourself to an elbow partner quickly and discuss this question with an elbow partner. In 60 seconds, I would like you to have created a few characteristics of what makes a good STEAM lesson.

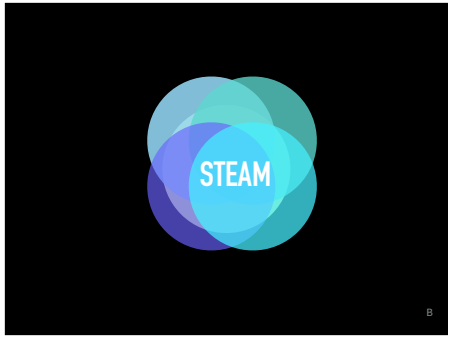
B: For this project, we focus on 4 characteristics of outstanding STEAM lessons



B: The first one and most cited is STEM is integrated



B: Teaching these subjects in individual silos is not STEAM. The topics must be integrated and used seamlessly.



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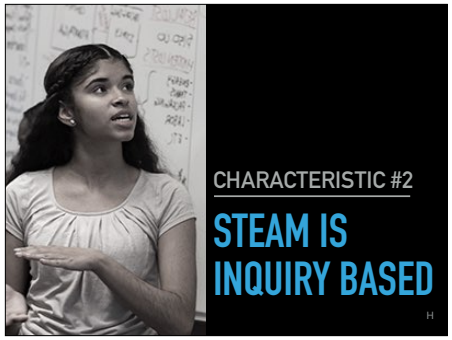
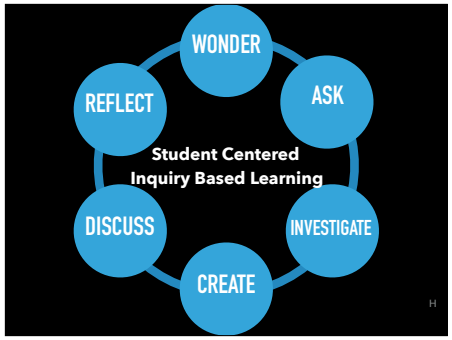
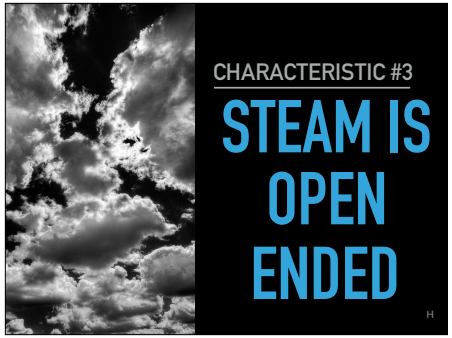


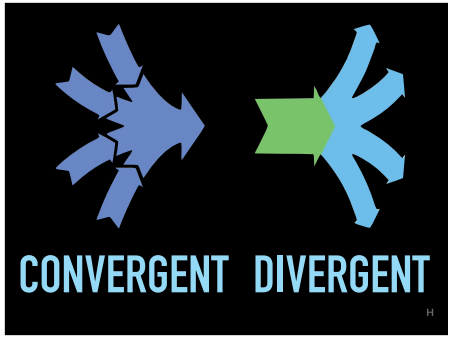
H: STEAM fosters curiosity and transfers ownership of learning to students. It is less teacher centered. Students create their own understandings.



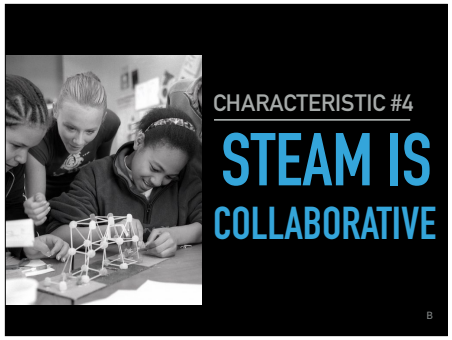
H: This is one model for inquiry based learning. We will progress through these steps today



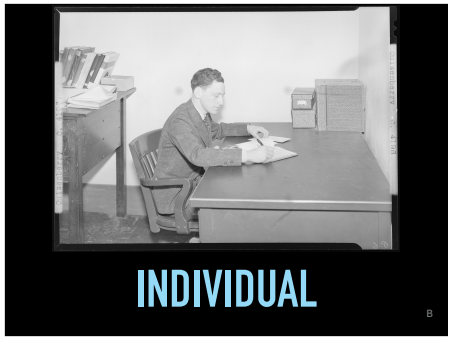
H: The third characteristic is STEAM is Open Ended.



H: The issue of open ended questioning brings up the concept of convergent vs. divergent thinking.

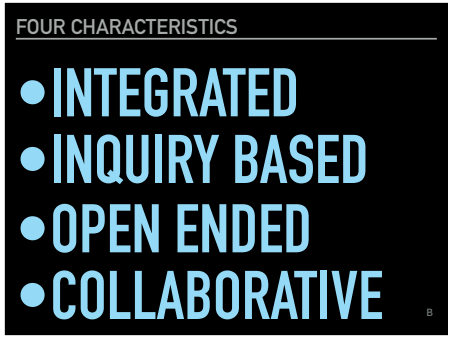


B: This leads to characteristic #4: STEM is collaborative.

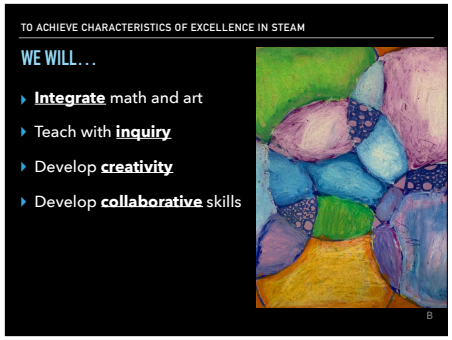


B: This image of the lone scientist or mathematician is obsolete.

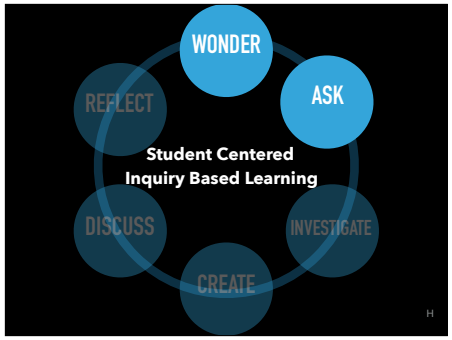
B: People working in STEAM careers are working together.



B: So here are the four characteristics of exemplary STEAM lessons that we develop in this project

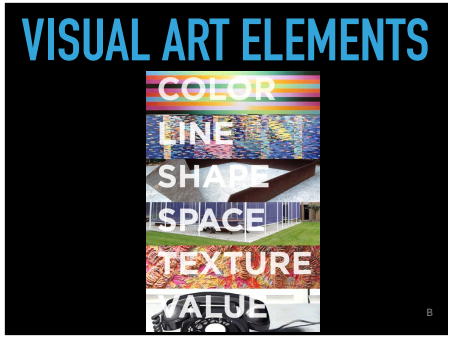


B: These are the paths we use to achieve those characteristics.

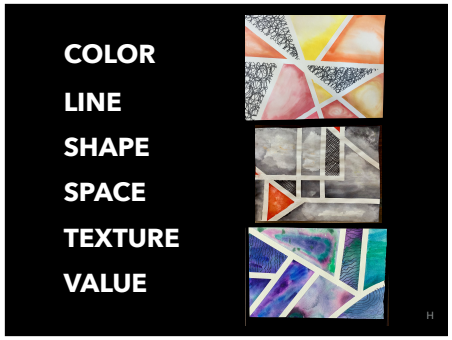


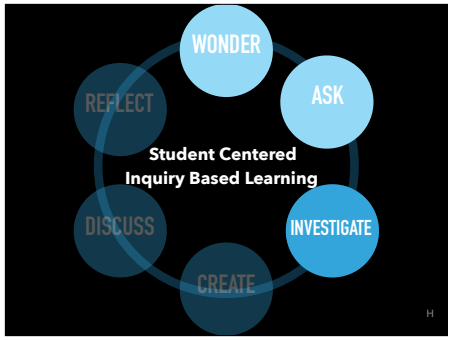
H: When we teach these lessons in classrooms, we begin the cycle of student centered inquiry based learning with wonder and asking questions

H: What do you notice? What do you wonder? What math, art or other concepts can you find?

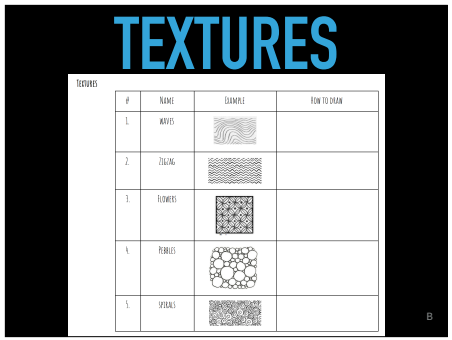


B: You might have noticed some of the elements of visual art. Just as the chemical elements are the building blocks of every material we know on Earth, the 2 dimensional visual art world is described with these six elements. Form completes the list as we move into the third dimension. This project has students practice all six of these elements.

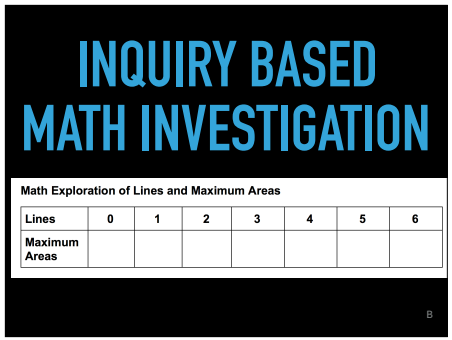




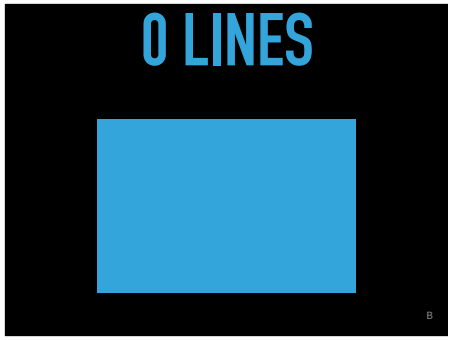
H: As we continue around the circle, let's investigate some math and art concepts.



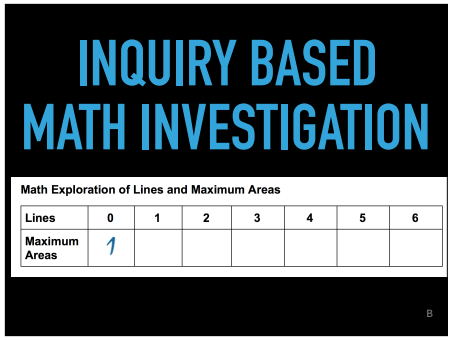
B: One of the investigations is visual textures. On your page, you see this is where students learn to draw each of these. At each grade level we teach a different set.



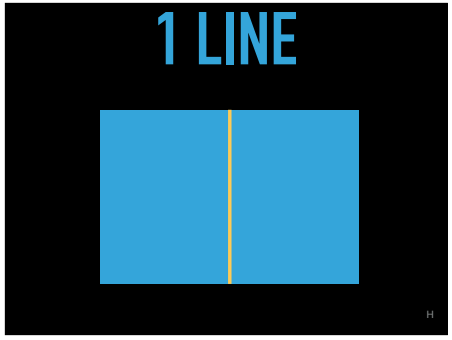
B: We also investigate some math patterns. Specifically, we are going to look at how LINES running across SPACE change the maximum number of possible partitioned areas.



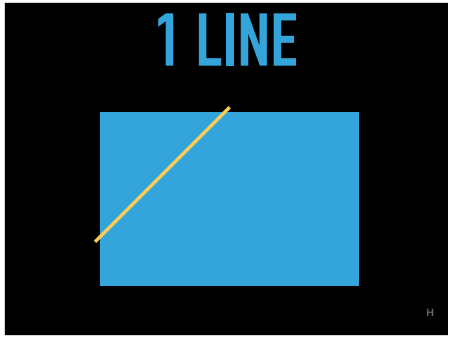
B: With no lines dividing the space, there is one area. Is there any way to have more than 1 area without dividing the SPACE with a LINE?



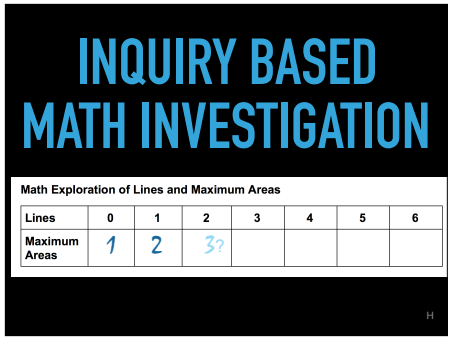
B: On your page, write 1 area under 0 lines.



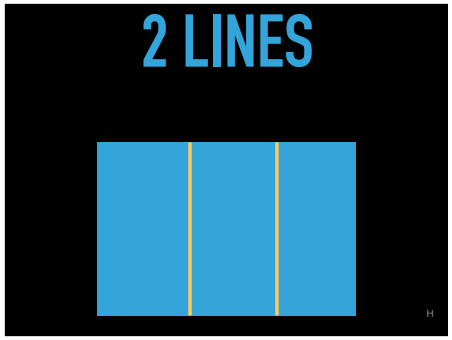
H: By adding a line across the space, we now have 2 areas.



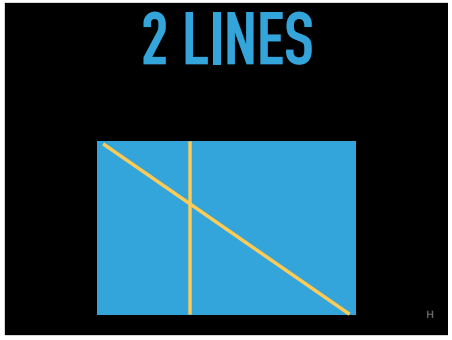
H: Is there any way to have more than 2 areas?



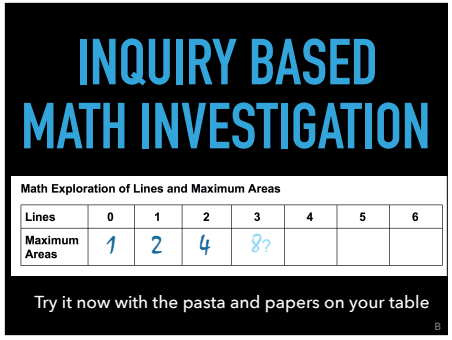
H: As students learn to look for patterns, they may see that the pattern, 1, 2… could continue with 3.



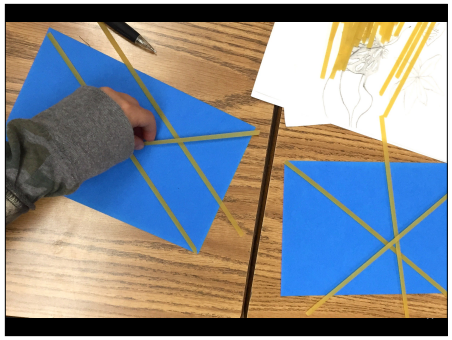
B: And in fact, many will confirm this with two lines making 3 areas. But is it possible to make more than 3 areas?

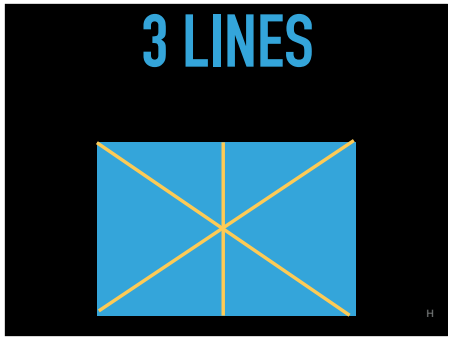


B: Here are 2 lines partitioning the space into 4 areas. Can we make more than 4 areas?

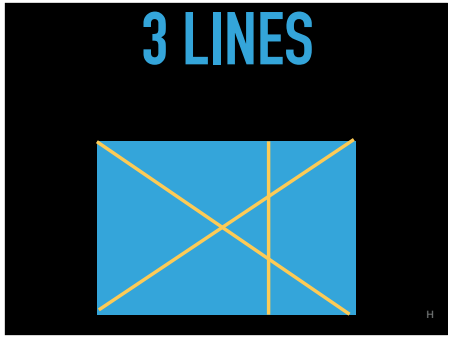


B: Notice this student centered approach as students conjecture and test hypotheses. As students continue to look for patterns, they may see that the pattern, 1+1 is 2, 2+2 is 4, so 4+4 could make 8. Try using the pasta on your table and the blue paper to see if you can find 8 areas, more than 8 or less than 8.

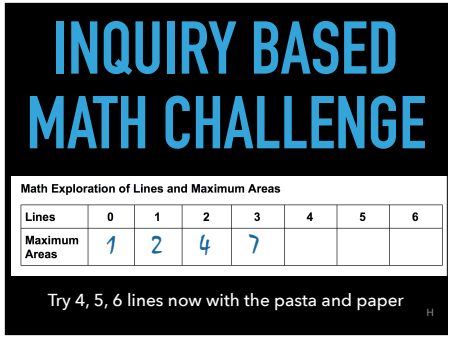




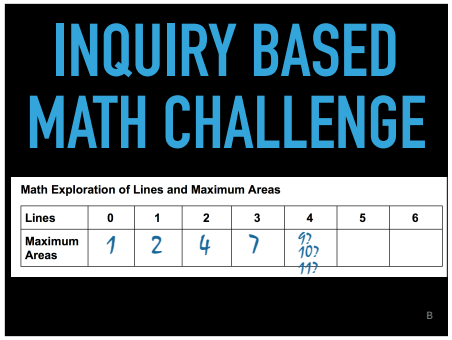
H: Many students can not confirm their hypothesis of 8 areas and find only 6 areas. Is there any way to get more than 6 areas?



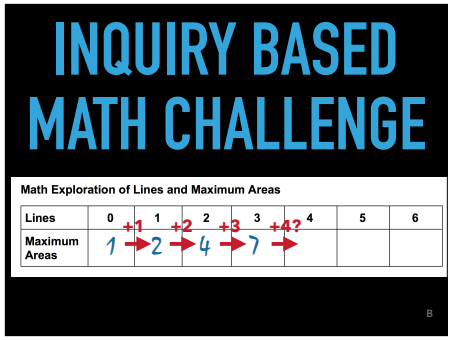
H: Some of you may notice if you slide any piece away from the common intersection point, you create 2 new intersection points and 1 new area. Is there any way to get more than 7 areas?



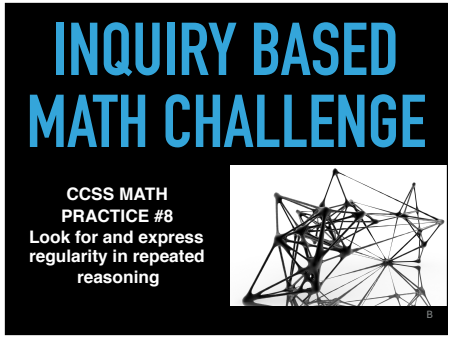
H: Continue with a 4th, 5th and 6th piece of pasta, recording your results each time.



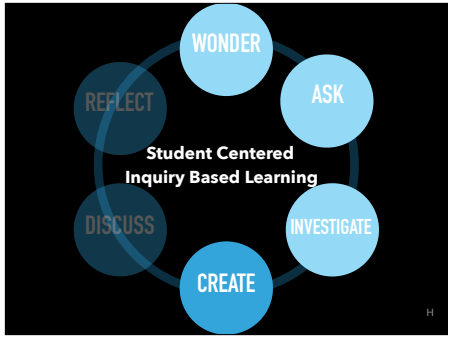
B: [bring attention back] With students, I ask for all possible answers… so for example, did any groups find 9, 10, 11 areas? More than 11? The room often gets energized as students go check each others arrangements to see if they really did get the areas they claimed.



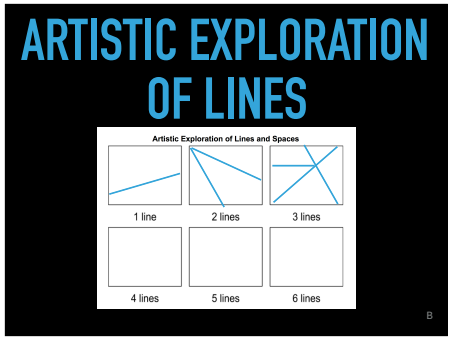
B: In discussion, some students infer a pattern like this. Can you confirm or reject this conjecture? Notice how we are allowing student discovery and discussion rather than providing teacher answers?



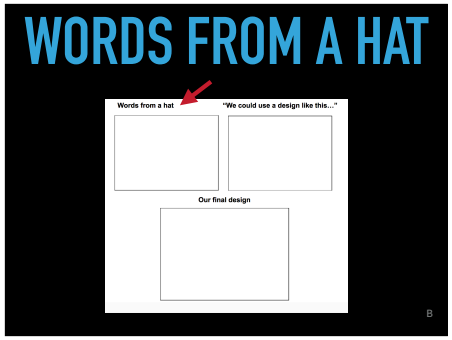
B: While many of the MPS are being used, I especially appreciate how students are look for regularity in patterns here.



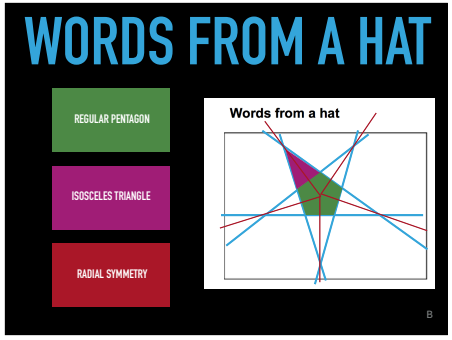
H: As we continue the inquiry based learning model, we now create.



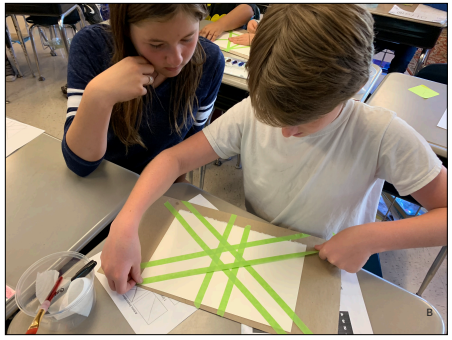
B: One way to create is purely aesthetic. What is an attractive placement of lines without regard to maximizing areas? Go ahead and draw what you find to be an attractive placement of lines up to 6 lines. Notice line segments can stop at an intersection point.



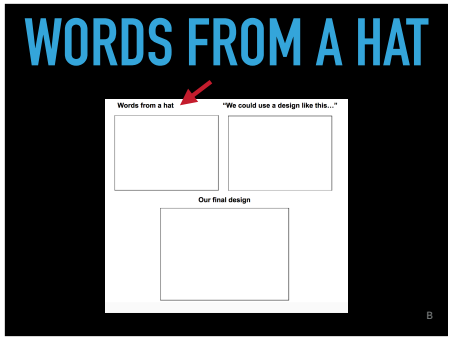
B: Another way to promote creativity is to impose some structure. For example, what if you had to demonstrate your understanding of math vocabulary?



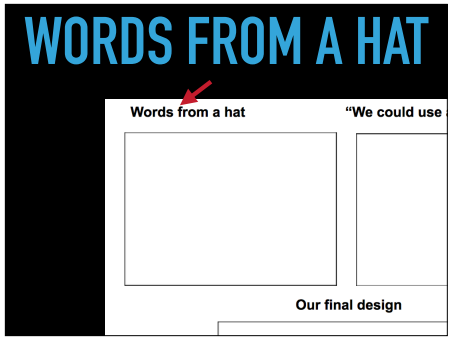
B: Here, for example, students are given an envelope of vocabulary words. They show their understanding of the words with the art they create. Consider this example. Is this the only way to show understanding of these words?

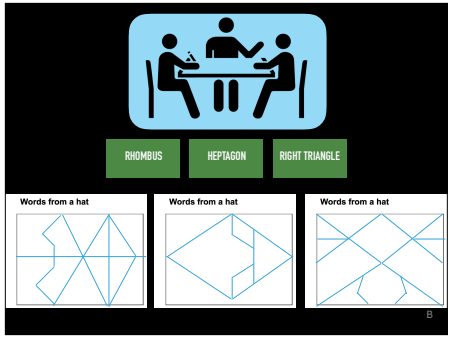


B: These students might be demonstrating their understanding of obtuse angles, regular polygons, parallel lines… you might see other possible concepts?

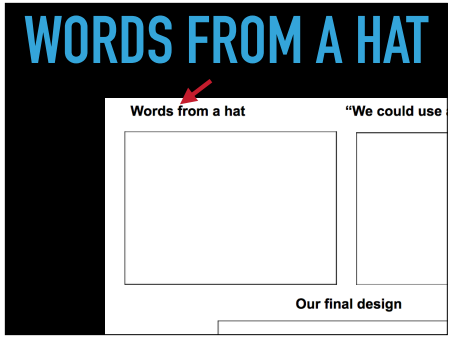


B: So let's explore this activity we call Words from a Hat

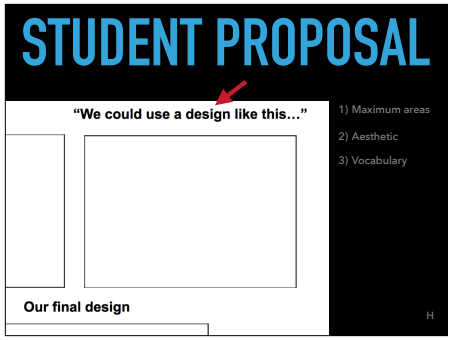




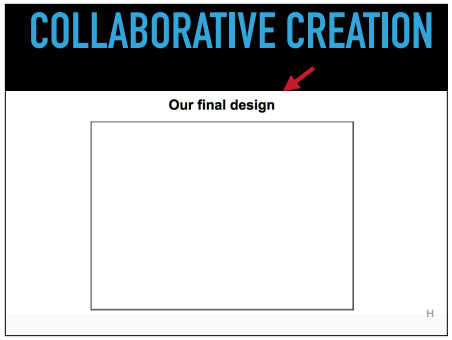
B: At your table, there are several envelopes. Divide them up so each group has one envelope. In this visual, three people are going to demonstrate their understanding of the words Rhombus, Heptagon and Right Triangle. Notice how each does it in their own way?



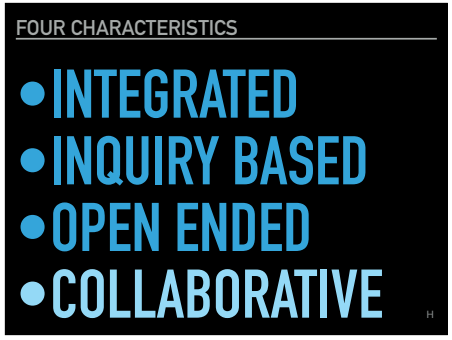
So now go ahead and create your version of the words in your envelope.



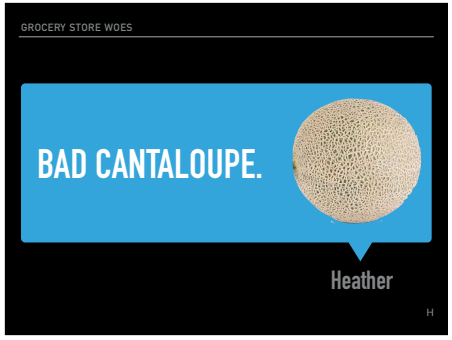
H Students have now explored dividing space several ways. 1) mathematically to maximize area 2) artistically and 3) to demonstrate their understanding of vocabulary. Now they can use all these experiences to propose a design to their group.



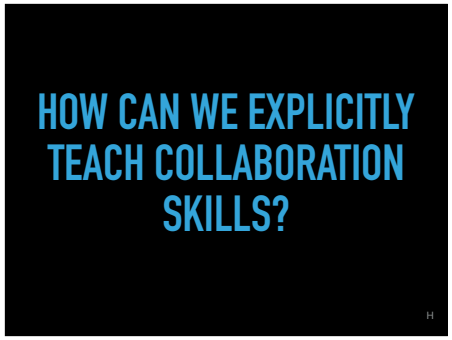
H The final design is either ONE of the group members creations or a hybrid creation.



H: The last characteristic of STEAM education that we're developing is collaboration.



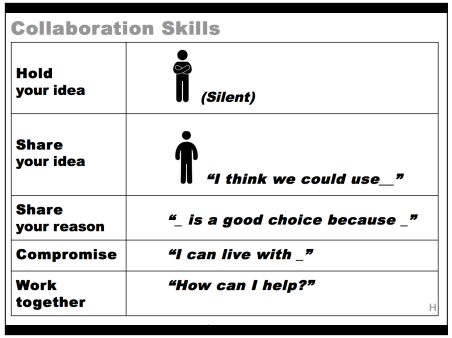
H: Sometimes I go to the grocery store and get a cantaloupe and it's no good. Not sweet, not ripe…whatever. So then I'm reluctant to buy a cantaloupe again for some time. The same has happened to me with using group work in the classroom. Am I alone here?



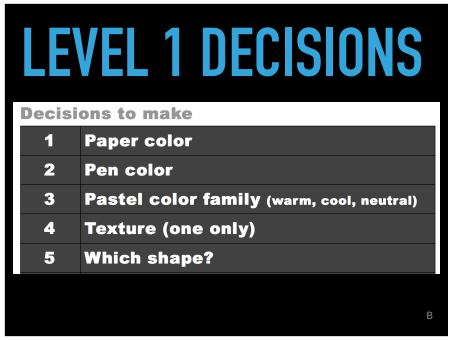
H: So if we want students to collaborate, but they don't always have the skills, how do we teach them?

B: We developed our approach to teaching collaboration skills from the work we have done using the Acting Right Curriculum from Sean Layne of Focus Five.

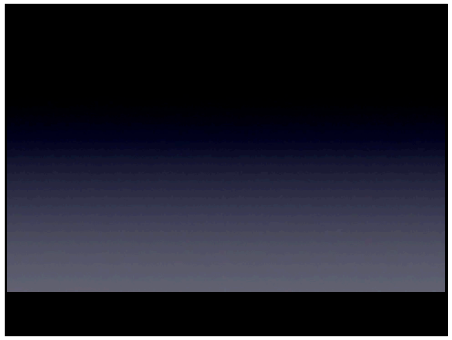
B: Collaboration skills are essential for STEAM education and Creative Learning. We identified five skills that people who collaborate use regularly and made those the skills we would teach and develop.

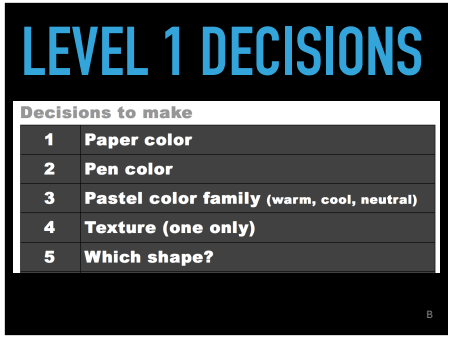


H: These are the signals and words that we teach to accompany each idea.

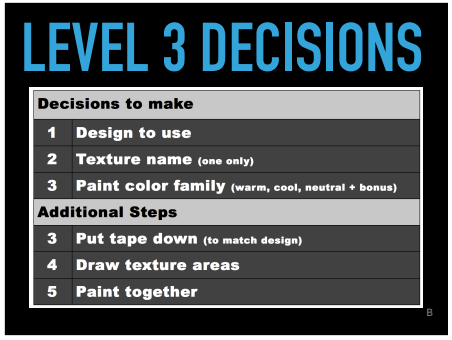


B: Students need low stakes decision making practice. In the younger grades, we have them make decisions such as which paper color should we use? Let's look at a short video of students learning and practicing these 5 skills

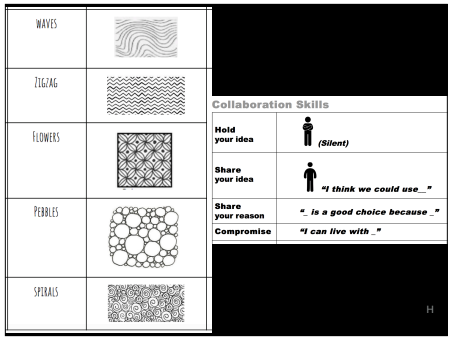




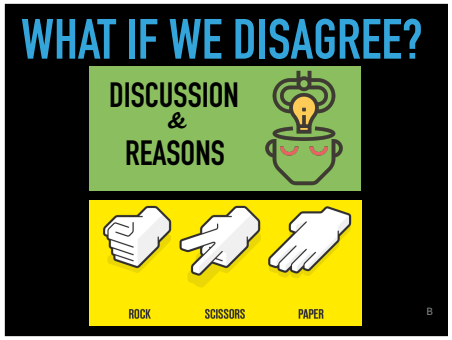
B: So you probably heard them making these decisions about pen color and which shape to use.



B: In THIS project, they have different decisions to make. They are still low stakes decisions, but they need practice making them.

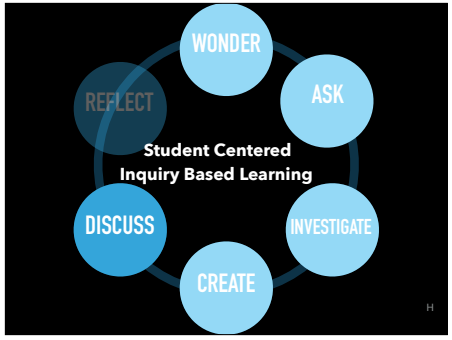


H: We would like you to see what this is like. The first time it might feel a little odd or scripted, but the students quickly get used to the process. Bill and I will demonstrate.
In your group, decide on a texture name. Hold it, share it, give a reason and then compromise until you all can live with one texture.

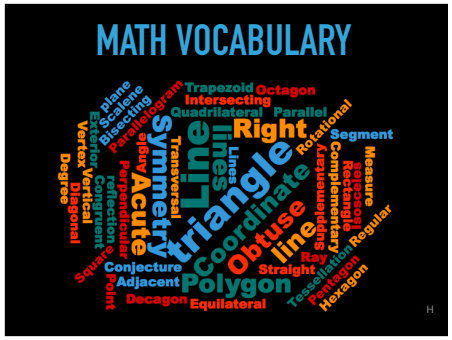


B: But what if a decision can't be made? This happens. We want students to have discussion around the validity of their reasons and realize that if they want to convey a visual message of "cool river stones" vs. "hot flames" that their artistic decisions should not be random. That said, sometimes decision making based on random chance is the only way they can resolve their disputes.

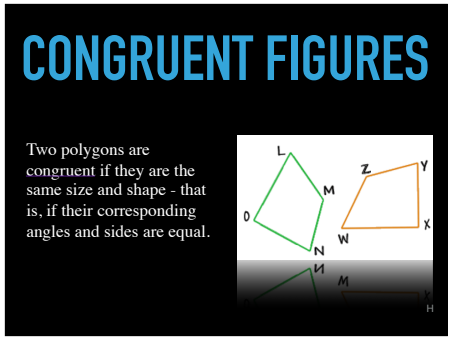
H: They agree on a color family, texture and how they will all participate. They put down the tape, draw the texture and then work together to paint.



H: At your tables you have 2 artworks that we are going to discuss. We saved time by making the art ahead of this workshop, but you may enjoy pulling the tape off. Please take turns pulling off the tape. Note how the high quality watercolor paper makes this process much easier than the less expensive paper.

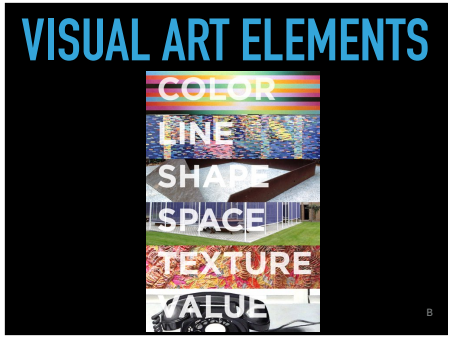


H: Here are some vocabulary words that you may or may not use at the grade you teach.

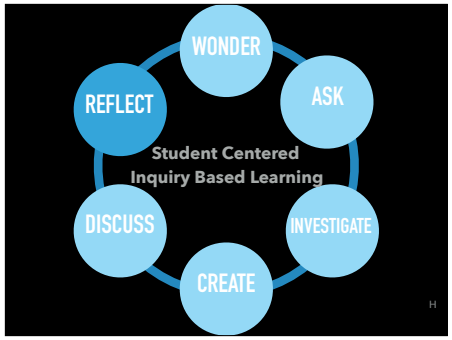


H: One group was exploring their Student Resource Handbook and came across this vocabulary term “congruent figures”. They had never heard of this before, but were able to find it in their artwork.

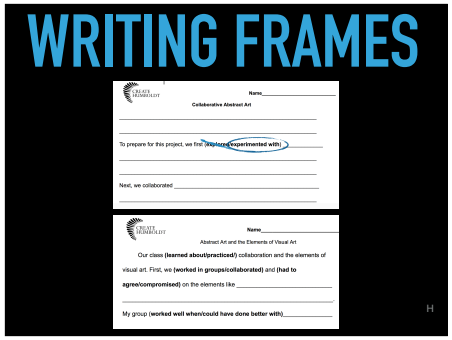
H: So please take 80 seconds to see what vocabulary you can find. The words may not be the ones on this slide.



B: We also ask students to discuss where they identify the visual art elements in the artwork they created.

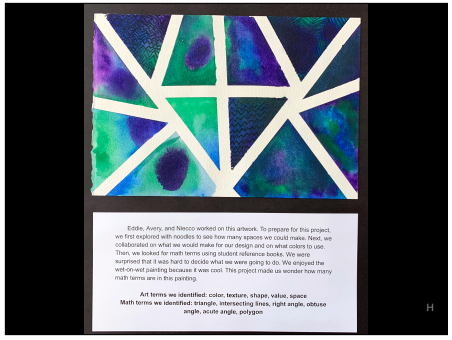


H: We're full circle now. Reflecting before we go around again.



H: We have different reflective writing frames on our site- this one is about the collaborative nature of the work and this one [next] is more about the visual art and mathematics.

H:



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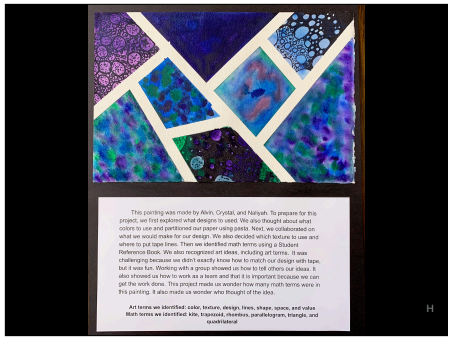

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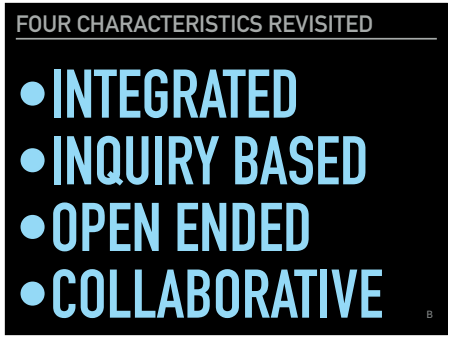
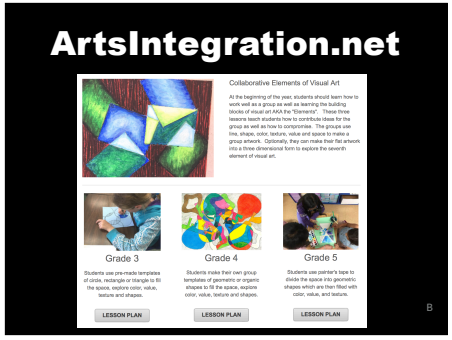


B:We hope we have addressed these four characteristics. Integrating math and art, following the inquiry learning circular cycle, allowing multiple, open ended possibilities and explicitly teaching collaboration skills.



B: You can find the lesson plans at our website in the “lessons area”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