Lesson Title	Patterns through geometry
Length of Lesson	50 minutes
Created By	Shane Irvin
Subject	Geometry
Grade Level	9^{th} -12^{th}
State Standards	3a. Use inductive reasoning to make conjectures and deductive reasoning to make valid conclusions.
DOK Level	DOK 2
DOK Application	Predict, Identify Patterns, Interpret, Make Observations
National Standards	Use visualization, spatial reasoning, and geometric modeling to solve problems.
Graduate Research Element	Being able to form pixels together to ultimately create a pattern which is then identified as a viewable and understandable object.

Student Learning Goal:
The learning goal for this lesson is for students to understand the presence of patterns in all objects. Using aerial photography, plane photography and up-close analysis of objects, the students will see if they can determine what objects are. They will work with their group to analyze objects from a distance where it is hard to potentially identify.

Once this is accomplished the students will use inductive reasoning to make conjectures and deductive reasoning to make valid conclusions by taking a group of given points. These points, if followed step by step would take too long. After they begin to see the formation of what the point create they will use the deductive reasoning to fill in the remainder or try to guess what they created.

Materials Needed (supplies, hand-outs, resources):
Writing utensil, handouts (see attached), examples of patterns (aerial imagery, regular photographs), wall paper, and a cloth.

Lesson Performance Task/Assessment:
The assessment for the students for this lesson will be a worksheet with set points for a grid. The students will start filling in the associated points on the graph paper. Once they feel that they have identified the pattern or object, that table can guess. The first table to guess will win. The students will be responsible for completing their worksheet and also working as a group.

Lesson Relevance to Performance Task and Students:
Patterns are extremely important to students and their growth in geometry. This lesson will allow the students to identify patterns during the creation of the pattern. It will also

allow students to see that not all patterns are able to be seen by the naked eye. Sometimes the student must zoom in to get the pattern.

Anticipatory Set/Capture Interest:
Show them a close up of an object and see if they can guess it. It will get them going for the lesson which deals with properly using patterns to identify poorly visible objects, after a few examples explain the competition between each table to complete the assigned secret patter. The students will naturally want to complete.

Guided Practice:
They will work with their group to analyze objects from a distance where it is hard to potentially identify.

Once this is accomplished the students will use inductive reasoning to make conjectures and deductive reasoning to make valid conclusions by taking a group of given points. These points, if followed step by step would take too long. After they begin to see the formation of what the point create they will use the deductive reasoning to fill in the remainder or try to guess what they created.

Independent Practice:
The students will then be responsible for formulating their own patterns by an assignment that only gives them point coordinates on a grid. Each table will have a different drawing and will have the chance to work together. The table that can either guess correctly or finishes first is the winner and is rewarded a specific achievement. The point of giving them specific instructions will challenge the students to not jump ahead and mess the drawing up, as the order of the drawing is not layers but sparatic.

Remediation and/or Enrichment:
Remediation:
In situations that remediation is needed the student can see the instructor for one on one tutoring. The student can also be paired with a high performing student with full understanding of the lesson.

Enrichment/Extension:
All of these extensions depend on the students' ability and knowledge of the subject matter. The student will have the opportunity to continue to work on the drawing directions by formulating new points in the drawing, creating the directions instead of following them. Individual IEP's will be supported.

Check(s) for Understanding:
What was the most common give away for the different patterns?

What patterns do you see every day?

Is a pattern just colors and shapes?

Review the worksheet with them as well as see who gets the questions right.

Closure:
The teacher can close the lesson by re-emphasizing the purpose of patterns by asking how many students thought they knew what the pattern was before they started. The questions from the assessment will be asked. After all questions are answered, the closing statement will be a picture of the graduate student's aerial photography and how even close up it has importance.

Possible Alternate Subject Integrations:
Patterns are found throughout science and math. Any subject can apply this lesson.

Teacher Notes:
Images can be from aerial photography, or just pictures in general. It's fun to see that a picture can blow up to be many clumps of color

http://landsat.gsfc.nasa.gov/

http://www.maris.state.ms.us/