Geometry Interview Project

You will be conducting a one-on-one geometry problem-solving interview with one student in grades K-12. You will audio or video record this interview. Sample interview questions and problems for you to use during the interview will be distributed in class. Your ultimate goal is to classify your subject as one of the following levels of geometric understanding:

Level 0. Visualization: A student at Level 0 can identify prototypes of basic geometric figures, such as a triangle, circle, or square. They view figures as a whole without analyzing their properties, such as sides, angles, etc. At this stage student might not call a thin, wedge-shaped triangle a "triangle", because it's so different from an equilateral triangle. Squares are called "diamonds" and not recognized as squares if their sides are oriented at 45° to the horizontal. Students at this level often believe something is true based on a single example (e.g., they may test a conjecture about "all" quadrilaterals by testing only a square). This level is characterized by "Pre-Composer" and "Piece Assembler" strategies for filling in geometric shapes with pattern blocks – students do not understand the flexible way shapes can be turned and flipped.

Level 1. Analysis: A student at Level 1 can discuss the properties of the basic figures (e.g., sides, angles, congruency) and recognize figures by these properties, but might still insist that "a square is not a rectangle." Students do not see the relationships between the properties, and understand the hierarchical organization of geometric figures. They might reason inductively from several examples (e.g., test a conjecture about all quadrilaterals by testing a square, rectangle, rhombus, and trapezoid), but not deductively. This level is also characterized by "Picture Maker" and "Shape Composer" strategies for filling in shapes with pattern blocks.

Level 2. Abstraction: A student at Level 2 has begun to reason deductively. They understand the relationships between properties and can reason with simple arguments about geometric figures. Students recognize relationships between types of shapes - for example, they recognize that all squares are rectangles, but not all rectangles are squares, and understand why. They might show the beginnings of deductive reasoning when confronted with a conjecture by, for example, generalizing from a specific example to all cases. They might show a conjecture is true for all triangles by starting with a prototypical triangle, and then showing that if the conjecture didn't hold, the triangle would not be able to form. This level is also characterized by a "Substitution Composer" strategy for filling in shapes with pattern blocks.

Level 3. Deduction: Students at this level understand the meaning of deductive processes – reasoning from valid inferences. The object of thought is deductive reasoning to form simple proofs, which the student learns to combine to form the system of formal proofs. Learners can construct geometric proofs at a high school level and understand their meaning. For example, they would be able to figure out proofs for complex properties relating to the angles in an inscribed quadrilateral or an inscribed triangle. They understand the role of undefined terms, definitions, axioms and theorems in Euclidean geometry. However, students at this level believe that axioms and definitions are fixed, rather than arbitrary, so they cannot yet conceive of non-Euclidean geometry (i.e., a geometric system where definitions work differently such that parallel lines can actually curve away from each other, or intersect).

You will be writing a report about the interview and classifying your subject's level of geometric understanding based on specific events from the interview and scholarly readings. You will be responsible for writing follow-up activities for this student that you believe will enhance their understanding of geometry.