1154-H1-2703   **Inyoung Lee*** (`ilee28@asu.edu`), Tempe, AZ 871804. *Two perspectives to interpret an object in relation to a coordinate system; coordinates-open and coordinates-closed.* Preliminary report.

For students to broaden their ways of thinking to non-standard coordinate systems, it is crucial that students get much chance to take into account an object itself that they are dealing with and of how it gets transformed between different coordinate systems. In this sense, I offer two perspectives to interpret an object in relation to a coordinate system; coordinates-open and coordinates-closed. For "coordinates-open" view, we consider any object as composed of points, and any coordinate system describes those points' locations. The object's points are "coordinatized" by the system laid atop the object. On the other hand, "coordinates-closed" means that an object is embedded in a particular coordinate system. The object is defined relative to the coordinate system, and the object is transformed into a different shape by a transformation that maps points in the first coordinate system to points in the second coordinate system. The Jacobian matrix as one of the transformation matrices takes its role of relating two representations of an object using local linearity and the concept of differentials. Based on the two perspectives, literature and students' conceptions will be discussed. (Received September 17, 2019)