Lecture Outline
On the Shoulders of Giants: Inertia

I. Newton's First Law
   a. History of the First Law
      Isaac Newton described the motion of objects with three laws. He compiled information from many different sources in the process of developing these laws.
      - A precursor to Newton's first law is found in the work of the Persian thinker, Abu 'Alī ibn Sīnā (whose historical context will be examined later in the lesson):
        1. Formulation from the Islamic Golden Age (translated): No [object] begins to move or comes to rest of itself.[1]
        2. Newton's First Law (translated): Every [object] persists in its state of being at rest or of moving uniformly straight forward, except insofar as it is compelled to change its state by force impressed.[2]
   b. Modern Statement of the First Law
      [In an inertial frame] an object at rest remains at rest and an object in motion at a constant velocity remains in motion at a constant velocity unless acted upon by a force.
      - Expand on: velocity (the case of an object at rest is simply the zero-velocity case)
      - Highlight that forces are not needed to sustain motion (only to change it), as this is a common misconception.
   c. Possible Examples (can be generated by students or given by instructor):
      - Reiterate demonstration
      - A water bottle in a car slowing to a stop
      - Hitting a ketchup bottle to get the last bit

II. Mass
   a. Define and connect to inertia (mass as a measure of inertia)
   b. Provide Example:
      - Flick two balls of the same size, but different mass, along the same surface and observe which resists motion to a greater extent

III. [If Time Allows] Net Force
   a. The force referenced in the law of inertia is the net force or the sum of all forces.
   b. Provide Example
      - Desk sitting on the floor (normal force, gravity, and horizontal motion of a student pushing the desk)
   c. Free Body Diagrams
      - Introduce free body diagrams using the example given above. Identify the net force.
      - Introduce an example in which the net force is not the same as one of the individual forces.

Sources:
Khan Academy, < https://www.khanacademy.org/science/physics/forces-newtons-laws/newtons-laws-of-motion/a/what-is-newtons-first-law> (Accessed 18 June 2020).
The Physics Classroom, <https://www.physicsclassroom.com/class/newtlaws/Lesson-1/Inertia-and-Mass >, (Accessed 18 June 2020).

[1] E. Hecht, Phys. Teach 53, 80 (2015): https://doi.org/10.1119/1.4905802.
[2] I. Newton edited by I.B. Cohen and A. Whitman, *Principia Mathematica* (University of California Press, Berkeley, 1999).