Nature of Science and Math: Analyzing the Presence in Everyday Communication

I selected three media sources summarizing the same research reported in *Nature*. In general, the Nature article presents information that cyclones are slowing and staying in one place longer than historical storms. Below is my analysis of one of those articles.

News media article being analyzed:
Miller, B. (2018, June 7). Hurricanes are slowing, which could be a big problem. *CNN.* Retrieved from https://www.cnn.com/2018/06/06/us/hurricanes-slowing-wxc/index.html

Part A: Nature of Science

Scientific Knowledge is Based on Empirical Evidence

The article contains lots of data presented as evidence. The problem is there are so many numbers and graphics presented, that the reader can be confused. The use of data (percentages, rainfall totals in inches, years) supports the learning outcome that science knowledge is based on empirical evidence. The article continues to meet this tenet with the learning outcomes that science arguments are strengthened by multiple lines of evidence supporting a single explanation and science includes the process of coordinating patterns of evidence with current theory. The theory being addressed is that increasing global temperatures are contributing to the increased rainfall. The article explains that "warmer air is able to hold more water vapor through a process called the Clausius-Clapeyron relationship, which shows that the water-holding capability of air increases about 7% with each degree Celsius of warming." The additional lines of evidence occurs when the author states, "According to Kossin's study, combining the additional water vapor available in the atmosphere from 1 degree Celsius of warming with a 10% slowdown from tropical cyclones that he observed would double the local rainfall and flooding impacts."

In the section titled "Why are storms slowing down?" the author explains the connection between the data reported in the research and a likely cause for it. This addresses the learning outcome that science knowledge is based upon logical and conceptual connections between evidence and explanations. The author does at this point present another scientists viewpoint indicating that there is another explanation for the reported data. In doing so, the author touches on the next tenet.

Scientific Knowledge is Open to Revision in Light of New Evidence

The second paragraph of the article presents data indicating a 10% decrease in forward speed of hurricanes over a 67 year time span and then follows that up with a statement "though there is some variation among ocean basins." This statement possibly addresses the learning outcome that the certainty and durability of science findings varies (middle school band) but no more discussion of the variability is discussed.

Although, there is a graphic that does show the variability in the different ocean basins.

As mentioned above, the possible naturally occurring explanation of the Pacific Decadal Oscillation causing the slowing of the storms also addresses this tenet with the learning outcome that most scientific knowledge is quite durable, but is, in principle, subject to change based on new evidence and/or reinterpretation of existing evidence (the Pacific Decadal Oscillation). At the end of the article, the original researcher is quoted as stating that more studies are needed to evaluate the natural and human-caused factors causing the slowing of hurricane speed which further highlights this tenet and suggests that science findings are frequently revised and/or reinterpreted based on new evidence.

Scientific Knowledge Assumes an Order and Consistency in Natural Systems
The article presents data for storms in most ocean basins and indicates that the pattern shows a slowing of storms in all basins except the Northern Indian Ocean basin. It also states that the slowing is more pronounced in the Northern Hemisphere. This reinforces the learning outcome that science assumes that events in natural systems occur in consistent patterns that are understandable through measurement and observation (middle school learning outcome.)

The article connects slower-moving storms to greater rainfall totals and recalls the Hurricane Harvey experience. The article continues to talk about trends resulting in increased rainfall totals and freshwater flooding. Although misleading, since only one event is presented to indicate the "trend," Hurricane Harvey is again referred to later in the article as an indication of future outcomes. Both these ideas could be seen as addressing the high school learning outcome that scientific knowledge is based on the assumption that natural laws operate today as they did in the past and they will continue to do so in the future.

Part B: Common Core Mathematics Practices
MP1 Make sense of problems and persevere in solving them.
The article presents lots of data in various formats, numbers as well as graphs. As such, the article meets this math practice because the reader is called upon to understand the graphs and check that all the data makes sense. The graph, "Heavy downpours are happening more frequently" is very complex and requires the reader to persevere in making sense of it. In the third paragraph, data is presented that states the slow down over land for North Atlantic and North Pacific are 20% and 30% respectively, yet the images that follow do not support this data. As a result, the reader is asked to take time to make sense of the graphics and data presented.

MP4 Model with Mathematics

This practice means that readers can apply math to solve problems arising in life, society, and the workplace. The article does lead the reader to consider real world applications in terms of the financial impact slower and wetter storms are likely to have on an area. A comparison to Hurricane Katrina with $125 billion in damage is presented for the reader to consider.

MP6 Attend to Precision

In the graphic, "Heavy downpours are happening more frequently," the author is very detailed in describing what the y-axis represents. He is careful in communicating precisely to others what the data means by describing how it is calculated and labeling the axes. Unfortunately, I believe that the information is overly complicated as presented and actually works to confuse the reader rather than further their understanding.

Additional articles in other media sources covering the same *Nature* research:

Gramling, C. (2018, June 6). Tropical cyclones have slowed over the last 70 years. *ScienceNews*. Retrieved from https://www.sciencenews.org/article/tropical-cyclones-have-slowed-over-last-70-years

Pierre-Louis, K. (2018, June 8). Hurricanes Are Lingering Longer. That Makes Them More Dangerous. *The New York Times*. Retrieved from https://www.nytimes.com/2018/06/06/climate/slow-hurricanes.html?rref=collection%2Fsectioncollection%2Fclimate&action=click&contentCollection=climate&region=rank&module=package&version=highlights&contentPlacement=2&pgtype=sectionfront