Article Review
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Predicting the future has always fascinated individuals, and is usually a task left to gypsies and fortune tellers Yet, predicting future can be done if mathematics and science are combined. Today scientist, meteorologist, oceanographers, storm chasers, data analyst and many others combine their forces to do just that. Predict the future. Individuals and organizations aided with super computers are predicting the path, strength, anticipated rainfall, and storm surge of a approaching hurricane. This incredible task has many implications and connections found in "Nature of Science" (NOS) and in the "Nature of Mathematics"NOM.

Getting students excited about learning and sparking a interest in S.T.E.M. is a first step in the "Nature of Science". Most children and adults will be naturally interested in the forces associated with storms. I have chosen an article entitled "Outer Banks could see a 13 foot storm surge from Florence"(CBS NEWS 2018) to find connections with the Nature of Mathematics and the Nature of Science. Using storms and the math and science associated with predicting them allows for imagination, creativity and predictions based on data previously collected. Applying crosscutting concepts, students can apply their skills in research and "knowledge derived by the observations of the natural world" (Lederman 2013) to make their own predictions and gather evidence to validate the hypothesis or find their their assumptions unsupported.

The "Nature of Science" (NOS) corresponds with the prediction of hurricane Florence when we look at some the following concepts found in (NOS). Scientist are gathering information on hurricane Florence twenty four hours a day. With this knowledge predictions are made, theories are published, facts about the storms current and past actions are reported. But, science is always able to change and so do hurricanes. With new evidence, predictions change, scientist revise their forecast and new models help to explain this natural phenomena. As Lederman states this" involves human imagination and creativity and is therefor partially subjective"(Lederman 2013). Personal feelings and opinions are often taken into account when formulating a hypothesis. Embracing multiple views and ideas can foster a more enlightened understanding and therefor produce quality results. This multiple view approach is similar to transformative learning as Seater & Ceulemans state " Transformitive learning refers to a change in the frame of reference, moving from a personal framework of individual ideas into one that references multiple views. Within this change comes decision making that is more enlightened and more likely to be based on sound reasoning" (Seater and Ceulemans 2017) A hurricanes future path is derived form multiple information sources and therefor more likely to be based on sound reasoning. Yet there are some observed regularities about hurricanes do not need confirmation and deliberation to be considered law. For example, we know that hurricanes do form over land.

The nature on Mathematics (NOS) and hurricane Florence can be fused in several ways. Hurricanes are able to produce vast amounts of data and in wide range of forms. From buoys reporting the size of waves to satellite images display the eye of the storm. Individuals are gathering data, working with measurements and constructing viable arguments for the hurricanes future paths. Math and science implication are found in almost every step. Individuals who fail to teach math as part of the scientific challenge are limiting their students STEM experience. Mathematics and science literacy are combined to form more coherent understand of our surroundings. The models generated which for hurricane Florence are generated with precision, creativity, logic and large amounts of data. With this new information and previous data patterns are formed. Creative mathematical solutions based on logic allow predictions to be made. This scientific endeavor is accomplished with the with mathematics.

Using mathematics to help us understand the changing world around us and offers individuals a creative a logical view. In education mathematics has a unique place, as the National Academy of Science states "The special role of mathematics in education is a consequence of its universal applicability. The results of mathematics--theorems and theories--are both significant and useful; the best results are also elegant and deep. Through its theorems, mathematics offers science both a foundation of truth and a standard of certainty."(National Academy of Science, 1989) Hurricanes are certainly a powerful force of nature. The mathematics and science involved in predicting their path and impact is very diverse. Combining mathematics with science, data, creativity, imagination, observations, laws, theories models and perseverance we are able to forecast the future (the weather that is)with some degree of certainty. It may not be a gypsies crystal ball, but with math collaborating with science the future of the Nature of Science and the Nature of Math looks sunny and bright.

CBS NEWS- http:/msn.com/en-us/weather/topstories/outer-banks-could-see-13-foot-storm-surg. (9/12/2018)

Ceulmans, K., & De prins, M. (2010). Teacher's manual and method for SD integration in curricula. Journal of Cleaner Production, 18(7), 645-651.

http://www.nextgenerationscience.org/resources/how-read-next-generation-standards

Lederman,N.G., & Lederman, J.S. (2014). Research on Teaching and Learning of Nature of Science. In N. G. Lederman & S.K. Abell (Eds.) Handbook of Research on Science Education, Volume II (pp. 600-620). New York, NY: Routledge.

Scarf Seater, C. (1998). An Analysis of the concept of teaching elementary school science education. (Unbublished doctoral dissertation). Simon Fraser University, Burnaby, BC.

The National Academies of Science, Engineering and Medicine. (1989). 500 Fifth Street, N.W. Washington, DC 20001

UNESCO (2014). Education for Sustainable Development Sourcebook. Education for Sustainable Development in Action. Learning and Training Tools. NA-2012, 51. Paris, France:author