

Nature of Science & Math: Analyzing the Presence of Everyday Communication

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Abstract

This paper identifies evidence of selected Next Generation Science Standards tenants; *Science as a Human Endeavor, Science as a Way of knowing, and Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena*, and the math competencies requiring *quantifiable data, modeling, and constructing viable arguments*, within the article “Design thinking for Social Innovation”. The connections identified provide evidence of scientific thinking, and math competencies that are present in research articles and thus imperative that students experience the process and cognitive strategies required in life.

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Evidence of The Nature of Science tenants and Math Common Core in the article “Design Thinking for Social Innovation”

**Part A Nature of Science****Science is a Human Endeavor**

Design thinking for Social Innovation references an empathetic introduction to the importance of design thinking (Brown & Wyatt, 2010). The article begins with a woman by the name of Shanti who is unable to obtain clean water for her family despite the close location of a water filtration center. The container that was designed by the facility cannot be carried in the traditional way water is obtained by the villages (Brown & Wyatt, 2010, p. 29). Wyatt make the observation, “The container isn’t designed to be held on the hip or the head, where she likes to carry heavy objects” (Brown & Wyatt, 2010). The author’s introduction engages the reader in the importance of empathy to a problem. According to A framework for K-12 science education: Practices, crosscutting concepts, and core ideas, “Asking questions is essential to developing scientific habits of mind.” (2012) Science is a result of human ingenuity, and natural curiosity allows us to generate ideas of what further information we need to know, as well as how we can begin developing a solution. Further in the reading we find that the water that Shanti was continuing to get for her family, though not filtered, was attainable with the containers that she and many families had available to them (Brown & Wyatt, 2010). “Scientific questions.... can result from the need to provide better solutions to a problem” (“A framework for,” 2012). According to the *The Nature of Science in The Next Generation Science Standards*, “...learning about science requires more than engaging in activities and conducting investigations.”

(“NGSS,” 2013) Rather, empathy for a situation drives student curiosity and provides a purpose for investigation, and analysis, which emphasizes science as a human endeavor.

### **Science is a Way of Knowing**

Observation and experimentation allows for verifiable information that aids in a quantifiable approach to study. “The World Health Organization praised the nets, crediting them with significant drops in malaria deaths in children under age 5: a 51 percent decline in Ethiopia, 34 percent decline in Ghana, and 66 percent decline in Rwanda.” However mosquito net distribution using one method led to unintended consequences” (Brown & Wyatt, 2010). The nets were provided to pregnant women and mothers with children under the age of 5. This statistical data is pertinent to the issue surrounding the rest of the community, which did not have access to the nets as well as the limited number of shop owners that did not want to house “free” items (Wyatt 32-33). Quantitative data is essential in analyzing the known facts, and using the evidence to approach and plan a solution. According to the *The Nature of Science in The Next Generation Science Standards*, “...learning about science requires more than engaging in activities and conducting investigations.” (NGSS, 2013, page 2) Students need to evaluate and develop the “tactics and strategy” to approach problems in a methodological approach (NGSS, 2013)

### **Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena**

The model proposed is based on qualitative and quantitative data, which is further developed into a variety of diagrams to illustrate the progression of the effective idea proposed. “Because raw data as such have little meaning, a major practice of scientists is to organize and

interpret data through tabulating, graphing, or statistical analysis.” (“A Framework for” 2012, pg. 61) *The Nature of Science in The Next Generation Science Standards* encourages teachers to choose practices that enhance the observation of patterns, and develop models based on their proposed explanation (NGSS, 2013, page 2). True understanding is visible when students are able to communicate their understanding. The design thinking model created by IDEO has aided in enhancing the prototyping and the design effort that reaches beyond aesthetics, to the social challenges too (Brown & Wyatt, 2010). “..a vibrant design thinking culture will encourage prototyping—quick, cheap, and dirty—as part of the creative process and not just as a way of validating finished ideas.” (Brown & Wyatt, 2010) All in all, the tenets of the Nature of Science are critical in developing the practices and cross cutting concepts that require teachers to develop a conceptual bridge o the nature of science. “The NOS (nature of science) and scientific inquiry fall within the realm of affect and process as opposed to cognitive outcomes of equal, if not greater importance than “traditional” subject matter (Lederman, N.G., Lederman, J.S., & Antink, A., 2013).

### **PART B Common Core Math Practices**

Overall the article Design thinking for Social Innovation identifies with the Common Core Math Practices. The investigations involving Shanti carrying water to her village provide students an opportunity to *abstractly and quantitatively* develop the measurements for the volume of water required by her family. It also allows for inquiry into shape and design of the container that she was effectively using to carry the non-filtered water. The quantitative data could be *modeled with mathematics* via charts and graphs a comparison between the two types of containers, and would also lend to discussion of a third design that could mathematically benefit Shanti in

carrying the water. Design that student develop would allow for peers to *Construct viable arguments and critique the reasoning of others.*

### References

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