"Can there be knowledge that is independent of culture? In regards to mathematics and another area of knowledge?"

As knowers, we assume the inseparable nature of knowledge and culture poses a threat to our pursuit of knowledge, however, different perspectives allow us to blend interpretations and arrive at more accurate conclusions. In mathematics, independence means the presence of one variable has no impact on the outcome of the other. Thus in order for culture to be independent, it must have no correlation with mathematical knowledge. In the human sciences however, independence can be interpreted to mean not dependent; knowledge must not depend on culture to exist. Culture, the collection of social behavior and norms for a particular group, heavily influences perspective, a critical factor in arriving at knowledge in the human sciences. Dependent on observations, the human sciences acquire knowledge through perspective and interpretation. Alternatively, mathematics uses reason and numerical data. Can areas of knowledge dependent on interpretation ever be truly objective? There can be some knowledge that is independent of culture, however, most knowledge is impacted and affected by culture.

Mathematics contradicts our assumptions by demonstrating knowledge independent of culture. We assume that knowledge can not be objective and independent of culture, however, mathematics counters these generalizations. Exploring the process of mathematical validation, Milo Beckman discusses the fundamental differences between two ways of knowing; math and science.[1] According to Beckman, math differs from science in that it determines truth through rules and laws rather than experimentation. Unreliant on experimental observations, mathematics avoids cultural bias that comes with interpretation, a necessary component in experimentation. Interpretation causes knowledge to be tainted by the interpreter's personal beliefs and inclinations, and since mathematics relies on numerical proofs independent from interpretation, it avoids cultural dependency. Essentially, the scope of mathematics is unbiased. Furthering this idea, the Pythagorean Proposition, a published book, contains 370 different proofs of the Pythagorean Theorem.[2] The proofs come from mathematicians from vastly different eras and countries; Greek mathematicians such as Euclid, Indian mathematicians such as Bhaskara, modern mathematicians such as Legendre, and even a US president (James Garfield).[3] Despite coming from different cultures and perceptions, the conceptual conclusion of all the mathematicians was the same; the square of two legs of a right triangle equals the square of the hypotenuse. Since their results were identical, mathematics is clearly culturally independent; if it wasn't, then the results would have been different as a result of clashing cultures. In determining math to be culturally independent, we ignore the methodology of arriving at mathematical knowledge and instead concentrate on the independence of the actual knowledge, or scope.

Although the scope of mathematics is independent of culture, the methodology for the production and acquisition of knowledge is heavily culturally dependent. The conceptual knowledge contained in mathematics remains identical regardless of culture, however, the

[1] Beckman, Milo. "Romy Asks, 'What Does Math Not Explain?'." *Medium*, Medium, 6 Oct. 2016, https://medium.com/@milobela/romy-asks-what-does-math-not-explain-25045f617aac.
[2] Loomis, Elisha Scott. *The Pythagorean Proposition*. National Council of Teachers of Mathematics, 1972.
[3] Yolkowski, James. "The Pythagorean Proposition by Elisha Scott Loomis." *Math Lair*, Math Lair, 7 Dec. 2014, https://mathlair.allfunandgames.ca/pythprop.php.

methods in which knowers arrive or share mathematical knowledge is entirely culturally dependent. In 2014, Amazon developed an experimental recruiting engine that would scan incoming applicants and determine whether they were 'good' or 'bad.' It analyzed information from the past 10 years of hiring history to machine-learn which qualities were preferred, and ended up showing a preference for male applicants.[4] Although the algorithm was purely built using mathematics and data, it showed a bias for men. The methods used to produce the algorithm, that is, having the algorithm use prior hiring tendencies, were biased, resulting in the algorithm attributing 'bad' to women and 'good' to men. Using reason to create the algorithm, the mathematicians incorrectly assumed that machine learning and the objective nature of numbers would create an objective algorithm. Clearly, the methods of production of knowledge allow mathematics to be susceptible to culture, since gender bias is a product of cultural beliefs. Essentially, our belief that the objectivity of mathematics can be applied to human problems to create an objective process is fundamentally flawed, as we introduce bias in producing and acquiring knowledge from mathematics.

Using the alternative definition of independence as a lack of dependence, the methodology of mathematics becomes culturally independent. My counterclaim argument assumed that independence meant a complete lack of connection, however, independence can also mean a lack of dependence. Mathematical models are not dependent on culture or bias; they would exist even if the information was completely objective and culture was not a factor. During the 2020 Covid-19 pandemic, models were created to determine the infection rate of Covid-19. These models used statistical data reported from countries around the world, and did not compensate for cultural factors. Culture and more specifically, living styles had an enormous impact on the spread of Covid-19. Third world countries, for example, have cities where residents live in close proximity to one another with little sanitation equipment to halt infection rate. This cultural difference of living styles was not factored into the model, yet the model still existed. Thus, as seen through mathematical models, math is not dependent upon culture. Although differing perspectives and ways of life can impact mathematics through the production and acquisition, mathematics does not rely on perspectives to exist; it is not dependent.

Considering independence to mean complete separation, the scope of mathematics is independent of culture while the methods are not. However, if one considers independence to mean a lack of dependence, then the methods and scope of mathematics are culturally independent as mathematical knowledge can be produced and acquired without culture.

Opposing mathematics, the human sciences demonstrate how knowledge is not independent of culture. Human science's dependence on the inductive method allows for culture to affect knowledge, as personal interpretations are necessary for generalized conclusions. Discussing how science cannot prove a negative, Greg Koukl explains how science relies on the inductive method; using observations to arrive at broad conclusions.[5] Since the inductive method is dependent on observations and interpretation, and science is built upon the inductive method, science itself is dependent on observation and interpretation. This allows for cultural bias since sense perception, the dominant way to arrive at knowledge from observations, is inherently tied

[4] Dastin, Jeffrey. "Amazon Scraps Secret AI Recruiting Tool That Showed Bias against Women." *Reuters*, Thomson Reuters, 10 Oct. 2018, https://www.reuters.com/article/us-amazon-com-jobs-automation-insight-idUSKCN1MK08G.
[5] Koukl, Greg. "What Science Can't Prove." *Stand to Reason*, Stand to Reason, 2 Apr. 2013, https://www.str.org/w/what-science-can-t-prove-1#.W6Zaay-ZNfT.

to culture. For example, studies found that people from Asian cultures were able to recall the relative size of an object more accurately than people from Western cultures, while people from Western cultures were able to more accurately determine the actual size of the object.[6] Clearly affected by culture and necessary for observing, sense perception allows for cultural bias in the human sciences. Even if sensory perception manages to be avoided, our subsequent interpretations are often culturally biased, as explored later on. Through determining the human sciences to be influenced by culture, we assume that all scientific knowledge is dependent on observations, and thus personal interpretation.

Although the methods used to arrive at scientific knowledge may be culturally influenced, the scope of the knowledge is not culturally bound. In science, our observations are of physical objects, laws, or conditions. Scientific properties or mental disorders stem from something physical. Our explanations of our observations may be culturally biased, however, the actual item is not "biased." The ICM, International Classification of Diseases, is a system of classifications used worldwide to determine and diagnose psychological disorders.[7] Despite cultural differences around the world, the ICM exists, and serves as a successful way to diagnose mental disorders relating to psychology, a human science. The symptoms and the way the human brain functions is the product of an actual physical state: billions and billions of neurons. The interpretation of the symptoms and whether it should be classified as a mental disorder is culturally influenced, but the physicality remains culturally independent, allowing the ICM to exist. The actual symptom does not change depending on the culture of the patient. Essentially, the scope of the human sciences is culturally independent, however, it is logistically impossible to arrive at this knowledge as our method of gaining knowledge is what contaminates the objectiveness of the knowledge.

Although the scope of the natural sciences may be culturally independent, it is impossible for our knowledge to be independent. In order for us to comprehend scientific knowledge, we are forced to classify and interpret knowledge, thus allowing it to become influenced by cultural differences, and as of now, we lack the resources to understand and account for the physical complexities, such as individual neurons firing or countless variables affecting the economy. Adam Shaw describes how in economics, accurate predictions are essentially impossible due to the presence of countless small variables; economists have failed to predict 148 of the last 150 recessions.[8] Since we lack the ability to account for every variable, we are unable to gain accurate and culturally independent knowledge. Economists are forced to learn as much as possible and make their own personal interpretations, which can be affected by culture. For example, in Western cultures, merit is a driving factor in evaluating ability.[9] This makes economists hesitant to propose the possibility of a recession, as the personal consequences of being incorrect are too great. These differing perspectives resulting from culture are an element of ourselves we cannot remove, and this means our scientific knowledge will always be culturally influenced to some degree.

[6] Psychneuro. "Culture's Influence on Perception." *On Psychology and Neuroscience*, On Psychology and Neuroscience, 18 Feb. 2016, https://psych-neuro.com/2016/02/17/cultures-influence-on-perception/.
[7] Paniagua, Freddy A. "ICD-10 versus DSM-5 on Cultural Issues - Freddy A. Paniagua, 2018." *SAGE Journals*, SAGE Journals , 7 Feb. 2018, https://journals.sagepub.com/doi/10.1177/2158244018756165.
[8] Shaw, Adam. "Why Economic Forecasting Has Always Been a Flawed Science." *The Guardian*, Guardian News and Media, 2 Sept. 2017, https://www.theguardian.com/money/2017/sep/02/economic-forecasting-flawed-science-data.
[9] Mandelbaum, Michael. "In Defense of Meritocracy." *American Purpose*, American Purpose, 25 Oct. 2021, https://www.americanpurpose.com/articles/in-defense-of-meritocracy/.

Affecting every aspect of our lives, culture becomes intricately tied with the production and acquisition of knowledge. Understanding the influence of culture on knowledge allows us to evaluate the objectiveness and thus accuracy of certain knowledge, leading to a deeper understanding. Someone living in an area where culture fails to play a dominant role in day-to-day life may argue that culture lacks significance, or someone who experiences multiple cultures and declares them to be relatively similar. However, even minute cultural differences affect most areas of knowledge, with the exception of mathematics.