Dependence of Mathematical Knowledge on Culture

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10. Is knowledge in mathematics and other Areas of Knowledge dependent on culture to the same degree and in the same ways?

Knowledge in mathematics and other areas of knowledge is dependent on culture in the same ways, but not to the same degree, with a few noteworthy exceptions. Mathematics has proven to be highly accurate from the time it began to be studied and put to use. However, knowledge from mathematics can be derived only if the cultural setting encourages it, and only if this knowledge and understanding promotes development of the culture. This makes mathematics more dependent on culture when compared with other areas and fields of knowledge. Although knowledge in other areas of knowledge is also dependent, to an extent, on culture in the same ways as mathematics, the degree of dependence is found to be much lesser than that of mathematics. Cultural needs bring about an interest and curiosity to develop mathematical knowledge, and although this is the case with other fields, the extent to which these fields are dependent is not as large as it is in mathematics.

In order to accurately answer the question at hand, we begin with the rather over-generalized premise that for any area of knowledge to develop and progress, the presence of interest and curiosity is unconditional. We then proceed to look at early mathematics, its development and the factors that gave birth to its rise and maturation. Was culture a prominent factor? We run into problems with this because there is no easy way to recognize culture as a factor, and even if we do, it is difficult to gauge its importance. Time acts as an obstacle to our knowing because mathematics has been practiced for time immemorial. Questions of validity and reliability spontaneously arise when looking at *anything* in a historical perspective. However, it is possible to look at the birth and rise of *modern* mathematics, analyze its factors and extrapolate these results to ancient mathematical development.

In probing for a connection between knowledge and culture, we may ask ourselves a set of simple and relevant questions whose answers have the potential of providing better insight into the problem: a) Can culture provoke interest and curiosity? b) Can culture hinder interest and curiosity? c) Are there any noticeable similarities/differences in the relationship between culture and other

areas of knowledge, and between culture and mathematics? The answers to all of these questions are certainly, yes! What then is it about the nature of mathematical knowledge that makes it so susceptible to cultural influence, especially in terms of content and acquisition? Will Durant notes that "as soon as a field of inquiry yields knowledge, it is called science."[1] Mathematics is a branch of science too. Thus without an "inquiry" or an active pursuit of knowledge—triggered by inquisitiveness and guided by curiosity—mathematics will have never attained the level of supremacy it enjoys today. This may be a debatable conclusion, but it nevertheless helps demarcate, among others, the influence on mathematics as caused by culture.

Counter-claims exist that it is not the cultural desire to enhance mathematical knowledge that led to its development, but rather its usefulness and consistency. Necessity leads to invention, no doubt, and this necessity can by all means be a cultural one. Early arithmetics enabled commerce; consequently, a culture actively engaged in trade and banking will have a more defined set of mathematical principles. Cultural differences spur mathematical development in one environment and hinder it in an other. If for instance the study of genetics and the science of cloning can be shunned by certain cultures, why cannot a similar cultural clash inhibit or promote mathematical knowledge? Sadly, the above counter-claim fails to justify the existence of pockets of "mathematically-intelligent" cultures as well as terminally "mathematical-illiterate" cultures.

A fine example would be that of the Egyptian culture. This rich and reputed culture had the practice of burying the dead in tombs, which were in a giant triangular-like structure called a pyramid. The building of pyramids, no doubt, called for an in-depth understanding of geometry and motivated Egyptians mathematicians to discover the properties of pyramidal structures. On the other hand, if the Egyptians, like most other cultures, simply buried the dead five-foot under the ground, they would not have any urgent need to understand and develop their mathematical knowledge in this fashion.

Now that we have established the exact relationship between mathematics and culture, we can proceed to compare the degree of dependence on culture between mathematics and other areas

[1] Durant, Will. *The Pleasures of Philosophy*. **http://www.willdurant.com/pleasures.htm**. Retrieved January 22, 2005.

of knowledge. Admittedly, the dependence of knowledge in culture is less evident in the current world, mostly because knowledge and information are shared so openly among the various cultures in the world. In assessing this dependence, it may be wise to once again ask ourself a pertinent question whose answer may shed some light on the problem at hand: Do the specific culture's practices and beliefs have any effect in the amount of knowledge they gain from the different areas of knowledge? The problem with ascertaining the correlation between culture and knowledge is that some areas of knowledge are far more evenly spread out than the others. Dr. Brian Donohue-Lynch comments that "cultural evolution (eg. from barbarism to civilization) [has prompted] humans to devise countless ways to catalog human diversity. Most often these supposed patterns reflect judgements in relation to one's own cultures' beliefs and practices."[2]

An all important question to answer is: would development in any area of knowledge break down if culture did? If it did, we can then conclude that there is an indubitable bond between knowledge gathering and culture. If obtaining knowledge from any area of knowledge simply slowed down as a result of culture break-down, then the degree of dependence is not as definite. In the realm of mathematics, it is the culture's historical background, its beliefs and practices that determine the degree of reliance. For example, a more architecture-oriented culture is likely to have a much wider set of mathematical principles than a culture which isn't. This claim is exemplified by the fact that when the Mogul emperor Shah Jahan decided to build the Taj Mahal, his architects and engineers had to first study the mathematics behind domes, and also required to have an elaborate knowledge on the various conic sections. We can attribute this finding to the Mogul culture, and the emperor's specific practice of honouring the dead. Indeed, these kind of examples are numerous in our own history. The ancient Babylonians had a better understanding of contemporary mathematical principles. Why? Because their cultural and geographical setting required them to tame rivers and the devastating floods caused by them. This incited a need to engineer canals and dams which could not have been possible without an in-depth understanding of mathematics. It is this cultural necessity that motivates and spurs people to augment their mathematical knowledge. Does the same thing happen with other areas of knowledge? Why, yes! Archaeology would be nowhere today

[2]Donohue-Lynch, Brian. *Types of Cultures*. **http://www.qvctc.commnet.edu/brian/typcult.html**. Retrieved January 22, 2005.

had cultures decided it was “unethical” or “injudicious” to unearth the dead. Astronomy was this close to being dismissed as a crank due to the then prevailing culture’s anti-zealous preponderance. But is it to the same degree that this reliance on cultural needs, beliefs and practices exists for areas of knowledge excluding mathematics? I would argue not.

Drawing from personal experience, I have noticed that my interest and curiosity in mathematics may be, loosely speaking, attributed to my ancestors’ cultural practice of working as accountants under the rich land-owners. Bookkeeping was almost always the default profession, and accountants often had to perform several calculations in their heads instantly. This incited them to devise clever mathematical “short-cuts”, observe patterns and use nature as a calculating tool. Furthermore, our culture’s religious practices require us to repeatedly chant mantras on a day-to-day basis as part of a routine. This encourages us to memorize objects and lists *by rote*, whilst people foreign to our culture might to do it in other ways. These are just a few of a plethora of instances where culture and cultural practices promote the development of a specific area of knowledge, while hinder others and cause people to disregard the rest. There is thus an untold dependency between culture and knowledge, and although this dependence occurs in the same manner, it is clearly evident, as elicited by my argument, that it is not to the same degree. At the same time, it is important to note that culture can have an influence only in various *areas of knowledge* but not in various *ways of knowing*.

As is the case with every theory of knowledge argument, we also have exceptions to this claim that ‘cultural dependence occurs in the same ways, but not to the same degree.’ Art, for example, is one of the oldest areas of knowledge that is still extant today. Drawing, painting, sculpting and other forms of art are highly dependent on culture in the same ways as mathematics: they are both driven by necessity, beliefs, practices, curiosity, inclination and affinity. But an important difference is that art would *not* break down if culture did. This, I assert, is not the case with mathematics. If culture broke down, there would be little or no motivation to further one’s mathematical knowledge. He would be much like an unemployed carpenter who sees no immediate need to enhance his toolbox.

Knowledge in mathematics and other areas of knowledge are thus unarguably dependent on cul-

ture for their improvement. Although knowledge in other areas of knowledge are dependent in the same ways as is knowledge in mathematics, the extent and degree of this dependence is far greater. Mathematics without culture would form as incomplete a picture as man without society.

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