"Bias inevitably affects knowledge construction." How far do you agree? [RI Promo 2022]

The problem of bias in knowledge construction has plagued many fields of knowledge for centuries, so much so that the word itself is almost synonymous with unreliability in many contexts. Bias — the introduction of subjectivity into knowledge construction — would cast doubt on many conclusions that we presently deem as objective and reliably obtained.¹ While some sceptics argue that subjectivity and bias are inherent and inevitable parts of knowledge construction, I ultimately contend that the degree to which bias can be eliminated depends on the field of inquiry: while it is completely absent from mathematical knowledge, it cannot be eradicated from scientific and social scientific inquiry.²

Mathematics is the clear outlier among the numerous fields of knowledge: few complaints of bias (if any at all) are heard within the mathematical world. This is due to the unique nature of mathematical knowledge that precludes subjectivity: it is analytically and deductively obtained. First, mathematical truths are necessary ones that simply could not be otherwise, eliminating the possibility that the subjective beliefs of the researcher have slipped into the process of knowledge construction. "1+1=2", for instance, is a necessary truth, since negating this mathematical statement would result in a contradiction — since 2 is defined as the sum of 1 and 1, there is no logically consistent universe in which summing 1 and 1 would not yield 2. In this manner, mathematical truths are universal for all because they are often analytic, leaving no room for any individual researcher to introduce his personal biases — even if a researcher was personally convinced that "1+1=3", he would not be able to prove or construct this knowledge claim without encountering a web of contradictions.³

Additionally, mathematical knowledge is deductively obtained: if the basic axioms of mathematics are granted, some mathematical truths will be obtained for certain

¹ Good clarification of what "affects" means.

² Clear stand.

³ Ok...

without any possibility of bias. For instance, if we accept the basic definition that even numbers are divisible by 2, the sum of 2 even numbers will be even, as proven below:

Consider x and y as two even numbers. They can thus be expressed as x = 2a and y = 2b, where a and b are integers. Hence, x+y = 2a+2b = 2(a+b). Since a+b is an integer, x+y is divisible by 2, and is even.

In this manner, there is no room for subjective interpretation in mathematical inquiry — even a biased researcher would be forced to admit that based on the fundamental axioms governing mathematics, certain deductively derived propositions are necessarily true. Thus, bias can be completely eliminated from mathematical inquiry.⁴

However, we can be less sanguine about eliminating bias from science and social science⁵ — it appears that despite our best efforts, biased results continue to plague these fields. Scientific inquiry encounters the problem of confirmation bias-the human brain is hardwired to selectively consider evidence that fits the conclusions one wants to arrive at. For instance, Blondlot — eagerly desiring a scientific breakthrough after his colleagues in Germany discovered X-rays — believed he saw a corona around certain crystals in his laboratory, leading him to mistakenly declare that he has discovered N-rays, a new type of radiation.⁶ In this manner, the subjective desires of scientists continue to affect what they observe, leading to biases in knowledge construction.⁷ Further, scientists often have to subjectively interpret the implications of their results given the Duhem-Quine problem - given that a potential piece of evidence could falsify either the main hypothesis or the underlying assumptions that undergird the hypothesis, scientists have to determine (according to their individual biases) what the evidence indicates. For instance, when scientists detected anomalies in Mercury's perihelion that did not match the predictions of Newtonian mechanics, they predicted a new planet Vulcan instead of questioning the principles of Newtonian physics they had grown up to trust. Hence, the element of subjective interpretation remains inextricable from scientific knowledge.⁸ In the most extreme cases, scientific knowledge can be laden with theoretical assumptions from a scientist's own paradigm

7 How so?

⁴ Ok.

⁵ Try to be less of a storyteller and take more of an argumentative approach (for your topic sentence).

⁶ And did he? Close the loop.

⁸ Can be better phrased to match the point you are making.

— the very terms used to define a particular discovery are imbued with biases and preconceived notions about how the world works. For example, after oxygen was discovered, it was first named "dephlogisticated air" since scientists believed in that paradigm that combustion would use up phlogiston, tainting their understanding of this new element they discovered.⁹ In this light, biases seem to pervade scientific inquiry.

Of course, scientists have devised ways of averting or correcting these biases¹⁰ — we have created new, precise scientific instruments that overcome the subjectivities of human perception. Colorimeters, for example, enable an objective determination of the colour of a substance by examining the wavelengths of light absorbed, thus minimising the effects of a biased scientist-observer. Additionally, biased results have been tossed out of science: Blondlot's N-rays were rejected after his results could not be replicated, and similar claims of cold fusion and MMR vaccines causing developmental disorders like autism have similarly been discredited by replication studies.¹¹ However, the process of peer review is far from perfect — an ongoing replication crisis exists in medicine, with some studies finding that over half of results in medical literature cannot be replicated, casting doubt on whether bias has been completely eliminated from science.¹²

Bias is perhaps the hardest to eliminate in the social sciences: a myriad of cognitive biases limit the objectivity of social scientific research.¹³ First, the Hawthorne effect plagues social scientific inquiry: studies have found that test subjects change their behaviour when they know they are being studied. For instance, researchers at the Hawthorne Works initially found that almost any change in lighting improved worker productivity, before subsequent analyses revealed that it was their presence that resulted in the improvement. Hence, the ability of researchers to access impartial knowledge — free from subjects' preconceived perceptions of the researcher that shape their behaviour — is doubtful. Further, test subjects are highly sensitive to subtle differences in question order and phrasing — a 1950 study found that Americans are much more likely to support letting reporters from communist nations into their country if the question was preceded by one about communist nations letting American

⁹ And so? Did it affect anything else? Flesh out implications.

¹⁰ Why do we want to correct / eliminate bias?

¹¹ Ok.

¹² Ok. Implications?

¹³ Avoid the example-driven approach! Focus on argument.

reporters in. Additionally, an Oxford study found that individuals — after reading the same vignette of an attacker — were more condemnatory of his behaviour if he was called a "terrorist" rather than a "shooter".¹⁴ Hence, the minute biases of researchers — affecting how they craft, order and phrase questions — will shape the way test subjects respond and taint the knowledge they construct.¹⁵

Of course, social scientists have also found ways of overcoming these biases — anonymous surveys help to minimise the Hawthorne effect when test subjects know they cannot be identified and using different versions of the survey with varying question order helps researchers detect potential order effects. However, the overwhelming variety and number of potential biases — and the dual sources of bias from both researcher and test subject — make bias hard to eliminate completely. This is why psychology — along with many other social scientific fields — faces a similar replication crisis.¹⁶

However, even as scientific and social scientific knowledge is inevitably laced with bias, this does not mean that they cease to be reliable enough to be trusted — "bias" cannot be confused as a synonym of "unreliable".¹⁷ It is undeniable that scientific knowledge has offered highly accurate predictions — Boyle's law, even though it may not be completely bias-free as it is laden with existing theories about gases, remains 99.9999% reliable as it attains a standard deviation of 5 sigma in experiments. Similarly, while metrics like the Consumer Price Index (CPI) involve subjective judgments regarding what goods and services to include (e.g. haircuts or Internet broadband), it remains a reliable marker of inflation¹⁸ — its movements have largely represented the price fluctuations experienced by ordinary households. Hence, bias does not render the bulk of scientific and social scientific knowledge unreliable.

In sum, whether bias can be eradicated from knowledge construction depends on the field — while entirely possible in mathematics, bias-free knowledge perhaps remains an elusive ideal in the sciences and social sciences. That said, they remain reliable

¹⁴ And what has all this got to do with bias? Make the links more explicit.

¹⁵ Is bias avoidable? Does it inevitably affect knowledge construction?

¹⁶ Hasty and unsupported.

¹⁷ Ok, why?

¹⁸ How so? How is bias mitigated such that knowledge still remains reliable?

fields of knowledge with substantial predictive accuracy, which means the inevitability of bias is perhaps not the crisis that sceptics make it out to be.

Score

AO1: 12/15 AO2: 8/10 AO3: 5/5 Total: 25/30

Comments

A very good response here. There is good awareness of the different kinds of bias present in knowledge construction, and you were able to illustrate these well. However, while there was an attempt to comment on how bias can be mitigated, it was insufficient. And there was still a lack of engagement on whether the effects of bias on knowledge constructions are inevitable. Pay more careful attention to the question prompt.