TOK Essay 2022

Word count: 1588

Is there solid justification for regarding knowledge in the natural sciences more highly than knowledge in another area of knowledge? Discuss with reference to the natural sciences and one other area of knowledge.

Knowledge is the understanding of a subject matter gained through education or experience[1]. Through knowledge we can understand concepts and apply them to different situations and areas of knowledge.

To address the chosen title, natural sciences can be analysed vis-a-vis the more subjective human sciences. This choice is driven by my higher level subject choices for IBDP. Studying both the natural sciences (Physics and Chemistry) and human sciences (Economics), it is useful to explore which of these areas of knowledge can be more highly regarded. From my perspective, knowledge in the natural sciences may be regarded more highly than in other areas of knowledge. But when can this premise be justified and on what basis? **Is there solid justification for regarding knowledge in the natural sciences more highly than knowledge in the human sciences?**

After analysing key elements of the question such as, what constitutes 'solid justification' or how we may interpret the phrase 'more highly', a few examples will be explored to evaluate the premise for justifying and regarding knowledge in the natural sciences 'more highly'. For balance, an example of knowledge in the natural sciences will be compared with an example of knowledge in the human sciences.

Moving on to the different elements in the question, 'justification' is to demonstrate something as reasonable or true[2]. Justification varies for each person as one may have different beliefs, opinions and values to someone else. What appears true or reasonable to one, may not to another.

Therefore the word 'solid' is important because it allows us to understand that the boundaries of the question are more towards objectivity rather than subjectivity. This solid justification may be achieved through evidence for example, in order to regard one stream of knowledge more highly. Moreover, for 'solid' justification, one can consider the 'a priori'[3] assumption that assumes that knowledge is gained solely through theoretical means as opposed to observation.

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[1]"Knowledge Definition & Meaning." *Merriam-Webster*, Merriam-Webster, www.merriam-webster.com/dictionary/knowledge.
[2]"JUSTIFICATION: Meaning & Definition for UK English." *Lexico Dictionaries | English*, Lexico Dictionaries, www.lexico.com/definition/justification
[3]"A PRIORI: Meaning & Definition for UK English." Lexico Dictionaries | English, Lexico Dictionaries, www.lexico.com/definition/a_priori.

The natural sciences such as Physics, Biology or Chemistry can be better suited to acquire evidence as hypotheses can be made and be experimentally tested. Through rigorous empirical processes, natural scientists are able to gather and develop scientific knowledge. In contrast, human scientists such as psychologists, economists or geographers often have to make generalisations with the facts available to them.[4]

Moreover, one can consider Karl Popper's falsification principle[5], a method that can be used to distinguish the evidence in the sciences from non-sciences. This principle essentially proposes that in order to prove a scientific theory, one should be able to test it and prove it false. For example, to falsify the hypothesis, 'all swans are white', one may observe a black swan.

The phrase 'more highly' is another subjective term that can have different interpretations and biases. For example, natural scientists may have a different opinion on what can be regarded more highly in comparison to human scientists or the public. There are different reasons for regarding something 'more highly' as well. For example, one may regard knowledge more highly based on utility while another may regard knowledge more highly based on the evidence that supports the knowledge. Based on what 'solid justification' might we regard knowledge in the natural sciences 'more highly'? Reliability? Quality? Usefulness? Results? There are a lot of subjective factors at play that can impact our opinions on the topic.

In the natural sciences, knowledge (once scientifically deduced), is more objective. For example, Newton's first law of motion, "an object will remain at rest or move at constant velocity unless acted upon by an external resultant force"[6]. After analysing different experimental setups, Newton was able to derive his laws of motion. In other different experiments, his laws were verified. Newton observed that bodies that do not experience a force will still come to a rest as a

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[4]Palat, Madhavan K. "Essay on Jawaharlal Nehru's Scientific Temper by Madhavan K. Palat." *Return to Frontpage*, The Hindu, 20 Dec. 2021, www.thehindu.com/society/nehru-did-not-set-the-natural-experimental-and-exact-sciences-in-opposition-to-human-sciences/article37988383.ece.

[5]Mcleod, Saul. "Karl Popper - Theory of Falsification." Karl Popper - Theory of Falsification | Simply Psychology, 1 May 2020, www.simplypsychology.org/Karl-Popper.html#:~:text=The Falsification Principle, proposed by,by observing a black swan.

[6]"Newton's Laws of Motion." *Encyclopædia Britannica*, Encyclopædia Britannica, Inc., www.britannica.com/science/Newtons-laws-of-motion.

result of having unbalanced forces acting on them including air resistance or friction[7]. Through the accumulation of scientific evidence (including empirical), one can regard knowledge highly.

In contrast, we can take a law from the human sciences such as the law of demand which states that, “there is an inverse relationship between the price of a product and its quantity demanded”[8]. This law consists of assumptions, including ‘the ceteris paribus’ assumption meaning all other things being equal and the assumption of a rational consumer. There will always be exceptions to the law of demand to hold true as a consumer may for example experience an increase in disposable income or will be willing to pay a high price for a product. Because assumptions have to be made for this law, the knowledge may be less reliable as it will not apply in all contexts.

In contrast, laws in the natural sciences will usually always apply once scientifically deduced from scientific method. Multiple trials can be conducted to minimise the impact of errors on the mean value of the collected data. If data has occurred consistently on multiple occasions, this can be classified as concrete/solid. Nevertheless, knowledge gained from scientific methods can also have some uncertainty due to uncontrolled variables and apparatus uncertainty.

On the other hand, there have been cases in the natural sciences where knowledge may not be regarded highly even though evidence exists. That is, the evidence may not constitute as solid justification for regarding it more highly. For example, dark matter is a concept that natural scientists say exists, but it cannot be observed. Natural scientists claim that this is a hypothetical phenomenon but still accounts for 85%[9] of the matter in the universe. Even though natural scientists say that there is evidence for this form of matter, “including gravitational effects that accepted theories of gravity cannot explain unless more matter is present than can be seen — imply dark matter's presence”[10], one may question the existence of dark matter, given that dark matter has never been observed.

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[7] “Law of Inertia.” *Encyclopædia Britannica*, Encyclopædia Britannica, Inc., www.britannica.com/science/law-of-inertia.
[8] “What Is Law Of Demand? Definition of Law Of Demand, Law Of Demand Meaning.” *The Economic Times*, economictimes.indiatimes.com/definition/law-of-demand.
[9] “Dark Matter.” *Wikipedia*, Wikimedia Foundation, 19 Feb. 2022, en.wikipedia.org/wiki/Dark_matter#:~:text=Dark matter is a hypothetical,the matter in the universe.&text=Because no one has directly,and radiation except through gravity.
[10] “Dark Matter.” *Wikipedia*, Wikimedia Foundation, 19 Feb. 2022, en.wikipedia.org/wiki/Dark_matter#:~:text=Dark matter is a hypothetical,the matter in the universe.&text=Because no one has directly,and radiation except through gravity.

Knowledge in the natural sciences evolves in light of available data. Looking at a recent example of coronavirus and its mutations, the natural sciences have been used to rapidly develop a vaccine. This security that the vaccines provide may be a reason to regard knowledge in the natural sciences highly.[11]

As new knowledge is acquired, knowledge from the natural sciences needs to adapt. What we know about something right now, may not hold true in the future. Paradigm shifts[12] occur in the natural sciences (ie. when is a change in the understanding of fundamental concepts). For example, the shift from the Ptolemaic system[13] (ie. where the Earth was assumed to be at the centre of the universe) to the Copernican system (ie. the Sun is at the centre of the universe). The adaptability and development of knowledge in the natural sciences may be a reason to regard the knowledge more highly.

This has been observed in chemistry as well, where with the acquisition of new scientific knowledge, understandings of concepts have changed. For example, the definition of the redox[14] processes changed over time. First defined through the changes of oxygen and hydrogen in a chemical reaction, then to the changes of electrons in a chemical reaction, and finally through oxidation numbers, our understanding of redox processes has evolved.

With that being said, knowledge in the natural sciences is still very much capable of developing with time. For example, our understanding of and ability to discover other planets is still limited and holds risks. The possibility of life on Mars is an example of a subject matter still unknown to us humans. Over time however, us humans will be able to strengthen our understanding of the universe and our solar system to allow for greater future benefit.

In the human sciences, there are often changes in perspectives for the application of theories. For example, in economics, there are two different economic perspectives, the Neo-Classical

[11]theoryofknowledgeanalternativeapproach, Author. *Theory of Knowledge: An Alternative Approach*, 18 Oct. 2021, mytok.blog/.
[12] "PARADIGM SHIFT: Meaning & Definition for UK English." Lexico Dictionaries | English, Lexico Dictionaries, www.lexico.com/definition/paradigm_shift.
[13]"Ptolemaic System." Encyclopædia Britannica, Encyclopædia Britannica, Inc., www.britannica.com/science/Ptolemaic-system.
[14] "Kognity." App, app.kognity.com/study/app/no-class/sid-48-cid-0/book/definitions-oxidation-reduction-id-2689.

and the Keynesian perspective[15]. Neo Classical economists believe in a free economy with no government intervention. A few decades later, Keynesian economics was adopted after the Great Depression by several governments. Therefore, human scientists also have to adapt their theories with time in order to fulfil in this case, the needs of an economy. Nowadays, most economies are a mix of Neo Classical and Keynesian economics (such as the US economy). The ability of human scientists to also develop theories to adapt to the needs of us humans (in this case an economy) can be used as solid justification.

To conclude, on the basis of scientific evidence, one can regard the knowledge in the natural sciences more highly than in the human sciences (which studies behaviour) where there is more uncertainty and predictions have to be made. Variables can be controlled in the natural sciences but in human sciences, more generalisations are made. Human sciences are also more subjective. However, so are the phrases ‘solid justification’ and ‘more highly’.

Furthermore, both the natural sciences and human sciences have evolved over time to adapt to human needs. The adaptability of knowledge in both these areas may be a reason to regard them highly.

Humans have gained so much through the natural sciences. From vaccines to buildings to technology. The utility we have gained from the natural sciences is immense. We have also been able to use human sciences to understand how humans behave. Nevertheless, there are justifications for not regarding the knowledge gained in these areas highly. Opinions regarding a certain stream of knowledge more highly than another will vary for everyone. Ultimately, it is of limited use to categorise or discriminate the knowledge gained in different subject areas as they all contribute to our understanding of the world.

[15]Team, The Investopedia. “Keynesian and Neo-Keynesian Economics: Know the Difference.” *Investopedia*, Investopedia, 8 Sept. 2021, www.investopedia.com/ask/answers/012615/what-difference-between-keynesian-and-neokeynesian-economics.asp#:~:text=Keynesian theory does not see,market as not self-regulating.

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