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**INTERNATIONAL BACCALAUREATE**

**THEORY OF KNOWLEDGE ESSAY**

*“The simplest explanation is the best explanation.”*

*Discuss the statement with reference to two areas of knowledge.*

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Clare Boothe Luce once said: *"The height of sophistication is simplicity"* (Luce, 1971), profound for its juxtaposition and consequently its emphasis on the definition of "simplicity". In layman terms, simplicity is usually linked to the ease of interpreting theories and concepts one is exposed to. On reading the title, it is important to address the subjectivity that lies in ascertaining which explanation qualifies as the "'best 'explanation". "Best" is judged subjectively by the interpreter, and is thus context-dependent. A scientific explanation given to an adolescent would be of lesser depth than one given to a scientist.

This emphasizes the importance of the concepts being explained and to whom, raising the question of: *What does "best explanation" mean in different Areas of Knowledge?* To answer this question, this essay explores the Natural Sciences and Human Sciences due to their contrasting nature of generating explanations, and concludes that both simple and complex explanations have unique utility, with the "best explanation" corresponding to the knower's purpose.

The prescribed title claims that simplicity is a relative characteristic of an explanation: one is "simpler" relative to another, inviting a comparison. The interdependence of the simplicity of an explanation to its interpretation implies that it is relative to the interpreter. Thus, I will be looking at simplicity from the angle of a practitioner in the relevant area of knowledge to avoid trivialising the title. In this context, the criteria with which I assess the "best" or most accurate explanation is how reflective and coherent it is of existing knowledge and additionally, its applicability to its relevant field to generate knowledge.

The purpose of the Natural Sciences is to discover the regularities and laws of nature – converting observations of one's surroundings into testable experiments in order to derive quantitative and qualitative evidence that supports hypotheses. Scientific practitioners employ the Scientific Method to examine scientific phenomena and is considered reliable for its independence of human preferences and dependence on empirical inquiry – i.e., different observers would arrive at the same results by replicating

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experiments. This suggests that scientific knowledge is objective, shared knowledge. The Natural Sciences can thus be termed reductionist (King, 1996). This means that it reduces a phenomenon to another theory by isolating an independent and dependent variable (lep.utm.edu, n.d.). This favours accuracy as a single and known variable carries fewer assumptions when generating knowledge since a causal link can be identified. For instance, in the HL Chemistry course we learnt two types of electronic configurations: the Neils Bohr configuration and the Aufbau principle configuration. The Neil Bohr's model is a series of numbers that represent the number of electrons surrounding the nucleus of an atom (*Oxygen: 2,6)* assuming a series of circular concentric energy shells (Abyss.uoredon.edu, n.d.). The Aufbau principle includes 4 letters for every orbital within an energy shell, that represents the distribution of electrons and shape of the orbital *(Oxygen:* $1s^2$, $2s^2$, $2p^4$*)* (Leon, n.d.). As the Aufbau principle carries fewer assumptions, it can be considered better and more 'complete' as it is reflective of and coheres to the knowledge of electron orbitals and energy levels. This renders the Neils Bohr configuration flawed and an oversimplification of the electron model. From a wider perspective, this could imply that all "simpler" explanations are oversimplifications of existing theories.

However, it is important to consider what would be the simplest explanation. A practitioner of the Natural Sciences would consider a 'simple explanation' one that encapsulates more theories. The combination of more theories implies that there are fewer assumptions, which associate to both 'more accurate', thus 'better', as well as 'simpler'. This is paraphrasing *'Occam's Razor,'* which states that an explanation requiring the fewest assumptions is most likely to be accurate (Hiroshi, 1997). What makes Occam's theory attractive to the Scientific Methodology is its use of reductionism: isolating and comparing variables to remove assumptions.

Generating knowledge in the Natural Sciences heavily relies on falsification. It allows for the fortification of theories with multiple experiments, and comparing the

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relevance and reliability of experimental conclusions to existing observations and theories. This is critical as, if conclusions do not cohere, it is not generating new knowledge. Therefore, to generate scientific knowledge a claim must be falsifiable. However, for a claim to be falsifiable, its assumptions must also be practical. An explanation with fewer assumptions has a thinner barrier from accurate knowledge, i.e., from being the 'best explanation'. Thus, the simpler the explanation, the easier it is to falsify. This implies that falsification, being vital to the Scientific Method, favours simplicity. This is evident in the field of Physics. Aristotle claimed that the Earth was made of 4 elements: air, water, fire and earth. Objects that were solid would have an affinity towards or 'destiny' to be with other solids, which was his 'simple' explanation for why solids fall to the ground and predicted that they fall at different rates. Galileo, in '*Galileo's Leaning Tower of Pisa Experiment'* (Mypages.iit.edu, n.d.) showed that all solids accelerate towards the Earth at the same rate, which "proves that Aristotle is wrong" (Stevin, 1961). However, Galileo assumed that air resistance was negligible. His new experimental results brought advancements in the underlying theory of gravity, falsifying Aristotelian Physics. This revolutionary shift in knowledge, or paradigm shift, was the consequence of the change in this methodology as it changed the dynamic of existing knowledge. Despite this change, the ability to experimentally show and replicate Galileo's findings implies that the Scientific Method favours simplicity.

After Newton worked upon Galileo's findings, i.e., built upon shared knowledge, he could better define energy and motion – causing the shift towards Newtonian Physics and Laws of Motion (Abyss.uoregon.edu, n.d.). However, Newton's Laws of Motions are not applicable for dimensional masses travelling near to the speed of light. This limitation is overlooked through the assumption of the system being isolated, and masses being 'point masses' travelling slower than the speed of light (Newtonian Mechanics, n.d.). Both Galileo's and Newton's assumptions are harder to falsify as they are more complex than Aristotle's assumptions: implying they are not as 'scientific' as Aristotle's theory.

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However, this is false as, in terms of generating knowledge in the Natural Sciences, both Newton's and Galileo's findings cohere better to existing observation and scientific phenomenon. This suggests that explanations are not interpreted in a vacuum, but instead with some intellectual background that must find relevance in the explanation, implying that the simpler may not always equate to accurate.

The purpose of the Human Sciences is to study, explain and predict human behaviour, such as in the field of Economics. However, unlike in the Natural Sciences, these predictions cannot possess universal laws without exceptions. In Economics, human behaviour is studied on an aggregate and is thus inherently a simplification. The methodologies in the Human Sciences cannot function without making assumptions on human rationality, their mental propositions and heuristic nature. Thus, as causal results, controlled variables, and empirical evidence are less relevant to the Human Sciences as they are to the Natural Sciences, practitioners must resolve to use statistics to interpret trends. The inherent uncertainties in predicting human behaviour are dealt with unfalsifiable assumptions. Though certain cases may be falsified using statistical trends, it is impossible to concretely determined how many are to be falsified to falsify an entire trend.

For instance, a familiar assumption to economists is *'ceteris paribus'* (Plato.stanford.edu, 2011), which states all external factors are 'equal'. This assumption is made to increase the practicality and utility of case studies and other research. Hence, "best explanations" in the Human Sciences differ from those in the Natural Sciences because, in the Human Sciences, "accuracy" is hard to define and achieve. The complexity of human beings is accompanied with innumerable variables that outweigh and variegate ideas of accuracy. In the Natural Sciences, fewer or no assumptions are preferred, whereas in the Human Sciences, assumptions are useful and preferred. This implies that it is through assumptions that simplicity is inculcated into the methodology of the Human Sciences. Like most theories in the Human Sciences, this calls for the

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discrepancy of whether variables share causation or correlation. This is impossible to determine as variables cannot be isolated and falsified, and are hence assumed to be “equal”. Therefore, in terms of knowledge generation, it is difficult to achieve “accurate” knowledge, but rather ‘applicable’ knowledge with the use of simple explanations of more assumptions, and a simpler methodology. The reliability of these economic models is always restricted to its inability to encapsulate the uncertainties and unpredictability present in individual human behaviour. Nonetheless, these trends and predictions have been proven useful in different fields, thus accepted for its applicability. This implies that the scope of the Human Sciences entwines simple explanations as the best explanation.

However, pragmatic economists and dogmatic scientists together cannot accord to considering the “best explanation” being the “simplest explanation”. The prescribed title overstates the question implying that it works over all areas of knowledge. However, it is shown to work differently within the Human and Natural Sciences. Applying this statement to other areas of knowledge that explore the interpretation of “best explanation” could lead to alternate conclusions, meaning the implication of “always” working is untrue. In conclusion, the “best explanation” circles back to the knowers and their purpose. If a general and superficial understanding or a basis for further understanding is seeked, simplest explanations are the suitable option. However, if one is in pursuit of a core understanding of a topic, to seek simplicity is rather contradictory and a more complex explanation is appropriate. Applying this to education systems, we should balance the simplicity and complexity of explanations to establish both a general and core understanding of the curriculum, most effectively teaching students.

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**Bibliography:**

Abyss.uoregon.edu. (n.d.). Bohr Atomic Model. [online] Available at: http://abyss.uoregon.edu/~js/glossary/bohr_atom.html [Accessed 4 Jun. 2017].

Abyss.uoregon.edu. (n.d.). Newtonian Physics. [online] Available at: http://abyss.uoregon.edu/~js/21st_century_science/lectures/lec03.html [Accessed 4 Jun. 2017].

Aether.lbl.gov. (n.d.). Aristotle's Physics. [online] Available at: http://aether.lbl.gov/www/classes/p10/aristotle-physics.html [Accessed 4 Jun. 2017].

Asimov, I. (1982). Asimov's biographical encyclopedia of science and technology. 1st ed. Garden City, N.Y.: Doubleday.

Halexandria.org. (n.d.). Assumptions. [online] Available at: http://www.halexandria.org/dward125.htm [Accessed 4 Jun. 2017].

Hiroshi, S. (1997). What is Occam's Razor?. [online] Math.ucr.edu. Available at: http://math.ucr.edu/home/baez/physics/General/occam.html [Accessed 4 Jun. 2017].

Iep.utm.edu. (n.d.). Reductionism | Internet Encyclopedia of Philosophy. [online] Available at: http://www.iep.utm.edu/red-ism/ [Accessed 5 Jun. 2017].

King, J. (1996). Reductionism. [online] Princeton.edu. Available at: https://www.princeton.edu/~freshman/art/reduction/reduction.html [Accessed 5 Jun. 2017].

Leon, N. (n.d.). Aufbau principle. [online] Iun.edu. Available at: http://www.iun.edu/~cpanhd/C101webnotes/modern-atomic-theory/aufbau-principle.html [Accessed 4 Jun. 2017].

Luce, C. (1971). Stuffed shirts. 1st ed. Freeport, N.Y.: Books for Libraries Press.

Mypages.iit.edu. (n.d.). Galileo and Free Fall. [online] Available at: http://mypages.iit.edu/~smart/martcar/lesson2/lesson2.htm [Accessed 4 Jun. 2017].

Newtonian Mechanics. (n.d.). 1st ed. [ebook] pp.91-96. Available at: http://vmm.math.uci.edu/ODEandCM/PDF_Files/ChapterFirstPages/Chapt4Frst6Pages.pdf [Accessed 4 Jun. 2017].

Plato.stanford.edu. (2011). Ceteris Paribus Laws (Stanford Encyclopedia of Philosophy). [online] Available at: https://plato.stanford.edu/entries/ceteris-paribus/ [Accessed 4 Jun. 2017].

Stevin, S. (1961). The principal works of Simon Stevin. 1st ed. Amsterdam: Swets & Zeitlinger.