**In Knowledge, there is always a trade-off between accuracy and simplicity’. Evaluate this statement with respect to two Areas of Knowledge’**

Elementary’[[1]](#footnote-1), Holmes exclaims. By this phrase, Conan Doyle suggests our protagonist finds simplicity in his accurate logical inferences. Conversely, as an IB learner, as I increase the accuracy of my knowledge of the world around me, I often find this new knowledge more challenging than what has gone before. It is this compromise to which I believe this question refers. Simplicity is a lack of complexity of knowledge, whether through an ease of understanding or lack of assumptions implicit within explanations. Accuracy is a measure of correctness of knowledge relative to what is actually true. I agree there is often a ‘trade-off’ between the characteristics, where it is only possible to gain an increase in one factor by compromising on the other. However, the extent to which this trade-off exists, and its outcomes in knowledge acquisition, may differ in the Human and Natural Sciences.

In the Natural Sciences, forming theories via inductive reasoning is a process where we simplify the complex nuances of the real-world to align with our limited human experience. Hence simplicity may limit the accuracy of scientific conclusions. When investigating the reactivity of tertiary haloalkanes for my Chemistry II, I noticed in my observations that increasing the ethanol concentration increased their hydrolysis rate. Applying inductive reasoning, I was certain that haloalkanes always reacted faster at higher solvent concentrations. I was reluctant to continue experimenting as it seemed self-evident this trend would always continue to hold true. Only after repeating my experiment in a non-polar solvent did I realise the true relationship was far more nuanced than I had previously imagined, as the opposite trend was now observed. This example shows a clear problem in induction: whilst I could be sure that that all the substances I had observed showed a trend, I could not be sure that this was always the case. By generalising without all future knowledge about potential exceptions that may arise, when forming inductive theories we sacrifice total accuracy for simplicity. However, as long as we are prepared to further refine our theories when new evidence arises, we should not abandon them altogether. In my opinion, scientific theories can still have great value when helping us to make predictions in the majority of cases.

However, a counter-claim is simplicity aids reasoning when gaging accuracy of scientific explanations. The simplicity principle states the simplest theory providing an equally acceptable explanation of experimental trends is ‘preferred’[[2]](#footnote-2). This was applied in Phlogiston’s refutation. Many once believed combusting substances gave off Phlogiston. [[3]](#footnote-3). As metals gain mass in combustion, if they simultaneously lost Phlogiston, the latter would require a negative mass. By the simplicity principle, it was concluded Lavoisier’s oxygen theory, which did not resort to this ludicrous assumption, whilst explaining the same experimental evidence, was more accurate. I think simplicity is desirable as scientists rely on empiricism; they verify their hypotheses through active experimentation. Simpler theories are likely to exist more within the bounds of experimental data. In contrast, as we move to more complex theories we are forced to make claims that are not fully falsifiable. We can test for oxygen but it would impossible to confirm Phlogiston’s negative mass to prove its existence. The greater falsifiability offered by simpler scientific theories means we can be more certain of their accuracy.

Moreover, when relaying shared knowledge to personal knowledge, language must be simplified to facilitate accurate understanding in Natural Sciences. In GCSE Biology, our sole teaching of respiration was the ‘oxidation of glucose to form cellular energy[[4]](#footnote-4). When moving to IB I became aware that this process was far more complex than I had previously learned, incorporating multiple intermediate stages. On learning this new information, I felt uncertain. It made little sense why my prior knowledge, having come from an authoritative source in my Biology teacher, seemed to contradict with these new teachings. Gaining a more accurate understanding of respiration at this higher level of complexity necessitated unlearning much prior knowledge, which was time-consuming. Hence, initially I felt simplicity had hindered accuracy of my personal understanding. However, I now believe this simpler explanation was important in providing a more readily comprehensible description of the basic principles of a process which would otherwise remained mired in unintelligibility. In turn, this simplification better prepared me to grasp the more accurate and complex explanations of respiration at a later stage. I think simplifying language is particularly vital in the Natural Sciences, where processes often require a great deal of prior terminology to understand. However, this simplified teaching must eventually yield to further complexities. Otherwise we might mistakenly believe in an overly simplistic view of the world and be left with minimal depth of understanding.

Whereas Natural Sciences seeks accuracy in understanding natural phenomena, the human scientist seeks to most closely understand human behaviour. Human Sciences’ models compromise on total accuracy through the use of assumptions. One example is rationality: that economic actors will work to maximise their private utility[[5]](#footnote-5). This assumption allows us to construct the simple Law of Demand: as price rises, demand of rational consumers, who only consume if their utility exceeds the price, will fall[[6]](#footnote-6). The assumption simplifies and unifies human behaviour. Conversely, if we had to consider how each individual consumer would react to a change it would be almost impossible to predict their future actions. Due to human variability, simplification through the use of assumptions is critical so predictions can be made.

Conversely, in ‘The Theory of the Leisure Class’[[7]](#footnote-7), the economist Thorsten Veblen somewhat refutes human rationality. He highlights that goods like luxury cars are ‘conspicuously consumed’[[8]](#footnote-8). They are a way for wealthy consumers to show off their economic power; hence their demand actually *increases* at higher prices. Whilst to an extent I agree simplifying human behaviour is necessary to enable prediction, we must be careful not to reduce human beings to the status of robotic, totally rational beings. As Veblen’s work shows, we can often be irrational and motivated by factors separated from reason like our social environment. Rejecting these factors by assuming rationality limits the accuracy of social scientific predictions by undermining the irrationality that makes us human.

According to the Verstehen position, the Human Sciences aims to understand social actions as understood by ‘‘agents’[[9]](#footnote-9)’ themselves. To gain an accurate understanding of human actions, we must trade simplistic statements of mechanical cause-and-effect and instead use emotion to empathise with the complexities of human motivations. Otherwise we might misunderstand what is truly going on. The sociologist Erving Goffman applied this position in ‘Asylums’[[10]](#footnote-10). Goffman studied mental institutions by immersing himself in the patients’ lives. He observed that when isolated in this state, patients would horde ‘everyday’[[11]](#footnote-11) items. Outwardly this behaviour might seem evidence of psychosis. However Goffman, applying the Verstehen approach, instead suggested that the patients’ behaviour was ‘eminently rational’[[12]](#footnote-12): they had been denied storage space and this was the only way to maintain some individual autonomy. This example shows that the sentient nature of humans means that simple empirical judgements of humans may be inaccurate. To gain a truly accurate understanding of human behaviour easy conclusions must be continually called into question, and we must empathise with humans to understand their complex motivations.

Conversely, emotional attachment in the Human Sciences can hinder accuracy of knowledge and limit objectivity. In ‘In Cold Blood’, the author Truman Capote aimed to delve into the psychological mind-set of the Clutter murderers. Whilst researching, Capote befriended the killer Perry Smith’; this close relationship may have undermined Capote’s credibility. For instance, in spite of the severity of Smith’s crimes, Capote still selectively focuses on his artistic side (describing his ‘beautiful penmanship’[[13]](#footnote-13)), to paint him as a troubled figure, undeserving of harsh punishment. Whilst emotion is undoubtedly important in connecting us with our human subjects, this example highlights how it is sometimes difficult to know whether empathy has truly led to a more accurate understanding. Emotion must always be tempered with factual evidence. In my opinion, Capote’s selective insistence of Smith’s sensitive side and his glossing over of his heinous crimes illustrates that here emotion has prevented an accurate and truly objective understanding of the whole situation being formed. Capote has attained not accuracy but instead a distortion of true reality.

Overall, I believe this statement has some truth in both areas of knowledge. Induction in the Natural Sciences involves a compromise of total accuracy for simplicity, which can be problematic as exceptions may arise in conflict with inductive conclusions. However as the example on simplified teaching shows simplicity can be beneficial in relaying complex scientific ideas. Similarly simplicity has been shown to aid reasoning when choosing between conflicting scientific explanations; here simplicity aids rather than limits accuracy. In Human Sciences, assumptions in modelling illustrate an example where we must trade total accuracy for simplicity. Although I agree this trade-off is necessary to allow for prediction we should take care not to ignore human irrationality. Although the sociologist Erving Goffman used emotion to empathise with his subjects’ complex motivations, I believe emotion must always be tempered by factual evidence. Otherwise we might generate inaccurate and subjective knowledge. Altogether, I would disagree that simplicity completely conflicts with accuracy but instead I believe the two can often co-exist. In my opinion simplicity is like zooming out of a detailed map: it enables us to see the rough boundaries of knowledge more clearly, reduces confusion, and provides an overview of what there is to know. As long as we can recognize its limitations and are determined to strive for more accurate knowledge when necessary, I believe simplicity can aid accuracy of knowledge.

Word Count: 1600

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