**"The role of analogy is to aid understanding rather than to provide justification." To what extent do you agree with this statement?**

An analogy is a comparison between objects that highlights respects in which they are seemingly similar, and thereby extending attributes of the source object to the target object. Analogies are commonly relied upon to aid understanding (Brown and Salter, 2010), i.e. clarify concepts. Conversely, using them in the process of justifying knowledge is quite uncommon; however, analogical reasoning—thinking that relies upon analogies—has been suggested as a plausible method of justifying knowledge (Bartha and Paul, 2019). Justification is harder to define, since it could entail proving something using logic and established facts or showing that something is true using subjective personal knowledge; an ambiguity which will be considered. Finally, "rather" insinuates that there is a clear distinction between these independent roles, implying that analogies can only be used for one role over the other; however, this may not always be the case. This essay will explore the function of analogies in these two roles within Religious Knowledge Systems and Natural Sciences.

Due to the existence of complex phenomena within Natural Sciences, scientists and teachers employ analogies to simplify abstract concepts, making them easily comprehensible (Brown and Salter, 2010). When learning about electrical circuits in IB Physics, our teacher analogised the circuit to a pump that pushes water through a closed pipe. Through imagination, we linked the flow of water to the flow of electrons, helping us understand circuit components. This representation of electron flow helped us understand concepts like voltage, current and charge. The analogy aided our understanding of the previously unfamiliar concept of circuits as we employed our memory and sense perception to apply our pre-existing, concrete knowledge of water in pipes to a more complex target domain which possessed common attributes with the analogue, thus allowing for comparisons to be drawn.

While analogies may be useful in aiding understanding of scientific phenomena, it remains a fact that almost all analogies suffer from limitations and, as such, could lead to misconceptions regarding the analogue. Considering the aforementioned analogy, it simplified electrical circuits—a concept which is abstract and mathematically complex. However, in doing so, certain characteristics were omitted. For example, the water analogy fails to clarify distinctions between series and parallel circuits or explain alternating current. As such, relying on analogies could impede the acquisition of valid knowledge since they simplify and do not fully reflect the analogue. Although they share common attributes, not everything about the two is the same, possibly leading to misunderstandings. Therefore, an implication is that it may not be advantageous to rely upon an analogy in aiding understanding if it is bound to later hinder and limit such understanding, possibly leading to misconceptions.

On the other hand, it is rare for analogies to be used in justifying scientific phenomena. This is because Natural Sciences, according to philosopher Karl Popper, are built upon the theory of falsifiability (Shuttleworth and Wilson, 2008). The nature of science is to renew itself as it is a dynamic process; the understandings that underlie ongoing research evolve and develop, and theories may be falsified and superseded by newer ones which provide more plausible explanations. In Natural Sciences, knowledge is created through the testing of hypotheses—predictions based off observations or theoretical concepts. In formulating hypotheses, the convention is to make them as falsifiable as possible—that is, they must be phrased in such a way that an experiment can be designed to prove them wrong (Tsokos, 2014). Failure to disprove a hypothesis would then provide evidence for the knowledge claim being made. Consequently, laws and theories can be developed to justify these phenomena, creating shared knowledge. As such, using analogies to provide justification for a scientific phenomenon is somewhat preposterous, due to the knowledge framework of the Natural Sciences.

That being said, analogical reasoning may result in the formation of plausible hypotheses which possess a degree of credibility, making them worthy of investigation. Consequently, this could allow for such hypotheses to be tested and validated, resulting in new, justified scientific knowledge. In the 20th century, it was observed that when light was shone on a metal surface, electrons were ejected; however, the frequency and energy of the electrons did not match the theoretical prediction at the time: that light behaves like a wave (Photonterrace.com, n.d.). The observations alluded to light behaving like a particle, since its behaviour was reminiscent of the properties of particles. Therefore, by analogy, this guided scientific discovery by pointing scientists in certain directions. This phenomenon—known as the photoelectric effect—allowed scientists to consequently develop the idea that light consists of photons (particles) with quantised energy, and that it can behave both as a particle and a wave (Einstein and Infeld, 1938). From this analogy and postulation, the field of quantum physics emerged, leading to a paradigm shift away from classical mechanics to the probabilistic nature of quantum mechanics. Although the use of analogy did not directly nor independently lead to the justification of this discovery, it helped shape the pathway of new shared knowledge.

Conversely, analogies are used within religious knowledge systems to justify new rulings regarding prevailing issues. In Islamic jurisprudence, the two main sources of law are the *Quran*—a holy book—and hadith—prophetic narrations (Alwazna, 2016). When these sources fail to explicitly mention a ruling for an Islamic issue, particularly a modern one which did not exist when the *Quran* was revealed, it may cast doubt within the Muslim community. In such cases, Muslim scholars refer to *Qiyas*—a form of analogical reasoning—in order to deduce and justify 'objective' laws which are (arguably) free of unsystematic opinion. This method involves extending the ruling of a precedent to a new problem, provided that the two share the same effective cause—that is, a specific set of circumstances that trigger the law into action (Esposito, n.d.). An example of this is the prohibition of drugs such as cocaine (Islam Online Archive, n.d.). Although the consumption of drugs is not explicitly mentioned

within the *Quran* or *hadith*, the consumption of alcohol is, and it is explicitly prohibited in the *Quran* because it intoxicates one's mind (Esposito, n.d.). Therefore, according to *Qiyas*, and using inductive reasoning, drugs such as cocaine would also be prohibited, since they are intoxicants. Muslims are obliged to abide by any rulings obtained through means of *Qiyas*, as there is consensus amongst scholars regarding its validity as a source of law (Abbah, 2013). As such, in a religious context, analogical reasoning can provide justification for new shared knowledge.

Furthermore, analogical reasoning can be employed to 'justify' God's existence. Abu Hanifa, during the 8th century, was regarded as one of the wisest Muslim scholars. One day, when challenged to a debate by an atheist regarding the existence of God, he deliberately arrived late to the Royal Palace, where the debate was held. The Caliph inquired about his lateness. He explained that when he arrived at River Tigris, there were no boats to take him to the other side. While waiting, a tree fell and cut itself into planks of equal length and width. The planks suddenly came together and formed a boat which drifted towards him, allowing him to cross the river. The atheist was confused, saying that the story was childish and ridiculous. Of course, that did not actually happen, however it was then that Abu Hanifa cleverly utilised an analogy, replying: "If you cannot believe that a boat came into being without a boat maker, then this is only a boat, how can you believe that the whole world, the universe, the stars, the oceans, and the planets came into being without a creator?" That marked the end of the debate, and the atheist was convinced (Karl, 2012).

In this case, a hypothetical analogy was used to argue for and justify the 'preposterousness' of the atheist's claim regarding God's inexistence, implying that there is 'certainty' about it; knowledge which was obtained through sense perception of nature and analogical reasoning. This real-life situation is particularly interesting because it shows how analogies can be hypothetical, and not based upon true events, in order to 'justify' knowledge. Furthermore, it introduces nuances in the

interpretation of ‘justify’. In religion, knowledge is heavily (but not solely) reliant upon faith. Therefore, from a Muslim’s perspective, the level of justification needed to substantiate a pre-existing, established ‘truth claim’ would significantly differ from the level of justification required in Natural Sciences, whereby objective testing and validation is required. While Abu Hanifa’s analogical argument may possess sufficient strength to convince some atheists of the existence of God, it’s not universally accepted as unequivocal justification, due to the diversity of peoples’ faiths and the existence of other beliefs. This contrasts Natural Sciences, whereby the justification needs to possess a much greater degree of sophistication for a claim to be widely accepted as shared knowledge. As such, shared knowledge of what ‘justifying’ entails can differ between areas of knowledge, suggesting differing roles of analogies in justification.

In conclusion, analogies in the Natural Sciences usually aid understanding—but could suffer from limitations—over providing justification, although they could lead to the discovery of justified knowledge. Conversely, in Religious Knowledge Systems, they are more often used to provide justification for rulings and to present arguments for the existence of God, although this justification seems to be tenuous when viewed from an objective, universal perspective. However, I disagree with the statement in the title as it tries to limit the role of analogies to simply aiding understanding over providing justification; it is somewhat reductionist to favour one role over the other due to the complexity of analogies. It is possible for analogies to serve in the two roles simultaneously and act as helpful tools in our acquisition of knowledge about the world, whether that would be through aiding understanding or through providing justification.

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