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"The Doubter is True Man of Science"

(UPSC CSE 2024)

Introduce the over all topic

If asked how to define science, many of us would undoubtedly answer that it is an objective method of discovering certainties about the world. But science cannot provide certainty because doubt is so fundamental in science that it makes its theories tentative and subject to revision with new findings. Moreover, scientific knowledge with doubt is constantly evolving as new research and approaches emerge.

State the relevant Information

But doubt does not build trust, nor does it help people's understanding. Therefore, the question arises why should people trust a process that always requires a disturbing state of uncertainty without providing concrete solutions?

Thesis Statement

Indeed, doubt may be disturbing but it also motivates us towards better understanding and develop innovative ideas. Doubt provides the person of science with an approach that requires changing our understanding of the natural world when new evidence emerges from experiment or observation. From this point of view, the French physiologist Claude Bernaud expressed that "the doubter is the true man of science; he only doubts himself and his explanations, but he believes in science".

Body Paragraphs

Body Paragraph -I

a. **Topic Sentence-** Doubt is a tool in science.

b. **Analysis and Explanation-** Healthy skepticism and questioning are crucial for scientific progress. It signifies that scientific inquiry thrives on challenging assumptions, testing theories and seeking evidences rather than accepting ideas at face value. Doubt act as a catalyst for innovation and deeper understanding by preventing intellectual stagnation and pushing for more accurate explanations. The history of science is filled with examples of how doubt has led to significant advancements.

c. **Supporting Material-** For instance, Charles Darwin's theory of evaluation was initially met with skepticism but ultimately revolutionized our understanding of biology. While doubt is essential, its important to maintain a balanced approach.
d. **Closing and Transition Sentence-** Scientific progress requires both the willingness to question and the ability to be confident in well supported findings.

Body Paragraph -II

a. **Topic Sentence-** Doubt is a crucial in science.
b. **Analysis and Explanation-** Doubt is a crucial in science as it feels inquiry, prevents intellectual stagnation and drives the pursuit of knowledge through rigorous testing and revision. It encourages questioning challenges assumptions and promotes the search for evidences ultimately leading to a more accurate understanding of the world.
c. **Supporting Material-** The transition from Newtonian physics to Einstein's theory of relativity demonstrates, how doubt can lead to revolutionary changes in scientific understanding.
d. **Closing and Transition Sentence-** Doubt should be balanced with humility, acknowledging the limits of current knowledge and the potential for future discoveries.

Body Paragraph -III

a. **Topic Sentence-** Doubt plays a crucial role in challenging and advancing scientific norms.
b. **Analysis and Explanation-** It derives scientific progress by encouraging intellectual humility promoting deeper inquiry and ensuring that knowledge remains adaptable. The scientific method itself is built upon skeptisim encouraging the questioning of established norms and assumptions. Doubt encourages scientists to question the status quo including established theories and acceptable knowledge. It fosters a mindset that values evidence over assertion is essential for navigating mis-information and making informed decisions.
c. **Supporting Content Material-** Examples include, Galileo Galilei questioning the geocentric view of the universe, Charles Darwin challenging the immutability of species, Einstein doubting the completeness of Newtonian physics.
d. **Closing and Transition Sentence-** These scientists doubts and questioning led to revolutionary changes in our understanding of the universe life and physics.

Body Paragraph- IV

a. **Topic Sentence-** Uncertainty presents challenges requiring man of science.
b. **Analysis and Explanation-** Embracing uncertainty is a crucial aspect of scientific progress allowing for open enquiry and the advancement of knowledge. Doubt when healthy can drive scientific exploration leading to new discoveries and a deeper understanding of the natural world. However, uncertainty also presents challenges requiring man of science to critically evaluate information and understand the scope of contextual knowledge. This is a fundamental part of the scientific process, where doubt is used to push boundaries and discover new understandings.
c. **Supporting Content Material (with closing sentence)-** For instance, man of science use error bars in graphs and confidence intervals in statistical analysis to express the degree of uncertainty in their measurements acknowledging that the true vale may fall within the range.

Body Paragraph- IV

a. **Topic Sentence-** Self doubt can paradoxically be a driving force in science.
b. **Analysis and Explanation-** Self doubt can paradoxically be a driving force in science, promoting scientists to delve deeper, question assumptions and strive for improvement, ultimately leading to innovation while it can also lead stagnation and hinder progress, particularly if its unchecked or interpreted as a sign of failure. Fear of failure can lead man of science to avoid taking calculated risks, hindering their ability to make impactful discoveries.
c. **Supporting Content Material-** While self doubt can contribute anxiety and making it difficult to focus on research but it can also be a powerful driving force in science, particularly when it is change into critical thinking, creativity and perseverance.
d. **Concluding Sentence of the paragraph-** Therefore, it is essential to manage self doubt, turning in into a tool for growth and discovery rather than barrier of progress.

Body Paragraph- V

a. **Topic Sentence-** Distinction between Doubt and disbelief.
Analysis and Explanation- Moreover, self doubt is not about doubting science itself, but rather about doubting one's own understanding of it and it is not static in nature like disbelief which often resistant stance that can hinder scientific progress. Doubt is a temporary state of uncertainty a questioning of a belief. Further, doubt is a crucial part of the scientific method encouraging further investigation and revision theories.

Disbelief on the other hand can be a barrier to scientific progress particularly when its driven by factors outside of scientific evidence. This is why, the man of science naturally harbour doubts, which drive then to question, investigate and refine their understanding of the natural world and lack of scientific literacy and misinformation is the key reason of disbelief.

b. **Supporting Content Material (it is also a closing sentence)-** For example, various sources refusing to get vaccinated against COVID disease were often based on misinformation and unsubstantiated claims about vaccine safety and effectiveness while on the other hand man of science asked questions regarding the elements of vaccine and their consequences on human body, because the need for man of science to continuously practice in scientific investigation even when they seen to be well established.

Body Paragraph- VI

a. **Topic Sentence-** Doubt is the factor of invention.
b. **Analysis and Explanation-** Italian astrologer Galileo Galilei once said, "Doubt is the father of invention." Doubt is one of the factors which can influence the expansion of knowledge through questioning established ideas and norms in crucial for sparking innovations and progress.

   Doubt sometimes tends to call on reason and somehow encourages people to hesitate before acting or belief, which implies that a willingness to doubt what is commonly accepted can lead to new discoveries and innovations.
c. **Supporting Content Material (it is also a closing sentence)-** For example, in atomic model theory Bohr state that electrons in atom move is shells around the nucleus which contains protons. But since he invent it, many scientists feel doubt with the law and try to argue and invent law by the improvement of scientific revolutionary as the feel uncertain towards Bohr's result.

   Similarly, Charaka and Sushruta, ancient Indian physicians challenged mythological explanations of diseases and sought to understand their cause and treatments through observation and experimentation. Their doubts about the established beliefs led to advancements in medicine and a more scientific approach of discoveries. Their writings are considered foundational texts in Ayurveda and explore various aspects of medicine, including anatomy pathology and therapeutics.

Conclusion Paragraph

On the whole, phrase emphasizes that the true man of science is not someone who simply accepts information blindly, but one who actively questions, explores, and attempts to refine knowledge through skepticism. Doubt is not a symbol of ignorance, but rather it is a reflection of the scientific spirit that drives us to discover the truth through rigorous testing and refinement of theories. By embracing doubt, the man of science creates an environment where new ideas can be discovered and tested, leading to breakthroughs and advancements in various fields resulting in innovation.

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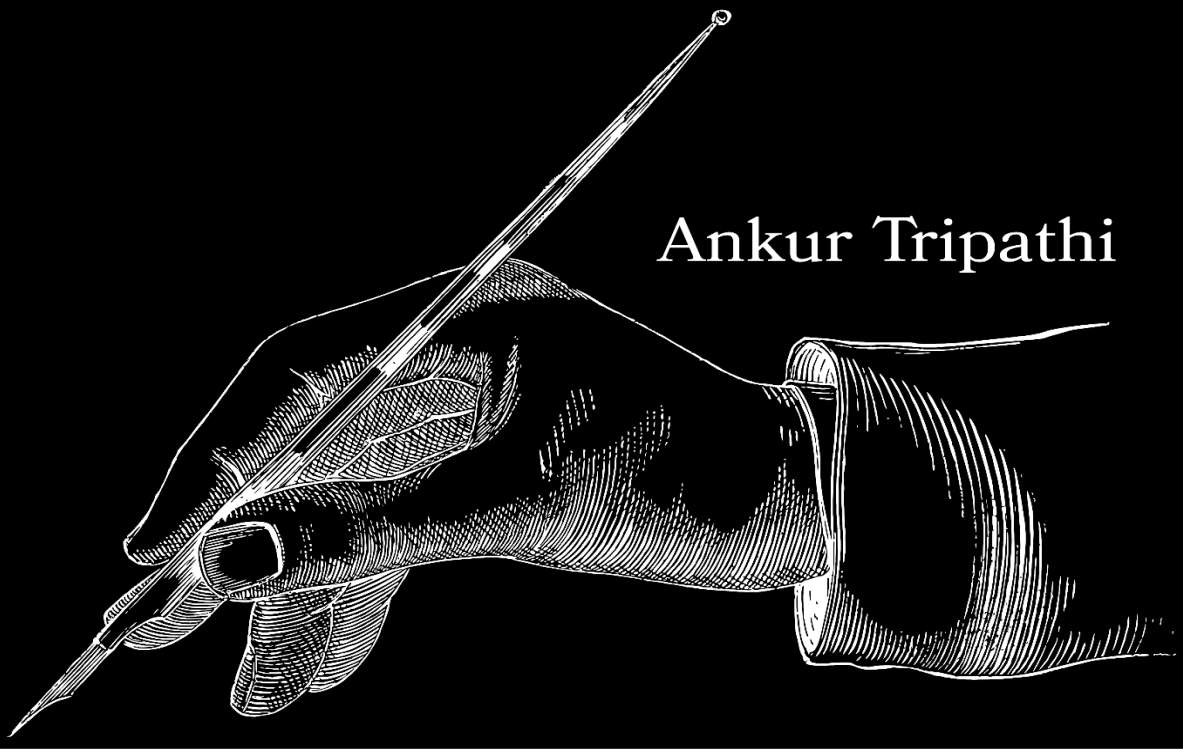

Ankur Tripathi

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