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Logical Reasoning including Mathematical Reasoning: Practical Problems and Possible Solution

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ABSTRACT

Logical reasoning in any form is an important aspect of life; it is persuading or convincing others with logic through writing or speech, for example, scientists, politicians, businessmen, financiers, solicitors and many others do this. This paper points out the frequent inefficacy of logical presentations, arguments and debates per se in bringing about the correct and wonted outcomes. It describes the scenario of people frequently involved in fruitless arguments and debates, and shows why the application of logic, for example, in logical argument or debate, could not often achieve the desired outcomes, much of the time ending up with frustration, unhappiness, bad feelings and poor relationships. Scenarios from mathematics, which probably represents the most rigorous form of logical reasoning, and science are described as well. The paper also delves into the problems encountered in logical reasoning as well as some modes of reasoning. It would be difficult and might be impossible to reason with and convince someone with a closed mind-set, someone who has made up the mind not to be convinced, or even someone who is not intelligent enough to be convinced. The paper presents a resolution to this serious problem, which is important, as that would be conducive to peace and harmony.

KEYWORDS: Deduction; debate; solution; future.

1. INTRODUCTION

All living beings, including animals, insects, and even bacteria and viruses, exhibit intelligence. Human beings evidently have much greater ability to make deductions or inferences, to perform the act of logical reasoning, which could be regarded the highest form of intelligence possessed by a living being, which makes them special and superior to all the other forms of life.

Human beings need to inter-act and cooperate with each other to survive and thrive, the more intelligent the person is the more able he is to survive and thrive, by adapting to his environment through the use of his intelligence. The ability to think logically and solve problems with logic is highly valued in society. It is this ability that helps society to progress. It is also this ability that could bring problems as when it is not used properly and wisely, whereby there would be arguments, disputes and conflicts.

Logical reasoning is the art of arriving at the correct conclusion. It is a highly valued skill which everyone would like to have. It is an important aspect of intelligence. The intellectual is the person who is recognized as having an abundance of this ability, being able to analyze things deeply and brimming with ideas. How well people, for example, intellectuals such as scientists, mathematicians and other professionals, make use of logic would determine how well society would progress. How badly people fare in this area would lead to problems and retrogression.

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2. UTILIZATION OF LOGIC

Logical reasoning abides by a widely accepted set of rules which are evidently correct, at least to those who accept the rules - which implies there might be others who do not accept these rules. For example, it might appear obvious that the following deduction is correct: If *Event A* causes *Event B*, and if *Event B* then causes *Event C*, then *Event C* is also caused by *Event A*. However, some not intelligent persons or some overly-intelligent/smart-alecky persons (who might, for example, confidently state that *Event C* above could happen independently of *Event B* though giving the impression of being caused by *Event B* and hence *Event A*) could possibly find logical reasoning such as this incomprehensible or unacceptable. And there could be much arguments and disputes over such logical statements. Logical deduction is the act of arriving at a correct conclusion, though correctness itself here might be contentious. In other words, what is evidently logical to some persons might not be logical to some others. There are evidently much of such disagreements and disputes in everyday affairs. Even the more objective and exact hard sciences, for example, mathematics and physics, are not untainted by disagreements and conflicts of views. For the case of mathematics, which could be regarded as an exact science that uses the purest and most rigorous form of logic, a proof to, or argument supporting, a mathematical statement has to be water-tight and examined with a fine-toothed comb by the mathematical community in order to be acceptable. Despite this, there have been controversies and disagreements among working mathematicians, who might have different thoughts on mathematics, for example, there is the Intuitionist school, which does not approve of the popularly used proof by contradiction, which is an indirect proof, in mathematics - in the proof by contradiction, also known as *reductio ad absurdum*, the proven absurdity or impossibility of a mathematical statement implies the truth of its opposite. One might claim that since mathematics is an exact science mathematicians should be thinking alike in one exact way, which unfortunately does not turn out that way. The various schools of mathematical thought, for example, Logicism, Intuitionism and Formalism, evidently interpret mathematical logic and mathematical philosophy differently.

It is with abstract entities, for example, relationships between objects which could not be easily visualized, or, physically sighted (seeable or in the state of being tangible), or quantified, that present the greatest difficulties in logical reasoning. The reverse is true for visualizable, tangible and quantifiable entities. For example, if we say that *3* is bigger than *2* which is bigger than *1*, and hence *3* is bigger than *1*, this statement would be obviously and incontrovertibly true, because *3*, *2* and *1* could be easily visualized and are quantities - countable objects. But a smart-aleck could disagree with this statement by differently interpreting this statement as not valid when viewed as follows: *3* (peanuts) is bigger than *2* (apples) which are bigger than *1* (elephant), and hence *3* (peanuts) is bigger than *1*(elephant). This might be deemed an ingenious, out-of-the-box or unusual interpretation. In the case of the famous long unsolved mathematical problem, the twin primes conjecture, for example, mathematicians find it extremely challenging to prove that there is infinitude of twin primes. Infinity is an abstract and unquantifiable attribute. How do we prove infinity when it could not be quantified, that is, it could not be counted or measured, and could not be physically sighted, that is, it is not tangible? (Infinity is in fact just an abstraction, without any material or physical reality.) Isn't it thus very difficult if not impossible to prove the infinity (something which is very abstract and without physical existence) of the twin primes in the infinite list of the integers? Summing up, we re-iterate that logical reasoning involving quantifiable (countable or measurable), visualizable, concrete or tangible objects would be evidently easier, while that involving qualitative or more abstract entities would encounter more difficulties. In the physical sciences, for example, physics, chemistry and biology, unlike in mathematics, logic alone would not suffice, and physical evidence or experimental proof would be needed to back up the logic.

3. DIFFICULTY OF LOGICAL ARGUMENTS OR DEBATES

We here consider how logical reasoning in the form of argument or debate often pans out in everyday life. (The author brings up this subject due to his own prior bad experiences with it.) One who asserts a logical statement and was sure of its correctness might think that the other party was not intelligent enough to comprehend the logic of the logically correct statement if the other party did not agree with the statement. But the "not intelligent" party himself might think that it was he who was wrong about the logical statement he asserted. What would happen if another person, even an apparently highly intelligent person, sided with the "not intelligent" party and claimed that the said logical statement was wrong? Wouldn't the intelligent person asserting the logical statement have some doubt about it now? Who was really logically correct and who was wrong? How could this impasse in logical argument or debate, which is evidently a frequent occurrence that causes frustration to the concerned parties, be resolved? Both the disputing parties each thought he was right, which is the problem, as only one of them could be right, or, in some instances, both could be wrong. As is often said of such a situation: They might argue till the cows come home but nothing would be resolved. Out of frustration, either or both parties might finally declare there is no point arguing if it is not leading to an agreement.

A resolution for conflicts of views is presented below.

4. CONCLUSION AND RESOLUTION

Though logical argument or debate is aimed at convincing intelligent or logical persons about certain logical statements or facts, it might fail to attain this objective, and the person who asserted the logical statement might be made to feel doubtful. To this end logical argument or debate has frequently failed. Logic might be regarded as a set of rules which are to be followed in order to arrive at a correct, valid conclusion, though these rules might be subject to various interpretations, which is actually the problem, besides the abstractness, tangibility or quantifiability of the subject. One should of course only attempt to convince the other person with one's logical reasoning if only one is confident that the latter is intelligent enough to understand it and objective enough to accept it, taking into consideration that the person might have negative emotions, egoistical feelings and prejudices. It is ineffectual and unwise to reason with a person who is mentally defective or prejudiced unless the reasoning is simple enough and comprehensible to him or he is prepared to abandon his prejudices. In other words, argument and debate should be carried out wisely and cautiously. There is no point in winning the argument by making the other party feel foolish and unhappy, thereby losing his respect and support. The argument should be respectful and sincere and should make the other party convinced and supportive of one's ideas. If the other party displays a closed mind-set, a mind stubbornly made up not to be convinced, refrain from argument would be the right course of action. On the other hand, when logic fails, emotional appeal might work, for it could be negative emotions which are blocking the other party's receptivity to logical argument.

There would be at least two groups to pay attention to, one group which is amenable to logical reasoning and the other group which is not amenable to logical reasoning due to the reason(s) given above. The serious problem concerns how to deal with this group which is not amenable to logical reasoning, for which a solution would be of some importance.

The consequences of failed logical reasoning could be frustration, misunderstanding, offence, unhappiness, feeling upset, possibly leading to loss of friendship, enmity and even violence, for example, quarrels and fights, which seem to be frequent occurrences. At the broader level, when countries fail to convince each other with logical reasoning, argument or persuasion, the outcomes could be serious, for example, conflicts and wars.

There are of course courts of law and arbitration centers (as well as mediation centers, for the disputing parties who do not wish to have rulings forced on them) for resolving conflicts and disputes. But for many disputes recourse to such avenues for resolution might be too much of a hassle, time-consuming and costly. It is the practice for logical statements, ideas or hypotheses to be reviewed, confirmed and approved by the relevant experts or specialists, that is, successfully passed through the review or investigative process, whether by a judge or jury in a court of law, a commission of inquiry or panel of experts in the investigation of an accident or disaster, the review by experts of a journal article, etc. But all this might be too time-consuming and not too practical, and the final assessment might be considered partial and unfair. A more practical, quicker and really impartial resolution might be necessary.

Person-to-person communications when settling differences are often fraught with emotions and suspicions. The disputing parties, and also the arbitrators to the disputes if there are any who might be deemed partial or unfair, might have axes to grind, some ulterior motives, the suspicion of which by the concerned parties leading to distrust. A non-emotional, non-human, but highly intelligent entity would be the ideal one to diffuse and resolve the situation. This entity could be a logical calculator or a conflict-resolution-logical computer which receives input (premises) and produces a logical output or conclusion, which would be totally impartial, fast and acceptable to the concerned parties, similar to the common calculator whose numerical computations no one doubts or questions and whom everyone totally trusts and depends on in their everyday life. This could be the savior of our world which is torn by differences and conflicts. There might be people who are skeptical and who scoff at this notion of a super-smart and super-efficient arbitrator. There are already computer programs for computers to draw and paint, compose poems and music, play chess with a chess grandmaster and win, and prove mathematical theorems, which are all highly complex activities. A logical calculator is therefore not a far-fetched possibility. There is one great advantage in this powerful artificial intelligence. While assessments from the human arbitrators, judges, experts, specialists or reviewers are likely to vary and also likely to lead to claims that some of the assessments are unfair, as some of these human assessors might be more strict or more lenient than the others, the logical output or answer from the logical computer would be standard and uniform for the same input or scenario and no one could complain about unfairness. If this "pacifier" were available, peace and harmony would likely prevail. We could then expect to live in a better world.

Though it might seem like science fiction, there is the possibility that in the future a very powerful computer or artificial intelligence might control the world. There has been some speculation by a number of artificial intelligence experts that one day human work would be made redundant by artificial intelligence. There seems to be some fear that in the future human beings would not only be displaced by artificial intelligence but would become their slaves. That is, human beings would then have become out-reasoned or outsmarted by artificial intelligence who would perhaps have become many times smarter, for example, one thousand times smarter than human beings.

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