

## RESEARCH ARTICLE



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## An Alternative Perspective of Science: Relevance of MK Gandhi's Views on Science

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### Abstract

**Objectives:** It is commonly misunderstood that Mohandas Karamchand Gandhi was against science and technological progress. This study shows that Gandhi conceives human life holistically and he analyzes various aspects of life as interlinked sub systems of an organic unit. Gandhi views science as a social enterprise and envisages the role of science for pursuit of truth, and as instrument for social reconstruction. He fathoms the potential of science to reduce socio-economic divide and as emancipatory agent to decimate discrimination based on caste, gender, region, religion etc. **Methods:** This study has used interpretive methods of research. The writings of Gandhi have been deeply explored and extract which show his understanding about science have been analysed in present context. Analysis of Gandhi's concerns about science have been done through perspectives of many scientists and philosophers. **Findings:** Gandhi never loses the focus on historical contexts of science in which science has been unfortunately used to propagate oppression and tyranny. Gandhi views science as power of knowledge which breeds wisdom and liberates us from various constrictions. Besides, he also conceive it as dangerous endeavour which can threat survival of humanity. He expects science to pay immediate attention to the issues affecting human beings. **Application/improvements:** The holistic conception of science as human endeavour interlinked with other spheres of life would enable teachers and students to look at science from broader perspective. Teaching methodology of science can be improved locating science in social context.

**Keywords:** Science; Research; Language; Learner; Humanity

### 1 Introduction

Science has certain specific characteristics which distinguish it from other disciplines define the nature of science. Although there are various aspects of science which link it to other spheres of human life. This holistic conception of science leads our path

how to engage with science. Science can be understood from various perspectives, levels and domains. Most commonly, science is viewed as a body of knowledge comprised in textbooks and journals in form of facts, definitions, concepts, theories and principles. The science is understood as a process of inquiry. Learning of science involves various processes of observation, measurement, classification, inference which enable a learner to undertake scientific inquiry in everyday life. The third aspect of science is development of scientific attitude in learners. Scientific thinking promotes learner to analyze, explore and evaluate in empirical manner. Gandhi goes beyond and include science as way of doing in every sphere of life. Gandhi has spoken or written many times critiquing science mostly with thought provoking arguments. He was not against science in totality but only de-humanising aspects of science. There is need for paradigm shift to comprehend Gandhi's understanding of science from perspective of sustainability of human beings than seeing him only through Western scientific progress paradigm. Gandhi sought to evaluate all spheres of human life and how these aspects impact each other. Gandhi keeps human beings at center and hence justice cannot be done to Gandhi if science is kept at center rather than human beings. Karl S. Popper's views about science can help in understand the inhibitions about science expressed by Gandhi. Popper says that people at a particular time are, "prisoners caught in the framework" of their theories, expectations and language. However, people can break out the framework any time only to enter into another framework rather broader. Popper admits the difficulties of discussion between people belonging to different frameworks, "But nothing is more fruitful than such a discussion; than the culture clash which has stimulated some of the greatest intellectual revolutions". Popper says that it is always possible to critically compare, "the competing theories" or "the competing frameworks" and to deny this would be a mistake<sup>(1)</sup>. These new insights enable us to demystify the myths about Gandhi as an anti-science person and reposition him in a different framework.

## 2 Conception of Science

Gandhi had a broad conception of science. He includes even the fields which ordinary people think out of purview of science. He gives value to the experiments done in various fields of human enquiry if done adopting scientific outlook. He considers, "fasting and prayer a science" himself a specialist of on the basis of, "[his] experiences in this particular field"<sup>(2)</sup>. Gandhi considered charkha [spinning wheel] as grand and noble science. He calls it grand as more closely a person studies it more, he discovers more in it. Gandhi calls it noble as "it touches millions of people" and has "universal application"<sup>(3)</sup>. He invokes collaboration of imminent scientists to give attention to charkha as they would give to their other experiments in laboratories. Gandhi pays "humble tribute to the spirit of research" but he clarifies that his, "complaint is against the direction" which this spirit had moved and not science<sup>(4)</sup>. He praised Marconi who improved upon and, "made wireless communication possible"<sup>(5)</sup>. Gandhi declared openly that he was not opposed to the rapid progress of science as people thought. Instead, he admired, "the scientific spirit of the West" but on the other hand he also criticizes it for ignoring morality or God. He particularly detests vivisection as, "unpardonable slaughter of innocent life" of animals in the name of science<sup>(6)</sup>. Gandhi invoked the scientists to acknowledge faults of and put limitations on the prevalent methods of pursuing knowledge. Gandhi reproduces an extract of Anton Chekhov to exhibit his own understanding of science, "When science and art are real, they aim not at temporary and private ends, but eternal and universal"<sup>(7)</sup>. These humanistic domains must have aim to seek truth as well as meaning of life. Gandhi's concern was that scientists work hard for search of scientific knowledge without foresight of its long term effects. The use of nuclear weapon in second World War has made scientists to think about their ethical responsibilities. Presently, one-fourth of scientists worldwide are working for weapons technology for the sake of national security or for huge monetary benefits from sale of arms. A large number of scientists are also engaged in highly funded research related to social issues like AIDS and cancer<sup>(8)</sup>. The rest of scientists working in academic or research institutions work for advancement of knowledge in their specialized fields immersed in laboratories or libraries distancing themselves from social concerns. Gandhi warns that "scientific truths and discoveries should first of all cease to be the mere instruments of greed"<sup>(9)</sup>. Gandhi calls for evaluation and assessment of social impacts of applications of scientific research in science establishment.

## 3 Learning of Science

Gandhi advocates experiential learning which is integral part of learning science. He was a staunch promoter of learning by doing. He can be considered as precursor of renowned American educationist John Dewey in activity-based learning. Dewey says that learning by doing helps in formation of abstract ideas more quickly through concrete experiences connected with real life. Gandhi gives importance of learning science through craft. In Gandhian plan there is no fear as due to fear, "an activity ceases to be educative"<sup>(10)</sup>. Hands on experience stimulates students' creativity and reflective thinking. These build students' confidence in handling real life situations through testing of application of concepts of science. Gandhi aims at developing psychomotor domain which would help in development of cognitive domain. Gandhi applies learning by doing in Indian context. He refutes the idea that, "intelligence can be developed only through book reading" rather he states, "the quickest

development of the mind can be achieved by artisan's work being learnt in a scientific manner"<sup>(11)</sup>. Learning of craft facilitates learning of science and makes a person capable of earning his livelihood. Gandhi also aims at making learners socially useful and productive persons through inculcating in them respect for manual labour. Gandhi envisages craft as method of extending control over limbs further to control over senses to help a person in spiritual progress.

Experiments are integral to science learning. Learning happens more naturally through watching demonstrations and doing experiments. Gandhi has realized relative importance of theory and practical knowledge. Gandhi expresses his understanding of basic nature of science as a discipline in which, "theory alone is of no value...(without) practical knowledge"<sup>(12)</sup>. He believes in inquiry and discovery approach. He invokes scientist and science teachers to develop low-cost experiments to make learning of science more interesting. Students loose interest in science without adequate experiments. He recalls his own school days where he lost interest in chemistry due to lack of practical experiments. Although later he finds that chemistry, "ought to have been a deeply interesting study"<sup>(13)</sup>. Dr Kalam says that doing science experiments bring clarity of abstract ideas. He further emphasizes that actual industry experience is much more valuable. He finds that as an engineering student trainee, "hands-on work on aircraft engine overhauling was very educative. When a principle learnt in the classroom is borne out by practical experience, it creates a strange sense of excitement —akin to unexpectedly running into an old friend among a crowd of strangers"<sup>(14)</sup>. Gandhi wants to link the theory, experiments and workplace to make learning of science better. Gandhi says that a teacher must possess the spirit of science and become collaborator of students in teaching learning process. He also advocates research also to be collaborative domain between scientists and common people, and among scientists and other professionals. Science is now understood as, "a socially distributed cognitive process"<sup>(15)</sup>. Gandhi views spinning wheel as an instrument which can be used to generalize many concepts of science. Gandhi believes in learning through apprenticeship of crafts. Later his wisdom was developed as educational concept, "cognitive apprenticeship emphasizes generalizing knowledge so that it can be used in many different settings"<sup>(16)</sup>.

## 4 Language and Learning Science

Gandhi finds that complicated languages in text books become hinderance for learning. The onus of simplifying the language to the level then comes on teacher. Many of students' conception are found to be different from those in textbooks. Socio-cultural and environmental context also affect learning of science. Gandhi was aware of foreign language as medium of instruction perpetuating, "incalculable intellectual and moral injury to the nation"<sup>(17)</sup>. Dr APJ Abdul Kalam his assessment finds that Tamil, "is internationally acclaimed for its clear-cut logic"<sup>(18)</sup>. He is optimistic about the capacity of this language to take science fully into its purview. Dr Kalam's confidence in his mother tongue was enhanced after he won first prize from a Tamil weekly for an article related to making of indigenous aircraft. Gandhi thinks that develops his cognitive domain much faster and can express better in his mother language instead of foreign language. The students also face difficulty in continuing higher education. Many students who have creative abilities to become scientist are not able to clear entrance examinations conducted by elite institutions due to language barrier of English. English language sometimes sows seeds of distrust towards indigenous culture and traditions in students' minds. Gandhi urges teachers and students to learn science through vernacular. However, he never rejects adopting foreign words when technical necessity demands, but he urges that the explanations must be given in vernacular<sup>(19)</sup>.

## 5 Science and Research

Gandhi's criticism of science leads towards generating alternative practices of science. He advocates various fundamental changes in institutional set up to promote learning of science from basic level to post graduation level. He postulates his ideas about science in purview of his non-violence stance. He focuses on various aspects of science i.e. criteria for choosing subject of research, practice of science, code of ethics for scientific worker etc. Gandhi's aim of science was clear, he expected scientists to contemplate how their work is going to help the weakest and the poorest people. Gandhi vies scientist for linking internal research to external research. Internal research means to communicate scientific ideas in layman's language to discuss societal and moral aspect. He invokes international community to work towards world peace with scientific precision and more patience. Scientific research is justified as quest for truth to know the world and as provisioner of practical or utilitarian means to improve physical conditions of life<sup>(20)</sup>. Gandhi adds third justification of ethics to scientific research so that its benefits can reach masses. He labels all research as useless without internal research which would link scientists' hearts with those billions of people. Gandhi announces the touchstone of ultimate goal of welfare of the poor for research. Gandhi chastises that without this aim the scientific research establishments would be, "no better than Satan's workshops"<sup>(21)</sup>. Gandhi took interest in scientific research especially affecting common man. He sent a questionnaire to many well-known chemists and doctors to obtain, "the chemical analysis and different food values" of jaggery, sugar, rice and other food items. Gandhi appreciated their timely response, but they had confessed that in some matters there had been no research. Gandhi found it tragic that no scientist

was able to give him , “the chemical analysis of such a simple article as gur (jaggery)”<sup>(22)</sup>.

## 6 Critique of Science

Gandhi shares his experiences and apprehensions about medicine that it enters a house never to leave. Gandhi cites various famous doctors to highlight the faults of medical science. He studies views of imminent medical professionals and finds that it is most dishonest profession. People are forced to pay 36 to 336 times of actual cost of medicine. He gives emphasis on capabilities of nature care and immunity of individual beside expertise of physician. More people die in hospitals due to medicines more than due to famines and wars<sup>(23)</sup>. Gandhi concludes after analysis of views of famous doctors that medical science is altogether imperfect and most of it based on guess work or hypotheses. He thinks that every individual is a, “unique organism” and no remedy can be, “universally applicable”<sup>(24)</sup>. Gandhi views human body as complex ecosystem. Later, Dr Alexis Carrel Gandhi’s ideas, “Disease is a personal event. It consists of the individual himself. There are as many different diseases as patients”<sup>(25)</sup>. The latest understanding about human body endorse Gandhi’s assumptions, “Inside your body is a jungle, with an enormous number of species living and dying and competing for resources. And those species have a serious impact on your body and health”<sup>(26)</sup>. The stomach in itself is a complicated ecosystem. Gandhi regarded the use of atom bomb on Hiroshima and Nagasaki as, “the wholesale destruction of men, women and children as the most diabolical use of science.”<sup>(27)</sup>. Gandhi finds non-violence as antidote to atom bomb. Peterson confirms Gandhi’s apprehensions more elaborately and questions the lofty aims of science, “scientists poured their talents into nuclear, biological, and chemical weaponry, pharmaceuticals of questionable value, toxic fertilizers, pesticides, herbicides, food additives, and other products of commerce rather than into scientific insights”<sup>(28)</sup>. He further says that scientists are not enthusiastic in social issues like criticizing tobacco industry even with common knowledge that smoking causes cancer. Gandhi points out limitation of science on religious and ethical matters. He says that he never had been, “able to use (science) for controlling (his) senses”<sup>(29)</sup>.

## 7 Towards New Hopes

Gandhi wanted spiritual wisdom to guide and help in progress of science. He also advocated establishment of scientific research institutes. Swami Vivekananda told Jamshed N Tata that it easy to bring technology but science needed to be researched indigenously. Tata thus founded Indian Institute of Science at Bangalore<sup>(30)</sup>. Gandhi although criticizes the use of atom bomb, he never loses hope, “atomic energy, though harnessed ... for destructive purposes, may be utilized by other scientists for humanitarian purposes”<sup>(31)</sup>. Gandhi believed in simplicity of solution to human problems in cost effective and ecological ways. He did not want to bring man to machine but to reach machine to man. He clarifies that his aim was, “not at eradication of all machinery, but limitations” on use of machinery<sup>(32)</sup>. Gandhi inspired many scientists and other professionals. British born architect and missionary, Laurie Baker MBE made India his home inspired by Gandhi. He worked for rural development focusing on providing low-cost housing. He established COSTFORD, the Center of Science and Technology for Rural Development in Kerala in 1970 to pool local talents and raw materials to turn low-cost house concept into reality<sup>(33)</sup>. The Research & Development teams of industry giants like General Electric (GE) now acknowledge the need of, “learning the virtue of simplicity” to redesign “overengineered products” to reach the masses. They have transformed the bulky ultrasound machine to Vscan which is “as compact and simple to use as a cellphone”<sup>(34)</sup>. Gandhi stresses on organic or natural fertilizers to improve fertility of soil. He firmly believes in practicability of sustainable agriculture. Gandhi is not limited to conservation of soil but also calls for replenish its organic health. Gandhian vision is proved by practice of millions of farmers globally who employ ecological agriculture methods. These farmers discover that, “as soil degradation is reversed, yields continue to rise”<sup>(35)</sup>. Gandhi viewed science as new hope even in the field of religion. In his discussion with world renown scientist Sir C. V. Raman, Gandhi was convinced that science can lead humanity towards spirituality and universal brotherhood<sup>(36)</sup>.

## 8 Conclusion

Gandhi did not oppose science but he was against scientism sweeping away humanity. He understood that it is irrational to ignore science but it is more irrational to ignore humanity for science. He was concerned about the direction of progress of science which would endanger humanity. Gandhi sees science in broader context of humanity and more particularly from colonial perspective. He gives substantial arguments based on undeniable facts that science had been used to bring inequality and oppression of men by men. He views scientific superiority of West as a tool for perpetuating racial discrimination. Gandhi expects that science must be used to solve problems human beings are facing, to bring out truth, to save environment and to help in spiritual progress of mankind. He however does not support the use of science as an instrument of exploitation, capitalist domination, destruction of war, lust for opulence and advancement of cut throat competition to dominate. Much of Gandhi’s

critique of science is embedded in his critique of modern civilization. Gandhi thus finds defects in practice or use of science not in science. He raises fundamental questions for long term survival of mankind than merely mesmerized by scientific progress. His wisdom about strategies of learning science is still relevant.

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