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CHAPTER 8

Physics Education to Develop the Society and Education

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Abstract:

Wild humans' journey to becoming social beings is based on their understanding of physics. From the use of fire to the use of 5G, physics is the torch bearer. Without physics, the human world is immovable today. The study draws society's attention to the importance and development of physics from the very beginning of the human species to today's superfast age of globalization. In the later part of the study, the matter of discussion is how Bengal has participated in developing the Physics study in time spaces. The development of Physics can contribute to society and the nation. Hence, it is prescribed that physics teaching from schools to universities, from science seminars to space research, should get more importance and dedication as physics is the torchbearer of educated human society.

Introduction:

Modern society is dependent on advanced technology. The public faces the same from purchasing energy-efficient air conditioners to legislative decisions regarding nuclear power plants. Almost all technology is based on scientific principles, and imparting a variety of technical knowledge, and scientific literacy are the most important contributions of the physics community. The involvement of diverse students at all levels is critical to this mission.

Physics education at all levels will focus on creating scientific leadership and a technically trained workforce. Advancement in the physics curriculum is an important part of science education. They are one of the best ways to provide information to society for making scientific decisions and providing technical training to create modern human resources.

The Journey of Physics :

The journey of wild humans to become social beings is based on their understanding of physics. The man understood the law of fire when they noticed the friction in the dry woods and the emergence of a forest fire. But research indicates the history of technology begins even before. Sharp flakes of stone were used as knives, and larger unshaped stones were used as hammers and anvils 3.3 million years ago and thus were likely used by modern human ancestors such as Australopithecus. When man first used fire is still not definitively known, but it was probably invented 1.5 million years ago. Evidence of burnt material is found in caves,

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which are more than 1 million years old. So, wild species of modern human beings have unknowingly begun their journey through the understanding and application of physics.

In the Neolithic Period, the journey of the modern human being begun simultaneously with the development of physics. The man moved from getting their food by foraging to farming. Men started living together in groups. Wearing began to be made of woven fabrics instead of the wild practice of using dead animal skins and skulls. They understood the nature of green and grey trees and invented the wheel, the boat, and instruments for agriculture.

During 6000 BCE, The first irrigation systems arose almost simultaneously in the civilizations. Irrigation demands a lot of labor, demonstrating a high level of social organization. Faster and faster, man became human, and wildlife converted to widespread society with the grace of physics. Informal education spread its impact on human life. Generation to the next generation spread their skills and inventions.

The first sailing ships were used during 4000 BCE with oars for navigation. One thousand years ago, people invented small boats to understand the nature of dry wood, but now they understand the physics of water flow and the use of oars.

During 1200 BCE, theproduction of iron became widespread. Iron succeeded bronze. The iron put metal tools into more hands than ever before. Physics, at this point in time, played an extraordinary role. The importance of blacksmiths in society touched a height. Blacksmiths are the first socialized example of understanding most physics fundamentals. Faster and faster, society was developing, informal education was developing, and human beings were developing with physics.

The first time the wind was utilized to power a mill was about 5,000 years after the invention of sailing ships. The Persian people understood the physics of wind. They were horizontal windmills. Later, European windmills came in vertical shapes. Finally, man understood to use of invisible wind to develop civilization to its heights. The human nature of understanding physics is the protagonist here.

Humans understood the magnet long ago. But the first magnetic compass dates from 1044. The nature of magnets, the nature of iron, the nature of wind, the nature of water, fire, soil, and metal–everything helped people develop their understanding of physics. And physics helped people to develop their society. Man became human.

Human society can’t survive without education. Formal, informal, guided, nonguided, whatever it may be, education from the previous generation to the present, from the experienced to the novice, is the utmost need of society. Physics helped people to build houses. Houses became institutions. Institutions framed a new society- civilization. Civilized people understood the importance of education. Physics helped the most in this case. Johannes Gutenberg completed the printing of the *Bible*. It was 1455. Physics brought the revolution to human civilization as it never did before. Humans are now getting the most powerful instrument of their entire journey of improvement till then- the Printing Machine. The ancient species understood the law of the circle. In the second half of the eighteenth century : 1765,

James Watt improved the concept of steam engine. The steam engine became one of the most important inventions of the Industrial Revolution.

James Watt's steam engine was enhanced by English engineer Richard Trevithick and used for transportation. He built the first railway locomotive at an ironworks in Wales in 1804. Robert Fulton put the engine on water. The invention of the steamboa**t** changed the scenario. Affordable and economical communication played a positive impact on the educational scenario.

NicéphoreNiépce developed an interest in employing a light-sensitive solution to copy lithographs onto glass, zinc, and eventually a pewter plate in the early 1820s. Then he had the brilliant idea of using his fix to duplicate an image captured in a camera obscura (a space or container with a hole in one end through which light is projected from the outside). He created the first known photograph, an eight-hour exposure of his home's courtyard, in 1826 or 1827. A different journey started with the grace of physics. The modern education system is majority dependent on this technology. From xerox to online classes, the journey started back in 1826/27.

Once it was possible to send information through a wire through dots and dashes, the next step was voice communication. On March 10, 1876, Alexander Graham Bell placed the first telephone call.

After thousands of trials, American inventor Thomas Edison got a carbon-filament light bulb to burn for 13½ hours. The Edison Electric Illuminating Company launched the first power plant in 1882 due to the work done by Edison and others in his laboratory on an electrical power distribution system to light homes and businesses. Education in the light of physics traveled long from the very begging of the **DNA** development of humans. A long journey of fatigue. Smaller and more effective internal combustion engines were developed. The first modern automobile was a three-wheeled vehicle that Karl Benz drove around a track using a one-cylinder engine. In an earlier era, people even lost their lives on strenuous journeys for knowledge. Now, motor vehicles are coming into the market to help people to explore. Life became easy, and people gathered energy and time for their quest for knowledge.

Society became more civilized. Civilized society got a gift in the form of radio in the year 1894 and was sending transmissions over longer and longer distances. Life became more entertaining and tension free with this blessing of physics. Physics made man fly at the very beginning of 20th Century. First came the airplane and then the invention of **Rocketry.** After the development of radio, the transmission of an image was the next logical step. Early television used a mechanical disk to scan an image. Another revolutionary achievement of physics. Just after ten years, John Atanasoff designed the first electronic digital computer. The machine may control the universe after man in the future.

The first nuclear power plant was built in 1950. Worldwide installed nuclear power increased to 100 GW in the late 1970s and expanded rapidly in the 1980s, reaching 300 GW in the 1990s.

The Soviet Union surprised the world when it launched the first artificial satellite, Sputnik 1. Human civilization boards its dream flight in search of the next world.

In 2017 the team behind the AlphaGo artificial intelligence program announced that it had become the best player in the world. Go is a game with simple rules but many possible situations. Last year Alphago defeated great player Lee Seidl 4-1 in a singles game. AlphaGo then played itself and, with continued improvement, was able to beat the version that defeated Lee 100-0. With machine learning, AlphaGo has become better than any human at the game.

Advanced undergraduate and postgraduate courses should reflect physics as it is practiced, making appropriate connections with other science fields and engineering and management schools. In addition, advanced university research opportunities are essential to introduce students to the practice of modern physics. Finally, physics education should reflect the career opportunitiesfor today's students. It’s alarming that a very small number of physics majors earn a bachelor's degree in physics, and more alarming is the fact that a lesser number of them get their desired employment.

Secondary teacher education greatly benefits from the involvement of physics education. The development of Physics can further contribute to the training of secondary school teachers by providing courses geared towards the education of future physics teachers and developing and implementing outreach programs. The involvement of diverse students at all levels is required in fulfilling the mission. To touch the target, teacher educators, curriculum committees, and central and state education boards should endeavor collaboratively.

Society and Physics Education in the context of West Bengal

Raja Rammohan Roy and Science Education

Rammohan Roy was the only Indian person to realize the need for modern science education in this country. 1823 A.D. He demanded the introduction of science education in this country through a letter to Governor Lord Amherst. Rammohan Roy himself wrote several books on science. He wrote a book called *Draghizaon Geometry*. It is said that he gave the name "Geometry" in the literature of mathematics. Rammohan Roy published several articles on science in his "Newspaper Kaumudi". Professor KshitimohanSen called Rammohan Roy the father of science in India for his great contribution to the practice of science.

Hindu College and Science Education

Along with Rammohan, conservative people like RadhakantDev, RamkamalSen, Prasanna Kumar Tagore also realized the need for science in this country. As a result of this realization, "Hindu College" was established in 1817 AD by the initiative of local people. In the beginning of education, Hindu College had two departments, School and College. In the college department, besides language and history, chronology, astronomy, mathematics and chemistry were taught in other branches of science. Role of Young Bengals and other Bengali intellectuals From the 1830s, the demand for science education and practice among Bengalis increased. At this time, the Young Bengals' "Academic Association" and the Parthenon

magazine talked about the spread of science practice and rationalism. Besides, many eminent persons like Akshay Kumar DuttaBankimchandraChattopadhyay, and RamendraSundarTrivedi personally wrote several books and articles on science, as well as strong speakers also highlighted the expansion of science education in this country. Akshay Kumar Dutta, the editor of the Tattvabodhini magazine, wrote two famous science books, "Relation of Human Nature to External Matter (1852) and "Physics (1856). That's why he is called the "Bacon of India". Besides Bankimchandra, Chattopadhyay writes VigyanRahasyaParandha. RamendrasundarTrivedi, in his book Mayapuri, writes that science is the only way to obtain pure knowledge.

Institutional Forms of Science Practice and Education

Gradually, science education organizations in educational institutions started from scattered and isolated practices. The first science teaching was organized at Srirampur College. When Hindu College was established in 1817 AD, science was included in the curriculum. Besides, at this time, the Bhu Book Society on Science Despite the publication of several books, he played an important role in the spread of science education. In Calcutta madrasas, Sanskrit colleges and other educational institutions, the issue of science education at the government level, including mathematics and science curriculum, gradually gained importance. 1835 AD General Committee of Public Instruction for every educational institution.Recommends the creation of professorships in mathematics and philosophy. In his report on education in 1854 AD, Charles Wood emphasized science and medical education. In 1857 AD, science education was provided in universities. Later, degrees in science were provided at Calcutta University. Mathematics, Inorganic Chemistry, Geography Medical science was included in the education of medicine and science. 1835 AD, Calcutta Medical College was established, medical education revolution came. 1836 AD Madhusudan Gupta performed the first post-mortem at Calcutta Medical College. In 1836, Madhusudan Gupta opened the first medical education class at Calcutta Medical College. MahendralalSarkar received MD degree from this institute. This way, science practice and education gradually became institutionalized in Bengal.

Characteristics and limitations of science education

Several characteristics and limitations of science education can be observed in the early and later stages of the colonial period. For example, no official initiative or activity has been observed in science education in Bengal. Most of Bengal's science practice and science education were carried out by private or non-governmental enterprises. All the science education provided in the educational institutions was based on theory classes. There was no provision for practical classes. A suitable teacher to teach science subjects was not available at that time. The science syllabus was also not attractive then. There was no special opportunity for science reading or research at the higher level. The conservative mentality of the country also created obstacles in the development of science education. It is pertinent to mention the

threat of social exclusion and the strong opposition of the conservatives against the first autopsy at Calcutta Medical College. In Bengal, no institution has been officially established for science education and basic research in science. We have already said that to protect the colonial interests and under the pressure of public opinion, the government did not do anything but organize science education. The government has not established any laboratories or institutes of higher science education. Because the British never wanted to develop basic research and innovative abilities through science education. "The Industrial Revolution in England proved that advanced technology and science were great tools for establishing power and dominance. In such a situation, it shows indifference to higher education and science research because the government did not want the subjugated India to be strong in science and technology. But it must be remembered that despite this government indifference, science and technical education in Bengal was unprecedented in the first half of the 20th century. Swadeshi Movement (1905) vowed to achieve Swadeshi i.e., self-reliance by boycotting everything British. In Western education, instead of slavery, the determination is made to become self-reliant. Instead of employment, the idea of alternative, independent employment is important. Independent-mindedness is born. And all this affects science practice and science education in this country. At this time, eminent scientists of the country came forward to gain self-strength through the pursuit of science. As there was no scope for independent and fundamental research within the government educational structure, AcharyaPrafulla Chandra Roy founded Bengal Chemical, Jagdish Chandra Bose founded the BasuVigyanMandir, Satyendranath Bose founded the Bengal VigyanParishad, MahendralalSarkar founded the Indian Association for the Sharing of Basic research like Science. By conducting discoveries and fundamental research, they increased national pride by bringing the talent and thinking of Indians to the level of international recognition in science education and practice. Today TanusriSahaDasgupta, ChitraDutta, Shankar Ghosh, Mani LalBhaumik, SurajitDhara, BikashSinha, SandipChakrabarty and so on are glittering stars in the sky of world physics from West Bengal.

Conclusion

Advanced undergraduate and postgraduate courses should reflect physics as it is currently practiced, making appropriate connections with other science fields and engineering and management schools. In addition, advanced university research opportunities are essential to introduce students to the practice of modern physics. Finally, physics education should reflect the career opportunities for today's students. It's alarming that a very small number of physics majors earn a bachelor's degree in physics, and more alarming is the fact that a lesser number of them get their desired employment.

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