IT Matters

Students should pursue higher education in science and take up research with innovative thinking

Lack interest in science, urgent need to revamp teaching

Do you want to launch rockets? Are you interested in establishing nuclear power stations and conducting research? Do you aspire to create eco-friendly innovations in green chemistry to tackle pollution? Are you eager to resolve power shortages through solar energy research? Do you wish to contribute to nanotechnology? Are you determined to find cures for diseases like tuberculosis? Dear students, here is your opportunity! There are special institutions offering advanced education in basic sciences.

Nehru - A Patron of Science

India's first Prime Minister, Jawaharlal Nehru, had an unwavering passion for science. He strongly believed in the idea: "The future belongs to those who embrace science and make it their ally." As the leader of newly independent India, he prioritized the development of foundational scientific research capabilities in the country.

He felt, "Only science and engineering have led to prosperity and progress in other nations! Similarly, India must advance as a developed nation by nurturing these fields." To eliminate poverty and ensure economic development, health, and education, Nehru believed that scientific and technological progress was the key.

Laboratories as Temples

When India gained independence, the economic conditions were dire. Out of every 100 children born, only 30 survived. Despite the lack of funds, Nehru invested heavily in science and technology, trusting in their potential. As a result, the infant mortality rate has dropped to half of what it was. Though there is still progress to be made, the growth in Indian science is commendable. Nehru even referred to modern laboratories and heavy industries as the "temples of modern India."

India on the Global Stage

Dr. Homi Jehangir Bhabha spearheaded atomic energy research, while Dr. Vikram Sarabhai led space research. Under their leadership, Indian science institutions developed autonomously. Over the past 78 years, Indian science has achieved numerous milestones. Today, India leads Asia in nuclear and space research. Recently,

Indian medical science has gained international recognition. Though there's still a long way to go, the scientific progress in the last 70 years is praiseworthy.

A Shocking Trend in Research

However, a major challenge today is the declining number of talented and passionate students pursuing basic sciences. A recent study shows that in the 1950s, about 31% of top-performing school students chose basic sciences in higher education. By the 1990s, this number fell to just 20%, mainly among average performers. Alarmingly, even students who win scholarships through national science competitions like those conducted by NCERT are not choosing science for further studies.

The Loss of Talent

It's disheartening that even those who excel in global science competitions like the Science Olympiad do not pursue basic sciences. Science thrives on curiosity and innovation. Young minds willing to challenge tradition and embrace novelty are essential. If every bright student chooses engineering or management over science, Indian scientific institutions will wither like crops without water.

Today, there is a declining interest in science education among students. In the near future, we may face a shortage of qualified science graduates for research institutions.

Why the Disinterest?

Why are bright students avoiding science? The current education system, which emphasizes rote learning and grades, often drains students' interest in science. There is an urgent need to revamp the way we teach and learn science. Students must move away from memorization and experience science as a process of exciting discovery. Curriculums should reflect current scientific developments. Hands-on learning and understanding scientific methods and reasoning should be emphasized more than just facts.

Science, technology, and innovation will drive societal impact in the future. Many countries have realized this and are investing heavily in science. Scientific discoveries are ac-

Scientist Dr. T. V. Venkateswaran

celerating social change. In today's liberalized economic environment, science has become central to development. Its societal impact is stronger than ever.

The joy and satisfaction that come from scientific research must be shared with students to inspire and draw more talented individuals toward science and increase our scientific human resources.

India as a Knowledge Superpower

If India is to re-emerge as a knowledge superpower in the 21st century, it must strengthen its position in science and technology. The central government has been actively working toward enhancing scientific infrastructure and educational environments.

Alongside long-standing challenges like food security and health, new ones such as global warming and water scarcity have emerged. Our success in addressing these depends on the quality of our educational institutions and the growth of science and technology.

Hence, it is vital that creative and capable students pursue higher education in science and take up responsibilities in research with innovative thinking.

Institutions like the Indian Institutes of Science Education and Research (IISERs) and central universities offer integrated 5-year BSc-MSc programs, some of which include teacher training. By enrolling in such basic science programs, one can actively contribute to India's scientific endeavors.

Online games to help adolescents reduce substance abuse

For adolescents struggling with substance abuse, traditional in-person interventions such as counseling are not always effective, and rural areas often lack access to these services.

A researcher at the University of Missouri is thinking outside the box, aiming to help game designers develop fun, digital games that make ditching bad habits easier by meeting adolescents where they already are: online.

Mansoo Yu, a professor in the College of Health Sciences, looked at 26 studies involving digital interventions including online games, virtual reality games, mobile app games and video games, to identify the key elements that make these interventions effective in helping adolescents reduce drinking, smoking and illicit drug use. He found the most effective games were personalized to the individual playing the game, had a social component for users to compete against their friends and family, and included content that encouraged behavior change.

The findings can provide a blueprint to design digital game-based interventions in ways that are most likely to help adolescents reduce substance abuse and encourage positive development.

"When it comes to designing the most effective interventions, you always want to meet people where they are, and the younger generation often prefers to meet up virtually instead of in person," Yu said. "Online interventions also increase accessibility in rural areas where in-person clinics and counseling services are not always available."

Yu added that unhealthy behaviors such as smoking often serve as a way of coping with underlying mental health issues, including anxiety and depression. Therefore, a key element of a successful digital game-based intervention is emphasizing positive activities that can serve as an alternative to unhealthy behaviors.

Building automation with focus on privacy

Researchers at the University of Tokyo developed a framework to enable decentralised artificial intelligence-based building automation with a focus on privacy. The system enables AI-powered devices like cameras and interfaces to cooperate directly, using a new form of device-to-device communication. In doing so, it eliminates the need for central servers and thus the need for centralized data retention, often seen as a potential security weak point and risk to private data.

We live in an increasingly automated world. Cars, homes, factories and offices are gaining a range of automated functions to steer them, heat them, light them, or control them in some way. There are a number of approaches to automation systems, but at present most require a lot of programmed behaviors, which can be labor-intensive and inflexible, or when AI is involved, requires a high degree of centralisation. But this brings with it some risk.

"A typical home or office automation system for lights or temperature

control may involve cameras to monitor occupants and alter conditions on their behalf," said Associate Professor Hideya Ochiai from the Department of Information and Communication Engineering. "Under a conventional approach, such data, which most consider quite personal, especially if it's from your own home, will be aggregated on a central system. A breach of this system could risk leakage of that personal data. So my team and I devised an improved approach that is not only decentralized but also does away with the need to store personal data longer than is needed for the immediate automation processes to take place."

Their approach, called Distributed Logic-Free Building Automation (D-LFBA), describes how devices such as cameras and other sensors, and controllers for lights or temperature control, can be made to communicate directly, which avoids relying on centralization, and can be given a small amount of internal storage, mitigating the need to capture and keep more data than is necessary.

"We effectively spread the load of a neural network, the computer program responsible for learning and controlling things, across the devices in the environment," said Ochiai. "Among the advantages already mentioned, it should provide a cross-vendor layer of compatibility, meaning the automation environment need not be composed of systems from one manufacturer."

What makes D-LFBA especially unique is its ability to learn without being programmed. Using synchronized timestamps, the system matches images with corresponding control states over time. As users interact with their environment, by flipping switches or moving between rooms, the system learns those preferences. Over time, it adjusts automatically.

"Even without humans writing logic, the AI can generate fine-grained control," said Ochiai. "We saw that during trials last year, users were amazed at how well the system adapted to their habits."