

EDUCATION PLUS

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Rakesh M. Krishnan

With its ever-expanding capabilities, Artificial

Intelligence (AI) is not just a tool but a force shaping our future. It can write stories, replicate Rembrandt's painting strokes, assist in adjudicating legal cases, aid medical treatment, recommend products, and even recognise human emotions. According to scientists, we are now in the third stage of AI evolution, a phase of deep learning and machine learning due to advancements in digital data and computing power. The third stage captures the transformation from a digital to a datafied society.

In a datafied society, data-based sense-making is central to constructing reality. This means systems processing data resembling intelligent behaviour are vital to our realities. UNESCO broadly defines the latter as the dynamic understanding of AI. The increasing influence of AI and machines in our lifeworld has sparked discussions on the emergence of digital habitus and human-machine interface implicating essential concerns like identities and democracy. These discussions have two main focuses: first, on how algorithms reshape our existence, and second, on the ethical implications of an algorithmic world on the human species. As we navigate this AI-driven future, staying engaged and thoughtful about its impact is crucial.

Pattern creation

AI and other technological innovations are technocratic Utopias created for a manageable present and predictable fu-



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Minds, machines, and humanity

Social Sciences and Humanities play a critical role in forging responsible AI

ture. Interestingly, Jonathan Penn, a historian and philosopher of Science, highlighted how rule-following or conformity is the basis of pattern creation of behaviour and mind in AI. Furthermore, pattern identification is crucial for administrative and economic decisions and profit-making exercises. Patterns help in clear identification and engagement; thus, the legibility of human behaviour leads to social domination and control by the owners of technology. At the same time, randomness and unexpectedness of human lives and behaviour are unpredictable and do not follow patterns.

Machine learning aims at actionable predictions indepen-

dent of human inputs. Formal mathematical models of human behaviour and intelligence is at the core of AI's software and algorithms. These models represent a simplified version of the human mind and body that can be calculated and predicted. In essence, creating intelligent machines requires the formal encoding of patterns. The process of identifying and compiling these patterns is influenced by social factors, raising the question of who writes the code and what kind of representative sample is used to extract patterns that caricature the 'human' in machines.

User-centric AI

The cultural context and di-

verse meanings that arise from human interactions are standardised to a specific type. As a result, AI reflects and reproduces the social world of the algorithm developers. The biases and intentions of the algorithm creators underscore the politics of technology and raise ethical questions. Additionally, beyond the intention and language of the software, there are questions about who can access the data generated by the machines and how this data is used beyond the operation of a specific machine. These concerns underscore the importance of responsible AI and the development of user-centric AI, which ensures that data is not misused. Un-

doubtedly, these concerns lead us to the need for responsible AI and the design of user-centric AI, placing a guarantee for the non-misuse of data.

Social Sciences and Humanities (SSH), as fields of knowing the social world and ongoing conversation with human nature, play a critical role in forging responsible AI. A couple of years ago, an interdisciplinary platform in the U.K. brought together social scientists and philosophers to collaborate with data scientists, design specialists, policymakers, and industry to align the social power of AI with the moral and ethical values of human society.

SSH provides insights and enlightening historical per-

spectives on what happens when individuals in a society have reduced communitarian relations, implications of old and new inequalities, identification of incentives and disincentives (construction of ethical order of living) required to maintain social order, and most importantly, how new artefacts can impact the social and political power in a society. Automation technologies reorder the nature-human-machine relationship. However, to what extent should this recasting of relationship happen without displacing human dignity, privacy, accountability, transparency, and fairness? Responsible AI is, in short, a demand for a user-centric AI. SSH provides invaluable cues to these pertinent dimensions of technology-led social change.

The rise of machine agency raises the question of human creativity and innovation, especially for thinking beyond tools and software to fashion human lives. In the impending world of calculable human interactions and predictive behaviour, we must ponder on the role of randomness and contingencies in the human world.

Technological breakthroughs, creative thinking, and engineering socio-political Utopias do not follow predictable lines. Resistance to predictions animates human agency by rescuing it from being one-dimensional and is the promise for humanity. To sustain these critical aspects of human lives, a continuous conversation with the social world and its creative expressions is needed more than before.

The writer is Assistant Professor of Sociology at GITAM University, Hyderabad.

SCHOLARSHIPS

Nikon Scholarship Programme

An initiative of Nikon India Private Limited

Eligibility: Open to Indian students who have completed Class 12 and are pursuing photography-related courses of minimum three-months duration. Annual family income should be less than ₹600,000.

Rewards: Up to ₹100,000

Application: Online

Deadline: November 30 www.b4s.in/edge/NIKONI2

Vahani Scholarship

An initiative from the Vahani Group.

Eligibility: Open to Indian citizens studying in Class 12 who have secured at least 85% in Classes II and 12 and have applied for a full-time UG degree at a recognised institution in India. Annual family income of less than ₹150,000 from all sources.

Rewards: Full tuition fees, stipend and other benefits

Application: Online

Deadline: December 1 www.b4s.in/edge/VAHSI

Dr. Gita Piramal Graduate Scholarship

An opportunity offered by Somerville College, Oxford University, the U.K.

Eligibility: Open to Indian nationals currently residing in the country and have applied for a Master's degree in Sustainability Science and Development.

Rewards: Course fees, living and travel expenses

Application: Online

Deadline: January 29, 2025 www.b4s.in/edge/NIKONI2

Courtesy: buddy4study.com

Research is a must

Uncertain about your career options? Low on self-confidence? This column may help

not so relevant. I don't want to invest two more years and still be where I am today. Hamza

Dear Hamza, This depends on your aspirations, interests, and the job market trends and needs. Consider combining further education with practical experience or certifications that align closely with your career goals. M.Sc. Biotechnology can open up specialised roles in research and development, pharmaceuticals, or biotechnology firms and offers opportunities across biotech companies, research institutions, and clinical labs. M.Sc. Bioinformatics combines Biology, Computer Science, and Data Analysis and can lead to roles in research, academia, or biotech companies that focus on chemical analysis and quality control and leads to roles related to quality assurance, pharmaceutical analysis, or environmental testing. An MBA is an option if you are interested in management, business development, or entrepreneurship. Also consider industry certifications or short-term courses in data analysis, project management, or specific technical skills.

Research and talk to professionals in each field to understand job prospects, industry trends, and the relevance of each degree.

I have completed my BA, LL.B and LLM in Intellectual Property Law and would like to do a Ph.D. How do I choose a

dissertation topic and select the university? Will it help to take up an Assistant Professorship or join a litigation firm? Bhargavi M.

Dear Bhargavi, For your dissertation, reflect on the areas of Intellectual Property (IP) Law that you are passionate about. Read recent articles and papers on the topic to identify gaps that need further exploration. Look out for trends and hot topics and discuss your interests with professors or mentors who can guide you. Look at the relevance of the topic and the potential impact on policy-making, industry practices, or legal reforms. Finally, be realistic with the resources, time, and data that you need to complete the Ph.D. To select a university, consider institutions known for research in IP law. Identify potential supervisors whose research interests align with yours. Evaluate the programme structure and funding options, scholarships, or research grants. An assistant professorship will help you engage in research, publish papers, and contribute to academic discourses, teach and mentor students and give access to academic resources, conferences, and a network of professionals. Academia, however, can be competitive, and securing a good position requires a strong publication record and research experience. A litigation firm will offer practical experience and application of your legal knowledge on real-world cases and help build a professional network. It could limit the time you have for research, as the focus will

be on casework and client service.

I am in Class 10 and interested in Law. I want to get into a good law school. Which subjects in Class 11 will help with the CLAT and other law entrance exams? Maria S.

Dear Maria, Proficiency in English is essential for entrance exams and legal studies, as it will help with comprehension, critical thinking, and essay writing. Improve your reading, vocabulary, understanding and usage of grammar. Legal Studies (if the subject is available) will give you a foundation to understand law, legal principles, case studies, and the legal system. History, Political Science, Economics and basic Maths will also help. Work on developing critical thinking and analytical skills, reading and comprehension, general knowledge, current affairs, essay writing and argumentation, as these are crucial for law exams and legal studies. Study the exam pattern of CLAT and other entrance exams. These usually assess English, general knowledge, legal and logical reasoning, and quantitative techniques. Take practice and mock exams to understand the pattern and improve time management. Join a coaching class if needed. Take part in debates and MUNs to enhance your confidence and public speaking. Look out for internships at legal firms or volunteer work related to social justice to gain practical experience and insights.

Disclaimer: This column is merely a guiding voice and provides advice and suggestions on education and careers.

The writer is a practising counsellor and a trainer. Send your questions to eduplus.thehindu@gmail.com with the subject line Off the Edge

Usha Iyer

Indigenous knowledge refers to the unique set of understandings, skills, and philosophies developed by local communities through centuries of direct interaction with their environment. Applying these wisdom practices to the concept of SDG methodology can provide profound insights and practical approaches to sustainability.

Traditional indigenous education is inherently connected with the natural world. Learning often takes place outdoors and cultivates a deep appreciation for Nature and encourages students to see themselves as part of a larger ecosystem.

Hands-on projects

Institutions that incorporate outdoor classrooms and hands-on ecological projects can foster a similar sense of stewardship among students. The curriculum can be designed to incorporate various subjects and skills rather than isolating them into rigid categories. For instance, a project on gardening may involve scientific inquiry, artistic expression, and social responsibility, thereby allowing students to engage multiple dimensions of their learning.

Indigenous communities have long practised sustainable living. For instance, many engage in crop rotation, controlled burns, and polyculture farming to enhance soil fertility and prevent depletion of resources. Such practices can be adapted into the curriculum and integrated across multiple subjects. For example, in Science, students can study plant biology and ecological principles; in Maths, they can calculate areas and yields; in Art, they can create signs and promotional materials.

Another aspect is building structures using locally sourced and sustainable materials. By adopting this

Learn from the past

Why we need to incorporate indigenous knowledge into the contemporary educational model



principles, institutions can show students the benefits of supporting local ecosystems and hands-on ecological projects can foster a similar sense of stewardship among students. The curriculum can be designed to incorporate various subjects and skills rather than isolating them into rigid categories. For instance, a project on gardening may involve scientific inquiry, artistic expression, and social responsibility, thereby allowing students to engage multiple dimensions of their learning.

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Incorporation of ecological calendars – based on natural cycles, such as the flowering of plants, bird migrations, or the behaviour of specific animals – into educational activities

can teach students about seasonal changes, biodiversity, and the importance of timing in agricultural and conservation efforts and lead to the discussion of critical topics such as climate change, biodiversity, and renewable energy.

Traditional Ecological Knowledge (TEK) includes understanding the relationships between living organisms and their environment. This knowledge can guide modern scientific inquiry and environmental management. By integrating TEK into science curriculums, an interdisciplinary approach that values both traditional wisdom and modern science can be promoted.

For instance, in a study of a forest ecosystem, students might learn from indigenous knowledge keepers about the significance of particular trees in local medicine or the role of specific species in sustaining ecological balance.

Respect for nature is a fundamental value and teaching mindfulness and respect for all living things can inspire a generation of environmentally conscious individuals. Activities like nature walks, meditation, and storytelling can instil a sense of

connection for the natural world. Learning move quietly and attentively will help them focus on sensory aspects such as the sound of rustling leaves, the scents of blooming flowers, and the sight of animals in their natural habitats and promote mindfulness. This combination of observation, reflection, and discussion also nurtures a profound respect for all living things.

Zero-waste

Indigenous societies typically practice circular economies, where waste is minimised, and materials are reused or repurposed. Educational institutions can implement zero-waste policies, encourage recycling and upcycling projects, and educate students on the importance of reducing their environmental footprint. A "Waste Audit" is a useful exercise in this regard. Small groups of students can collect and categorise waste generated from classrooms, cafeterias, and other areas and analyse the data gathered to identify common waste items and their potential for reuse. For instance, paper waste could be transformed into recycled art projects or compost.

Indigenous knowledge often includes a deep understanding of local flora and fauna. Schools can celebrate this by preserving native plant species, creating habitats for local wildlife, and teaching students about the cultural significance of these species. Indigenous knowledge offers a treasure trove of sustainable practices that can be harnessed to create more effective and holistic institutions. By blending traditional wisdom with contemporary educational models, we can cultivate a generation that is deeply connected to and responsible for the health of our planet.

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The author is Founder and Director, The Green School Bangalore, Bengaluru



CAREER CUES
Richa Dwivedi Saklani

Find the sweet spot

Tips for students to pick the right subjects for Class 11 and 12



goals. Then the filter of subjects should be applied. It may be necessary to take some subjects you don't enjoy or do well in to open career choices such as aspiring doctors and architects having to study Physics and Chemistry or aspiring pilots, psychologists or entrepreneurs studying Maths or aspiring Maths or aspiring designers studying Art.

It also helps to know the necessary and desirable subjects for career paths in the country or system you want to apply to. For instance, Economics usually requires Maths for all countries. The U.S. generally likes to see Math for all courses, Canada is keen on Chemistry for any Engineering or Computer Science course and Maths for Psychology courses, while the U.K. usually demands two Sciences for most STEM areas. Delhi University has, by far, the most stringent subject res-

trictions, as do Engineering and Medical colleges in India.

Tips for parents

Balance passion with practicality: Your child loves to write and aspires to be a writer, and you don't want to discourage them? While we always want children to be able to follow their passion, it's also important to be practical.

Discuss the importance of employability, market demand, earning and growth prospects, the kind of life they want for themselves in the future. Also talk about transferable skills.

Work through academic roadblocks: Students often find themselves changing their dream career or aim, because the necessary subjects seem too tough, boring or intimidating. Don't give up so easily. Discuss academic challenges and

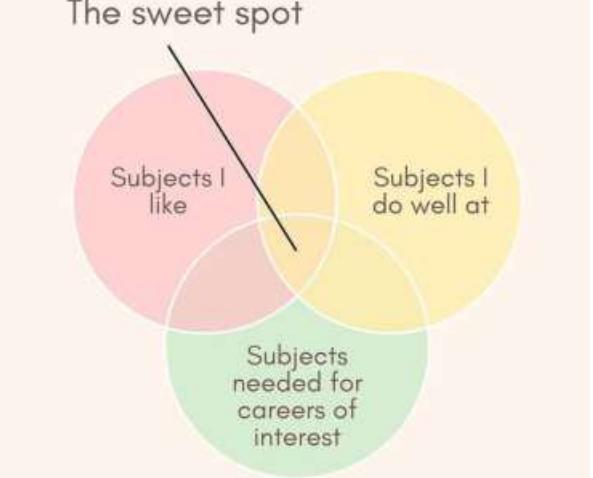
how you can help overcome them. Try and improve your child's relationship with the subject and consider dropping it only after serious thought. It is important for the child to make an informed, thoughtful decision and to make it themselves (for the large part) so they can take ownership of their education journey.

Speak to counsellors, professionals and mentors: Your child wants to become a lawyer? Have them speak to a lawyer and ask about the field. Let them intern at a law firm, pursue an online course and understand the field better. Speak to the school counsellor about subject choices and options at the school. Attend career days and workshops on colleges that schools host. Approach professional career counsellors who can guide you on career prospects, environments and personality traits across different fields.

While many paths are opening across creative, academic, business and technical fields, each area is also changing rapidly. So, the most important thing is to help your child choose a path that will sustain their interest long enough for them to learn, navigate changes and make their own path.

With inputs from Kritika Malhotra

The writer is Founder and CEO, Inomi Learning, a Gurugram-based career and college guidance firm. info@inomi.in



introductory course online. Remember, this is only a good place to start, since different boards have different approaches. Most schools will allow you to sit in on sample classes before you decide your final subject choices to ratify this.

Subjects you love

Many students say, "I love Maths when I understand it, or practise it well..." The truth is that some subjects take more immersion to make sense of whether you

really like them. Again, some subjects are fun simply because they seem easy. However, Class 11 presents a quantum leap in the depth and breadth of content across subjects that had been relatively simple till Class 10.

This is an exploration parents and students should do together, giving each subject a fair shot before you decide what you really enjoy. It also helps to watch simple explainer or

tutor videos on Class 11 subjects and observe your own level of engagement with the concepts, and your curiosity to learn more.

As a thumb rule, if learning a new concept in a subject makes you feel excited and curious to know more, you are likely to find it engaging and immersive through high school. On the other hand, if a class, test or exam in a subject makes you feel stressed, even after preparing your

best, it may not be a great idea to take it up in senior school!

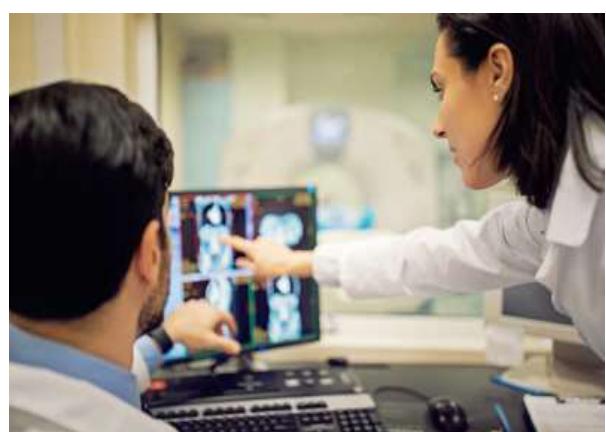
Subjects needed for potential careers

This is perhaps the most complex factor to analyse. The logic feels circular: should I not choose the subject first and then see what careers it leads me to? Or should it be the other way round?

Career choices should be made keeping in mind your skills, personality and

In the forefront

With radiotherapy being a vital component of cancer treatment, radiation oncologists play a vital role in the battle against cancer



Dr. Manoj Gupta

Radiotherapy is one of the fundamental cancer treatment therapies. It uses ionising radiation to kill or damage cancer cells while minimising damage to nearby healthy tissues. Often employed as part of a comprehensive treatment plan that may include surgery, chemotherapy, or immunotherapy, radiotherapy is a vital component of both curative and palliative care in contemporary oncology. It improves the quality of life by shrinking tumours, relieving pain, and halting the spread of cancer.

For radiotherapy to be effective, high-energy radiation beams – typically X-rays, gamma rays, or protons – must be directed toward particular body parts to enter malignant cells and disrupt their DNA, eventually stopping them from proliferating and spreading. Radiotherapy can be administered externally using devices like linear accelerators or internally through brachytherapy, where radioactive sources are implanted directly into or near the tumour.

Radiation oncologist
A radiation oncologist, previously known as a radiotherapist, is a specialised medical professional who creates and manages the treatment for those who undergo radiation therapy. Based on the size, location, and nature of the tumour, radiation oncologists choose the right kind and

dosage of radiation and modify the treatment depending on the effect on the patient. In addition to making sure patients are comfortable, they also ensure that the patient is aware of the process and participate in diagnosing, staging, follow-up care, evaluating treatment efficacy and watching for any cancer recurrence. They are also trained in giving chemotherapy and providing palliative care including pain management.

Education

The first step is a medical degree (MBBS or equivalent) followed by specialisation in radiation oncology, usually through postgraduate a postgraduate degree such as an MD (Doctor of Medicine) or DNB (Diplomate of National Board). Usually, this takes an additional three years after finishing undergraduate studies.

With experience, they may take on leadership roles, such as supervising junior radiation oncologists or managing radiotherapy departments. Knowledge of modern radiotherapy techniques like intensity modulated radiotherapy (IMRT), image guided radiotherapy (IGRT), stereotactic radiosurgery (SRS), stereotactic body radiotherapy (SBRT) and image guided brachytherapy (IGBT) are important. Additionally, they can pursue advanced academic degrees, such as a DM Medical Oncology.

Scope
Radiation therapy holds

great potential as a career choice in India due to the increasing prevalence of cancer, the expansion of healthcare infrastructure, and the continual advancements in radiotherapy technology. With cancer cases on the rise – particularly in densely populated areas – the demand for skilled radiation oncologists is becoming more critical than ever. Approximately 80% of all cancer patients will require radiotherapy at some stage of their treatment, underscoring the vital role, radiation oncologists play in modern oncology care.

The demand for radiation oncologists is going to be more in future mainly due to increasing incidence of cancer and the huge gap between demand and supply in the country. There are approximately 700 radiotherapy machines, but according WHO's criteria of one machine per million populations, 1400 machines will be required. This will create more jobs in the future.

Moreover, advances in radiotherapy technology require specialised training, further highlighting the need for a skilled workforce. A well-trained radiation oncologist will be better equipped to handle the complexities of modern techniques like stereotactic radiosurgery (SRS), stereotactic body radiation therapy (SBRT), intensity-modulated radiation therapy (IMRT), and image-guided radiotherapy (IGRT).

Radiation Oncologists are at the core of cancer treatment. Their unique abilities, extensive educational background, and commitment to patient care render them indispensable in the battle against this illness. In addition to providing intellectual satisfaction, this line of work allows individuals to have a long-lasting impact on the lives of cancer patients.

The writer is President of the Association of Radiation Oncologists of India (AROI) and Former Dean of All India Institute of Medical Sciences (AIIMS), Rishikesh

Shiv Singh Tomar

Agriculture education is becoming prominent today as contemporary farming approaches, management of crops and concepts of biodiversity have strong connections with sustainability and conservation issues. One of the fundamental aspects of Agriculture education is fieldwork. This practical element enables students to use the knowledge gained in the classroom in real-world settings and understand the concepts and techniques learnt. For example, students can gain a deeper understanding of the different growth stages of crops, and pest management to enhance their learning experience.

Benefits

Engaging in fieldwork also facilitates the cultivation of crucial skills such as problem-solving, critical thinking, and decision-making, which are integral in managing the intricate challenges of modern agriculture and harnessing technology

Get their hands dirty

Why fieldwork is an important component of Agriculture education

and data collection to enhance crop yield.

By working in varied weather conditions, students will get an idea of the problems that farmers face on a daily basis. Not only will this help them develop resilience and adaptability but also enable them to devise innovative strategies for these problems.

Often fieldwork involves collaborating with farmers, agronomists, and other industry experts. These interactions offer significant networking opportunities and insights into probable career opportunities.

Another key advantage is garnering significant knowledge of sustainable agricultural practices.

Students get first-hand information and exposure about concepts such as crop rotation, organic farming, and integrated pest management. This can strengthen the significance of sustainability in Agriculture and motivates them to embrace environment-friendly practices.

Curricular integration
However, the concept of field work needs to be seamlessly incorporated into the curriculum. This will ensure that field ex-

porting. Additionally, virtual exposure to fields can help students to examine diverse agricultural settings. Collaborations with agricultural businesses, research organisations, and government bodies will offer access to advanced resources and expertise.

Student safety is an aspect that educational institutions must ensure by offering comprehensive training and essential protective gear. The approach should be designed to address all possible risks such as adverse weather conditions, equipment malfunction and other unforeseen circumstances.

The effectiveness of this approach requires meticulous evaluation through a combination of assessments such as practical exams and project reports. Educational institutions should emphasise the creation of a robust and dynamic learning environment that empowers students to contribute to the future of farming.

The writer is Dean, School of Agricultural Sciences, G.D. Goenka University.

Kalpana Gangaramani

Dialysis, a life-saving intervention for end-stage renal disease, has evolved into highly specialised medical field. The increasing complexity of patient care has led to the emergence of specialised areas within dialysis, ensuring optimal outcomes and improved quality of life for patients. As the field continues to evolve, the demand for skilled professionals is increasing.

First let's look at what this treatment is all about. Dialysis functions as an artificial kidney, filtering waste products and excess fluid from the blood when the kidneys are unable to perform these essential functions. There are two primary types: Haemodialysis, which involves filtering a patient's blood through a dialyser, an artificial kidney machine, and peritoneal dialysis, in which a cleansing fluid (dialysate) is introduced



FREEPIC

dialysis principles, and practical skills.

B.Voc. Dialysis Technology: A three-year programme focusing on practical training in dialysis equipment operation, maintenance, and patient care.

PG Diploma in Dialysis Technology: A specialised programme designed to deepen knowledge and skills in dialysis techniques and procedures.

Certification as Dialysis Technician: A focused training course in dialysis machine operation, equipment maintenance, and patient care.

These courses are pathways to careers as dialysis technician or supervisor; dialysis nurse and offer roles in nephrology clinics, hospitals, dialysis centres, and R&D. Beyond this, successful dialysis specialists require a comprehensive skill set including: in-depth understanding of kidney anatomy, physiology, and pathology, proficiency in dialysis equipment operation and

maintenance., expertise in patient assessment, monitoring, and care, knowledge of dialysis-related complications and their management, and effective communication and interpersonal skills for patient interaction and collaboration with healthcare teams.

Given the rapid advancements in technology and treatment modalities, professionals should engage in continuous learning to stay updated and participate in events and conferences to expand knowledge and network with peers and embrace research and innovation to contribute to the advancement of dialysis care. Most important is the prioritisation of patient-centred care and deliver compassionate support.

For those passionate about a career in healthcare and making a positive impact, this offers a rewarding career.

The writer is Founder and Managing Director of Target Publications Pvt Ltd.

into the abdomen through a catheter.

Education and skills
Some of the specialised courses in this field comprise:

Advanced Diploma in Renal Dialysis Technolo-

gy (ADRDT): A two-year programme that prepares one to be dialysis technicians.

B.Sc. Dialysis Technol-

ogy: A three-year course that provides a comprehensive foundation in chronic kidney disease, physiology, proficiency in dialysis equipment operation and

Beyond the basics

A career as a dialysis specialist is rewarding and offers an opportunity to make a positive impact