

EDUCATION PLUS

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Rudra Pratap

Engineering has been central to India's development, from building large-scale infrastructure in the post-independence era to powering the digital economy today. But the demands on engineers are changing at a faster pace than most institutions can adapt to. Preparing engineers for this future means transforming the way we teach and learn. Yet, many colleges continue to operate as if little has changed, risking a generation of engineers whose skills are outdated the day they graduate.

Fundamentals

Before we talk about what must change, it's important to recognise what hasn't. Engineering, at its core, is grounded in solid scientific principles. The fundamental laws of Physics are still at its heart. What has changed are the tools, methodologies, and the broader contexts in which these principles are applied. We now have far smarter tools that take away the drudgery and make us more productive. But a lack of solid understanding of fundamentals is still akin to building a skyscraper without a proper foundation.

An engineer today must navigate a vastly more complex landscape. The shift from analogue to digital, from isolated technical challenges to interconnected societal problems,



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necessitates a new approach to engineering education which integrates interdisciplinary thinking, adaptability, and a strong moral compass. We're not just building bridges and microchips any more; we're shaping data ecosystems, climate tech, and health systems.

Skills to build

Digital and computational competency: Most engineering programmes still treat programming, AI, and data science as electives. That's a mistake. Whether you're building bridges, biomedical devices, or supply chains, you need to understand how digital systems function, how data flows, and how machine learning is shaping design and diagnostics. A 2023 McKinsey report projected that over 50% of tasks in engineer-

ing-heavy roles could be automated by AI within a decade. If our graduates aren't equipped to understand, build, and supervise these tools, they will become irrelevant.

Communication and collaboration skills:

The myth of the silent genius engineer has overstayed its welcome. In reality, engineers are now expected to work cross-functionally with designers, regulators, policymakers, and communities. The ability to write clearly, present ideas persuasively, and lead conversations is as important as solving equations. Engineering programmes must embed communication training not as soft-skill add-ons, but as core competencies. Engineers must be trained to not just build things, but to also explain why they mat-

ter, and for whom.

Design thinking and sustainability: Gone are the days when engineering was purely about functionality. Today's engineers must keep the users' needs and context in mind. Courses must train students to think like designers and systems engineers. Sustainability has become a non-negotiable aspect of design. Engineers must now ask: What's the full lifecycle of the product? How does it interact with its environment? Can it be repaired, reused, or recycled? Design thinking makes engineering smarter, and sustainability ensures innovation does not come at the planet's expense.

Empathy and societal engagement: Today's engineers must be socially aware. The problems of the future – whether it's

clean water, equitable healthcare or energy crises – can't be solved in isolation. Courses in humanities shouldn't be checkboxes. Programmes must integrate real-world projects that connect students to the communities they aim to serve. When students work on sanitation systems in informal settlements or develop assistive tech for disabled users, they build better understanding of human needs.

Optimisation and navigating trade-offs: Modern engineering problems are rarely one-dimensional. Building a product or system today means optimising for cost, performance, efficiency, sustainability, and scalability. In this situation, optimisation becomes a superpower. Future-ready engineers must be trained in mathematical and computational optimisation as core courses. As industries become more complex and globalised, engineers who can navigate multi-dimensional constraints, variables, and trade-offs will be invaluable.

Reimagining Engineering education is essential if India is to lead in the deep-tech era. Success will not be measured by the number of engineers we produce, but by whether they are equipped to advance critical fields. Meeting this standard is the responsibility of every Engineering institution. If we can achieve this, India will not only prepare engineers for relevance, but also for global leadership in shaping the future.

The writer is the Founding Vice Chancellor, Plaksha University and former Deputy Director, Indian Institute of Science, Bengaluru.

SCHOLARSHIPS

Ashoka University Achievers' Merit Scholarships

Offered by the Ashoka University

Eligibility: Students who have a final or predicted score of 98% and more in Classes 10 and 12 in the CBSE or ISC board exams and demonstrate strong performance in the university's admissions process

Rewards: Up to 100% waiver

Application: Online
Deadline: November 26
www.b4s.in/edge/AUMSI

family income not exceeding ₹6,00,000

Rewards: ₹75,000

Application: Online
Deadline: November 30
www.b4s.in/edge/EEGS

Baba Gurbachan Singh Scholarship

An initiative of the Sant Nirankari Mandal

Eligibility: Students with minimum 60% marks in Classes 10 and 12 and are pursuing a diploma in Engineering or a degree in one of the specified courses (list on site) offered by a recognised Indian institution and have an annual family income below ₹350,000

Rewards: Up to ₹50,000 a year or annual fee, whichever is less

Application: Offline through speed post:

Education Department, Sant Nirankari Administrative Block, Nirankari Chowk, Burari Road, Delhi 110009 (India)
Deadline: November 30
www.b4s.in/edge/BGS6

Courtesy: buddy4study.com

to, and recover from natural disasters.

The Made to Move Communities programme is for students to explore how mobility challenges affect their communities and propose solutions to create better connected cities.

For details, visit www.otis.com/mtmc

New skills for a new era

Why we need to reimagine engineering education for India's deep-tech future

Research your options

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



OFF THE EDGE

Nandini Raman

I am in the final year of B.V.Sc. and AH. I am considering an MBA. What kind of work experience would be most suitable for this? Another option is a career with NABARD. What is the best way to prepare for the exam? Are there any scholarships or fellowships to pursue PG studies abroad in my field? Anita

Dear Anita,
Your veterinary background is a fantastic differentiator. Two to four years of work experience in core agribusiness and animal health or sales and marketing roles in pharma, operations or supply chain jobs in dairy or meat processing, rural banking and so on will broaden your profile. A career in NABARD will allow you to stay connected with your core domain. You will need to take the NABARD Grade A exam. Understand the syllabus and exam pattern and read their annual reports, monthly magazine and focus papers to prepare.

You can also pursue a Master's or Ph.D. in Public Health, Food Safety and Security, Animal Science, Veterinary Microbiology/Pathology, One Health, Agribusiness Management. If you're looking to study abroad, almost all top universities offer merit and need-based scholarships. Check the financial aid pages of the universities you plan to apply to. Your other options include

jobs in the government and public sector organisations such as ICAR and FSSAI or work with international organisations on global health and livestock projects or start your own dairy or poultry farm or pet clinic.

I am in Class 11. While I plan to do a B.Tech, I also want to take the Civil Services exams. For the past year, I have been reading newspapers to get a grip on current affairs. I wish to start preparing for the UPSC from the first year of college. What else should I do? Deepak

Dear Deepak,
Right now, excel in Science and Maths for the B.Tech admission. Focus on NCERT books, both for your boards and UPSC prep. Also read Classes 9-12 textbooks for History, Geography, Polity, and Economics. Keep up your habit of reading the newspaper. Try to understand and analyse the content for a deeper understanding. Start making notes for different subjects like polity, governance, international relations, economy, environment, science and technology, and social issues. Work on your language skills and focus on comprehension and writing.

In college, maintain a good CGPA. Formalise your UPSC prep and familiarise yourself with the exam format. Choose the Optional Subject carefully. Since you have a science background, a Science or Engineering optional can be advantageous. Find like-minded friends, as a study group can be a great source of motivation and knowledge sharing. Enroll in a good Mains test series. It will force you to write, provide discipline, and give

you feedback. Solve mock papers for Prelims every week and work on your speed and accuracy. Participate in college clubs, especially debating, writing for the college magazine, and social service initiatives to build personality, communication skills, and provide fodder for the interview.

My son has finished B.Com. and is working as a Catalogue Associate in Amazon. He has finished a VI Basic course and is trying to do a weekend MBA course. He is a bit confused about his future plans. Sethuraman

Dear Sethuraman,
Why does he want to do an MBA? Ask him to invest time in self-research and goal setting first. What job does he want after the MBA? Ask him to research roles on LinkedIn and company career pages. What do the job descriptions entail? What skills are required? What excites him the most? Get him to research high-growth, high-demand roles that value his B.Com. and operational experience and then pursue the MBA.

Some good fits for him could be in product management (especially in e-commerce/fintech), business or data analysis (his VI course is a direct stepping stone here). He could also look for an internal transfer in Amazon to a more analytical role right away.

Get him to account for any skill gaps and work on bridging those through relevant certifications or short term accredited courses to create a practical portfolio. He can then re-evaluate if he wants to do a full-time MBA or a

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

Arun Rajamani

Imagine a future in which our economic growth is hindered by climate-induced disruptions and a lack of skilled workers stalls the nation's green transition. This isn't a dystopian fantasy, but a potential reality already being reported. Last year, the International Labour Organization (ILO) warned that more than 70% of all workers worldwide are at risk of exposure to excessive heat. India lost an estimated \$100 billion from heat-induced productivity losses. According to the World Bank, climate change could push more people below the poverty line – 3.2 million Indians by 2030 – with early signs already visible in the school drop-out rates among vulnerable communities affected by extreme weather events.

However, this challenge also presents a significant opportunity. As rapid urbanisation, resource scarcity, and extreme weather reshape how we work, learn, and interact with our environment, climate education is not just another subject but a way of thinking, problem-solving, and decision-making that is key to building our future workforce.

India's green job market is booming, with demand seeing a 20-30% annual growth and projections exceeding earlier estimates. However, climate-related careers remain under-represented. In today's AI-driven world, learners are increasingly focused on fields such as AI, machine learning, and robotics. However, as automation reshapes traditional job markets, the future workforce will need hybrid skills that combine technological fluency with environmental intelligence. While AI may transform how industries operate, we will still require human judgment in areas such as sustainability, ethics, and systems thinking.

Strategic skill set

To bridge this gap, climate literacy will have to move from a moral imperative to a strategic skill set. We need a workforce equipped with the skills and knowledge to drive innovation, develop sustainable solutions, and manage the transition to a low-carbon economy. This also requires strong partnerships between educational institutions, government bodies, industry leaders, and research organisations.

Policy and institutional landscapes are shifting, and our education policies emphasise environmental consciousness and sustainable development. Regulatory bodies, along with educational institutions, are now mandating sustainability frameworks, while institutions across the world are introducing full-fledged degree programmes in environmental science, climate studies, and sustainable urban planning.

ning require professionals who are fluent in both technical systems and environmental contexts. With misinformation threatening climate action, the role of education has never been more vital. Around the world, there is a growing push to integrate environmental literacy into mainstream education, reflecting a broader recognition that today's learners must be equipped to tackle the climate challenges of tomorrow.

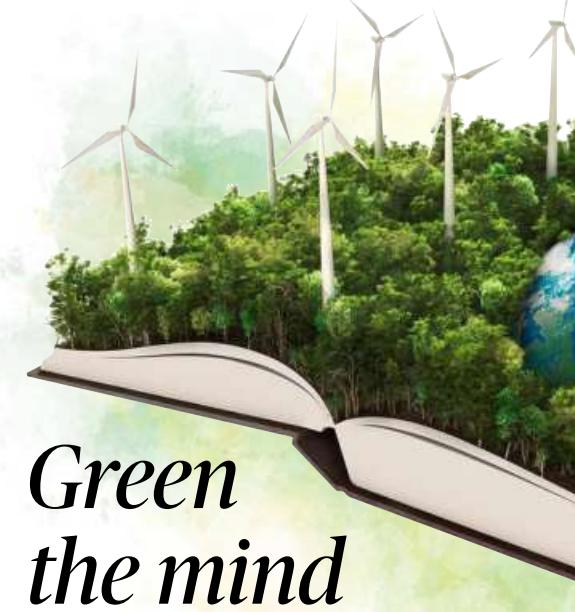
Beyond information

Climate education must do more than inform, it must prepare students to act. This means embedding practical, interdisciplinary skills such as analytical thinking, digital literacy, and problem-solving into the curriculum, alongside climate literacy. Curriculum changes and teacher training must keep pace with rapid shifts in technology and regulation to ensure relevance.

Climate change is a global challenge that demands local action and education is one of the most powerful tools we have. As policy, funding, and global hiring increasingly prioritise green skills, climate literacy will soon be as essential as digital literacy. This is already visible in new-age careers such as Climate Data Scientist, Sustainability Analyst, Green Tech Designer, Climate-AI Modeller, and Disaster Risk Expert, alongside paths in Environmental Law, Sustainable Architecture, and Climate Reporting.

To prepare for this future, we need a multifaceted approach where skills such as analytical thinking, systems literacy, digital fluency, and environmental understanding are embedded from an early age. This will empower the next generation to become better decision-makers, innovators, and citizens who can actively shape a more sustainable and equitable future.

The writer is Managing Director, Cambridge University Press and Assessment, South Asia



Green the mind

Integrating environmental literacy into mainstream education will equip today's learners to tackle the climate challenges of tomorrow.

tions and project-based learning into the curriculum. By offering programmes that guide learners through climate awareness, we can encourage action at the grassroots level, empowering young people and communities to build a sustainable future.

Climate change is a global challenge that demands local action and education is one of the most powerful tools we have. As policy, funding, and global hiring increasingly prioritise green skills, climate literacy will soon be as essential as digital literacy. This is already visible in new-age careers such as Climate Data Scientist, Sustainability Analyst, Green Tech Designer, Climate-AI Modeller, and Disaster Risk Expert, alongside paths in Environmental Law, Sustainable Architecture, and Climate Reporting.

The writer is Managing Director, Cambridge University Press and Assessment, South Asia

Apoorva Shroff

There was a time when sustainability in Architecture was considered an optional add-on, something nice to have, but not essential. That time has long passed. Today, whether you are designing a home in the hills or a campus in a dense city, it is impossible to ignore the role buildings play in the larger environmental equation.

If you are a student considering a career in Architecture, this is both a responsibility and an opportunity. You are entering the profession at a moment when the shift towards sustainable practices isn't just welcome, but urgently needed.

So, how can you begin preparing for a career in sustainable architecture while you are still studying? A few pointers:

Start with the basics: Before diving into technical tools or certifications, it

A sustainable mindset

Tips for Architecture students to integrate sustainability into their education and how they approach design

is important to comprehend the fundamentals of sustainable design. These aren't abstract ideas but often rooted in common sense and an understanding of how buildings interact with their surrounding environment. Think about

how to reduce dependence on artificial cooling and lighting through passive strategies, building orientation, natural ventilation, thermal mass, or strategic shading. Consider how the choice of materials affects not just the budget, but also

carbon emissions, insulation, and longevity. Learn how to think about water use, drainage, and long-term maintenance early in your design process. This kind of thinking often begins by simply observing your surroundings.

Look at how older buildings in your town respond to climate, how verandas or courtyards function, or how a tree can cool an entire facade. These observations will shape the kind of architect you grow into.

Make climate the



starting point: A good sustainable design doesn't look the same everywhere. It is responsive to its context, especially the climate. Spend time learning how to read sun paths, wind directions, rainfall patterns, and how they inform built form. If you are in a design studio, ask: "What would change in this plan if I were designing for a desert instead of a coastal town?" These questions will train you to think beyond aesthetics. Many architecture schools offer electives on climate-responsive design.

Take them seriously, not just to score well, but to build a skillset that will always stay relevant.

Choose internships that align with your values: It is tempting to go after big names for internships but, often, the most valuable learning happens in smaller, more focused firms, especially those that are committed to sustainability, even if they aren't shouting about it. Look for places where you will be able to get your hands dirty.

or finding ways to cool a space without increasing costs. It means thinking long-term, even when deadlines are tight. Reading, and staying updated with evolving policies help, like India's energy codes or local green building incentives. But more than anything, it helps to talk to people such as contractors, masons, engineers who deal with the real-world implications of what architects draw on paper.

Tools and thinking:

Digital tools have made it easier than ever to simulate building performance and environmental impact. These help you test how a design performs with respect to light, heat, and airflow. But a tool is only as good as the person using it.

Use them to support your decisions, not to make them for you. You will still need to question the assumptions behind every output.

Stay grounded: Sustainability isn't always glamorous. Sometimes, it means convincing a client

to reuse existing materials

or finding ways to cool a space without increasing costs. It means thinking long-term, even when deadlines are tight. Reading, and staying updated with evolving policies help, like India's energy codes or local green building incentives. But more than anything, it helps to talk to people such as contractors, masons, engineers who deal with the real-world implications of what architects draw on paper.

Sustainability as a habit:

Over time, sustainable thinking stops being a separate task and becomes part of how you approach design.

That is the goal: not just to learn a trend, but to build a mindset. Not every project you work on in your career will check every box on a sustainability checklist. But if your values are in the right place and your fundamentals are strong, you will find ways to make a difference.

The writer is Founder and Principal Designer at lyth Design.

YOUNG ACHIEVERS



Finding our spark

Chennai-born twins on winning at HackHarvard 2025

Harpita Pandian

Harpith Pandian

It was Friday afternoon and, instead of winding down at our college dorm, we zipped our backpacks, caught a train, and hopped on a five-hour bus ride from New Jersey to Boston, Massachusetts. Our destination: Harvard University to participate in HackHarvard 2025, a prestigious hackathon competition that brings together the brightest student tech-innovators from across the world.

As second-year students studying Computer Science, AI, and Cognitive Science at Rutgers University Honors College, hackathons have become one of our favourite adventures: 24-hour sprints to build technical projects that help solve real world problems. As a two-person team, we set out to push our coding skills and creativity over an unforgettable weekend at HackHarvard 2025.

The competition opened with tracks on themes like Sustainability, Security, and Entertainment. The Infosys Human Augmentation Track immediately caught our eye: the challenge was to build immersive technology that augments human capabilities. That's where our project Halo was born.

The name Halo stands for Help and Life-Saving Augmented Reality Overlay, and the inspiration came from a personal ex-

perience. Last year, our mom – who has lived with Type 1 diabetes for over 18 years – collapsed from a near-fatal medical emergency of Diabetic Ketoacidosis (DKA). Doctors later told us that what saved her life wasn't luck or medicine but how quickly we recognised the emergency in those critical first minutes and acted.

That moment stuck with us. No one should feel helpless in a medical crisis – whether it's a family member, classmate, or stranger. Halo became our answer: an iOS app that uses Augmented Reality (AR) and Voice AI to guide people through medical emergencies, and turn panic into confident action.

The overnight build At exactly 8.00 p.m., we opened our laptops, sketched out the plan, and got to work. We designed Halo as a Swift-native iOS app built for use on everyday iPhones and iPads – no headsets or special hardware required. At every hackathon, we pick one or new technologies to master. This time, we experimented with advanced motion-tracking and augmented reality using the Swift programming language.

By midnight, between cups of hot coffee and lines of code, we found ourselves surrounded by students from over 30 countries, all united by a shared love for building. It wasn't all smooth sailing; there was a point

when the motion tracking kept failing, and we were tempted to scale back the idea. But we reminded ourselves that hackathons aren't about perfection; they're about persistence and quick prototyping. By splitting tasks and working late into the night, we finally got our app working and ready for judging.

Results and reflections

When Halo was announced as the first-place winner in the Infosys Human Augmentation Track, we were elated. This success was deeply fulfilling, and marked our sixth Hackathon win of 2025. In the future, we plan to refine Halo and deploy the app in schools and workplaces as a powerful assistive and emergency training tool, supported by medical partnerships.

For us, Halo was more than a winning project. This experience was a reminder to enjoy the journey of building: the long hours of coding, the annoying bugs that taught us patience, and the new friendships made at 4.00 a.m. After leaving Boston, what stayed with us wasn't the adrenaline of the prize or the applause, but a bigger realisation: innovation feels most meaningful when it touches lives. That's the spark that keeps us building.

The writers are pursuing their Bachelor's degrees in Computer Science, Artificial Intelligence, and Cognitive Science at Rutgers University, the U.S.

H.B Raghavendra

In today's achievement-oriented society, students often measure their value through their degree, grades, or the prestige of their institution. However, this narrow view limits personal growth and prevents them from embracing their full potential. A degree is an important milestone and a foundation for one's career but should never define one's identity or self-worth.

Our society tends to frame personal identity around academic choices, asking questions like "What are you studying?" or "How do you envision your journey after graduation?" These questions, though seemingly innocuous, make implicit assumptions that a person's worth is tied directly to their academics or career trajectory.

Many students internalise these ideas, making them prone to worry, anxiety about failure, or apprehensions about their career path. Yet life rarely follows a clear linear route from degree to job to identity. People are inherently multi-dimensional, capable of growth, change, and reinvention well beyond the boundaries of their formal education.

Consider this: Steve Jobs, the co-founder of Apple, dropped out of college

yet changed the world through innovation and design. Oprah Winfrey majored in communications but became a media celebrity and philanthropist, thanks to her tenacity. Jeff Bezos, who studied Electrical Engineering and Computer Science, revolutionised retail and cloud computing. These examples show that a degree is a valuable tool but success often requires blending passions, skills, and experiences from multiple domains.

Damaging effects

When people conflate academic achievements with personal worth, it could have damaging effects. Failure or poor academic per-

formance may feel like an inadequacy, leading to reduced resilience. Students might hold back from exploring new passions or taking risks, which can hinder their creativity and personal development. Career switches or unconventional paths can provoke imposter syndrome, leaving individuals doubting their legitimacy despite new competencies.

Separating identity from academic credentials fosters a healthier perspective, empowering students to experiment, learn from failure, and pursue paths aligned with evolving interests and values. Educators hold a vital responsibility in cultivating and guiding this way of thinking. By

sharing stories of challenges and growth from their own lives, teachers normalise lifelong learning beyond exams. They can emphasise soft skills such as communication, creativity, critical thinking, and collaboration, qualities that transcend academic fields and are essential to success in any career.

In addition, educators can broaden students' exposure through interdisciplinary workshops, internships, and guest lectures, encouraging them to find opportunities beyond their academic niche. Validation of student efforts in various dimensions, not just grades, helps build confidence, self-awareness, and resilience. This holistic ap-

proach supports identity formation that embraces multiple strengths and potentials.

Qualities to develop

Ultimately, a successful and fulfilling career is often less about the title or a degree and more about passion, perseverance, and adaptability. Today's dynamic world demands flexibility, the willingness to pivot, learn new skills, and redefine success on individual terms. An identity too rigidly attached to a degree can hinder these qualities.

To students reading this: your degree is an invaluable foundation, but it does not encompass your full potential. Every experience plays a role in shaping both your personal and professional path. Stay curious, embrace opportunities, and give yourself the space to grow and transform. Reject the notion that your worth is linked solely to academic accolades or job titles. Your identity is dynamic, shaped by your purpose, values, and the impact you make.

Embracing this idea prepares you to navigate life's uncertainties and thrive in the transforming future. Let your degree be the springboard, not the ceiling, for the identity that you want to build.

The writer is the Vice Chancellor of CMR University, Bengaluru.

Just a springboard

Why students must not link their identity to their degree



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Sanjay Laul

The tightening of immigration rules in foreign countries has created some confusion in students planning to study abroad. Understanding the application process and early planning will help students prepare for the various changes they need to take into account. Here are five factors to keep in mind as they prepare for admissions

Track policy shifts: With regulations being tightened across major destinations, it is important to follow developments and buy time. In Canada, due to the study permit cap, most students have to get a provincial or territorial attestation letter. In the U.K., a 2024 review kept the Graduate Route but involved more scrutiny, which could affect timelines and post-study choices. Australia replaced GTE with a Genuine Student requirement, raised the thresholds for English and began closer checks of statements and evidences.

Airtight documents: Financial records, proof of funds, tuition receipts, sponsor letters, and English scores aligned to the study plan should be foolproof. Make sure the scans are clear and readable.

Shifting sands

Five tips for students applying to study abroad in light of changing rules



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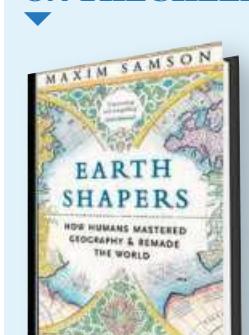
Those who have dependents must show availability of funds to support them and for health insurance. Where document templates are available, use the latest version from the official website to avoid any mismatch.

Official channels: The U.K. review recommended mandatory registration for international recruitment agents. Until newer rules are announced, students should stick with official university channels, checklists and advisors who

Do not panic: Public attitudes have hardened in several destinations. Ipsos reports that about two in three people across surveyed countries now say there are "too many immigrants." Students are not unwelcome, but may be scrutinised more carefully. Applications should clearly and consistently explain programme fit, funding, and post-study plans. Many campuses offer orientation, counselling, and clear reporting channels. Keeping emergency contacts, knowing rights and local norms, registering with a consulate where available, and joining recognised student groups strengthens support.

Treat the process like an academic project. Start early, make sure every item on your checklist is ticked off, ensure transparency and clarity in funding, course choice and post-study work options. Pick courses with real projects, internships, and industry-recognised credentials. This will show employers and visa officers the purpose of your study plan and help universities support you more effectively once you are on campus.

ON THE SHELF



Earth Shapers
Mountains, meridians, rivers and borders; these are some of the features that carve up the world on our maps and in our minds. But geography is far less set in stone than we might believe and, over time, we have become experts at reshaping our surroundings. From the Qhapaq Nan, South America's 'Great Road', and the Panama Canal to Mozambique's railways and Korea's sacred Baekdu-daegan mountain range, Samson explores how we mould the world around us. And how, as we etch our needs onto the natural landscape, we alter the course of history.

Author: Maxim Samson
Publisher: Hachette
Price: ₹999

The writer is founder of MSM Unify