THEIR VIEW

Bridge learning gaps by making better use of existing resources

Our current ICT infrastructure in schools presents a practical, cost-effective and scalable opportunity to improve outcomes

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India's aspiration to become a developed nation by 2047 hinges critically on the strength of its human capital. However, persistent learning gaps in public education—highlighted by assessments like the Annual Status of Education Report (ASER) and Performance Assessment, Review, and Analysis of Knowledge for Holistic Development (PARAKH)—pose headwinds to this vision. In response to these learning gaps, the government introduced the National Education Policy (NEP) in 2020 and the National Initiative for Proficiency in Reading with Understanding and Numeracy (NIPUN Bharat Mission) in 2021, and is undertaking many other systemic reforms. The impact of these will unfold in the years to come, once the slow systemic effects of educational reform start to become visible.

The reasons behind learning gaps in public schools are well known and many—ranging from pedagogical methods, rote-based assessment practices and teacher shortages to structural issues in training institutions like District Institutes of Education and Training (DIETs), among others. Addressing each of these issues demands long-term solutions and sustained efforts, but the key question right now is: Are there potential pathways that can help bridge learning gaps and be implemented quickly, efficiently and within our existing resources?

Technology-led learning could offer a practical way forward, especially since budget allocations for it already exist with the ministry of education. Over the past two decades, the government has invested heavily in establishing computer (ICT) labs in secondary schools, with such facilities sanctioned for over 120,000 schools till date. These labs are primarily intended to help students build basic digital skills. However, given the rapid advancements in tech-led learning solutions, India should use ICT labs for subject learning.

Recent experiences by a few state governments with the use of ICT labs as 'learning labs' have shown promising results in bridging learning gaps. With the availability of advanced AI-based tools, these labs can complement classroom teaching and help students learn more effectively without the need for an additional financial outlay. This strategy is especially valuable for schools struggling with teacher scarcity or deep learning gaps.

Early initiatives such as those led by Niti Aayog in aspirational districts (280 schools), Mission Buniyaad by Rajasthan's government (3,500 plus schools) and a similar programme in Andhra Pradesh (524 schools) offer hope. All three have effectively leveraged advanced AI-based personalized and adaptive learning (PAL) solutions within available ICT budgets for schools to support subject learning. These labs are equipped with PAL tools that deliver customized content to each student, based on individual learning needs. Two students in the same classroom can follow different learning paths tailored to their specific needs and pace.

Did it work? Independent evaluations—one led by Nobel Laureate Michael Kremer for the Andhra Pradesh programme and another by an independent evaluator for the Niti Aayog initiative—clearly show the positive impact of a well-executed ICT-led intervention. When ICT infrastructure is consistently used for academic learning, students have demonstrated gains equivalent to 0.9 to 2.5 additional equivalent years of learning within 2 to 3 years of implementation in the Niti Aayog and Andhra Pradesh programmes. Students in Rajasthan showed an increase of 21 percentage points in their learning score within two years. The transformative potential of this approach is clear.

To enhance its impact, Niti Aayog introduced a significant policy shift by linking payments to ICT providers with actual improvements in student learning outcomes. This marked a departure from the practice of vendors being paid simply for setting up ICT labs, regardless of their usage or impact. Under Niti's model, a substantial portion of the payment was withheld unless measurable learning gains were achieved. This outcomes-based approach—also known as 'pay for results'—created incentives for providers to work closely with schools and ensure that ICT labs were used to drive meaningful education.

Interestingly, once digital-led learning becomes a regular practice in schools, anecdotal evidence from these programmes shows a positive shift in student behaviour. Enrolment and attendance rates have improved as students demonstrate a strong interest in engaging digital tools.

States with adequate ICT infrastructure should consider blending classroom teaching with the use of 'learning labs.' However, a few critical elements must be addressed for integration success.

First, states must pursue a vision where ICT labs are seen not merely as infrastructure, but as real 'learning labs' that are an integral part of the academic curriculum. This shift in perspective helps create a shared vision across all levels, right from senior bureaucrats to classroom teachers. Thereafter, any learning-focused initiative taken by the state education system would place emphasis on ICT labs for outcome improvement.

Second, responsible procurement of future ICT labs is essential. This includes selecting advanced ICT infrastructure that has a long lifespan, requires less maintenance and enables the deployment of high-quality AI-driven PAL content (which is vital for personalised learning).

Third, ICT providers must be held accountable for supporting schools in using these labs effectively. The 'pay for results' model offers a practical framework by linking vendor payments to measurable improvements in student learning.

Fourth, regular monitoring, continuous learning during implementation and timely course corrections must serve as core guiding principles. Real-time data from ICT lab usage, combined with its ongoing impact on student learning, will offer valuable insights. Gaps need to be identified early and corrective action must be taken promptly.

Systemic gaps in India's education sector must be addressed with urgency and sustained effort. Technology-led learning is not a substitute for quality teachers, but it can be a powerful complement. The use of existing ICT infrastructure presents a practical, cost-effective and scalable opportunity.

As the country's education system strives to deliver more with limited resources, making better use of what already exists may well be the most impactful step towards better outcomes.

MINT CURATOR

India is outpacing America in its transition to clean energy

First China, then India. The US is becoming a renewables laggard

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India's energy transition gained pace as cost dynamics shifted. BLOOMBERG

Once upon a time, the US was the world's sole clean energy superpower. Until 2011, it led the world in connecting wind and solar generators to the grid. Then China took over, to a point where its lead now looks unassailable: The People's Republic added eight times more renewables than the US last year. This year, India is likely to overtake America too.

The country connected 22 gigawatts of wind and solar in the first half—a dramatic recovery from a troubling slowdown in 2022 and 2023, and enough at full output to power nearly one-tenth of the grid. Assuming this is maintained through December, that should put India ahead of the 40GW that the US government expects this year.

It's also setting the world's most populous nation on course to hit a target of Prime Minister Narendra Modi's that once seemed implausible: to reach 500GW of non-fossil generation by 2030. Such a shift will herald the dawn of a new clean energy superpower, and give the world some of its best hopes of averting disastrous climate change.

It's a remarkable turnaround for a country whose renewable industry looked like a lost cause barely more than a year ago. What happened?

One factor is financing. Easing inflation has allowed the Reserve Bank of India to cut its policy rate by a percentage point since December to the lowest level in three years. This reduces the price of renewables, which are particularly exposed to debt costs. Regulatory deadlines have also played a role: A waiver on transmission charges for wind and solar expired at the end of last month, causing developers to rush to complete their builds in time to get the financial benefit.

The end of that waiver may cause a wobble for the sector over the next year or so, but the changes will be introduced slowly. Over the balance of the decade there's now good reason to think the recent pace can be sustained. The rash of projects breaking ground this past year means about 414GW of clean power is already either operating or under construction, including nuclear and hydroelectric plants. That's not far off India's 500GW target, and we've still got more than five years to go.

Industrialists are counting on it. Solar panel manufacturing has been ramping up to the point where it now runs far in excess of domestic demand, at 91GW. With lower tariffs on exports to the US than their rivals in China and Southeast Asia, this excess supply might make local panel makers rare beneficiaries of US President Donald Trump's war on clean energy. That certainly seems to be the assumption of a group of US competitors that last week sought anti-dumping measures to keep Indian products out of their market.

For many years, India had a sceptical take on the energy transition, arguing since the 1970s that poverty was a more pressing problem than protecting the environment. The difference now is that zero-carbon power is decisively cheaper than the competition. Rising incomes, meanwhile, mean the government needs to also think about the needs of roughly half a billion middle-class citizens, who worry more about where to find a good job in a clean, liveable city than the basics of subsistence living.

India is still building coal-fired power plants to make sure those newly-minted urbanites don't suffer power cuts in the middle of punishing heatwaves, but they are not necessarily being used. Thanks to milder weather than in recent years and the rising volumes of renewables pushing it off the grid, fossil-fired power generation fell 4% in the first half relative to 2024. That's the first time it has dropped since the covid-19 pandemic hit in 2020, and occurred even as electricity generation rose 0.8%. Retirements of old plants mean that fossil-generation capacity has actually declined slightly so far this year.

It's still possible that emissions from India's power sector won't peak until well into the 2030s. Even so, the faster rollout of renewables, combined with declining pollution from China and the rich world, means the global picture is improving faster than you'd realize if you were focused only on the steampunk posturing in Washington.

Renewable power isn't just cleaner—it's also cheaper, and more suited to the aspirations of the billions in the Global South who want a better, healthier life.

Rich nations like the US can afford the indulgence of a campaign against modern energy, at least until their citizens realize how badly they're being shortchanged. It's a fatal myopia, though.

For all Trump likes to boast of energy dominance, America is falling behind on the most important energy technologies of the 21st century. ©BLOOMBERG

THEIR VIEW

Use UTCs to prepare India's workforce for the future

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The paradox of high growth of unemployment alongside rapid economic growth is one of India's most urgent challenges. Some large employment-intensive and fast-growing sectors like construction, garments, transportation, etc, will help make growth more labour intensive. However, this can only be a short-run holding operation at best. Most jobs offered in these sectors would be low-skilled, low-paid jobs. It would match the low-skill profile of most entrants to the workforce. Over half of them are not employable, according to employers' organizations. Less than 5% have any certified skills compared to over 70% in most European countries and over 90% in some East Asian economies. This skill profile cannot be changed overnight. But these are not the kinds of jobs young workers aspire to. Nor is this the workforce we need. In the 21st century, control of emerging technologies and a suitably skilled workforce will be the key determinants of which countries remain competitive and prosperous.

Unfortunately, our numerous skilling programmes have had little impact on actual employment. We need disruptive change and an altogether different approach to prepare India's workforce for the 21st century. In proposing an approach similar to successful technical schools in Germany and University Technical Colleges (UTCs) in the UK, I have drawn on David Harbourne's recent work on the subject.

We need disruptive change in our skilling programme, but this disruption must be managed within the framework of India's National Education Policy (NEP). The policy has proposed a four-stage system for school education: Foundational stage of 5 years including *anganwadi*/pre-school (ages 3-6) followed by classes 1 and 2 (ages 6-8); a preparatory stage of 3 years (ages 8-11) in classes 3 to 5; the middle stage of 3 years (ages 11-14) for classes 6 to 8; and the secondary stage of 4 years (ages 14-18) for classes 9-12. UTCs would be an alternative to secondary stage schools, allowing students the flexibility to subsequently choose between higher education and vocational training. The STEM-oriented curriculum would include science, mathematics, compulsory language courses in the mother tongue,the national language Hindi, and a global language English, plus optional social science courses. These classroom courses would be combined with technical skilling in some field, including team-based technical projects in collaboration with companies on real world technical problems. Students would also have hours for sports or other extra-curricular activities, but no homework.

University Technical Colleges in partnership with industry could address skilling gaps

The term 'University Technical College' is important. As vocational training is seen as an inferior alternative to conventional secondary stage school followed by college and a university degree, the term indicates that a UTC also offers a path to higher education and a university degree; in addition, a UTC course equips students with technical skills in some field and real world project experience with a firm in that field, which will enhance their eligibility for apprenticeships and employability. Access to higher education, if desired, together with better employability gives UTCs an edge over conventional schools. It should gradually wipe out negative perceptions of vocational education. But it also implies a key feature of UTCs: they must be attached to a university and one or more companies as core partners. For example, students of Gothenburg Technical Gymnasium in Germany, located near a Volvo plant, have worked on technical issues tackled by Volvo or other engineering firms. Similarly, the JCB Academy in Rochester, England, has had partnerships with Rolls Royce, Toyota and others, apart from JCB itself.

UTCs may face initial resistance and challenges. One of these is enrolment. Conventional schools would want to retain their best middle-stage students for their own secondary classes. This is not a problem, provided UTCs can enrol the modal group of students and not just tail-enders. For this, each UTC will need a network of feeder schools through which they can reach out to students and parents to ensure applications.

Another major challenge will be finance. By design, UTCs will be more staff and resource intensive than conventional secondary schools. Governments may have to provide the capital and running costs during the initial years. But after an initial period of three years and possibly another three years after a midterm review and course correction, UTCs should become self-financing. Best practices and innovative cost-cutting measures can be adopted through comparisons among UTCs. Networking among UTCs providing similar technical skills in a city will enable scale economies, such as sharing the cost of specialist teachers. Most importantly, other than for means-tested scholarship students, the UTCs must establish student loan schemes in collaboration with banks. UTCs should be rolled out first in cities with many high-tech firms like Bengaluru, Hyderabad and Gurugram, and then be gradually extended to other cities.

Finally, the success of a UTC programme will depend on the awareness of students (and parents) and their 'buy in'. For this, effective communication through multiple levels of government, academic experts and media will have to play a critical role. Such communicators would also be important partners, along with companies, universities and feeder schools, in the country's mission to successfully establish a UTC system.

These are the author's personal views.