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Beyond credentials: education, skill formation and the unequal architecture of work in India

Abhishek Pandey

abhishekdbsh@gmail.com

Institute for Human Development

Sunny Kumar

Institute for Human Development

Article

Keywords: skill development, vocational education, capability approach, structural transformation, student aspirations, dignity of labour, India

Posted Date: November 3rd, 2026

DOI: https://doi.org/10.21203/rs.3.rs-11079984/v1

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Additional Declarations: No competing interests reported.

Abstract

The lack of qualified labour and the difficulty of aligning educational programmes with changing labour-market requirements are often identified as central challenges of skill development in India. However, these concerns represent only part of the broader challenge. The key question is whether the education and skill-development system enable students to translate academic learning, occupational experience and credentials into practical competencies, career progression and decent employment. This paper draws on the NITI Aayog initiative Education and Skills Required for the Future, undertaken by the Institute for Human Development (IHD), and combines secondary data from official sources on education, higher education, GDP, sectoral value added and employment with institutional key informant interviews and 51 focus group discussions involving 514 higher-secondary students. It also considers historical and contemporary evidence within the institutional planning horizons of 2030, 2035 and 2047. The evidence suggests a persistent structural imbalance. The Indian economy has become increasingly service-oriented. But employment stays heavily concentrated in agriculture and other relatively low-wage activities with limited opportunities for occupational progression. At the same time, educational participation has risen without ensuring equal access to digital resources, experiential learning, career guidance, certified vocational training and sustained work experience. The student narratives suggests that it is not about wanting to get ahead, it is about how few ways there are in the institutions to turn that wanting into real education and jobs. The paper draws on human capital theory, the capability approach, democratic education, the dignity of labour and recognition to argue for a shift away from the measure of training inputs and placements to the measure of educational and professional trajectories. The key focus areas in the short term should be improvement in career guidance, digital access and practical skills. Reforms in the medium term should include integration of vocational and tertiary education pathways. While the long-term strategies should include strengthening of ITIs, polytechnics, higher technical pathways and lifelong learning. The main argument is that the development of skills generates social and economic value that is meaningful when the competencies acquired are recognised through occupational mobility, decent work and the real freedom to choose and pursue career paths.

1. Introduction

India with its demographic dividend and its evolving economy has placed education and skills development at the center of its development strategy. The education system at different levels, from primary schooling to tertiary education, vocational institutions and short-term training courses, has been greatly improved. But this expansion has not yet bridged the gap between educational qualifications and realistic job opportunities. Degrees can be awarded without regular contact with professional settings, current equipment or career advice; gifted young people can gain qualifications that do not meet the needs of the labor market; and economic growth can go hand in hand with informal employment, low starting salaries and limited opportunities for career progression. So the idea of skill cannot be reduced to the number of people trained. They are also the structural conditions for the conversion of knowledge to competence, competence to employment and employment to a means of agency rather than mere subsistence.

This paper attempts to answer three interrelated questions. First, what opportunities does the education and training system provide for upward mobility, digital access, occupational choice and experiential learning? Second, how should changes in production and employment be understood for skill policy when sectoral

growth does not generate comparable occupational mobility? Third, what normative principles should govern the relationship between education and labour in a society marked by inequalities of caste, gender, region and class? Together, these questions shift attention from a generic 'skills gap' to the institutional translation of enrolment into sustained learning, curricula into usable knowledge, certification into recognition, and technological change into accessible opportunity.

The paper draws on evidence generated through Education and Skills Required for the Future, a project undertaken by the Institute for Human Development (IHD) for NITI Aayog. The project report has been submitted to NITI Aayog and remains unpublished when this article was prepared. The present article is an independent scholarly analysis of selected project evidence. Members of the author team participated directly in the fieldwork, including Key Informant Interviews (KIIs) and focus group discussions (FGDs). The quantitative component uses UDISE+, AISHE, national accounts, Employment and Unemployment Surveys, Periodic Labour Force Survey data and official skill-development records. The qualitative material examines institutional priorities and student experiences across short-, medium- and long-term horizons for 2030, 2035 and 2047.

The analysis proceeds from the literature and conceptual framework to the educational and institutional structure of skilling, changes in output and employment, time-horizon priorities, student experiences, normative interpretation and a student-centred national skill compact.

2. Education and Skill Formation in Literature: Divergent Standpoints and the Unresolved Evidence Gap

The discourse on education and skill development is not divided by contrasting views on the value of learning, but by contrasting views on its purpose. Human-capital theory regards education and training as investments in productivity, income and national development (Becker, 1964; Schultz, 1961). This perspective has had a powerful impact on contemporary policy, emphasizing the need for curricula to be responsive to technological change and for employers to be at the heart of identifying labour-market demand. But literature also warns against equating competence with narrow task-specific performance. Research on vocational education emphasizes that training systems are embedded within labour-market institutions, social policies and occupational structures and cannot effectively tackle unemployment in an economy which does not offer secure and adequately remunerated employment (Allais, 2012; McGrath, 2012; Mehrotra, 2014). Learners require access to conceptual knowledge and not just the skills for particular jobs (Wheelahan, 2010). Brown et al (2011) similarly show that the increase in educational credentials can boost competitiveness, but not necessarily parallel employment opportunities. These concerns are reinforced by capability and democratic-education perspectives. Sen (1999) and Nussbaum (2011) argue that education is important for expanding substantive freedoms, while Dewey (1916) emphasises the relationship between knowledge and experience as fundamental to democratic education. Ambedkar's analysis of the 'division of labour' in the Indian context provides an additional caution: occupational specialisation becomes inequitable when it reproduces inherited occupational roles rather than broadening opportunities (Ambedkar, 1936, 2014). The distinction, therefore, is between a demand-responsive perspective that evaluates skills primarily in terms of productivity and employment, and a broader perspective that considers the forms of knowledge, autonomy, recognition and social relationships that a skills system creates.

Existing research on India has contributed substantially to understanding the demographic dividend, vocational training, institutional fragmentation, graduate employability, apprenticeships and the gap between educational outcomes and labour-market requirements (Mehrotra, 2014; MSDE, 2015). Moreover, recent research also supports this institutional reading of skill formation. Endow and Mehta (2022) attribute weak school-to-work transitions in India to unequal access to education, skill mismatch and low uptake of vocational education. Gupta and Dharap (2024) illustrate the potential of India's skilling architecture, but also the coordination and implementation challenges they face. Schneider et al. (2023) document the persistence of theory-driven and insufficiently practice-oriented teaching in Indian ITIs. Digital opportunity is also socially differentiated: Rajam et al. (2021) find large caste-based gaps in both access to digital technologies and digital skills. On the employment front, Abdullah and Mansoor (2024), Moktan and Chakrabarti (2024) and Paul et al. (2023 highlight the continuation of low-quality jobs and the incomplete translation of growth into secure jobs. Cognitive flexibility and diversified skills are emphasized by Zhang et al. (2024) for the future of work, while skills are shown to be developmentally limited in contexts where institutional recognition and social belonging are weak by Ncube and Pandey (2026).

However, three analytical gaps remain. First, macroeconomic analyses generally examine changes in sectoral output and employment but pay limited attention to how students interact with the institutions responsible for preparing them for the changing economy. Second, evaluations of skill-development programmes tend to focus on enrolment, completion and placement, while paying less attention to subsequent promotion, earnings, recognition and occupational mobility. Third, qualitative studies of students' aspirations and educational experiences have provided important insights into curricula and institutional constraints but have less frequently connected these experiences with longer-term changes in sectoral value creation, labour-force participation and occupational structure.

This paper seeks to address these gaps by bringing together four interconnected levels of evidence: the educational foundations of skill development; the institutional pathways through which vocational and technical skills are acquired; the structural relationship between economic transformation and employment; and the lived experiences of students as they navigate these systems. The approach is interpretive rather than additive, and the goal is not to argue that any one body of evidence can answer the skills question but to investigate how different types of evidence are complementary and change the interpretation of the problem. For example, the fact that the share of national income from services is higher does not necessarily translate into opportunities if students do not have reliable digital access or if employment in the growing service sectors is uncertain. Similarly, a vocational diploma may have limited development value if the qualification is not recognized by employers or if opportunities for occupational progression are limited. The integration of official secondary data with key informant interviews and student views conceptualizes skill development as an institutional and social process of transformation rather than simply a quantitative shortfall in training provision.

3. Analytical Orientation and Evidence Base

This section sets out the conceptual orientation and evidence base used to connect skill formation with educational opportunity, institutional pathways and labour-market structure.

3.1 Skills as capabilities, knowledge and social recognition

The normative lexicon of this discussion is mostly provided by the capacity framework. Capabilities are the true opportunities of people to lead lives they value (Sen 1999). In education, the idea is a delineation between what is formally provided and what is actually available. The same course would be experienced differently by a reliable urban student with technology, transport and professional contacts than by a rural first-generation learner with poor connectivity, limited mobility and acute financial pressures. These characteristics are called "conversion factors" and they decide if a resource becomes a viable opportunity. Nussbaum's (2011) emphasis on institutional backup underlines that intention cannot substitute for the needed material and social conditions for action.

Dewey's (1916) conception of education has an epistemic dimension. The value of experiential learning lies not in its resemblance to the world of work, but in the way it combines action with inquiry, decision-making and consequence. A narrow competency framework may teach a process, but it does not allow the student to understand the larger production system, to adapt to changes, or to question harmful behaviours. Sennett (2008) describes craftsmanship as a cognitive engagement in processes of creation, repair, diagnosis and maintenance. Vocational competence is no less intellectually worthy than scholarly activities. The basic contrast is between superficial and deep learning, not between manual and cognitive tasks.

3.2 Evidence, scope and interpretive limits

The empirical basis incorporates official secondary data and primary qualitative data generated through the IHD project. The educational indicators are based on UDISE + 2023–24 and AISHE 2021–22. The economic analysis is based on the 2011–12-base national-accounts series, Employment and Unemployment Surveys and PLFS data up to 2023–24. Institutional evidence includes 27 Sector Skill Councils, 19 ITIs, 16 polytechnics and 18 senior higher education officials across 10 states. The student component consisted of 51 FGDs with 514 higher-secondary students of Science, Commerce and Humanities streams in six field locations.

Main fieldwork was done by project team researchers, including members of the present author team. The qualitative material used here has been anonymized and does not contain participant names or direct personal identifiers. The KIIs and FGDs were purposive inquiries to identify institutional mechanisms and stakeholder perspectives and are not considered to be nationally representative or used to estimate prevalence.

This article draws on qualitative evidence that is organized around recurring domains in the field material: curriculum relevance, digital access, career guidance, practical exposure, institutional pathways and employer linkages. These accounts are triangulated with official statistics in an effort to identify convergences, contrasts and mechanisms rather than to create numerical weights for interview themes. National data provide a sense of scale, while the KIIs and FGDs explain how the institutional provision is implemented and experienced. This way, the difference between statistical representation and qualitative interpretation is maintained.

The paper retains the original data of the project and does not combine it with the latest versions. This is particularly relevant in national accounts, where changes in the base year and subsequent adjustments can affect historical data and growth rates. The following macroeconomic tables reproduce the internally

consistent series used in this analysis and indicate their reference years. They should be read as a story of structural change, rather than as a presentation of the latest amended national accounts.[1]

4. Present Status of Education and Skill Development in India

This section examines whether participation, vocational pathways, digital access and institutional arrangements enable students to convert educational access into usable capabilities.

4.1 Participation, progression and the educational base of skilling

Skill formation begins before specialised vocational training. Literacy, numeracy, scientific reasoning, communication, digital fluency and collaboration provide its foundation. In 2023–24, more than 248 million pupils were enrolled in about 1.472 million Indian schools, including 1.018 million government schools (Department of School Education and Literacy [DSE&L], 2024a). Participation nevertheless narrows across stages: under the NEP-aligned structure, GER was 96% at the preparatory stage, 90% at the middle stage and 66% at the secondary stage; the secondary dropout rate was 10.9% and retention to the secondary stage 45.6% (DSE&L, 2024b). These losses constrain later access to technical and higher education.

Higher education widens opportunity but does not by itself ensure practical competence. AISHE 2021–22 reported 1,168 universities, 45,473 colleges and 12,002 stand-alone institutions, with a GER of 28.4% for ages 18–23 (Department of Higher Education [DHE], 2024). The growth of institutions has led to more chances, but experiential learning is uneven, especially in general degree programs and colleges that have limited labs, software, placement networks, and industry partnerships. The distinction between access and conversion should be made: joining a degree course is an academic achievement but it becomes a professional competence only if students are able to combine disciplinary knowledge with tools, communication, judgement and reliable channels for future learning or employment.

Vocational enrolment is pretty low compared to traditional education. The program shows that more than 12 lakh students from 10,158 Government schools and 8,583 CBSE schools are getting vocational education. But DISE data of 2016-17 shows that only 3% of 8.2 million Class XII candidates were enrolled in vocational programs (UNESCO New Delhi, 2020). Although the reference year does not allow for a direct comparison with current activity, the data suggests a continued gap between institutional offerings and actual participation. The inequity leads to restricted access and legitimate concerns about status, career advancement and professional advantages. Students and parents often view academic qualifications as a promise of future opportunities, while vocational training is seen as either unsatisfactory or poorly paid. Growth without permeability may so reinforce rather than demolish hierarchy. There needs to be a valid professional pathway connecting schooling experiences with ITIs, polytechnics, apprenticeships, certifications, degrees and entrepreneurship via explicit credit recognition and lateral entry alternatives. Table 1, below, summarises these indicators of participation, progression and institutional capacity and vocational participation.

Table 1

Selected indicators of the educational base for skill development

Indicator	Reference year	Reported status	Interpretive significance
Students in school education	2023–24	24.8 crore	Scale of the foundational learning base
Schools	2023–24	14.72 lakh; 10.18 lakh government	Public institutions carry the principal equity responsibility
Secondary-stage GER	2023–24	66%	Substantial attrition before advanced vocational choice
Secondary dropout rate	2023–24	10.9%	Interrupted progression into technical and higher education
Retention to secondary stage	2023–24	45.6%	Cumulative narrowing of the student pathway
Higher-education GER (18–23)	2021–22	28.4%	Limited reach of advanced and professional learning
Universities / colleges / standalone institutions	2021–22	1,168 / 45,473 / 12,002	Large network with uneven practical capacity
Class XII examinees in vocational streams	2016–17	Around 3% of 82 lakh examinees	Vocational participation remained marginal at the senior-secondary exit stage

Note. All figures are secondary data. School participation and institutional indicators are drawn from UDISE + 2023–24 and AISHE 2021–22. The vocational-stream figure is based on DISE 2016–17 as reported by UNESCO New Delhi (2020). It refers to Class XII examinees, not total school enrolment.

4.2 Digital access and the unequal conversion of opportunity

Digital literacy has become a key element in both education and the workplace. It allows access to apps, simulations, programming platforms, digital design environments, online assessments, employment portals, financial services, and platform-mediated services. The presence of an equipment or laboratory does not mean frequent educational application. According to the UDISE+ report, 50.9 per cent of all educational institutions and 43.5 per cent of government schools have functional computers for instruction. Only 19.3% of government educational institutions at middle and secondary levels had functioning ICT laboratories (DSE&L, 2024a). This is important because assessment, design, communication and job search are more and more requiring digital competence. Digital inequality is also socially structured. Representative evidence at the national level shows large caste-based differences in access to digital technologies and skills to use them (Rajam et al., 2021).

It is important to note that state averages reveal the unevenness behind national provision. More than 94 per cent of schools in Kerala, Punjab and Haryana had computers in working order, compared with less than 22 per cent in Meghalaya, Bihar and West Bengal. The gap was even wider between government schools. Thus, a formally common curriculum can lead to very different opportunities for practice and competence. The interstate variation in functional computer facilities discussed above is presented in Table 2.

Table 2

Functional computer facilities for pedagogical purposes in selected states, 2023–24

State	All schools (%)	Government schools (%)	Relative position
Kerala	99.1	99.4	High
Punjab	96.8	97.9	High
Haryana	94.9	96.8	High
Sikkim	88.6	87.0	High
Andhra Pradesh	84.1	79.2	High
Meghalaya	17.0	10.0	Low
Bihar	18.0	10.9	Low
West Bengal	21.8	18.3	Low
Manipur	30.5	16.7	Low
Uttar Pradesh	33.8	22.7	Low

Note. Figures are from UDISE + 2023–24. “Functional” denotes facilities reported as usable for pedagogical purposes; it does not measure the frequency, duration or quality of student access.

4.3 Institutional breadth without seamless progression

India’s talent ecosystem is made up of several pathways that vary in length, institutional control and links to formal schooling. Schemes like Pradhan Mantri Kaushal Vikas Yojana, Deen Dayal Upadhyaya Grameen Kaushalya Yojana and National Urban Livelihoods Mission are short duration schemes and provide vocational training for a period ranging from few weeks to few monthsSector Skill Councils develop occupational standards, qualification packs, assessment systems and linkages with employers. Project field work covered 27 of the 36 councils across manufacturing, services, energy, agriculture, disability, care, handicrafts and sports. Interviews indicated the necessity for earlier hands-on experience in fields like green technologies, electronics, semiconductors, biological sciences, digital technology, telecommunications, electric mobility and tourism.

There are longer pathways through ITI, polytechnics and apprenticeships. The DGT network recorded 14,955 ITIs while the share of women in long-term ITI and NSTI programs increased from 9.8% in 2015–16 to 13.3% in 2023–24 (MSDE, 2024). Recent research nevertheless finds that Indian ITI teaching can remain theory-driven and insufficiently practice-oriented (Schneider et al., 2023). For instance, ITIs generally offer one- or two-year vocational training courses, and polytechnics offer three-year diploma programs after Class X, which can lead to jobs or to engineering degrees. These institutions not only serve to meet immediate livelihood needs, but also to create pathways to further education and occupational advancement. But their effectiveness depends on the availability of equipment, the quality of practical training, transport facilities, accommodation, the connectivity with employers and placement opportunities, and wider social recognition of technical qualifications. The problem is so, not only the lack of institutions, but also the lack of consistency and permeability of institutions. Vocational subjects at the school level may not be aligned with ITI trades; short-term certificates may have uncertain labour-market value; skill modules in higher education may be

considered as peripheral; and apprenticeships may continue to be concentrated in a limited number of industries and occupations. Consequently, students may amass credentials without a clear educational or vocational direction. The National Credit Framework and work-integrated degree programs are aimed at facilitating the transfer and recognition of academic learning, practical training and prior experience (University Grants Commission, 2020, 2023). But for this to work, portability means clear equivalency between qualifications, the right guidance and institutions ready to recognise learning from different pathways. These elements are not necessary to have formal flexibility without meaningful student mobility.

5. Economic Transformation and Skill Question: Evidence from Output and Employment

This section examines the divergence between changes in India's output structure and the slower transformation of employment.

5.1 Growth, per capita output and the limits of aggregate expansion

India's real GDP expanded strongly over the national-accounts series used here: average annual growth was 5.8% in the 1990s and 6.3% in the 2000s, before greater volatility in the 2010s. Growth slowed to 6.80% in 2017–18 and 3.87% in 2019–20, contracted by 5.78% in 2020–21 and rebounded by 9.69% in 2021–22. The series reports 8.15% growth for 2023–24 (Ministry of Statistics and Programme Implementation [MoSPI], 2025). Aggregate growth, however, does not by itself indicate whether new employment is secure, productive or accessible to differently situated learners. The selected trends in real GDP growth and per capita GDP discussed above are presented in Table 3.

Table 3

Selected indicators of real GDP and per capita GDP, 1990–91 to 2024–25

Indicator / period	Reported value	Interpretive relevance
Average annual real GDP growth, 1990–91 to 1999–2000	5.8%	Post-reform expansion with episodic volatility
Average annual real GDP growth, 2000–01 to 2009–10	6.3%	Stronger growth associated with services and infrastructure
Real GDP growth, 2017–18	6.80%	Moderation before the pandemic
Real GDP growth, 2019–20	3.87%	Structural and cyclical slowdown
Real GDP growth, 2020–21	−5.78%	Pandemic contraction
Real GDP growth, 2021–22	9.69%	Base-effect and recovery rebound
Real GDP growth, 2023–24	8.15%	Strong expansion in the series used in this study
Per capita GDP, 1990–91	₹29,971	Low starting base
Estimated per capita GDP, 2024–25	₹1,84,884	Long-run rise in average output per person

Note. Figures are compiled from MoSPI national accounts at 2011–12 prices. The 2024–25 per capita figure is an estimate in the series used in this study; later rebased estimates are not combined with it.

5.2 Sectoral value added and the reorganisation of the economy

Output composition changed more sharply than aggregate growth. The primary sector's GVA share fell from 39.1% in 1990–91 to 16.2% in 2024–25, while the secondary sector rose from 24.0% to 28.8%. Manufacturing increased from about 14% to 17.0%, with a higher intermediate peak, and construction rose from 7.1% to 9.2%. Services expanded from 36.8% to 55.0% of GVA (MoSPI, 2025).

Within services, trade, hotels and restaurants rose from 7.9% to 18.5% of GVA and finance, real estate and business services from 15.1% to 23.4%, while public administration, health and education remained broadly stable. This shift raises demand for digital, communication, managerial and sector-specific competencies, but a service-led economy is not uniformly high-skilled: it also contains low-paid retail, delivery, domestic and care work. Skill policy must therefore distinguish expansion of service output from expansion of secure occupational pathways. The changing sectoral composition of Gross Value Added is summarised in Table 4.

Table 4

Changing sectoral composition of Gross Value Added, 1990–91 to 2024–25

Sector / sub-sector	1990–91 share (%)	2024–25 share (%)	Direction of change
Primary sector	39.1	16.2	Sharp decline
Agriculture	33.8	14.2	Sharp decline
Mining and quarrying	5.3	2.1	Decline
Secondary sector	24.0	28.8	Moderate increase
Manufacturing	About 14.0	17.0	Increase, below 2017–18 peak
Construction	7.1	9.2	Increase
Tertiary sector	36.8	55.0	Strong increase
Trade, hotels and restaurants	7.9	18.5	Strong increase
Finance, real estate and business services	15.1	23.4	Strong increase
Public administration, health and education	12.7	13.1	Broadly stable

Note. Figures are from MoSPI national accounts. Sub-sector labels and values use the classification and data vintage applied consistently in this study.

5.3 Labour participation and the persistence of agrarian employment

Labour-market engagement has also been non-linear. LFPR fell from 64.6% in 1994 to 49.8% in 2018 and WPR from 63.4% to 46.8%, before recovering to 60.1% and 58.2%, respectively, in 2024 (National Sample Survey Office [NSSO], 2024). Higher participation does not necessarily imply better work: it can reflect stronger opportunity, distress-driven entry or changes in the recognition of women's work. Recent studies similarly emphasise that employment quantity and employment quality remain distinct problems in India (Abdullah and Mansoor, 2024; Moktan and Chakrabarti, 2024).

Gender inequalities remain pronounced. Female LFPR was 40.3% in 2024 compared with 76.3% for men, and 64.3% of working women were in agriculture compared with 36% of employed men. Such concentration reflects more than occupational preference; it is shaped by uneven non-farm opportunity, mobility and safety constraints, care responsibilities and the local availability of acceptable work.

Employment structure has changed more slowly than output. Primary-sector employment fell from 63.3% in 1994 to 40% in 2018 before rising to 46% in 2024. The secondary share rose from 15.1% to 24%, largely through construction, while services accounted for just over 30% of employment. This incomplete transition is consistent with wider evidence that India's growth has not generated secure non-farm employment at a comparable pace (Paul et al., 2023). The above mentioned key labour-force and employment trends are summarized in Table 5.

Table 5

Selected labour-force and employment indicators, 1994–2024

Indicator	Earlier status	Latest status	Analytical implication
Labour Force Participation Rate	64.6% (1994); 49.8% (2018)	60.1% (2024)	Recovery after a prolonged decline
Worker Population Ratio	63.4% (1994); 46.8% (2018)	58.2% (2024)	Higher employment engagement, quality still uncertain
Female / male LFPR	—	40.3% / 76.3% (2024)	Persistent gender gap
Employed population	360.8 million (1994)	619.3 million (2024)	Large absolute expansion of the workforce
Primary-sector employment share	63.3% (1994); 40.0% (2018)	46.0% (2024)	Post-2018 return to agriculture
Secondary-sector employment share	15.1% (1994)	24.0% (2024)	Growth led substantially by construction
Female / male share employed in agriculture	—	64.3% / 36.0% (2024)	Strongly gendered concentration

Note. Figures are from the Employment and Unemployment Surveys and the Periodic Labour Force Survey, National Statistical Office. Absolute employment estimates use the series applied consistently in this study.

5.4 Occupational change without a secure middle

The employment data suggest that low-wage and lower-level work is slowly disappearing, not disappearing entirely. The report classifies managers, professionals and advanced technical occupations as highly skilled categories, which increased from around 4% in 1994 to 12.2% in 2022. Managerial and executive occupations increased from 2.1 percent to 7.1 percent. Professional occupations increased from 1.9 percent to 5 percent. In the same period elementary occupations declined from 31.2% to 23.2%. These changes suggest a major shift toward more complex, knowledge intensive occupations, particularly in areas like information technology, finance, health care and administration.

However, employment remains largely concentrated in operational and intermediate occupations. It is important to note that employment in service and sales occupations rose from 7.6 per cent to 9.9 per cent and employment in plant and machinery operations rose from 3.1 per cent to 5.4 per cent. Craft and related trades were fairly steady at about 11%. The proportion of employed persons in skilled agricultural occupations decreased, but still represented more than a third of all employed persons. The occupations should not be considered as a homogenous ‘low-skill’ group. These range from a machine operator using computerized controls, an electrician troubleshooting integrated systems, a care professional managing digital health information and a logistics worker using tracking software. All require combinations of technical, digital, communication and regulatory competencies. Research into future work also emphasizes cognitive flexibility and a wide range of skills rather than just deep specialization (Zhang et al., 2024).

The challenge, therefore, is not simply to provide more training, but to ensure that training reflects changing job requirements while also providing the conceptual knowledge needed for adaptation, progression and continued learning. The selected shifts in occupational structure are summarised in Table 6.

Table 6
Selected shifts in occupational structure

Occupational category	Earlier share	Later share	Interpretive signal
High-skilled occupations (combined)	4.0% (1994)	12.2% (2022)	Expansion of professional and managerial work
Managers and senior officials	2.1% (1994)	7.1% (2022)	Growth of organisational and supervisory roles
Professionals	1.9% (1994)	5.0% (2022)	Rising knowledge-intensive employment
Service and sales roles	7.6% (1994)	9.9% (2022)	Expansion of service-facing work
Skilled agricultural work	39.1% (1994)	35.4% (2022)	Decline, but continued concentration
Plant and machine operators	3.1% (1994)	5.4% (2022)	Slow industrial deepening
Elementary occupations	31.2% (1994)	23.2% (2022)	Decline without elimination of precarious work

Note. Figures are from the Employment and Unemployment Surveys and the Periodic Labour Force Survey. The reference years are not treated as a continuous annual series.

5.5 The output–employment disjunction

The most important difference relates to the sectoral distribution of value added and employment. The primary sector contributed 16.2% of Gross Value Added in the 2024-25 production series, and employed 46% of the labour force in the 2024 employment series. The secondary industry contributed 28.8 percent to Gross Value Added and 24 percent to employment. Services made up 55% of Gross Value Added but employed about 30% of the workforce. The comparison is more illustrative than exact of the breakdown of production, given the different reference years and statistical approaches. This prudence aside, the disparity is statistically significant in magnitude.[2]

That the primary sector has more workers than its share of production means that labour is concentrated in low-productivity activities. This helps explain the coexistence of economic expansion with restricted income mobility. The opposite trend in services suggests that high productivity does not always translate into high employment creation. This is the context in which the ‘skills gap’ should be interpreted. Workers will not be incentivised by training in isolation if profitable employment are geographically clustered, if starting pay are too low, or if employers structure labour in a context of contractual uncertainty. In spite of the potential, students could struggle to reach emerging sectors due to poor foundational and technical competencies. The gap is pushed by education systems, the structure of production and of labor-market organisations. Table 7 below presents the indicative differences between sectoral GVA and employment shares

Table 7

Indicative comparison of sectoral GVA and employment shares

Broad sector	GVA share, 2024–25 (%)	Employment share, 2024 (%)	Employment minus GVA share (percentage points)
Primary	16.2	46.0	+ 29.8
Secondary	28.8	24.0	−4.8
Tertiary / services	55.0	30.0	−25.0

Note. Author's descriptive calculation using MoSPI national-accounts data and employment data from the Employment and Unemployment Surveys and Periodic Labour Force Survey. The series refer to adjacent years and different statistical systems; the percentage-point differences are descriptive indicators rather than direct measures of labour productivity. The service employment share is the rounded residual after primary- and secondary-sector shares.

6. Student-Centred Priorities Across Short-, Medium- and Long-Term Horizons

This section examines the evolving priorities of India's skill-development system across the short-term (2030), medium-term (2035) and long-term (2047) horizons. It considers how institutional pathways can progressively strengthen practical competence, educational mobility, occupational progression and students' capacity to respond to technological and labour-market change

6.1 Short term to 2030: making existing pathways usable

The main objective is not to create a new framework, but to improve the usefulness, accessibility and clarity of existing pathways. According to interviews with Sector Skill Councils (SSCs), short courses and institutional partnerships increasingly cover areas such as artificial intelligence, data analytics, cybersecurity, electric vehicles, mechatronics, robotics, drone applications, computer-aided design and sustainability. The educational significance of these initiatives lies partly in providing students with early exposure to emerging fields that they may not otherwise encounter before making important academic and career decisions. Such exposure can help reduce information disparities, particularly where family and social networks provide limited knowledge about emerging occupations.

Short courses are only useful if the certifications they confer are recognized and relevant to employment and career progression. For example, SSC participants reported that training can be unattractive if blue-collar jobs are considered low-status, if employers do not value certificates, if the recruitment period does not align with the training period or if the starting salaries are not high enough to cover the costs of relocating and taking up work. These limitations should not necessarily be interpreted as lack of ambition of learners but rather as rational responses to expected costs and returns of training. By 2030, public programmes should therefore report not only completion and placement rates but also employment relevance, median starting salaries, retention after six and twelve months, progression to higher education, and outcomes disaggregated by gender, social group and geographical location.

Both guidance on careers and practical experience are important. Learners require good information on course structure, fees, financial assistance, conditions of employment, career progression and, where relevant, opportunities for employment beyond their immediate locality. Career guidance should broaden students' choices and not funnel disadvantaged learners into low-paying jobs because these are available in the locality. Experiential learning should involve guided practice, sound safety procedures, constructive criticism, and demonstrable proficiency. A certificate of attendance or a nominal internship, by itself, cannot bridge the gap between theoretical knowledge and practical competence.

6.2 Medium term to 2035: integrating applied learning with higher education

In the med-term it is not the expansion of additional courses that is needed but the reorganisation of programs. Key goals revealed through key informant interviews with vice-chancellors, principals and registrars include multidisciplinary education, industry integration, skill development laboratories, internships, entrepreneurship initiatives, innovative academic programs and labour market insights. Organisations developed projects in sustainability, ethical artificial intelligence, healthcare, building and locally relevant livelihoods, and innovation centers and incubation. The traditional view is that employability is developed throughout the whole curriculum design; it cannot be rectified by a short session at the end of a degree program.

Work-based education should be progressive and credit-worthy for academic purposes. The initiative lists occurrences from full-fledged 'Practice School' programs, semester-long scholarships, municipal internships, to industry-specific projects. The important thing is not to imitate a given institutional model, but to structure experiences. The first years may be spent observing, exploring the community and doing practical work in the laboratory; later years can involve supervised field work, entrepreneurial ventures, research work or extensive internships. Reflection is important: learners should relate their job experience to values, ethics, rules and the wider societal aims of the activity.

Special attention is required for undergraduate students. In KIIs with placement and trainers, ongoing challenges were noted in the areas of communication, confidence, digital skills, data analysis, teamwork, and practical experience. All fields should have access to a core set of competences that are universally applicable, yet without the humanities and social sciences being perceived as lesser vocational subjects. Professional and civic skills are composition, analysis, historical understanding, moral reasoning, and public conversation. The goal of the reform is to attach them to real applications, digital resources, and concrete job opportunities, while maintaining intellectual diversity.

6.3 Long term to 2047: technical institutions, occupational mobility and lifelong learning

By 2047, the capacity of ITIs and polytechnics becomes a core. The project field work covered 19 ITIs in 14 states and 16 polytechnics in 16 states. Utilisation reported varied with continuing gaps in equipment, transport, hostels, industry linkages and placement. High enrolment trades were electrician, fitter, computer operator and programming assistant. More use of modern training materials and experiential learning was reported by institutions.

Placement results reflect the limits of certification by itself. Some sampled ITIs reported placement rates of 40–70% while others reported much lower rates. Some students opted to work in delivery or warehousing, where the pay was immediately better than they could make in an entry-level trade, although there were fewer opportunities for advancement in the long run. These choices represent not only student aspiration, but also the value placed on qualifications in the labour market.

Polytechnics offer early employment and lateral entry to degree courses. Advanced technicians need a long-term approach that creates recognised pathways in manufacturing, energy, healthcare, infrastructure and digital services, moving beyond routine operation to diagnostics, quality assurance, supervision and entrepreneurship. Lifelong learning must facilitate re-entry, recognition of prior learning and occupational transition, rather than place the entire burden of reskilling on individual workers.

7. Student Voices and Institutional Evidence: From Aspiration to Feasible Pathways

Focus group discussions indicate that the main constraint is not lack of ambition. Students said they wanted to work in engineering, healthcare, law, public service, design, commerce, digital technology and community entrepreneurship. Many also said they wanted to continue their education. But students from disadvantaged backgrounds often have to balance further education with the immediate need to earn money. One of the students of Class X said, “I will work in my brother’s repair shop and then take an electrician training” (student FGD). This account does not provide any evidence of a rejection of education, but rather demonstrates the ways in which financial and family circumstances affect the timing and sequencing of educational and occupational choices. Such learners would be able to acquire, re-enter, and be recognized for prior learning and experience under a more flexible system rather than view interruptions in education as permanent setbacks.

Dissatisfaction with curriculum was a significant source. Students said that they felt that their education was very assessment driven and did not have a lot of real-world application, but that they understood the importance of theoretical knowledge. “The curriculum is geared toward textbooks but we don’t get skills in resume writing, interview strategies or computer applications which are needed by employers,” said one Class XII participant (student FGD). In the same vein, one of the higher-education stakeholders said, “Our official education system lacks communication skills, computer skills, online literacy and awareness of contemporary issues, and the job market is heavily dependent on them” (KII). None of these perspectives suggest that students or institutional stakeholders want to replace theoretical knowledge with narrow vocational training. Instead, they reveal the sparse opportunities for bridging formal knowledge with practice and transferable competencies.

Career guidance was another concern. One student (student FGD) observed, “There is no systematic guidance on how to choose a career that matches interests or trends in the labour market, but often it relies on random guest lectures” (student FGD). Poor guidance can limit options in two ways. Some students may focus on a limited range of socially recognised jobs, while others may make educational or occupational choices without sufficient information about costs, career pathways, working conditions or employment prospects. Effective career guidance should therefore provide information on scholarships, regional and national labour-market

trends, working conditions and opportunities for combining education and employment. Such guidance must expand the options for students, not funnel disadvantaged learners into short-term programs simply because these are the most readily available options in their areas.

Students were able to differentiate between institution based activity and meaningful exposure to workplace. “We don’t do internships very often, we only do some sporadic class projects where we can showcase our work, but that builds our confidence, but we don’t have the practical experience outside of school,” said one participant. This is an important distinction because classroom projects and work experiences build different dimensions of competency. Projects can foster initiative, collaboration and problem-solving skills and workplaces provide learners with exposure to professional standards, tools, time management, safety procedures, organisational practices and ethical requirements. One of the technical institutions within the KII proposed a framework for longer paid internships where students would spend eight months in 'Practice Schools' in manufacturing, start-ups and information technology (project KII). The wider implication is that relevant work experience should be systematically incorporated into educational pathways, documented and recognised, rather than an occasional extracurricular activity.

Entrepreneurial aspirations also appear to exceed the institutional support available to students. One Commerce student stated, “I want to open a boutique in the future but I need help in business planning” (student FGD). Learners may have entrepreneurial ambitions but lack familiarity with market analysis, business registration, financial management, customer relations and digital marketing. Entrepreneurial education that relies primarily on motivational messages may therefore be insufficient. Students could instead benefit from supervised small-scale enterprises in which they learn about accounting, legal requirements, local supply chains and digital marketing while gaining experience with both individual and collaborative forms of enterprise. Such practical exposure could help connect entrepreneurial aspirations with the knowledge and institutional support required to pursue them.

The realisation of educational and occupational aspirations also varies by gender and geography. The institutional interviews indicate that women may face geographical, safety-related and family-related constraints in their choice of subjects and courses despite strong academic performance. Students in rural areas may have more limited access to advanced laboratories, specialised instruction and professional networks. These constraints cannot be overcome through individual confidence or motivation alone. Confidence is also shaped by institutional conditions, including sustained opportunities for practice, constructive feedback, appropriate role models and access to learning environments that recognise and develop students’ capabilities. Skill-development policy should therefore consider mobility, safety, institutional support and representation as integral conditions for educational and occupational opportunity. The policy on skills should view mobility, safety, transportation and representation as educational qualifications rather than as other societal barriers.[3]

8. Philosophical Interpretation: What Should Skill Development Enable?

This section interprets the findings through capability, dignity of labour, social hierarchy and epistemic justice, asking what skill development should enable beyond initial employability.

8.1 From employability to substantive capability

Employability is valuable as it identifies the talents and qualities that enable a person to obtain and retain employment. It is a fallacy when it holds the learner solely responsible for unemployment, low earnings or shaky contracts. Even with biased recruitment, low local demand or wages that don't support migration, a student can still improve their coding, communication and adaptation abilities. The capabilities approach corrects this individualisation by questioning whether the social framework offers real choices (Sen, 1999). Skills development should be considered in terms of someone's ability to get a job, to refuse to accept embarrassing working conditions, to continue their education, to change jobs and to take part in decisions affecting their professional life.

This criterion changes the definition of achievement. Completion and initial placement should be seen not as end states, but as transitional phases in a learner's educational and occupational journey. A scheme that temporarily places learners in unrelated jobs could meet an administrative target but not improve their skills or long-term employment prospects. In contrast, even where immediate employment is not the main objective, a program which promotes further education, local entrepreneurship or a more informed entry into the labour market may bring greater benefits in the long term. In this sense assessment should be aligned to the learner's journey and not the reporting cycle of the program.

8.2 Dignity of labour, caste and the hierarchy of knowledge

The low aspirational value of many vocational routes cannot be separated from the social organisation of labour. Jobs that require a lot of labour, such as care work, cleaning, crafts and regular services, are necessary yet are frequently underpaid and ignored. Public calls for talent cannot overcome this hierarchy, and workplace practices imply that competent individuals are interchangeable. Craftsmanship is characterised by Sennett (2008) as the discernment shown trough practice: awareness to materials, appraisal, adaptation, timeliness and accountability. To recognise intelligence you need evaluation systems that value demonstrated abilities and surroundings that promote autonomy and development.

Respect for labour in India must be seen in connection with caste. Ambedkar's distinction between a division of labour and a division of labourers is a warning against educational routes that assign vocational prospects on the basis of innate disadvantages. Initial vocational experience can be strong in expanding options, connecting schooling to real life applications and leading to recognised technical employment. It is unfair that students from poor origins, such as those from rural, Dalit, Adivasi, minority, disabled or female backgrounds, are disproportionately placed in inferior courses whereas students from rich families have a variety of academic and career options. The ethical criterion is permeability: Is the vocational learner capable of changing, moving between industries and redefining her professional identity?

8.3 Epistemic Justice, Student Agency and the Future of Work

When considering skill policy, an important question of epistemic justice is raised: whose knowledge counts in defining competence and judging the success of institutions? While employers and technical bodies have much to contribute in terms of information on occupational standards and technological developments, students and workers early in their careers have a wealth of knowledge about the actual workings of educational and training systems. Their experiences provide insights into barriers, such as limited hands-on

training, inaccessible labs, migration costs, unpaid internships and inadequate recognition of certifications that administrative data may not capture sufficiently. Therefore, student testimony must be regarded as evidence, not simply as illustrative material.

This is especially true when it involves imagining the future of work in 2047. Technological innovation has important social consequences. Automation, digital platforms and ecological transformations can open up new opportunities, but also lead to displacement, job insecurity and new modes of inequality. Their effects will depend not only on technological change, but also on regulatory choices, institutional arrangements and the allocation of decision-making authority. Education, therefore, must do more than simply adapt to new labour-market needs. It should prepare learners to comprehend new forms of work, to examine their ethical and social consequences, to respond to unjust conditions and to participate meaningfully in technological change. Thus, seeing students as knowledgeable and active agents in determining the future of a work links epistemic justice to preparedness for technological and social change. Recent work similarly suggests that diversified cognitive capabilities are more resilient under automation (Zhang et al., 2024), while recognition and belonging can determine whether skills translate into viable livelihoods (Ncube and Pandey, 2026).

9. Toward a Student-Centred National Skill Compact

A coherent reform agenda should be based on a universal capability foundation by the end of secondary education. We expect all students to demonstrate basic competencies in digital literacy as well as information literacy, communication, collaboration, financial literacy, workplace safety and problem solving. These competences should be assessed through portfolios, simulations and practical projects rather than mainly through traditional memory-based examinations. National standards don't have to mean sameness. Instead they should be adaptable to local economies, languages and environmental contexts, while ensuring that competencies remain transferable across institutions.

Digital access should be treated as a basic condition of educational opportunity. Public reporting should distinguish between the installation of digital facilities, their functionality, intended access, connectivity and actual student use. Institutions with limited access should receive priority in terms of financial resources, shared laboratories, mobile facilities and equipment support. A digital curriculum that can be accessed only through privately purchased resources risks reproducing existing inequalities. Basic digital and educational opportunities should therefore not depend on household financial capacity; ensuring equitable access is a core public responsibility.

Placement support and hands-on training should become regular institutional facilities rather than occasional additions to education and training programmes. Career guidance should be provided when students make choices at the upper-secondary level and should continue throughout higher education and vocational training. Such guidance should connect students' interests and skills with credible information on programme costs, financial assistance, programme quality, earnings, working conditions and opportunities for career progression. Experiential learning should be progressive, academically credit-bearing and financially supported through stipends or travel assistance where participation involves additional costs. Internships should have clearly defined educational objectives, supervision, safety procedures, constructive feedback and formal assessment.

Vocational and academic pathways should also become more permeable. School-level vocational courses should be aligned with ITIs, polytechnics and degree programmes. Short-term certificates should be stackable where learning outcomes are appropriately assessed and recognised. Diploma and ITI graduates should have clearly defined opportunities for lateral entry into higher education and advanced technical pathways. An advanced-technician strategy should involve strengthening the institutional network that connects technical institutions with industry, energy, healthcare, infrastructure and digital-services sectors. Transparent proficiency levels, recognition of technical competencies and clear progression pathways should enable technical occupations to become sustainable and respected career options.

Public reporting should focus on the quality of educational and occupational transitions, not just the number of people trained. Dashboards should be maintained on completion, assessment outcomes, placement, employment relevance, starting salaries, retention, further education and employer characteristics of skill-development programs disaggregated by gender, social group, disability, location and first-generation status. Independent tracer studies should be carried out with learners after initial placement. Such measures would help ascertain whether programs support sustained occupational mobility or leave learners in temporary, unrelated or low-quality employment.

Employers also have an important responsibility in ensuring that acquired skills are recognised and rewarded. Government-funded training providers should strengthen apprenticeships, onboarding, access to equipment, curriculum updating and pathways to competitive entry-level wages. Certification will command greater value only when organisations apply standards consistently and recognise demonstrated competencies. Public procurement and targeted incentives can encourage firms to recruit newly certified workers, provide supervised workplace training and establish pathways for wage and occupational progression. Poor returns to some technical qualifications cannot be addressed simply by changing students' attitudes or aspirations; they also require changes in employer practices and labour-market institutions.

The students should have a meaningful role in the design and evaluation of skill-development systems. Annual institutional capacity assessments should capture actual access to laboratories, software, internships, counselling and placement services. Institutions should publicly report their responses to identified gaps and specify timelines for improvement. Sector Skill Councils and other relevant bodies should involve students and recent graduates so that occupational standards reflect both workplace requirements and the realities of entry-level learners. This is more than a consultation mechanism. It recognises learners as active participants in the skill-development process and acknowledges that their experiences and knowledge are important for evaluating whether policies work in practice.

10. Conclusion

India has developed a huge and diverse ecosystem for education and skill development, but the different parts have not yet coalesced into a coherent educational and occupational trajectory. Participation drops sharply before the secondary level, access to digital resources is very unequal, vocational training is not always well integrated into academic pathways, and technical qualifications do not always translate into recognised and well-paid jobs. This is not simply about individual performance or motivation. Instead they point to a more fundamental institutional divergence between the education and training and the employment systems. The

evidence presented in this paper suggests that it will not be enough to simply increase the number of courses or training opportunities to address these issues. In India, the economic structure has witnessed the increasing significance of services, while agriculture still employs a large section of the workforce. But while the sphere of professional and managerial employment is expanding, elementary, service and other lower level jobs still take up a considerable share of workers. Economic growth creates resources and new jobs, but does not necessarily lead to their equitable distribution or access. So, skill development must be linked to institutional reform, increased employer responsibility and sustained public investment in conditions that give meaning to education and training.

Student experiences are an important measure of where we need to improve. Students want reliable digital access, practical learning, career guidance, professional exposure, internships and better linkages with employers. Their accounts suggest aspirations are widespread but institutional opportunities to realise aspirations are not evenly distributed. Therefore, a learner-centred system should not measure its success only in terms of how quickly a learner finds a job. It should also enhance real opportunities for acquiring knowledge and skills, securing meaningful employment, progressing within an occupation, returning to education and changing career pathways when circumstances or aspirations change.

Skill development, then, is inextricably linked with social equality and human agency. Competencies are valued not only for their acquisition, but also for their recognition by employers and institutions; their reward through decent wages and working conditions; and their rootedness in opportunities for educational and occupational mobility. India's road to 2047 must be built on the pillars of economic productivity and individual agency, technical capability and intellectual diversity, technological advancement and equitable access. The ultimate success of skill development should not be measured simply by the number of people who acquire qualifications or training, but by the number of people who gain meaningful capabilities and are able to use them to secure decent work, progress professionally and exercise real choice over their educational and occupational futures.

Declarations

Data availability statement:

The secondary data used in this study are available in the official sources cited in the manuscript. Supplementary material is provided for the research instruments for the major qualitative component, such as the Focus Group Discussion and Key Informant Interview schedules. The qualitative data at the participant level is not available in the public domain as it was collected under confidentiality conditions. Any qualitative material presented in the manuscript has been anonymised and does not contain any direct personal identifiers.

Author contributions

The first author led the theoretical framing and manuscript drafting and contributed substantially to fieldwork, data collection, analysis and interpretation. The second author contributed substantially to fieldwork and data collection, interpretation of the evidence, critical review, substantive editing and manuscript refinement. Both authors contributed to the study and approved the final manuscript.

Competing interests

The authors declare no competing interests.

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Endnotes

1. Data vintage and comparability: UDISE+ 2023–24, AISHE 2021–22, PLFS 2023–24 and the 2011–12-base national-accounts series are retained consistently; later releases and rebased series are not combined with them.

2. The GVA–employment comparison uses adjacent reference years and different official statistical systems. Percentage-point differences are descriptive indicators of structural imbalance, not direct productivity estimates or causal decompositions.

3. Student quotations are anonymised project FGD evidence. Only broad descriptors recorded in the project material are retained; minor typographical standardisation does not alter substantive meaning.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- 1.FocusedGroupDiscussionforStudentNov5.docx
- 4.QuestionnaireNITIPlacementcellSept4.docx
- 5.QuestionnaireNITIVCRegistrarSept4revisedOct29.docx
- 3.QuestionnaireNITIEducatorsHigherEduSept4revisedOct29.docx
- 1.SurveyQuestionsPolytechnicsSept4.docx
- 2.QuestionnaireNITIITISept4revisedOct29.docx
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