



The Political Economy of Engineering Education in India: Institutionalisation of knowledge and its access

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Abstract

The rapid expansion of engineering and technical education in post liberalisation India has significantly transformed the structure and character of higher education. This paper critically examines the political economy of engineering education within the broader framework of globalisation, privatization and neo liberal reforms. It argues that although privatization was introduced in the name of quality, efficiency and democratization of access, it has simultaneously intensified existing structures of caste, class, gender and regional inequalities. The paper sociologically analyzes how professional education, particularly engineering education, has increasingly become market driven, commercially oriented and shaped by the logic of profit accumulation rather than social justice and inclusive development.

Drawing upon secondary data, government reports, policy documents and content analysis, the study explores the institutional growth of engineering education in India and interrogates the relationship between privatization, merit discourse and social exclusion. The paper critically engages with theoretical perspectives on cultural capital, meritocracy and neoliberalism to demonstrate how students from working class, rural and historically marginalised communities continue to face structural barriers in accessing quality technical education. The study also examines the contradiction between quantitative expansion and qualitative decline in engineering education. While private engineering institutions have mushroomed across the country, many suffer from inadequate infrastructure, poor academic standards, outdated curricula and weak industry academia linkage, resulting in large scale unemployability among engineering graduates. The paper argues that the discourse of “merit” within technical education often conceals deeper inequalities embedded within the unequal distribution of economic, social and cultural capital. The paper concludes that the neoliberal restructuring of engineering education in India has transformed education from a public good into a market commodity, thereby reproducing new forms of exclusion and marginalisation. It emphasizes the need for democratization of technical education through stronger public investment, equitable access policies and socially inclusive educational frameworks capable of addressing the structural inequalities embedded within the contemporary education system.

Keywords: Engineering education, political economy, neo-liberalism, privatisation and class inequality

Introduction

Indian higher education is undergoing a phase of massive expansion. In the post-independence period, the Indian educational system has emerged as one of the largest systems in the world. Keeping in mind its importance as a crucial component of social, economic and political development, education has been conceived as a public good intended to reach all sections of society. However, globalisation has played a vital role in shaping and regulating different aspects of the educational process and has opened up a global and international platform for the flow of knowledge. One of the most significant dimensions of globalisation is privatization, which has transformed not only the labour market and work organizations but also educational processes. Thus, the restructuring and reconsideration of the educational system has been deeply influenced by globalisation.

In the post-liberal era, the education system, along with the processes of learning and knowledge production, has gradually shifted towards a new direction characterised by institutionalisation and specialisation. The institutionalisation and specialisation of knowledge have largely been shaped by the processes of globalisation and industrialisation. The process of economic development has compelled societies to institutionalize and specialize certain

forms of knowledge within the framework of formal education. Engineering education is one such domain of specialised knowledge primarily associated with the production, maintenance and management of material and technological systems. Across the world, engineering education has emerged as an important response to the challenges of the emerging knowledge society and the increasing integration of global economies.

The higher education system in India can broadly be divided into two major categories, namely general education and professional education. Nearly 80 per cent of students are enrolled in general education disciplines such as arts (42 per cent), science (19 per cent) and commerce (18 per cent), whereas the remaining 20 per cent are enrolled in professional courses such as engineering and technology, medicine, agriculture, veterinary sciences and law. Of this 20 per cent enrolment in professional education, engineering and technology accounted for only 10 per cent during 2009–2010 (UGC, 2010).

However, there still exists a serious lack of equity within the education system, as students from working class backgrounds, rural areas and disadvantaged social groups remain more vulnerable in terms of educational access. Along with the processes of knowledge production and distribution from the pre-modern to the modern period, it is

also important to critically understand the accessibility of research and innovation among different social groups, particularly Scheduled Castes and Scheduled Tribes, who have historically remained marginalised. Apart from this, gender disparity remains another major concern that requires critical sociological analysis. Historically, access to education has been conceptualised and structured around the dichotomy of masculinity and femininity. Through the process of gender socialisation, men and women are often assigned different educational roles and expectations, where women are generally associated with formal and non-technical education, whereas men are socially encouraged to pursue science, commerce and various technical courses.

However, in India, geographical and regional imbalances also remain major concerns in the access to and expansion of engineering education. In one academic year alone, 85 new self-financing engineering colleges were approved by AICTE in Tamil Nadu, bringing the total number to 444, second only to Andhra Pradesh before its bifurcation (523). The five southern states together account for nearly 69 per cent of the 8.19 lakh students enrolled in 2,297 engineering colleges across the country (The Hindu, 2017) [23]. The southern region alone contains almost half of the total engineering institutions, whereas the eastern region accounts for only about 7 per cent. States such as Uttar Pradesh, Rajasthan and Odisha together account for merely 14 per cent of India's technical colleges. Such regional imbalance, along with questions of educational quality, has become a serious concern. At the extreme end of the spectrum, states such as Mizoram and Nagaland, along with Daman and Diu, have no engineering institutions. Tamil Nadu has the highest sanctioned intake with 19 seats per 10,000 population, whereas large states such as Uttar Pradesh and Madhya Pradesh have only three and six seats respectively per 10,000 population (Chopra & Sharma, 2010).

Private initiatives in higher education have become a universal phenomenon particularly in the professional courses like medicine, science, technology and engineering. Unlike higher education, the fact is that school education has also become privatised and to the extent that the government schools have become only an option for those who cannot afford private education. Further Gundemeda (2014) [14], in his book *Hegemony and education: Social Construction of Knowledge in India in the Era of Globalisation*, argues that the marketization of school education in general and intermediated education in particular became the most visible form of homogenization of education and the marketization of knowledge. Thus in education sector the process of privatization creates a class inequality where a few section of the society access private education but a majority of the people those who belong to socially and economically backward class lag behind accessing private education. Scheduled Caste, Scheduled Tribe and other socially and culturally marginalised sections of the society are the most unprivileged group in accessing private education.

However, another important dimension of privatization is the competition among private enterprises, which further creates institutional hierarchies within the education sector. Among these, elite and branded private institutions dominate the educational market through monopoly, symbolic prestige and economic power. Thus, the brandedization of private educational institutions reinforces

market domination and reproduces inequalities through the process of monopolisation.

Statement of the Problem

There exists a wide disparity in access to higher education in general and engineering education in particular among different social groups in India. Engineering education has remained highly selective in terms of providing access to disadvantaged sections of society such as Scheduled Castes (SCs), Scheduled Tribes (STs) and women (Rao, 2006). The gross enrolment ratio in higher education among girls was 12.7 per cent compared to 17 per cent among males during 2009–2010 (Government of India, 2011) [13, 26]. From the perspective of gender disparity, although students from different socio-cultural, economic and linguistic backgrounds enrol in engineering education, the majority of them are male, while female participation remains significantly low. Traditional social and cultural norms in Indian society have historically acted as barriers preventing women from entering technical fields such as engineering. This trend is not limited to India alone; even in Western societies, engineering has historically remained an overwhelmingly male dominated profession, both in educational institutions and within the engineering workforce. The percentage of SC enrolment in engineering education increased to 16.1 per cent in 2006–2007 [1, 10] from merely 3.6 per cent in 1985–1986. Similarly, the enrolment share of STs in engineering education increased from less than 1 per cent to 5.6 per cent during the same period of twenty years. A study conducted by Ghuman *et al.* (2009), using primary survey data of 2,085 students in rural Punjab, found that nearly three-fourths of students studying professional education programmes belonged to forward castes. This clearly indicates that professional education in India remains relatively inaccessible to students belonging to socially backward communities. Furthermore, access to higher education among women belonging to disadvantaged social groups, particularly SCs and STs, appears to be worse than that of women belonging to forward castes. The representation of women from these communities within engineering education remains extremely low. Only about 4 per cent of SC women and 1.5 per cent of ST women have access to engineering education.

The paper seeks to critically examine the Indian education system within the broader framework of the neo-liberal economy, with reference to engineering education, which promotes privatization. The beginning of the 1990s marked the era of globalisation in India, during which privatization gradually replaced state control over the management and ownership of public sector enterprises by transferring greater control to private ownership. Thus, the introduction of privatization emerged as a new mode of economic accumulation within public enterprises, services, agencies and other state institutions. However, within the education sector, privatization has intensified class inequalities where marginalised social groups, particularly Scheduled Castes (SCs), Scheduled Tribes (STs) and Other Backward Classes (OBCs), continue to face exclusion not only in accessing quality education but also in securing opportunities within the labour market. Therefore, the universalisation of privatization has not only created a new class of privileged groups but has also further marginalised historically disadvantaged sections of society.

In contrast to private institutions, public institutions have historically been viewed as important sites of democratization, particularly for historically excluded and marginalised communities. However, elite public institutions such as the Indian Institutes of Technology (IITs) have also largely remained dominated by socially privileged groups possessing greater social and cultural capital. According to the National Commission for Scheduled Castes and Scheduled Tribes, Fourth Report (1996^[19]-97 and 1997-98), nearly 82 per cent of Class-I government and non-government positions in 1989 were monopolised by dominant social groups with privileged forms of capital. Their representation in these positions was disproportionately high, whereas SCs, STs, OBCs and Muslims, who together constitute more than 80 per cent of the population, accounted for less than 11 per cent representation in these services. Thus, the process of marginalisation within both private and public educational institutions, particularly in engineering education, raises critical questions regarding the overrepresentation of privileged groups and the exclusion of historically marginalised communities from educational and occupational opportunities.

Methodology

The present study critically analyzes the trends and transformations of engineering and technical education within the broader context of the neo-liberal era in India. The study primarily adopts a qualitative approach by using the method of content analysis to examine the political economy of professional education in general and engineering and technical education in particular. The paper attempts to understand how globalisation, privatization and liberalisation have shaped the institutional structure, accessibility and quality of engineering education in India. The study focuses on various sociological dimensions of technical education, including issues of class, caste, gender, regional imbalance and the accessibility of engineering education among working class and historically marginalised communities. It also examines the institutional expansion of technical education, the role of private enterprises and the emerging inequalities within the educational system under the neo-liberal economy. The data for the study has been collected from secondary sources such as reports of various ministries of the Government of India, policy documents, AICTE and UGC reports, journal articles, books, institutional reports and official websites. In addition, relevant statistical data, previous research studies and academic literature have been critically reviewed in order to understand the changing nature of engineering education and its broader sociological implications in contemporary Indian society.

Knowledge Production and the Politics of Colonialism

Even after 75 years of independence, India continues to remain dependent on Western technology and innovations. The processes of Liberalisation, Privatization and Globalisation (LPG) facilitated the free flow of economy, technology and knowledge, which created opportunities for Western enterprises to expand and dominate within India. However, this process requires critical examination because, over time, India has not fully expanded its potential in the fields of technology, innovation and indigenous knowledge production to the extent that was expected. The Indian

education system, particularly institutions providing technical and engineering education, including premier institutions such as IITs and NITs, has not adequately succeeded in developing indigenous technologies and innovative models. Although these institutions have contributed significantly towards technical education, the larger question of self-reliance in knowledge production and technological innovation still remains a major concern within the context of post-colonial development.

The establishment and growth of Indian educational institutions can be understood through the system of learning that existed prior to British intervention. Syed Nurullah and J. P. Naik (1951), in the book **A History of Education in India During the British Period**, discussed how education during colonial rule was largely confined to the mercantile and socially privileged classes. Initially, the British government focused on encouraging educated and privileged natives of India with the belief that they would promote scientific knowledge among the broader population. However, this objective was not fully successful, as attempts towards the democratization of education were largely constrained by structural inequalities and issues related to accessibility and quality within the colonial education system.

Talukder (1998), in the book **Indian Civil Service Examination and Savarna Merit**, argues that the independence of India on 15th August 1947^[18] largely became advantageous for the socially elite and privileged classes. According to the author, important positions within public institutions became increasingly occupied by these privileged groups. Similarly, newly established institutions of national importance such as the IITs also came under the dominance of socially privileged sections, and this trend continues even today. There remains little doubt that the IITs emerged in response to the developmental aspirations of the socially elite and privileged classes of newly independent India.

The discourse surrounding the history and development of science and technology can be traced back to the nineteenth century. During this period, European nations, in search of raw materials, markets and investment opportunities, initiated a new wave of overseas colonization by transferring labour, capital and technology to the non-capitalist regions of the world. Todd (1995)^[25] explains that the impact of European expansion varied across regions because some areas were settled by Europeans who intended to establish permanent societies, whereas in other regions Europeans were interested mainly in temporary settlement and economic exploitation of local resources and populations. As a result, two forms of colonies emerged, namely “colonies of settlement” such as North America, Australia and New Zealand, and “colonies of sojourn” such as Latin America, Asia and Africa. The colonies of settlement experienced the long term influence of governments committed to local economic development, whereas the colonies of sojourn were characterised by poverty, insecurity and dependency. At the same time, colonies of sojourn remained heavily dependent on imported technology and external economic control. Thus, colonial disparities significantly widened the economic and technological gap between industrial Europe and the colonised societies (Headrick, 1998).

In the Indian context as well, colonialism played a significant role in shaping the growth of technology and

innovation. The development of modern agriculture, irrigation projects, transportation and communication systems, as well as the structure of technical education and educational institutions in India, was largely influenced by colonial rule (Macleod & Kumar, 1995).

Institutional Structure of Engineering and Technical Education

Technical education refers to a form of education that aims to develop skills and competencies that enable individuals to handle machines, technologies and other artificial equipment. It assists and supplements existing labour power in order to increase productivity and expand the scale of production. Before discussing the quality of teaching and learning within engineering education, it is important to briefly examine the institutional growth and enrolment statistics related to technical and engineering education in India.

In India, out of the total 20 per cent enrolment in professional courses, engineering and technology accounted for nearly 10 per cent during 2009–2010 (UGC, 2010). Furthermore, between 1991 and 2011, the number of higher educational institutions in India, including all disciplines, increased at an annual growth rate of 8 per cent, whereas engineering education institutions increased at nearly 15 per cent (Government of India, 1991, 2011) ^[12, 13]. Similarly, enrolment in engineering colleges increased sevenfold during this period, whereas overall enrolment in higher education increased only threefold (UGC, 1991, 2010) ^[26]. There were only 242 degree level engineering institutions in the country during 1985–1986 ^[7] with a total intake capacity of 0.17 million students. This number increased significantly to 3,346 institutions with more than 3.69 million intake capacity by 2013–2014. During the same period, higher educational institutions (HEIs) in India increased from 5,427 to 40,373, representing an annual average growth rate of 7.43 per cent, whereas engineering education institutions increased by nearly 10 per cent per annum.

The overwhelming increase in higher educational institutions, particularly during the post-liberalisation period, has largely been driven by the intervention of the private sector (Agarwal, 2006) ^[1]. After the 1980s, many state governments encouraged private entrepreneurs to establish self-financed professional colleges without direct financial assistance, except for the provision of land and infrastructural support at subsidised rates (Blom & Cheong, 2010) ^[6]. Although private participation in technical education in India began earlier with the establishment of institutions such as the Indian Institute of Science, Bangalore in 1906, Birla Institute of Technology, Ranchi in 1955 and Birla Institute of Technology and Science, Pilani in 1964, the rapid expansion of private technical institutions took place mainly after the liberalisation of the Indian economy in 1991 (Chopra & Sharma, 2010) ^[6, 12].

During the 1950s and 1960s, financially privileged individuals often donated money to public institutions or established philanthropy based private schools and colleges. In contrast, in the contemporary period, even those possessing comparatively smaller amounts of capital prefer to establish private self-financing colleges and universities (Tilak, 2014 ^[24], p. 35). However, the earlier charitable and philanthropic character of educational institutions has gradually been replaced by profit-oriented commercial

interests, where many newly established private engineering institutions function primarily on commercial lines. Although several private institutions in technical and engineering education are legally described as charitable or not-for-profit institutions, in practice many of them operate as profit-making enterprises (ibid).

It is argued that the beneficiaries of technical education are not only students, but also industries, the government and society at large. Therefore, financial investment in the technical education system should be viewed as a long term investment in the national economy, and the cost of such education should be shared collectively by all beneficiaries, particularly the government (AICTE, 1994) ^[2]. However, with the implementation of the New Economic Policy of 1991 ^[12], broadly known as the Structural Adjustment Programme, the trend gradually shifted towards private funding of higher education in general and engineering education in particular. This shift has been reflected in the declining public support for higher and technical education in the post-economic reform period.

It has been highlighted that a majority of privately funded and managed engineering institutions are engaged in various malpractices such as collecting exorbitant capitation fees and other institutional charges, manipulating entrance examination results and violating admission norms in favour of students who are financially capable of paying higher fees. Moreover, many commercial institutions operating within higher education function as satellite institutions of foreign universities. Further, several national level studies in India (Biswas, Chopra, Jha & Singh, 2010; Kumar, Sengupta & Vij, 2005; Rao, 2006) ^[1, 6, 21] have established that the unregulated and uneven growth of the private sector in engineering education has contributed to the decline in the quality of teaching and learning within these institutions. These studies have highlighted issues such as the shortage of qualified faculty, weak industry–academia interaction, outdated curricula and the absence of a strong quality assurance mechanism within the broader framework of engineering and technical education in India.

Does Privatization of Technical Education Stand for Quality?

The primary objective behind the introduction of privatization in education is often justified in the name of quality and transparency, particularly within technical education. Post-Mandal India has witnessed intense debates and discourses surrounding merit and quality in higher education. These discourses have largely consolidated the notion of ‘open category merit’ as absolute, natural and unquestionable. However, the idea of so called ‘merit’ is itself socially constructed and closely associated with an individual’s cultural capital. Pierre Bourdieu (1986) ^[7] argues that cultural capital is acquired through one’s class position and social background. Extending the Marxist understanding of the economy as a major determinant of social life, Bourdieu explains that cultural capital exists in embodied, objectified and institutionalised forms, all of which are deeply shaped by economic conditions. Thus, merit cannot be understood merely as individual ability or talent; rather, it is an embodied form of cultural capital possessed by students belonging to socially and economically privileged families who are supported by other forms of capital such as social, economic and symbolic capital. On the other hand, students belonging to

marginalised communities, particularly in the Indian context, are not only deprived of economic resources but also lack access to other forms of capital necessary to compete within the educational system. As a result, the discourse of quality and merit often reproduces existing inequalities by privileging socially dominant groups while excluding marginalised communities from meaningful participation within technical and engineering education.

Coming to the discourse of quality associated with private institutions, particularly engineering and technical education in the Indian context, presents a rather negative picture. After the 1990s, private engineering and technical institutions started rapidly mushrooming across the country. According to the statistical data provided by the All India Council for Technical Education (AICTE), Government of India (2018), there were a total of 6,447 engineering and technical institutions in India, out of which 4,708 belonged to the private sector. However, if we critically examine the outcomes of this rapid expansion, it reveals a significant decline in the quality of education being provided by many of these private institutions. This reflects a paradigm shift where quantitative expansion has increasingly overshadowed the question of quality within engineering and technical education.

However, one of the major problems associated with engineering education in India is the growing disparity between the increasing number of engineering graduates and the availability of employment opportunities. According to the Ministry of Human Resource Development (HRD), nearly 2.9 million students enrol in engineering and technical education every year, while around 1.5 million engineering graduates enter the labour market annually. The rapid quantitative expansion of engineering education on the one hand and the limited employment opportunities on the other have created a significant gap between education and employability. A study conducted by the Delhi based employment solutions company Aspiring Minds on 150,000 engineering graduates in 2013^[4] found that only 3 per cent of students were suitable for software or product based industries, while only 7 per cent were employable in core engineering sectors. This situation largely reflects the lack of adequate technical and professional skills among graduates. As a result, every year a large proportion of engineering graduates remain unemployed, which creates instability not only within the economic sphere but also within the broader social structure of the country. The disparity between the number of engineering graduates and employment opportunities becomes even more significant when viewed from the perspective of socially and economically marginalised communities. If such conditions persist even among the general population of engineering graduates, the process of exclusion and marginalisation becomes far more severe for students belonging to historically disadvantaged social groups.

Quality in the Teaching Learning Process

Engineering education becomes meaningful and productive only when it effectively responds to the needs of industries and the labour market. Industrialisation created opportunities for technical professionals capable of handling, managing and maintaining machines and technological systems. Thus, the emergence and expansion of engineering education took place in accordance with the requirements of industrial and economic development. In

this context, the process of industrialisation institutionalised specialised technical knowledge within the framework of formal education. However, maintaining quality and innovation in the process of knowledge production within classrooms remains both important and challenging. Therefore, the issue of quality in the teaching learning process continues to remain a major concern within educational institutions and universities. In advanced countries, engineering graduates generally possess higher technical competencies and innovative capacities in handling modern technologies, whereas in developing countries such as India there exists a significant deficiency in assimilating and innovating such technical skills. This problem is largely associated with the nature and structure of the educational system itself. At the same time, the IIT model has achieved relative success because of its comparatively strong academic structure and productive learning environment, and Indian engineers have significantly contributed to technological and economic development in many countries across the world. However, the rapid expansion of a large number of private engineering institutions has often failed to maintain and provide quality education. Therefore, this gap in quality needs to be addressed through appropriate educational reforms, stronger institutional mechanisms and effective governmental interventions through policies and programmes.

Along with pedagogy and the teaching learning process, several factors such as outdated curricula, inadequate academic infrastructure, shortage of qualified faculty, lack of innovative and creative activities, absence of a proper academic environment and weak participatory government mechanisms have contributed to the declining standards of engineering institutions in the country. Therefore, universities and technical institutions should not only disseminate existing knowledge but also develop the capacity to understand future technological and social needs so that new knowledge can be generated. In this context, academic programmes should be designed with sufficient strength and flexibility to cross disciplinary boundaries and encourage innovation, creativity and interdisciplinary knowledge production.

Opting for and gaining admission into an engineering college after the completion of higher secondary education is also closely associated with the analytical and adaptive capacities of students. For many school students, it becomes difficult to adjust and cope with an entirely new academic and technical environment. One of the major limitations of the existing school education system in India is that it remains largely book-oriented and examination-centred, where students are mainly encouraged to memorize and reproduce already existing knowledge. As a result, students often remain distant from the culture of critical thinking, creativity and innovation beyond textbook knowledge. Therefore, the educational system should create spaces that encourage students to think beyond prescribed texts and develop innovative and analytical approaches towards knowledge production.

Most engineering colleges continue to follow a pattern of teaching that is largely theoretical and examination-oriented, similar to the traditional school education system, primarily in order to maintain high pass percentages and institutional results. Particularly in many private engineering colleges, the emphasis often remains on awarding degrees and increasing student intake for institutional reputation rather

than ensuring meaningful knowledge production and skill development. At the same time, curriculum design continues to remain an important issue of discussion within technical education. The curriculum should be designed in accordance with industrial and technological requirements, while also providing adequate scope for interdisciplinary learning and choice based courses according to the changing needs of students and industries.

Conclusion

The growing demand for scientific and technological research and innovation across the world, along with the free flow of knowledge, ideas, economy and technology, has contributed to the universalisation of engineering and technical education in order to bridge physical as well as territorial boundaries across societies. In this context, globalisation has interconnected societies and expanded the scope of technological and educational exchange. However, the increasing demand for engineering education in India and the expanding role of privatization in fulfilling this demand have simultaneously created new forms of marginalisation among students, particularly in relation to employability, technical skills and labour market participation. On the one hand, the rapid establishment of a large number of private engineering institutions without adequate infrastructure and academic quality has resulted in the production of underqualified graduates who often fail to meet the requirements of industries and the labour market. On the other hand, the reproduction of class inequalities among lower middle class, working class and socially and economically marginalised caste groups has also been reinforced through the dominance of English as the medium of instruction in a multilingual and multicultural society like India. Finally, socially and culturally marginalised communities such as Scheduled Castes, Scheduled Tribes and Other Backward Classes continue to experience educational and economic exclusion within the framework of the neo-liberal economy. Therefore, the crux of the argument is that the political economy of neo-liberal policies and the process of privatization, particularly in the domain of engineering and technical education, continue to produce and reproduce class and caste inequalities, thereby intensifying the marginalisation of historically disadvantaged sections of society.

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