Chapter - II

SCIENTIFIC AND TECHNOLOGICAL INSTITUTIONS

After the annexation of the Punjab by the British in 1849, the new rulers required assistance in the spheres like public health, public works, agriculture and industry, which required scientific and technical training. After annexation of the Punjab in 1849, the British gradually changed the character of education from religious to secular. They initiated teaching of some new subjects related to science and technology like medicine, geology, zoology, botany, physiology, engineering, agriculture, veterinary, commerce and industry etc. Science education was regarded as an important channel for the transmission of modern science in the Punjab. At the same time, technical education was expected to lead Punjab to industrialization and material prosperity. But British education policy was a characteristic policy of too little and that too late. The little scientific and technical education imparted was only a means to expand and consolidate their empire in India and to extract maximum profit from the natural resources of the country with the help of local man-power. Teaching of science for the sake of knowledge did not fit in the British plan.

The introduction of western system of education by the British Government was a boon for the Indians. Dada Bhai Naorji rightly said, 'If there is one thing more than another for which the Indian people are particularly and deeply faithful to the British Nations, it is the blessing of education which British has bestowed upon the Indians' 1. The British wanted a class of people who could ever remain faithful and loyal towards them. They chose the middle classes who could act as an agency through which the government could function successfully.

In 1829, Lord William Bentick, Governor General of India, stated the settled policy of the government in the following words: 'It was the wish and admitted policy of the government to render its own language gradually and

eventually the language of public business throughout the country. His
famous proclamation of March 1835 promulgated that the chief aim of the
educational policy should be to promote knowledge of European literature and
science through the medium of English education.

Time, undoubtedly justified Bentick’s policy but also exposed the utter
impracticability of this view. When in 1840, the control of the educational
institutions in the North-Western provinces was transferred from the
government of Bengal to the local governments, the latter came to the
decision that in order to produce any perceptible impression upon the minds
of the people, the attempt should be made to introduce education through the
medium of the vernacular language and not through any foreign tongue.
Again, in the Dispatch of the Court of Directors to the government of Madras,
dated 23rd March 1847, it was reiterated that the principle of religious
neutrality should be observed and enforced by the British Government in India
in its educational dealings as well as in the general administration of the
country. Lord Dalhousie, Governor-General of India, in 1849 followed the
policy handed down to him by his predecessors. The Punjab Government
was, however, favourably placed for educational work in as much as it could
avail itself of the wisdom gained in the sister provinces and it was spared the
necessity of repeating the mistakes of the past.

The beginnings of a modern system of education in the Punjab were
started immediately after its annexation in 1849. The early administrators did
a lot to spread education. It is interesting to note that there was a strong
desire among the people in Lahore and Amritsar to learn English. Reading
and writing of English, arithmetic, elementary geography constituted the

2. H.R. James, *Education and Statesmanship in India*, (London: Longmans Green and Co.,
1917), p 29.
George Bell and Sons, 1891), p. 39.
5. H.R. Mehta, *History of Growth and Development of Western Education in the Punjab*,
Grover (ed.), *The Story of Punjab Yesterday and Today - Political History and Development
130.
course of study. We have already mentioned Ranjit Singh's interest in western education. He made special arrangement for the education of his sons in western science and mathematics. Many Punjabi gentlemen privately taught their sons English. They employed the people of Bengal who possessed a smattering of English as teacher of this language. English education had become a ladder to elevation in social rank and a channel to wealth and prosperity. The people greeted introduction of English education and they learnt it with enthusiasm, not because it was the language of the rulers but also because it was a key to the treasure house of the western knowledge. To be able to speak English also became a mark of social superiority.

It was believed that the new ideas flooded the Punjabi's mind. New concepts opened new channels of thought. A whole new spirit entered the Punjabi's outlook, possessed it, agitated it, shook it and left it quivering with excitement in the 19th century.

The introduction of science and technology in India, particularly in Punjab after its annexation, is one of the most important developments in the history of modern India. Right from the establishment of British power in India, the idea that science could be used to build and maintain their rule in India came to dominate the thinking of British colonisers. India was the first part of the Empire where the British made a conscious effort to introduce and develop applied science and technology. In addition to commercial interests, administrative reasons led to the introduction and extension of science and technology in India.

Expansion of British rule in India necessitated scientific surveys, zoological and botanical explorations. Therefore, it was made compulsory to train the local youths in required branches of science. Numerous survey projects were undertaken in different parts of India. First major survey

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7. Ibid., p.130.
9. Ibid., p.238.
operation in North India was made by Francis White on Delhi\textsuperscript{11}, and by Young George Everest on mountain ranges of the Himalayas \textsuperscript{12}. Alexander Burns worked on the salt mines of the Punjab \textsuperscript{13}. The principal object of the survey was to obtain a clearer idea of the extent, properties, strength and resource of the country.

Though Shankaracharya had explored the region (Himalayan) in the eighth century A.D. the resultant pilgrims maps were stylized and formed with religions rather than any scientific appeal \textsuperscript{14}. Flora and fauna of Himalayas also induced the British surveyors to focus on it. These surveys gave the Indians first glimpse of western science. It is however, noteworthy that British surveyors were always preoccupied with colonial interests. Strategy pressed upon them to limit their plans to military route. British surveyors had so much interest in Punjab that even during the uprising of 1857, when the British were involved in the most challenging crisis of their imperial career in India, survey works were being carried out in the Punjab and Kashmir regions \textsuperscript{15}. In the beginning, European surveyors had carried out their works with the help of local flagmen. However, they realised very soon that no proper survey could be made without the help of well-trained Indians and therefore the first thing to do was to train them. Working under Europeans Indians too acquired some scientific information. Their credentials in the fields in which they were employed constituted another dimension of Indian response to the new science. This led to the opening of training schools and colleges.

The exploration of the natural resources of Punjab was one of the most explicit features of colonial science. For the northwest provinces, a centre for botanical researches was funded at Saharanpur in 1817. Various European Botanists explored botany of Kashmir Himalayas and Sind \textsuperscript{16}. Physical surveys and botanical exploration preceded geological researches on account of their strategic and commercial usefulness. In Punjab, Gypsum, graphite or

\begin{itemize}
\item \textsuperscript{11} Ibid., p. 24.
\item \textsuperscript{12} Ibid., p. 25.
\item \textsuperscript{13} Ibid., p. 37.
\item \textsuperscript{14} Ibid., p. 25.
\item \textsuperscript{15} Ibid., p. 27.
\item \textsuperscript{16} Ibid., p. 34.
\end{itemize}
black lead in the Himalayan mountains were discovered in the hills on the bank of the river Satluj near Mandi in Punjab \(^{17}\). Scientific explorations could be more useful when the collections were preserved and demonstrated to those who had some taste in scientific matters. The specimens of fossils and substances of geological explorations collected by hard labour needed a museum. The first Indian Museum came into existence in 1867. Museums were generally built for public interest. Lahore Museum was built in February 1893 \(^{18}\).

Formation of Scientific societies was an important aspect of British Scientific works in India. These societies arranged, encouraged and rewarded scientific pursuits in different fields. The most prestigious of the scientific societies was the Asiatic Society of Bengal, established in 1784 \(^ {19}\). In Punjab, an Agri-Horticultural society was established in Lahore in 1851, having majority of Europeans as its members. The objects of society included improvement by all means of existing modes of cultivation, the introduction of new plants for culture, providing of seeds and plants for members, and the systematic collection and diffusion of information of all kinds connected with agriculture, horticulture, and allied pursuits \(^ {20}\).

So, British scientific activities offered a little scope for the involvement of Indians. But pressure for the promotion of scientific and technical education led to the opening of some separate institutions in Punjab. Firstly, there arose a great necessity for civil engineers in Punjab. The physical features of Punjab offered facilities for irrigation. The rivers originating in the Himalayas fed numerous canals for irrigation, some of which were large and difficult to maintain. Many of these, which existed, were capable of extension. There were valuable water resources in Punjab, which at that time only turned a few crude water mills. Navigation on rivers was imperfect and liable to frequent interruptions. All that was required to accomplish these plans was the

17. Ibid., pp.36-39.
application of engineering information. Engineers were in great demand to lay out roads, to construct them, to metal them and to bridge them. British also wanted engineers in Punjab for the construction of roads and railways. The migrated Bengali, who accompanied British to Punjab, was not fulfilling their needs. The only agency at the disposal of the government was insufficient to meet the requirements. The handful of doctors, at the disposal of the government, whose services were much required for British's sick soldiers, were insufficient to meet the requirements. Working under such circumstances, the government was left with no alternatives but to prepare a subordinate class of civil engineers. For this purpose it made plans to establish an engineering college 21. Besides, services of Indians could be more readily available and at a cheaper rate than the services of Europeans 22.

The first institution, founded for the purpose of imparting knowledge of European literature and European Science was Delhi College established in Delhi in 1825 23. It made a pioneering effort to popularise western science. The Oriental Department of the College carried out studies in modern education through the medium of Urdu. The Educational Committee was created to translate into Urdu, scientific books then taught in European schools. The faculty of English of the College launched the Society for the promotion of knowledge in India through the medium of Vernaculars, which subsequently came to be known as the Delhi College Vernacular Translation Society. It translated as many as 125 books, chiefly Greek Classics, Persian works, and scientific treatises into Urdu, all in the time span of about twenty years 24. The

21. The Friend of India, March 23, 1854; Report on the Administration of Punjab (1850-1851); Selections from the Records of Government of India (Foreign Department), No. 11, Calcutta, 1853.
22. While European Engineers in the Public Works Department were paid from Rs. 250 to Rs. 1000 per month. Indian Supervisors and Overseas got from Rs. 25 to Rs. 145 per month; Home Public Proceedings, no 24.
23. Delhi College, originally established as Madrassa-i-Ghaziuddin by Nawab Ghaziauddin Froz Jung in 1772, was rechristened as Delhi College in 1825. The study of Delhi was taken because after 1857 it became a part of Punjab Province.
Society fostered a rich and many-sided education, and transformed Urdu from a language of poetry to the transmitter of western scientific ideas 25.

Delhi College achieved something which was qualitatively very different from the contemporary Calcutta renaissance 26. Delhi had a well-defined school curriculum and a local language. On to this were grafted European philosophy and science. The students here showed a clear-cut inclination towards a scientific rather than a literary education. For translations into local language, many European teachers helped in this work 27. This was perhaps the reason why learning English, was not, as in Bengal, regarded as vitally important. Altaf Hussain Hali (1837-1914), one of the most renowned alumni of the college, commented, 'We regarded the English learning as a means of getting job, not an education' 28. Thus, the Delhi College made remarkable efforts in the dissemination of modern science through the medium of the local language.

After annexation of Punjab there arose a tremendous pressure for the opening of engineering institutions. As a result, many engineering institutions were opened in Punjab. In 1845, James Thomason, who gave practical shape to the utilitarian principles in India, formulated a scheme by which the most advanced pupils of Delhi College were given practical acquaintance with engineering to their theoretical attainments 29. The government during 1873-74 had sanctioned a scheme of examination in Civil Engineering. However, a long-standing need for a higher Institute of Engineering was fulfilled in 1922 when the Maclagan College of Engineering was opened at Mughalpura, near Lahore. It aimed at providing theoretical and practical training in Electrical and Mechanical Engineering 30. Approximately 457 students got their training from this college during 1927-37 31. There was practically no unemployment in this

26. Ibid., p. 6.
27. Ibid., p.7.
28. Ibid., p.7.
profession 32. The irrigation projects, roads, building, and electricity branches of the Public Works Department of the provincial government, employed persons with engineering qualifications.

The profession of engineering remained by far the most backward of the recognised professions, due to the backwardness of technology and industry 33. No adequate facilities existed in the Punjab for engineering education. The Panjab University financed the engineering classes of a very elementary type held at the Mayo School of Art, Lahore 34. From the engineering class of the School, 18 out of 22 candidates passed the first Examination in Civil Engineering of the Panjab University. Out of 15 boys who left the School in 1898-99, 13 obtained suitable employment 35. There were 57 students in these classes in 1904-5 36. These classes were taken over by the Department of Public Instruction in 1905-6 and organised as Government School of Engineering 37. This School prepared students as overseers 38. In 1922, nearly 103 students got instruction and this number rose to 129 in 1927. During 1927-37, 734 students qualified, 627 as overseers and 107 as draftsmen 39.

Apart from the Engineering School at Rasul, Engineering classes were also held in the Dayanand Anglo-Vedic College, Lahore. But the number of students never became very large. In 1911-12, for example, there were only 94 students in the engineering classes at the D.A.V. College 40. Victoria Diamond Jubilee Hindu Technical Institute, Lahore, founded in 1897-98, also provided practical training in mechanical engineering. In the beginning, it provided instruction in Industrial Arts and Crafts and later on started the

35. Home (Education), May-December, 1900, No. 1034.
37. Ibid., 1905-6, p. 62.
38. Ibid., 1911-12, pp. 179, 191.
engineering courses. It had 50 students in the classes for Mechanical Engineering and Engine Driving in 1912. The introduction of railways and electric telegraph made it necessary to prepare a class of trained Indians not only to expedite their development but also to operate them. So in 1889 a Railway Technical School was opened at Lahore. In 1905, night classes in technical subjects had also been established in Railway Technical School, these classes were successful to an extent. Unfortunately, Indians were employed merely as labourers and mechanics such as turners, fitters, lathe men and smiths. The British authorities did not entrust any Indian with a challenging task in which punctuality, forethought and presence of mind were eminently needed. For a long time, Indians were excluded from railways, telegraph and Public Works Departments, which resulted in keeping the engineering profession in backward state despite the opening of numerous colleges. As the demand for schools of Industry and Art was increasing day by day, the Mayo School of Art and the Railway Technical School were established at Lahore, respectively in 1875-76.

The facilities for the industrial education in the province were also inadequate. Thus, the Punjab government contemplated to open Industrial schools for the improvement of arts and manufacturers. Considering the variety of occupations which were to be available to students in the future, it seems only reasonable that their lines of training should be allowed to diverge whilst they were still in the state of pupilage. But nothing could be done in this direction for want of funds. In 1874-75, Mayo School of Industrial Art was opened in Shimla, which had 44 students on roll. In the same year an industrial school was opened at Kasur. Many other industrial schools were established in Ludhiana, Lahore, Hoshiarpur, Gurdaspur and Delhi. These schools helped in enabling the students to earn their living in different crafts.

42. Punjab Administration Report 1911-12, p.191.
43. Ibid., 1901-02, p.172, para 631.
44. Home Department (education), November 1905, No. 44-56(A).
46. B.B. Misra, The Indian Middle Classes, p. 335.
47. Punjab Administration Report 1874-75, p. 126, para 308.
49. Ibid., 1885-86, p. 138, para 731.
such as - carpentry metal work, wood work, shoe-making, engraving, tailoring and weaving $^{50}$. However, all the technical and industrial schools except the technical classes held at the D. A. V. College, Lahore, were in fact craft schools, which aimed at teaching some craft such as carpentry, metal work, woodwork, shoemaking, engraving, tailoring and weaving, along with some elementary education in order to enable the students to earn a living $^{51}$.

There were schools to teach new skills, the Industrial Home at Gujranwala, one weaving and the carpentry schools at Ludhiana, Government Technical School Lahore among them, were important $^{52}$. In 1928-29, the total number of industrial schools maintained by the Government rose to 24. Efforts were made to ensure that these schools turned out craftsmen trained at high standards as far as possible in the particular specialised crafts. For example, the government Industrial School at Kulu specialised in wool spinning and wool weaving, at Gujranwala in tools making, one at Jhang in lock making and the one at Kasur in Leather work $^{53}$. The institute of dying and Calico printing at Shahadara provided training in technical and commercial processes involving dying, bleaching, and finishing of yarn. The Central Weaving Institute at Amritsar was another which incorporated scientific technology and popularised automatic looms for encouraging handloom industry. In addition Government Hosiery Institute at Ludhiana was established in 1926, it imparted training in hosiery, material processing and preparation of designs of garments $^{54}$.

After finishing the course, the students in spite of practising their technical training, accepted a modest position in the service of the government $^{55}$. To remedy this defect, the British government decided not to increase the number of schools and restricted admission to those boys who

$^{50}$ Home (Education) November 1905, No. 44-45(A).
$^{51}$ Ibid., 1905, No. 44-56 (A).
were known by their caste or occupation likely to practice in life the handicrafts taught in schools\textsuperscript{56}.

In the meantime, public opinion was growing keen on the point and demanded rapid development of industries and technical education. Therefore, the question again received detailed attention at the hands of the Indian Industrial Commission 1917-18\textsuperscript{57}. According to the recommendation of the Commission, the Punjab Government took concrete steps and the Industrial Schools were divided into two categories primary and middle. The Primary Industrial Schools were to provide instruction in manual arts such as wood-work and smithy, drawing and in the general subjects of the primary school curriculum. Teaching of craft was not to be attempted at this stage. The course for the middle schools was designed to give specialised training in craftwork \textsuperscript{58}. As a result, the number of industrial schools in the province increased from 24 with 2,249 pupils to 28 with 2,540 pupils during 1914-15. The number of industrial schools rose to 26 and that of the pupils to 4,336 in 1929-30 as compared to 19 with 1,639 pupils in 1911 \textsuperscript{59}. Gradually, a number of technical and industrial institutions were established at local level. New Board Industrial Schools had been started at Rewari, Dera Gazi Khan, Ambala, Jullundur, Ludhiana, Hissar, Rohtak, and Ferozepur etc\textsuperscript{60}.

Some efforts were also made for the training of men for organized industries. Thus, the Central Weaving Institute was established at Amritsar in 1920 \textsuperscript{61}. The Government Hosiery Institute at Ludhiana was established in 1926 \textsuperscript{62}. In 1932, the number of students in industrial schools further rose to 4,429. Thereafter the depression and cheap imported articles necessitated a

\textsuperscript{56}Indian Education Policy, A Resolution issued by the Governor-General in Council on 11th March 1904, p.34.
\textsuperscript{57}At the Time when Indian Industrial Commission reported in industrial schools in both the Punjab and the united provinces were administered by the Department of Education, but those in the latter area were inspected by the Director of Industries, who practically controlled them: A. Abbot, Report on Vocational Education in India, Manager of Publications, Delhi 1937, p. 760. See also Report on the Indian Industrial Commission, 1917-18, Calcutta 1919, pp. 276-8, and 284.
\textsuperscript{58}Report on the Progress of Education in the Punjab 1918-19, Appendix (A).
\textsuperscript{59}Punjab Administration Report 1929-30, p.65.
\textsuperscript{60}Ibid., 1912-13, p. 85.
\textsuperscript{61}Facilities for Technical Education in India, Pt, iv, Calcutta 1930, p. 27.
change in the policy regarding the management and organisation of industrial schools 63. Although the building trade employed lakhs of skilled workmen, it was strange that there was not a single school where the art of brick laying plastering, flooring, painting, and plumbing was taught in a practical manner. The Engineering Colleges and Schools taught these subjects but only theoretically and produced engineers', supervisors and overseers, who did not work with their own hands64. The scheme for post-matriculate Handicraft school was, therefore, devised to train matriculates for a period of two years. In the first year, three days in the week were to be devoted to theory and other three days to practical work. Besides working on the construction of buildings, the students were to work in various workshops. In the second year, they would specialise in one or two branches. They were, thus, enabled to earn something as paid apprentices. After two years of training they could get a Diploma enabling them to earn for their livelihood. It was recommended to the Governor-in-Council that a research fund be established to enable consistent work for agricultural and industrial research in the province 65. Furthermore, a vigorous programme of internal re-organisation and overhauling of the courses was initiated. Specialised trades such as machine making, engine and pump making, woodworking, wool spinning and wool weaving, lace and braid-making were started in the industrial schools 66. Separate schools were also opened to teach a particular craft 67. Other changes made were the discontinuation of primary classes in the Industrial schools and the restricting of admission only to students of sufficient general education of the level of the 6th or 8th class68.

As regards the industrial training for girls, it was in 1927 when Minister of Industries, appointed a full-time officer to develop and organise industrial training for girls. This project started with 2 schools and 200 students. In January 1946, there were 40 such schools in the province both government and private, and the number of students receiving training ran into several

63 .Ibid., 1931-32, Calcutta 1933, p. 7.
64 .The Tribune, 15 November, 1927, p. 8.
65 .Ibid., p. 9.
68 .Ibid., 1932-33, p. 7.
thousands. The crafts taught in these schools covered tailoring, dressmaking, hand and machine embroidery, silma tilla knitting, toy making, weaving, and basketry. These industrial schools were particularly helpful to widows, orphans and other helpless people of the lower strata of society.

The Indian National Congress took up the question of technical education at its 14th session held at Madras in 1898. It reaffirmed its stand at Lucknow and Lahore sessions in 1899 and 1900 respectively. The regional press also raised the demand for technical education. The Paisa Akhbar (Lahore) observed that the government should take the initiative and establish technical schools first and then gradually leave the natives to maintain such schools. The Khalsa Bahadur of Lahore remarked that the majority of the educated Punjabis did not know how to earn their livelihood and that the lucky few, who succeeded in entering government service, received such low salaries that they could lay by nothing for the rainy day. The practical and technical education was the only remedy for the evil. The Rafiq-i-Hind (Lahore) suggested that the best way to eradicate the evil of poverty was to promote technical education in the country. The Sialkot Paper (Sialkot) argued that in order to better the condition of the people, government should take steps by opening commercial agricultural and technical schools in the country.

The nature of technical education to be imparted in the newly opened technical institutions also drew the attention of Indian leaders. The subjects mostly taught in these institutions were carpentry, shoe making and tailoring. They criticized the government for providing limited technical education, which primarily focused upon improvement of the style of work of carpenters, smiths and other handicrafts. They pointed out that India already had enough number of trained artisans. What the country needed was more engineers. The main

69. The Tribune, 29 January 1946.
71. Resolution No XVI, 15th Congress, Lucknow, 1899.
72. The Paisa Akhbar, 1st April, 1899.
73. The Khalsa Bahadur, 25, February, 1901.
74. The Rafiq-i-Hind, 2 March, 1901.
75. The Sialkot Paper, 24 May, 1901.
goal of the technical education must not be the revival of the extinct and dying industries, which would produce goods being imported at that moment. Emphasis had, therefore, to be placed on education that would help in the starting of new industries by familiarising Indian technicians with the latest developments in the theory and practice of modern machines and mechanical appliances. It was for this reason that the Indians stressed on the education and training for technical cadres abroad.

However, the government followed a policy of discouragement of the growth of railway and ancillary industries, coupled with discrimination against training Indians as apprentices in railways workshops. Europeans and Anglo-Indians held upper and middle grade appointments. In 1913, for instance, who held 90% of the posts carrying a salary of Rs. 500 and above although they formed only 0.08% of the population. In 1921, there were 1,351 Europeans and Anglo-Indians officers against 262 Indians.

The irrigation department ranked next to the railways in terms of predominance of Europeans and Anglo-Indian. Government owned factories rarely trained Indians for supervisory posts. In the Posts and Telegraphs Department also, in higher paid ranks, Indian had disproportionately a small number of jobs. There was an increasing criticism of the government's employment policy and in 1918, Srinivas Shastri moved a resolution in the Imperial Legislative Council and urging that the technical and scientific services should be recruited entirely in India.

There was a fairly widespread notion among the British official and private employers that Indians lacked an aptitude for technical training. There was a bias among European employers against employing Indians. Under these circumstances the government was unwilling to employ highly trained personnel.

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Indians. The growth of higher scientific and technical education naturally suffered.

Indian resentment of the preferential treatment mainly on racial grounds had twin effects. On the one hand, it led to demands for greater self-sufficiency in scientific training and research, and on the other it increased the growing resentment of educated Indians towards British rule and hence helped the cause of Indian nationalism. For example, demands for self-sufficiency were raised through many forums.

On August 1869, in the issue of Calcutta Journal of Medicine, Mahendra Lal Sircar, wrote an article entitled ‘On the desirability of a national institution for the cultivation of Science by the natives of India’: ‘We want an institution which will combine the character, the scope and objects of the Royal Institute of London and of the British Association for the Advancement of science. We want an institution which shall be for the instruction of masses, and we wish that institution entirely under native management and control82.

Sircar felt that the underdevelopment of India was due to its backwardness in science. Indians had the potential to master modern science; they had shown themselves master of science in the past. This could be achieved through self-help 83. He desired that Indians should cultivate science not only for ‘economic betterment, but also for their regeneration'. After earnest efforts, he succeeded in establishing in 1876 - ‘The Indian Association for the Cultivation of Science’ 84. The Association was an institution for the masses with full 'audience participation. Where any lover of science could come and work the way scientist felt it necessary. Being a national association created entirely by private donation, the association would have no government control. In Panjab, one such institution was established by Ruchi Ram Sahni i.e. 'Panjab Science Institute' for the popularization of scientific knowledge of all kinds throughout the province by

83. Ibid.
84. Ibid.
means of lectures illustrated with experiments and lantern slides, as well as the publication of tracts. Subsequently, encouragement of technical education and setting up of chemical industries in Punjab were also included. Pamphlets on the manufacture of soap, indigo and other products of common use were written and circulated. Cash prizes for writing short papers and pamphlets were also offered.

Turning to agricultural education, there was no facility for training in agriculture in the province till 1909, when the Punjab Agriculture College and Research Institute was opened at Lyallpur to provide a thorough general education in all branches of the agricultural science. The institution was to fulfill a two-fold purpose. The problems connected with the agriculture of the province were to be studied in the laboratory and in the field, while thorough general education in all branches of the agricultural science was to be given to the students who would concentrate on the progress of agriculture along modern lines either in the fields of the agriculture department or on their own lands. Besides the College at Lyallpur, teaching of agriculture as a subject was also started in 1923 by the Khalsa College, Amritsar. However, those classes covered only two years of the four-year degree course, and the students willing to complete the degree course had to spend two years more at the Agriculture College and Research Institute at Lyallpur. As a result, the demand for admission at the Lyallpur College gradually increased and in 1938-39, there were 310 students studying for the degree course.

The agricultural education at the college level, however, failed to make an impact on agriculture because the main objective of the students was to

87. Quinquennial Review of the Progress of Education in India 1902-7, pp.176-77.
enter the ranks of the Agriculture department and hardly 2 or 3 % of them went back to their farms 90.

Till 1919, there had been no satisfactory arrangements for the teaching of agriculture at the secondary stage, except in a few schools where theoretical teaching of agriculture as an optional subject was provided in the high classes only 91. On the recommendations of the Provincial Conference, on Agricultural Education which was held at Shimla in 1917, it was decided that rather than to start a number of separate agricultural schools, an effort should be made to give an agricultural bias to the general teaching imparted in rural middle schools by the introduction of training in practical agriculture 92. For this purpose, a farm of about three acres was attached to every school in which agricultural course had been introduced but owing to financial stringency and non-availability of land near the schools in urban areas, the alternative of school gardens of from half an acre to one acre in the area was adopted in 1923 93. The government also undertook to pay a grant of Rs. 3,530 per school to meet its initial expenditure in this respect. But soon after the introduction of the scheme the province had to face severe deficit. Consequently, most of the District Boards opted for the abolition of education in agriculture which they considered expensive 94. Even though progress in this field of education remained slow, yet by the end of the year 1922-23, 44 vernacular middle schools were teaching agriculture as a subject under the supervision of the trained agricultural teachers. In the high schools also, the purely theoretical teaching of agriculture was supplemented by practical work on land 95. The experiment proved successful and was commended by the Royal Commission on agriculture, 1928 96. From 1932 onwards, theoretical and practical agriculture was made an integral part of the middle school

91 Report on the Progress of Education in the Punjab 1918-19,Appendix-B.
92 Proceedings of the Conference of Inspecting Officers 1920,Lahore 1921,p.15.
94 Proceedings of the Punjab Educational Conference, an Exhibition held in December 1926,Lahore 1927,p.402.
95 Report on the Progress of Education in the Punjab 1918-19,Appendix-B.
As a result of the agricultural training provided in the schools in the rural areas, the farmers began to take a genuine interest in agricultural progress and reform.

Talking about medical education it may be pointed out that Indians were allowed to have education in any branch of medical science irrespective of caste and creed. Medical profession now ceased to be the birth right of a Vaid or Hakim. European method of treatment created a need for training medical practitioners who could help the European doctors at subordinate levels. In 1835, Calcutta Medical College was founded to provide western education to the people. There also arose a great demand for the opening of a medical institution in Punjab as the native medical officers from Bengal failed to win the confidence of Punjabis. The British government also conceded that the Punjabis would not go to Calcutta for Medical Education. So in 1860, The Medical College Lahore was established to provide western medicine to the people and to satisfy the demand for Punjabi doctors, as the trained doctors from Bengal generally disliked taking up service so far from their homes, and when appointed, they did not often command the confidence of the people. By 1883-84, the Medical School had turned out sub-assistant surgeons or Licentiates in medicine and Surgery and 384 doctors and hospital assistants including 33 hospital assistants instituted in 1879-80. By 1885, 67 assistant surgeons were employed by the government. Attached to the Medical School were the midwifery class started in 1877-78 and the practising Hakim class was started in the year 1877-78 and the practising Hakim class was started in the year.

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98. Ibid., pp. 84-85.
99. Foreign Political Proceedings, August 13, 1858, No. 388.
100. Medical College Lahore prepared the students for the degree of Bachelor of Medicine and doctor of Medicine; Foreign Political Proceedings, No. 389-90.
101. There were two departments in the Medical School Lahore the class for Sub-Assistant Surgeon and the class for Hospital assistant and Doctors. Instructions in the Sub-Assistant Surgeon Class was in English and the course extended over five years. The Hospital Assistants and Doctors received instruction in Urdu and the period of their instruction was three years. In 1879-80, an English class for Hospital Assistants was also started; H.R. Mehta, A History of the Growth and Development of Western Education in the Punjab, p.80.
103. Among 67 assistant surgeons there were a Muslim and 52 Hindus. The Hindus included 20 Khatris, 7 Arora, 13 Brahmans, and 7 members of minor trading castes; N.G. Barrier, 'Punjab Politics and the Disturbances of 1907:The Response of the British Government in India to Agrarian Unrest', in Modern Asian Studies, 1,(4), pp. 353-383.
following. The school was shifted to Amritsar in 1920. In 1901, the total number of school and college students on rolls was 434 and rose to 556 students in college and 547 in school in 1938-39.

By 1901-02, the prejudice against western medicine had considerably broken down in the case of male students but resistance against women undertaking medical education took longer to be broken. The North Indian School of Medicine for Christian Women had been established at Ludhiana in 1894. It enlarged its scope with the help of a grant from the government and came to be known as Women's Christian Medical College. During 1900-01, there were 43 students on the rolls. One more Medical School was opened at Ludhiana in 1934. In 1938-39 there were 229 students at Ludhiana in the two institutions.

Facilities were also available for the study of Indian system of medicine through the Vedic class attached to Dayanand Anglo-Vedic College, and the Yunani classes attached to the Islamia College at Lahore. In 1913-14, the number of students on the rolls of the Yunani class was eighteen and the Vedic class at the D. A. V. College had 43 Students. In 1938-39, there were 214 students in these classes for which no fees were charged.

In 1946, the Emergency Committee appointed for the promotion of medical education suggested an output of 4,000 to 4,500 doctors a year as the target to be aimed at in the next ten years. With a view to achieving this a reorganisation of the medical curriculum and the establishment in every medical college of a department of preventive and social medicine were proposed in 1846. It was felt that the economic barriers should not prevent suitable students from entering the medical profession. It was also considered essential to establish an All-India Medical Institute in order to bring together in one place, educational facilities of the highest order for the training.

105. Ibid., 1938-39, p.70.
106. Ibid., 1913-14, p.12.
108. The Tribune, 4 March, 1946.
of doctors and of the more important categories of health-workers. \(^{109}\)

Veterinary College established at Lahore in 1882 was the only institution in the Punjab, which trained students in veterinary medicine and surgery. The Veterinary College, Lahore, introduced a four-year degree course. The minimum qualifications for admission were matriculation, though candidates with higher educational qualifications also sought admission. \(^{110}\) In 1899, there were 99 students on rolls, which rose to 181 in 1913-14 and to 202 in 1938-39. Students from outside the province crowded the classes. New rules were, therefore, sanctioned, allowing the admission of 17 private and District Board students from the Punjab. \(^{112}\)

However, there was no likelihood of employment for the men qualifying from this college. However, there was a big demand for licentiate of veterinary practice in the Punjab and Indian states and the supply of trained men were unequal to the demands. \(^{113}\) In 1946, the Punjab Government intended to send about 40 students to foreign countries for training in veterinary science. \(^{114}\)

A unique experiment, better known as Hakim experiment or Sialkot experiment took place in the province of Punjab in the post-mutiny year i.e. after 1857. The British felt the dire necessity of securing the loyalty of the agricultural classes of the Punjab, which formed an important component of the British army. They had helped to suppress the mutiny and which appeared, with their better physical build-up than the rest of the Indians, to be the most promising base for future army recruitments. How could the medical problems of this vast rural population be solved? It became a troublesome issue for the authorities because the number of Punjabis trained in allopathic system was too small to face the enormity of the challenge. The barriers of language, religion, local customs and belief and inaccessibility of great many areas during monsoons and wintry cold conditions made the task all the more difficult. The most appropriate solution that gradually emerged in the 1860s.

\(^{109}\) Ibid., p.6.
\(^{111}\) Home (Education), Nov. 14, 1899, No. 1034.
\(^{112}\) Report on the Progress of Education in the Punjab 1913-14, p. 17.
\(^{113}\) Report of the Punjab Unemployment Committee 1937-38, p. 58.
\(^{114}\) The Tribune, 5 April 1946.
was to enlist the services of local hakims who, after having received rudimentary training in allopathic at the government hospitals, were to be sent back to their respective areas for medical practice.

It was felt that such a programme would not only facilitate the government’s vaccination and anti-cholera measures but also popularise western medical science and culture. These cultural interlocutors, in the long run, would themselves, confirm the superiority of the western therapeutics leading to its safe transplantation by subverting the inferior Unani-tibb and Ayurveda.  

Many British Officials, medical and civil, favoured the use of hakims as a means of extending the medical system into rural areas. The hakims being Punjabis solved various social problems. They came from respectable families and their systems of practice were carefully adapted to the prejudices and practices of their patients. John Lawrence, the Chief Commissioner of Punjab, had suggested and authorised the training and use of hakims as vaccinators in 1857 and earlier approved their use in times of exceptional need. Thus, when confronted with a cholera epidemic in 1856, the Kangra District Dispensary Committee Employed Hakims to treat patients and distribute medicines. The Civil Surgeon instructed these men in the proper use of medicines.  

The reasons and the precedents already referred to led the Punjab government in 1867 to sanction a programme by the District Commissioner of Sialkot, Lt. Col T.W. Mercer to establish a District-wise scheme for medical relief, dependent for its manpower needs on district Hakims. The Hakims in Mercer’s programme were to treat diseases, distribute simple medicines (primarily quinine), to act as sanitary inspectors and as registrar of vital statistics, and also to aid in the vaccination programme.

The success of Sialkot experiment, later on, prompted the Lahore Medical School in 1870 to add a class for the relatives of Hakims. The class was trained in allopathic technique, particularly in anatomy and surgery in which Unani-tibb was considered to be very weak. The programme proved so successful that Rahim then, sub-assistant, was appointed as the Superintendent of the Hakims’ class. It further resulted in the Lt. Governor’s approval for the regularisation of programme and the award of suitable degree to the successful candidates. In 1872, Punjab University College Senate authorised the Oriental College to grant certificates and titles to Hakims and Vaids in the dual programme. The Oriental College programme, however, met its doom when the question of medical registration came up in 1882. Originally put forward by the Bombay Government, the proposed bill, modelled on the United Kingdom’s Medical Registration Acts, was to apply to the whole of India. Though the bill would not forbid irregular practice, it would confer certain exclusive rights on the registered practitioners such as the right to sue for fees, and the right to call oneself a registered practitioner. Normally such a bill would have been welcomed and supported by the allopathic medical profession. But in the Punjab such support was not forthcoming because of the belief that the bill as proposed would give Hakims and Ayurvedic practitioners who possessed university qualifications the same right as the allopathic physicians vis-à-vis the government.\footnote{118. Ibid., p.47.}

Regular allopathic professionals everywhere opposed the bill tooth and nail. They strongly felt that by supporting Unani-tibb in any way the government would be encouraging the most regressive tendencies in Indian society. Hence, the Punjab government’s decision in 1889, led to the virtual exclusion of Hakims from government medical service, appeared to be a victory for scientific medicine. Henceforth, allopathic practitioners came to enjoy a monopoly of all the government medical positions.\footnote{119. Ibid., p.48.}

This is the sum total of the scientific and technical education which developed in India as well as in Punjab under the British Rule. Science education could be an important channel for the transmission of modern
science to India. At the same time, technical education could lead India to industrialisation and material prosperity. But British education policy was a characteristic policy of too little, too late. In the beginning, the British, instead of giving instructions in western science wasted their limited education funds on the moral development of their Indian subjects. Although they tried to give some instruction in oriental literature and science, yet the revival of Indian literature at the cost of teaching of modern science was an attempt to keep people backward.

In the English education, oriental learning was totally rejected and, undue preference was given to literary instruction. British interest in European literature and science proved a fatal blow to Indian scientific tradition, which could not be discarded altogether. Earlier, Muslim rulers had successfully introduced Islamic science of medicine, astronomy, geography and navigation in India. But unlike the British, their response to the existing tradition of science in India was not reactionary. The Muslims did not consider Indian literature and science useless and absurd, hence a remarkable exchange of scientific ideas between the Hindu and Muslim exponents of science. But the British, once they became secure in India were totally negative\(^\text{120}\). Projection of the superiority of European mind became a vital issue in their plans for the promotion of learning in India.

In the new education system framed under colonial compulsions, there was therefore, no place of oriental literature and indigenous works of science. The imposition of English language as a means of instruction for the Indians was also impractical as through vernacular languages they could wisely imbibe modern science. The British stress on giving instruction through English language was based on the success of English medium in Calcutta. The popularity of the English language was, however, confined to the metropolitan cities because here existed an extensive demand for men with

\(^{120}\) The British government changed its tune in 1824 and declared that with respect to the sciences, it is worse than a waste of time to employ persons either to teach or to learn them in the state in which they are found in the Oriental books. See, Home Public- Letters from the Court of Directors, February 18, 1824.
some familiarity with English. But compared to Calcutta, English evoked negligible response in Delhi\textsuperscript{121}.

The real fault in the British education policy was the undue and disproportionate attention devoted to literature as compared with science. This caused the legal, judicial, and administrative profession to be over crowded. The scientific and practical professions on the other hand, were starved and neglected.

Opportunities for Indians in the colonial, educational, and scientific services were limited. Indians were appointed to positions in the provincial and subordinate services, while the prestigious imperial services were reserved for Europeans. So, the growth of higher scientific and technical education naturally suffered.

Not that the Indian did not react to the lacuna in the educational system. Dissatisfied and disillusioned with British education policy, some Indians genuinely regretted that at present education is but name. It seems now the eager desire of the government to multiply the number of schools without improving knowledge\textsuperscript{122}. The \textit{Hindu Patriot} noted the numerous educational institutions in the provinces send forth annually a large number of educated youths who consider a clerkship in the treasury or any other public office as the ultimate of their aims and expectations. It further noted that practical mechanics or engineering forms no portion of their education. The end aim of their education is to make them either accountants or letter-writers\textsuperscript{123}. The Punjab press also took a lively interest. It noted that higher education was the only means by which the material and moral welfare of the country could be promoted, but unfortunately government was reducing its expenditure on it, thereby discouraging it\textsuperscript{124}. The \textit{Ataliq-i-Hind} (Lahore) suggested to the government to open industrial schools, if they wanted to

\begin{itemize}
  \item \textsuperscript{121} In the year 1829, more than 420 students studied English in the Anglo-Indian college of Calcutta, while the Delhi English Institute, despite its best efforts, could induce only 68 students for the same purpose, Home Public - Letters from the Court of Directors, October 24, 1832.
  \item \textsuperscript{122} \textit{The Englishmen}, January 12, 1857.
  \item \textsuperscript{123} \textit{The Hindu Patriot}, May 4, 1854 and April 6, 1854.
  \item \textsuperscript{124} \textit{Native Paper Report}, Punjab, 1895, p.554.
\end{itemize}
avoid the problem of educated unemployment\textsuperscript{125}. The \textit{Punjabee} wrote, 'India has produced excellent clerks and accountants, it has not produced a single man who could make a pin or a needle with all education it has received during one century'\textsuperscript{126}. Some other newspapers also raised their voice in favour of introduction of scientific and technical education. When the Lahore Literary and Scientific Institution was founded in 1854, the \textit{Lahore Chronicle} suggested that lectures might embrace discourses on electricity, chemistry, animal magnetism, the electric telegraph, the steam engine, hydrostatics, hydraulics etc \textsuperscript{127}. A wave was thus passing over the country, agitating the minds of the people and drawing their attention to this subject. The cultivation of the science became the watchword with the sons of Punjab. They began to feel that science affords the purest enjoyment in the world.

Some efforts were made to import scientific and technical education, but the little science education imported was to expand and to consolidate British Empire in India and to extract maximum profits from the natural resources of the country with the help of local manpower. Teaching of science for the sake of knowledge did not fit in the British plans. There was a fairly widespread notion among the British Official and private employers that Indians lacked an aptitude for scientific and technical training.

There was a bias among European employers against employing Indians. Under these circumstances, government itself was unwilling to employ highly trained Indians, which actually hampered the growth of scientific and technical education in India. Indian resentment against the preferential treatment to Europeans had grown since the 1880s. This resentment was fostered by many highly publicized instances such as deliberate discrimination in appointments to the Imperial Services. In 1889, there was a vacancy of a Principal in Poona Science College, but that post was not given to the distinguished scientist Naigamwala because it was reserved for Europeans. Other distinguished Indians namely P.C. Ray, S.S.

\textsuperscript{125} \textit{Native Paper Report}, Punjab, 1892, p. 3.
\textsuperscript{126} \textit{The Punjabi}, (Lahore), 3 October, 1904.
\textsuperscript{127} \textit{The Lahore Chronicle}, 3 February, 1855.
Bhatnagar were confined to the provincial service. They suffered racial discrimination 128.

Establishment of as many as 170 colleges including several medical and engineering colleges and technical institutions (affiliated to the five university-Calcutta, Madras, Bombay, Lahore and Delhi) had only trained and employed Indians as clerks, second-rank technicians and engineers to run railways, shipping or canal construction ventures or to gather information about botanical, zoological and mineral resources. Transfer and relocation of western scientific knowledge and technologies was only partly successful in terms of long-term benefits to the Indian people 129. It was so because these ventures were conceived of and remained as mere technological projects, which did not target at diffusion of knowledge, and skills. Indian were educated to a certain point. Culture of technology was withheld from them. As colonial subjects, non-Europeans including Indians were denied opportunities for enterprise, investment and experience 130. It is evident from Rai Bahadur Ganga Ram’s bitter experience who was discouraged not only from making investment on lift-irrigation technology to harness water near Renala in Lower Bari Doab canal but also deprived of a contract to construct tube wells on his plot in Upper Chanab colony 131.

Hence, it was difficult for any Indian to get state patronage or funding for projects concerned with dissemination of scientific awareness 132. The absence of large-scale industries also did not favour the growth of a science movement. Actually, the colonial state was not interested in the development of science.

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130. Ibid.
The resentment against the inferior position in appointments of the natives in the Punjab also began to gain momentum. In 1887, 146 covenanted servants held supervisory posts from Assistant Commissionership to lieutenant Governorships. The government was also charged for the abolition of the open competition for the government appointments. The Tribune dated 7th July 1904, assailed the policy of the government in no uncertain terms when it recorded: 'The abolition of open competition for government appointments will open the door wide for robbery and nepotism'. It also regretted the conspiracy of the authorities of keeping certain castes, because of their birth, practically out of government service.

The resentment generated by this preferential treatment mainly on racial grounds had twin effects. On the one hand, it led to demands for greater self-sufficiency in scientific training and research, and on the other it increased the growing resentment of educated Indian towards the British rule and hence helped the cause of Indian nationalism.

In the next chapter, we will focus on various technological projects, which the British introduced in Punjab to extract the maximum profit out of natural resources of Punjab. It also tends to answer what was the state of technology in Punjab when the British took over? Did the technological implements suit Punjab conditions and needs? What did British provide for the improvement of technology, What was the response of Punjabi people to western techniques and technologies?

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134. Ibid., 14.
135. The Tribune, Lahore, 7th July, 1904.
136. Ibid.