Title of the Project : A case study of people's perception towards Science and Technology

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Objectives :

The primary objectives of the study are :

1. To evaluate people's understanding of scientific and technological contributions and issues related to their day to day life.
2. To evaluate people's perception of S&T contribution to the present standard of living and the former's assessment about the future relationship between science, technology and economic prosperity.
3. To evaluate the disparities in various aspects, from points 1-2 above, in rural/urban areas, and by gender, age, education, religion/caste, states etc.

.Executive Summary :

(1) About the Study :

1. People's perception towards Science and Technology (S&T) is a relatively unexplored area of study and the existing surveys carried out on the subject are only indicative but not representative in nature. To understand the people's perception about scientific and technological issues, the awareness about these issues, and how closely the masses follow such issues, Department of Science and Technology (DST), Delhi commissioned the present study titled " A Case Study of People's Perception towards Science and Technology". It provides information on
   - the level of people's understanding of scientific and technological contributions and issues related to their day to day life; and
   - the level of people's perception of S&T's contribution to the present standard of living and the former's assessment about the future relationship between science, technology and economic prosperity.
2. The literacy level varies from a minimum of 38.48 percent for Bihar to the maximum of 89.81 percent for Kerala. These two states have been selected for the study, as they represent the extreme cases of literacy levels and overall development. For the rural sample two districts, and within each district three villages were selected from both states. The urban sample comprises Delhi, Bangalore, Thiruvananthapuram and Patna.
3. In each of the selected village/urban block, individuals above fifteen years of age were listed through a specially designed proforma. The listing proforma sought individual's particulars such as age, education and occupation. After completing the listing operation, individuals were then classified into one of the strata, based on sex, age and educational qualification. A maximum of two individuals were selected from each effective stratum to ensure that each listed individual in the stratum had an equal probability of selection. A total of 532 individuals from rural areas and 1072 individuals in the urban areas constituted the ultimate sampling

units.

4. The questionnaire based approach, containing open and closed questions, was used in the present survey to analyse the level of the perception of people in different areas of science.

5. The data for the survey were collected during September to December 1997-98.

6. In the following sections, a summary of the findings of the Chapters II - IV is given.

(II) Information Acquisition :

7. Source of Information : The major source of information for rural people is the 'radio' (over 87%). The second important source of information in Bihar (rural) is the local leader/people (54 %) followed by television (28%). A smaller proportion of people of Bihar (rural) have opted for the print media as important source of information is the newspaper followed by television and magazines. In general, urban masses use all types of channels of information but television and newspapers are the two most important sources of information in urban areas like Delhi and Bangalore. Local people/leaders are the least preferred choice as a source of information in urban areas, with the exception of Patna.

8. Utilisation pattern of information sources : The majority of rural people who have less access to TV and newspaper, prefer to listen to the radio regularly or occasionally. However, urban people spend more time to watch TV progrmames and to read newspapers. For instance, in Bihar (rural) a substantial proportion of respondents have reported that they neither watch TV (40%) nor read newspapers (47%). However, these proportions for a city like Delhi are only 2 percent and 17 percent.

9. Level of Confidence in the Channel of Information : The majority of respondents expressed that television and radio are two most important authentic sources for information. In general, better educated respondents are reported greater reliance on print materials (newspapers and magazines) while less educated individuals relied more often on audiovisuals. Among various information sources, the local leader/people as an information source is the least reliable across the sample places.

10. Preference for Reading Medica :

- Forty two percent of population do not read any types of books/magazines in Bihar (rural) followed by Patna (28.4%). However, this proportion is very small in other sample places particularly in urban areas. In rural areas (Bihar & Kerala), majority of people prefer to read religious books/magazines followed by novels/stories and books related to films. But this proportion for Kerala (rural) is much higher than Bihar (rural).
- In urban areas, there is no definite type of preference for reading. For example, in Delhi and Bangalore, the majority (30-48%) prefer to read all types of print media. However, in Thiruvananthapuram, people prefer to read novels/stories (78.3%) and books related to films (76.7%) rather than scientific (53.9%) and religious books (37.2 %).
- Reading of scientific magazines/books are the least preferred choice of respondents in rural areas and Patna.
- Women in rural areas prefer to read books/magazines related to religion

and films than their counterpart in urban areas. It is expected that rural people are more religious than urban people and have great faith in religion. This is reflected from this study that even rural people with higher education prefer to read religious books in comparison to other books. However, urban people with higher education, by and large, give equal importance to all types of books as far as preference for reading is concerned.

11. Preference of Information : News is the most preferred information in all the sample places except Bihar (rural) and Patna where people ranked it third. However, information related to films is placed at second or third place with respect to the preference of the people. S&T occupies fifth place, the least preferred subject, except for the city of Bangalore (where it is ranked second). People living in urban areas show greater preference for all subjects than do people in rural areas and this may be due to greater cultural activity in the city which generates its own interest.

(III) Public Understanding of Science :

1. Using a set of twelve items to gauge public understanding, Thiruvananthapuram ranked first followed by Bangalore, Delhi and Kerala (rural) while Bihar (rural) ranked sixth. Across the twelve items, Thiruvananthapuram, Bangalore and Delhi ranked either first, second or third except for two concepts, i.e. smoking causes serious health problems and hybrid varieties yield more than do local varieties. Patna and Kerala (rural) ranked fourth or fifth irrespective of items posed to respondents. Among sample places, it is observed that the level of understanding of people of Bihar (rural) is significantly lower than other sample places.

2. Respondents with a higher the level of education have better level of understanding of concepts than respondents with a low level of education. Similarly, the level of understanding of students and service men is significantly higher than people who opt for occupations like, agriculture, wage earning, trading etc.

(IV) Level of Awareness

1.

1.1 Level of Awareness in the area of Agriculture : The proportion of the 'least' informed in agriculture is approximately 51 percent for Bihar (rural). In other words a majority of the population of Bihar (rural) is aware of answer to less than five of twelve of the questions which were asked to each respondents. This proportion is much higher in urban areas particularly for Delhi. For Kerala (rural and urban) the share of population who answered over eight technologies/process correctly, is the highest.

1.2 1.2 About 48% of people in Kerala (rural) are aware of the use of these technologies followed by 32% in Bihar (rural) The level of use of these technologies for Thiruvananthapuram and Patna is the same (10-11%) respectively. However, this proportion is the least for Delhi (3%).

1.3 The share of population who answered two major benefits of various technologies correctly is on the contrary, significantly higher than rural areas. It is also important to note that approximately 34% of the population of Bihar (rural) are using technologies/process without knowing their importance (benefits).

2. Level of Awareness in the House hold Sector : Majority of people (over 50%)

fall under the category of "most" informed with respect to the awareness of household technologies across sample places. It varies from between 96% for Thiruvananthapuram to 53% for Bihar (rural). The proportion of people using these technologies ranges from 40% for Bihar (rural) to 77% for Delhi. Also, the majority of people are aware about two major benefits of technologies/processes related to household sector.

3. Level of Awareness in the field of Communication : Results reveal that the majority of people (over 50%) of urban areas like Delhi, Bangalore and Thiruvananthapuram fall under the category of the "most" informed in the field of communication. However, this proportion for Patna and Bihar (rural) is 36% and 11%, respectively. It is also observed that the majority of people of Delhi (67%) and Bangalore (50%) were using these technologies in day-to-day routine, but this proportion is the least for rural Bihar (9%).

4. Level of Awareness in the field of Health & Hygiene : Over 60% of people of urban areas (except Patna) are aware about five to six technologies/processes related to health and hygiene. This proportion for Patna is 24 percent which is less than even rural Kerala (47%). However, people of Bihar (rural) falls under the category of the "Least" informed in health and hygiene. In comparison to other subject areas, health and hygiene has a higher percentage of people unaware about major benefits and the proportion varies from 4% for Delhi to 24% for Bihar (rural).

(V) The impact of Science and Technology on the Quality of Life

1. A positive attribution to S&T of a high standard of living, improved public health and an increased enjoyment of life of individuals across sample places. Even in the case of improved working conditions and national/world peace, a plurality of respondents thought that the contribution of S&T has been more positive than negative.

2. There are significant differences between the assessment of men and women on S&T's impact on the quality of life. In general, men show a more positive response to S&T than do women. From this finding, it may be concluded that the benefits of S&T outweight its harmful consequences; better educated respondents are more likely to assess the balance as strongly favouring beneficial over harmful results.

(VI) People's Perception of and Reaction to Modern Technology

1. A large proportion (above 50%) of people have a negative perception towards modern technology that varies from 53% for Bangalore to 93% for Bihar (rural) The level of perception for Thiruvananthapuram (64%) and Delhi (65%) is approximately same. As far as Kerala (rural) is concerned, the negative perception is much lower than for Bihar (rural for all the issues considered.

2. As in case of negative perception, a large proportion of people react negatively towards modern technology. It varies from 50% for Bangalore to 92% for Bihar (rural). The three main issues related to modern technology that were reacted negatively by majority of people across the sample places are

    - Threat of jobs (63% for Bangalore to 97% for Bihar-rural).
    - Reduces people's creativity (53.8% for Bangalore to 94% for Bihar-rural).

- Alienates people from work (47.6% for Bangalore to 93% for rural-Bihar)/.

Among different sample places, the negative reaction for Bihar (Rural) is much higher than other sample places for different issues.

3. There are indications of a relationship between the perception and reaction of people to modern technology. The difference between mean scores as well as standard deviations on the negative perception (X) and the negative reaction (Y) are not significant for respective sample places. In fact, the standard deviations for both are approximately equal across sample places. In fact, the standard deviations for both are approximately equal across sample places. Again, the two deviations move in the same direction which suggests that on the whole, they have a positive relationship. Also, the regression coefficients are positive and range from 0.83 for Bihar (rural) to 0.94 for Delhi. This shows a positive relationship between the perception of and reaction to people to modern technology by respondents. The measure of the level of association, indicates the range of the standard error of estimate's value as 1.6 to 2.7, which however, indicate that this relationship is not strictly a perfect linear function (a zero value expresses a perfect linerar relationship).
4. The negative behaviour towards modern technology arises from the perceived enslavement of the people who loose their creativity and initiative and become a mere tenderer of technologies without sufficient room to improve respective skills. Of course, all these impinge upon people's motivation and the effectiveness and efficiency in production. This, the negative behaviour towards modern technology needs to be checked through behaviour modification techniques.
5. Despite the fact that this study seems to be the first of its kind in India, the findings appear to be sufficiently rich to permit NCAER to offer some recommendations for policy-makers. The introduction of new technologies must as a condition necessitate the introduction of some form of feed back mechanism to monitor the effectiveness of communication between researcher/policy-makers must be in a form that easily facilitates understanding for people and if any form of discrepancy exists this may lead to negative consequences.

Industries :

1. Industries should prepare, in association with appropriate academic departments, profiles for their long range and medium range requirements including areas like (a) Analytical Chemistry including Quality control, Applied Chemistry, (b) Computer and Electronics/Software Development, Computer Science Electronics, Maths © Energy Audit - Electrical/Mechanical/Civil/Management (d) Safety Audit-Electrical/Mechanical/Civil/management (e) Water Treatment/Management-Applied Chemistry/Meteorology/Environment (f) Environment-management-Environment/Applied Chemistry (g) New Strain Development for Bioengineering-Zoology/Applied Chemistry.Studies on fuller utilisation of capacity need techno-economic expertise in which interdisciplinary interaction could be valuable in assessing both the production and marketing aspects.
2. There should be greater association of scientific, technical, business management and allied specialists from the academic sector on the

Management Boards of Industries.

3. Experts from the Academic and Industrial fields should have better representation in the Management Boards of Public Sector Industrial Concerns in the state.
4. Technical Advisory Committee be constituted in all major industrial units, with suitable representation for specialists from Academic Institutions.
5. Industries which have facilities not available in academic institutions in the neighbourhood should undertake training of faculty.
6. Industries should set up Technology Upgradation Cells for discussing technology issues, and these Cells should have the services of suitable experts from academic fields.
7. Energy audit studies at a more intensive level by suitable experts have to supplement exploratory work by the students.
8. The assistance of academicians should be availed of by the industries for improvements in quality, and marketability aspects to enable them to withstand competition.
9. Campus interviews should preferably be held by boards of technical financial and marketing specialists, as the present system in most cases leads to multiple offers for the top ten or so only.
10. Major Industries should designate some individual who can act as a nodal point for interaction with Academic Institutions.
11. Imdustries and academic Institutions may organise Open House Days periodically for visits and discussions.
12. Project work on utilisation of industrial waste materials be encouraged and supported by Industry.
13. Financial support be provided by industries for carrying out Project Work, Research and Development on problems of special interest to them.
14. Special efforts be made to identify projects of interest to industries, and industrial project work be carried out as far as possible under the joint auspices of academicians and industrial experts.
15. Short term programmes be arranged by Industries and by University Departments to familiarise each other with specialised techniques, use of sophisticated equipment, and significant development in the fields of Science, Technology and Management.
16. Suitable specialists from the Universities and Colleges be invited to spend time in Industry for a duration, from a few weeks during vacations up to an year, studying various operational aspects and vacations up to an year, studying various operational aspects and discussing with concerned persons, to assist in analysing technical problems and finding appropriate solutions, or conducting R&D on problems of industrial importance, and that such persons be provided necessary facilities and status to enable them to function effectively.

C. NEED FOR MODIFYING EXISTING CURRICULA TO MEET THE CURRENT AND EMERGING NEEDS OF INDUSTRY IN KERALA

A Committee on Job Oriented Educatin, of which Prof. N. Balakrishnan Nair, Chairman, STEC was the Chairman, had been set up by the Kerala University. A number of suggestions had been made which were yet to be implemented.

Industrial specialists are being increasingly consulted in the matter of revision of technical syllabi. A number of seminars were held in this connection involving representatives of industry, and about a dozen courses have been revised in the Kerala University.

There has been considerable effort to examine the engineering curricula at the undergraduate level also. Regarding the introduction of new courses, the general feeling among academicians in Kerala is that the traditional general training courses are still the best. Most of the graduates from Kerala are employed outside. Hence narrow specialisations are not considered desirable.

The clamour from the students and the public has been for innovative courses, for which large capitation fees are being offered, and avidly collected, in the proposed new engineering colleges.

There is felt need for modicication of supervisory development programmes. The Quality Improvement Programme Centre has been making a worthwhile contribution. Engineers from industry have been participating to the extent of three or four out of thirty. More facilities for training teaching staff are considered desirable.

One of the decisions of the Industrial Liaison Board was that before starting any new course, the views of industry should be sought about the prospects of the course, and the content of the course. This does not take place adquately at present. The popularity of the course among the students, and their willingness to pay capitation fees, has tended to be the determinants.

It was also recommended that Entrepreneurship should be included as a subject of study in the Engineering curriculum. The subject is yet to receive adequate emphasis at the undergraduate level.

Provision was to be made for lateral entry into various courses so that a person from industry could take one or more courses of his interest. There is at present no such possibility.

The starting of appropriate part-time evening post-graduate courses of special interet to industry to cater to personnel from industry had been proposed by the ILB. Apart from the School of Technology, Cochin University, the only college with part-time post-graduate course in Engineering is the college of Engineering, Thiruvananthapuram. At botyh these places, the subjects of study are largely limited to Civil, Mechanical and Electrical CUSAT has a course in Chemical Engineering in addition, while COE, Thiruvananthapuram has Electronics in addition.

Past experience in the introduction of Sandwich courses and highly specialised courses has not been encouraging. In the Calicut experiment in Chemical Technology, the introduction of 6 months industrial experience extended the duration of the course to 4 years and six months. There was the problem of examinations. The University did not accept the proposal to defer the examination.

The only course for which field work or practical training is an integral part at present is Architecture in which 6 months field work experience after the third year is stipulated by the Council of Architects. But even here, the field work tends to be relegated to the end of the course.

The recommended 4 to 6 months practical training as a compulsory part of degree course like Production Engineering, Industrial Engineering, Instrumentation Engineering, etc. has not been found feasible so far.

Adequate emphasis is to be laid on developments of new products and the improvements of on-line products.

The development of a viable technology for handling urban waste can help in the development of industry in the neighbouring rural areas.

Professional organisations like the Institutions of Engineers can promote Industry-Academic interaction by helping in recognising and rewarding outstanding project work of industrial significance done in academic institutions.

RECOMMENDATINS

I. Modifying Existing Curricula

1. The syllabuses for the various degree and diploma courses be progressively reviewed and restructured in association with experts from industry to give them an industrial bias, and to bring them in line with the latest development.
2. Appropriate part-time diploma/degree courses in areas like Industrial Electronics, Industrial Management, Pollution Control, Realibility Studies, Instrumentation, Industrial Law, Industrial Safety, Management in Financial Problems etc. be organised in Academic Institutions of Industries, as may be appropriate, with the active collaboration of both the sectors.
3. Industry oriented courses be modified, restructured, or discontinued according to changing requirements and the time for tailoring courses for industrial needs be shortened.
4. Productivity,m Optimisation, and Minimum loss studies be given greater emphasis as production industries in Kerala tend to be less profitable than service industries.
5. The creativity of students be fully utilised in effecting greater diversification of the products of Small Scale Industries.
6. Greater stress be laid on adaptive technology.

II Project Work :

1. Project work be made an essential component of all applied courses.
2. Special efforts be made to identify projects of interests to industries.
3. Industrial project work be carried out as far as possible under the joint auspices of academicians and industrial experts.
4. Project work in the final year be organised as a group activity in which energy audit studies and value added studies find appropriate stress.
5. Development of small technology be given greater importance in our Project and Development work.

III Training :

1. Suitable training programmes be organised with the help of industry to upgrade the skills of technicians in the educational institutions.
2. In-company training for workers in areas like industrial chemistry, Middle level management, Environmental protection, Consumer Protection etc., be provided by academic institutions where necessary.

3. Short term programmes be arranged by the University Departments and by the Industries to familiarise each other with specialised techniques, use of sophisticated equipments, and significant developments in the fields of Science, Technology and Management.

D. ORGANISATION OF COURSES LINKED WITH BETTER UTLISATION OF THE ABUNDANT NATURAL RESURCES OF KERALA

Kerala accounts for about 20 to 25% of the raw clay mined every year in India. Statistics show that Kerala has deposits of 820 lakhs tonnes of China Clay, 120 lakh tonnes of fire-clay and 20 lakhs tonnes of ball clay.

There are two major factories dealing with chinaware and porcelain, 5 factories in structural clay products, and about 400 factories producting tiles. Only two industrial units are now producting paper coating clay. The large quantity of clay is being used as filler in industries engaged in the production of rubbner, paper and pesticides.

Research and Development work on clays is in progress in the RRL at Thiruvananthapuram. Names of at least three specialists in Clays, and three others in Cerqmics in the State are inlcuded in Appendix-VI.

There is no appropriate degree or diploma level course in Ceramics in Kerala inspite of demand by some of the concerned organisations. A suitable course can be organised in association with Kerala Ceramics Ltd. Or other industrial undetaking.

The Rare Earth deposits in Kerala are large and extensive, and rank among the best in the world. Travancore Titanium Products Ltd. At Thiruvananthapuram and Kerala Minerals and Metals at Chavara Process these sands, and produce Titanium dioxide, beneficiated Ilmenite etc. The Indian Rare Earths (IRE) has tow factories in Kerala, One of the IRE units at Chavara is engaged in the prodeuction of Ilmenite, Rutile, Zircon, Sillimanite and Monasite., The IRE unit at Udyogamandal is processing monasite for making for Rare Earth Chloride, and Trisodium phosphate, Thorium Hydroxide Cerium Hydrate, Lanthanum Nitrate, Yttrium concentrate etc. A sister unit at Trombay is engaged in the metallurgy of Thorium and other metals.

Indian Aluminium Company at Alupuram produces Aluminium. Aluminium Industries with units at Kundara, Munnar and Thiruvananthapuram, produces a range of Aluminium products. Fairly large deposits of Bauxite have been discovered in several places. Cominco Binani Zinc Ltd. At Binanipuram products Electrolytics grade Zinc, Cadmium etc.

The proper exploitation of the Rare Earths and other non-ferrous metallic resources holds immense promise for the future. Metallurgy is not a subject taught at nay of tht Engineering Institutions in Kerala. A course on non-ferrous Metallurgy, organised at Chavara in association with Kerala Minerals and Metals, and Indian Rare Earths can be very productive.

Kerala had been the largest p;roducer of coconuts in the country. The annual production is about 4500 million coconuts. Some of the other major crops in the state are Tapioca (about 3.5 million tonnes) Cashewnuts (1,00,000 tonnes) Tea (40,00 tonnes)

Pepper (40,00 tonnes) Coffee (50,000 tonnes) and cardamom. The proper exploitation of coconuts, cashew apples, and tapioca, leaves much to be desired. While new processes have the production of cocunut water, dessicated coconut, coconut oil, coconut milk powder, coconut cream, activated carbon, commercial oil. Kerala is far behind countries like Indonesia, Philippines and even Srilanka. The possibilities of using tapioca and Cashew apples as bases for processed food stuffs have yet to be adequately developed in comparison to be processing of spices.

Apart from Coconut, Tapioca, and Cashew, Kerala produces about 4 lakh tonnes of fruits and a much larger quantity of vegetables. Proper preservation and processing of these could greatly benefit the economy.

There are at present 25 major industries engaged in Food processing, and production of beverages, with an annual turnover of over Rs. 100 crores, There are also over 3000 small scale industries in the fields, many of which are not working properly. There are also five factors producing liquor, spirits, and beer.

Food processing has received very inadequate attention in the academic fields. There is no degree course in Food Technology or Food Processing in any of the Engineering Colleges. The Kerala Agricultural Univeristy has a Department of Processing Technology and another of Post Harvest Technology and Agricultural Processing. These departments had only miarginal staff. There was no one with a Doctorate in these two departments.

Kerala also produced about 6.5 lakhs tonnes of fish. Fish Processing in an important industry in the State. Export of processed fish accounts for about Rs. 720 crores.

Fish processing is taught as a subject for the bachelors degree (B.F.Sc.) at the College of Fisheries, Panangad. But at the Masters degree level, there is no intake. The college has half a dozen persons with Doctorate in Fish Processing.

Organistion of suitable degree courses in Food Technology, Food Processing and other related areas, in cooperation with Food and Fish Processing Industries is very desirable.

Kerala has a long coast line of about 600 kilometers with a major harbour at Kochi and over a dozen smaller harbours. Fishing is an important activity in which about a million people are involved, of whom about a fifth is engaged in the extensive backwaters.

Although fisheries engineering is taught as one of the subjects for the degree course in Fisheries College, there is no regular engineering courses dealing with marine engineering, harbour engineering, or ocean engineering.

Rubber estates in Kerala cover over 3.6 lakhs of hectares. Nearly 90% of the natural rubber produced in the country comes from Kerala.. But hardly 20% of it is used in the State.

There are 17 major industries engaged in manufacture of rubber products in Kerala, and about 2000 units in the small scale industries sector.

There is a composite course on Polymer Science and Rubber Technology at Cochin University with an intake of only 12 students. Most of those who pass out get employment outside Kerala. The rubber board conducts various short-term training programmes to help the rubber producers in various ways.

Considering the extent of popular involvement in the production of rubber, it is desirable that suitable course on Rubber Chemistry and Rubber Technology with suitable reference to natural rubber are started to get the maximum returns for the immense investment in the field.

The recent work by the Kerala Forest Research Institute on the utilistion of rubbner wood as a building material has opened up great possibilities. There are 8 factories in the field of veneers and plywood, forest coverage and its over exploitation. There are also over 4000 small scale units concerned with wood products.

Western India Plywood at Valliyapattom, one of the most outstanding industries in the field, has a large complement of experts in various areas connected with Wood Technology. The organisation of suitable graduate programmke on Wood Technology in association with the experts of Western India Plywood and the Forest Research Institute, can be very beneficial.