



Cost and Budgeting

**Management of
Academic
Resources**

**Concept,
Importance
and Need**

**Strategies for
Quality
Improvement**

**Management of Student
Support System**

Management of Infrastructure

4

“शिक्षा मानव को बन्धनों से मुक्त करती है और आज के युग में तो यह लोकतंत्र की भावना का आधार भी है। जन्म तथा अन्य कारणों से उत्पन्न जाति एवं वर्गगत विषमताओं को दूर करते हुए मनुष्य को इन सबसे ऊपर उठाती है।”

— इन्दिरा गांधी



“Education is a liberating force, and in our age it is also a democratising force, cutting across the barriers of caste and class, smoothing out inequalities imposed by birth and other circumstances.”

— Indira Gandhi



Block

4

MANAGEMENT OF INFRASTRUCTURE

UNIT 13

Concept, Importance and Need of Infrastructure Management	5
--	----------

UNIT 14

Management of Physical Resources	28
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UNIT 15

Utilisation of Infra-structural Resources	48
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BLOCK 4 MANAGEMENT OF INFRASTRUCTURE

Introduction

The course IV, an institutional management has a block on infrastructural management. The term infrastructure will be included the basic built assets that provide a structural foundation for any institution. As we know that any institution provides the necessary support to the core activities which will lead to the attainment of the objectives set by the institution, for an educational institution infrastructure comprises buildings, classrooms, library, teaching staffs, funds and so on. Actually physical resources facilitate the institution to attain pre-determined objectives by utilizing infrastructural items to make way smoother. This block consists of three units. Let us go for brief introduction of three units.

Unit 13 deals with Concept, Importance and Need of Management of Infrastructure. As we know that management of infrastructure both human and physical, basically is very significant in Indian context because, Indian education is expanding rapidly. It is only for public consciousness regarding education. Apart from that financial assistance may take important role for that purpose. For generating resources in education through the governmental and non-governmental agencies are also discussed sequentially. Some apex bodies in the country like UGC and AICTE etc. which coordinating, monitoring and regulating the standards of higher education in the country have been explained.

Unit 14 deals with Management of Physical Resources. For an educational institution infrastructure such as capital, employers, raw materials at the right place at the right time and planning, organising and coordinating of different infrastructural can lead the resources efficiency and effectiveness of an institution. Proper utilization of physical resources and timely use of infrastructural materials are the keys of success of an institution.

Unit 15 deals with Utilisation of Infrastructural Resources. We shall discuss the conventional patterns of utilisation of infrastructural resources, its approaches and methods. Later the innovation of ICT globalisation and the other changes and their impact on management shall also discuss in the unit.

Block-1 Management of Curriculum

Unit-1	Classroom Management (Instructional Management)
Unit-2	Curriculum Transaction
Unit-3	Management of Evaluation
Unit-4	Management of Academic Resources
Unit-5	Management of Curricular & Co-curricular Programmes & Activities

Block-2 Management of Financial Resources

Unit-6	Educational Finance: Meaning, Importance and Scope
Unit-7	Cost and Budgeting
Unit-8	Accounting and Auditing
Unit-9	Resource Mobilization

Block- 3 Management of Human and Administrative Resources

Unit-10	Management of Student Support System
Unit-11	Management of Administrative Resources
Unit-12	Management of Human Resources

Block-4 Management of Infrastructure

Unit-13	Concept, Importance and Need of Infrastructure Management
Unit-14	Management of Physical Resources
Unit-15	Utilisation of Infra-structural Resources

Block-5 Total Quality Management

Unit-16	Quality Control, Quality Assurance and Indicators
Unit-17	Tools of Management
Unit-18	Strategies for Quality Improvement
Unit-19	Role of different Agencies
Unit-20	Quality Concerns and Issues for Research

UNIT 13 CONCEPT, IMPORTANCE AND NEED OF INFRASTRUCTURE MANAGEMENT

Structure

- 13.1 Introduction
- 13.2 Objectives
- 13.3 Resources for Financing Higher Education
 - 13.3.1 Financing Education in Pre-Independent India
 - 13.3.2 Financing Education in Post Independent India
- 13.4 Role of Coordinating Bodies
 - 13.4.1 University Grants commission (UGC)
 - 13.4.2 All India Council for Technical Education (AICTE)
- 13.5 Mechanism of Generating Grants
- 13.6 The Constraints Involved
- 13.7 Consideration for management of Resources
- 13.8 Approaches to Budgeting
 - 13.8.1 Incremental
 - 13.8.2 Revenues
 - 13.8.3 Zero-based Budgeting
 - 13.8.4 Supplemental
- 13.9 Impact on Resource Generation Measures
- 13.10 Impact of ICT and ODL
- 13.11 Let Us Sum Up
- 13.12 References
- 13.13 Unit End Activities
- 13.14 Answers to Check Your Progress

13.1 INTRODUCTION

The efficiency of any system depends on the efficient functioning of its constituents. In the case of an educational system, the constituents— teachers, teaching material and other infrastructural facilities – are crucial in determining its efficiency. Proper planning for management of these constituents of an institution is required and is essential for the effective achievement of the institutional goals. Hence management of infrastructure both human and physical particularly in the context of Indian higher education assumes tremendous significance. This is primarily because Indian higher education has undergone expansion in terms of number of institutions, courses of study, departments, teachers and students. Hence in this unit we shall discuss the need and importance of infrastructure management in higher education.

13.2 OBJECTIVES

After going through this unit, you will be able to:

- identify the resources for financing higher education.
- describe the management structure prevalent in these organizations.
- understand the considerations for infrastructure planning.
- explain the process of budget preparation in the context of financial management of an institution.

13.3 RESOURCES FOR FINANCING HIGHER EDUCATION

All over the world demand for education is ever increasing. The number of school going children is over one billion, which is one-fifth of the world's population. This has put a pressure on the traditional system, particularly in the developing countries, who have invested large sums in the expansion of primary, secondary and tertiary education. Alongside, there is also an increase in the demand for continuing education. Developed countries also strive to increase the efficiency and effectiveness of their institutions through education and training to maintain the competitive edge. (Rumble, 1997).

Conventionally efficiency in educational systems is achieved through several sub-systems which have evolved over a period of time. These according to Rumble (1997) are –

- Use of written texts for imparting instruction.
- Development of libraries where scholars and students can consult.
- Use of written examinations instead of oral ones, the scheme was first implemented by the Chinese.
- Development of printing in Korea followed later in Europe to meet the rising demand for reading.
- Development in the eighteenth and nineteenth century of the classroom as the basic organizational unit of the school.

Hence with the advancement of technology the labour intensive activities were being replaced by technological devices to improve efficiency of education. It is well accepted that productivity of any organization or its output improves when human effort is augmented by technology. We shall discuss about this at a later stage, how open and distance education can prove to be more cost effective than conventional teaching – learning systems.

We can also safely conclude that for an efficient functioning of an educational institution, the financing system should also be efficient. For the success of an educational enterprise and for efficient goal achievement it is important that agencies providing the funding method adopted by them and time period taken for the process will determine the efficiency of the institution. At this stage let us now look into some resources of financing of higher education.

Higher Education

We all agree that educational institutions are non-profit making bodies i.e. they do not sell their services to their clientele i.e. students. It implies that funds for the management of educational system have to be raised from other sources than the students. Also educational services have to be useful to the receivers and ultimately the society. So the responsibility of financing higher education rests with the society.

The sources of financing higher education in the developing economies in general and in India in particular are:

- Government (through grants)
- Students (fee income)
- Private donors (philanthropists, industry etc)

Before we discuss the individual sources of financing higher education it is important to understand the planning and financing of higher education in India since the origin of the modern system of higher education to the present times.

13.3.1 Financing Education in Pre-Independent India

Educational finance was very centralized till 1870. The process of decentralization began in 1871 and continued till 1921, when diarchy was introduced under Morley-Minto Reforms and education became a provincial subject until 1937, when the Indian Minister for Education got full control. However till 1947, the system suffered because no financial assistance was given to the provincial government. The situation improved only after independence.

Even in pre-independent financing in education operated at three levels :

1. The Central Government
2. The State or Provincial Governments
3. Local bodies/ private non-governmental sector (Kaur. K., 2003)

13.3.2 Financing Education in Post-Independent India

A policy for financing was developed after independence. The Central government gave considerable financial assistance to the State Governments to implement their plans.

The new constitution in 1950 included education under state list thereby giving complete responsibility of education to the states . However in 1976, the 42nd constitutional amendment put education in the concurrent list.

The details of financing of higher education are available mainly in the Five Year Plans.

An analysis of the first five year plan shows that the annual expenditure of the central and state governments on education increased from Rs.65 crores in 1950-5 to Rs.116 crores in 1955-56. During the same period, development expense on the maintenance of institutions already established, increased from less than Rs.20 crores in 1950-51 and 1951-52 to about Rs.47 crores in 1955-56. Expenditure on education from other than government sources was estimated in 1955-56 to be about Rs.71 crores against about Rs.49 crores before the plan. The distribution of expenditure between the Central and State Governments in the first five years plan (1951-56) is shown in table 13.1.

Table 13.1: Distribution of Expenditure

Central/State Govt.	University Education	Technical & Vocational Education
Central Government	247.0	1155.0
State Government	925.1	990.4
Total (1954-56)	1172.1 (7.8%)	2145.4 (14.2%)
Development Expenditure in 1950-51	120.0 (6.2%)	265.6 (13.6%)

A comparison of the First Five Year Plan with the Ninth Plan Expenditure and Tenth Plan outlay shows a significant increase in allocation of financial resources for education. The outlay for tenth five year plan is shown in Table 13.2.

Table 13.2: Ninth Plan expenditure and approved outlay of Tenth Plan (2002-2007)

Sub Heads	Ninth Plan Expenditure (Rs. In crores)	Tenth approved outlay (Rs. In crores)
University and Higher Education	2270.02	4176.50
Technical Education	2109.54	4700.00

Source: Tenth Five Year Plan 2002-2007; Planning Commission 2002, Vol II, p.65. (Reproduced from Kaur, K, 2003)

The outlay of Rs.4176.50 crores for tenth five year plan is 1.7 times the ninth plan outlay of Rs.2270.02 crores (Kaur, K., 2003). Reliance on government sources for funds has almost doubled from the first to the tenth five year plan. However only government resources do not suffice to meet the increasing demand and consequent increase in enrolment at the tertiary level of education. There is a need to experiment with several other alternative resources like student fees, students loans, privatization etc (Rani, Geetha P.,2002)

Several committees have been constituted to examine the issues of resource mobilization for higher education. The consensus which emerged is that major source of income is the student fees. They recommend a 15-25 percent hike in student fees, so as to recover the annual and recurring cost per student (Rani, P., 2002). However the government is finding it very difficult to manage with the existing funding resources. The approach papers to the plan to the Ninth & Tenth Five Year Plans have emphasized networking among institutions so that existing resources are shared and optimally utilized. Non formal channels of education like Open and Distance Learning can be adopted to supplement the formal systems with a focus on quality and accountability. The plan documents recommend restructuring in tuition fees and suggest generation of additional resources through non governmental agencies, like industries and community contributions (Rani Geetha,P., 2002).

Check Your Progress

Note : a) Space is given below for writing your answers.

b) Check your answers with those given at the end of this unit.

1. What are the sources of financing Higher education in India?

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2. Briefly discuss two ways of supplementing the government resources to meet the increasing expenditure on higher education.

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13.4 ROLE OF COORDINATING BODIES

Let us now examine the role of co-ordinating bodies at various levels in financing **higher education (IGNOU 2003)**.

The Constitution of India empowers the center to exercise overall power with regards to higher and professional education. This has been very clearly mentioned in **Entry 66** of the constitutional provision, which reads as:

Coordination and determination of standards in institutions for higher education or research or scientific and technical institutions.

As a result of these provisions the UGC was established in 1956 and later the All India Council for Technical Education (AICTE) was set up as a statutory body in 1988. Some of the other coordinating bodies which derive their mandate from entry 66 of the constitution are –

- The Medical Council of India
- The Bar Council of India
- The Nursing Council of India
- The Indian Council of Agricultural Research
- The Pharmacy Council of India
- The Institute of Architects
- The Institute of Accountancy
- National Council for Teacher Education

The coordinating bodies listed above fall under two categories – (i) statutory bodies – UGC and AICTE (ii) Bodies registered under the society registration act for eg. MCI and ICAR. Those grouped in category (ii) cannot regulate and coordinate standards of education in their fields.

It will be pertinent at this point to examine the role of UGC and AICTE as funding bodies in higher education institutions which has a direct bearing on infrastructure management in these institutions. Let us go for discussing below:

13.4.1 University Grants Commission (UGC)

The genesis of the UGC can be traced to the recommendation of the report of Central Advisory Board of Education (CABE) in 1944, on the post war education development in India, also known as the Sargeant Report. After much deliberation through the university education commission, 1948, the UGC was eventually established in 1956, as a statutory body. It was established through an Act of Parliament for the coordination, determination and maintenance of standards of university education in the country.

● Funds of UGC

UGC provides funds to colleges and universities for the development of higher education and research. It receives grants – in aid from the Central Government under both non-plan and plan heads. The non-plan grants are meant essentially to meet the maintenance costs of the central universities, some deemed universities, colleges of Delhi and some ongoing schemes of the UGC both in Central and State

universities. The plan grants are used for general development of every university in terms of creating infrastructural facilities – construction of buildings, purchase of furniture equipment for laboratories development of libraries and other academic and administrative needs. UGC also provides plan grants under special schemes programmes for promotion of quality, excellence, teaching and research.

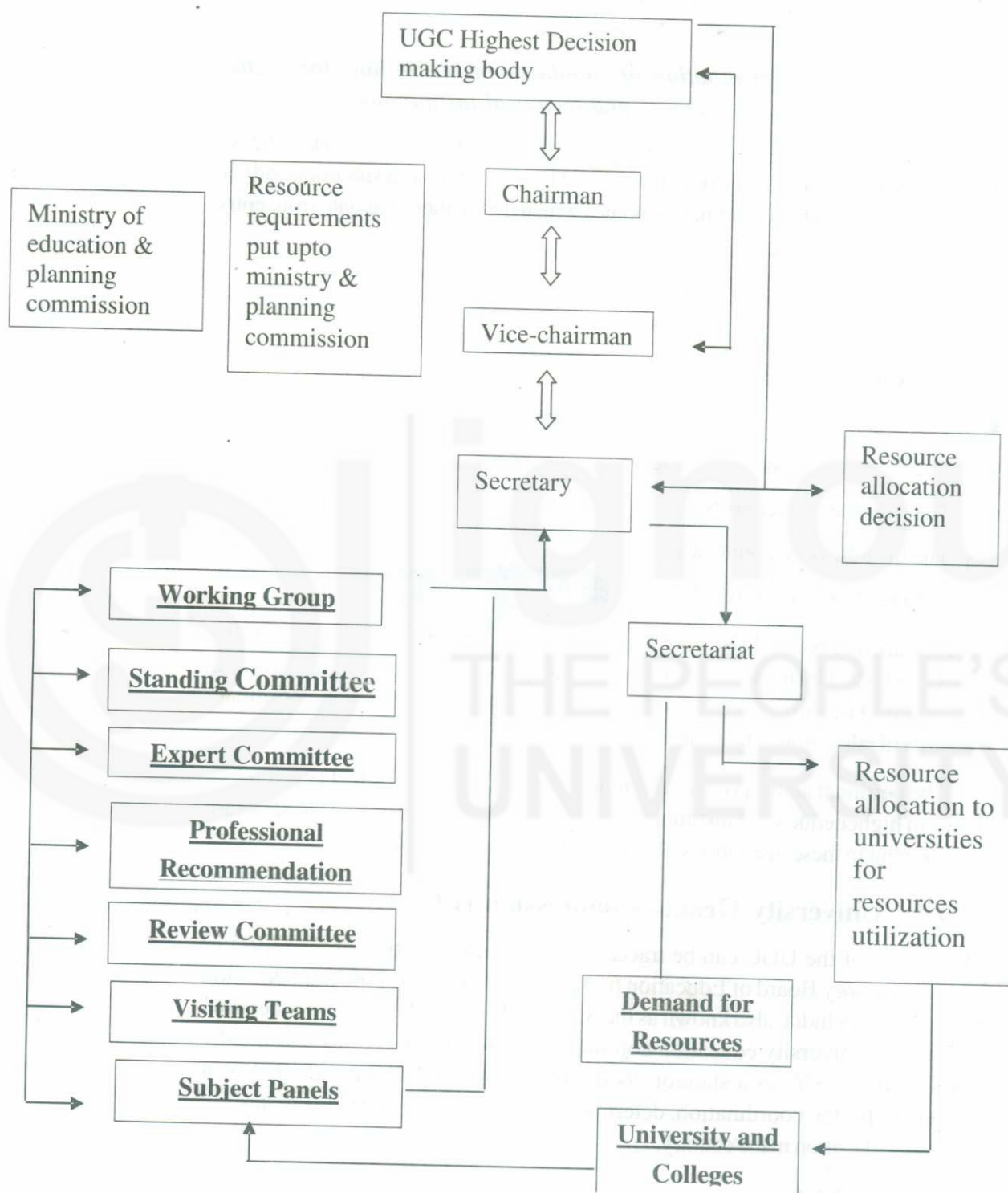


Fig. 13.1 : Scheme of UGC operations

UGC is the only grant giving agency in the country vested with the twin responsibility of providing funds and coordination, determination and maintaining standards in institutions of higher education. Its main functions are :

- Promote and coordinate university and college education by fixing the standards of teaching, examination and research in the universities.
- Enquire into the financial needs of universities and colleges.
- Allocate and disburse financial grants to universities and colleges.
- Allocate and disburse funds to deemed universities for maintenance and in special cases for development.
- Give advice to any university for improvement of its educational standards.
- Advise the Central or State Governments on allocation of any financial grants to the universities.
- Advise any authority on the establishment of a new university.
- Ask any university information related to its financial position or studies in different branches of a subject or related to its teaching and examination system.

Current Challenges

The UGC has to gear up to confront radical challenges in a diversity of programmes, its structure, its curricular and in the maximum use of information and communication technology. For the Tenth Plan period it was mandated to give more emphasis to improvement of academic and physical infrastructure of the higher education system, particularly in view of the impact of globalization (Kaur, 2003).

Some Recent Initiatives (IGNOU 2003)

The UGC has taken some major initiatives to raise the quality and standards of higher education.

These are: Setting up of centers of advanced study and research to improve the standard and quality of teaching and research.

- Periodic review and renewal of curricular content of courses in various disciplines and special schemes for introduction of emerging areas of education and training.
- Establishment of common facilities for research, networking of resources for information and documentation.
- Induction of electronic media in higher education.
- Provision of fellowship and scholarship to students.
- Launching of special programmes for socially disadvantaged and weaker section in higher education. Since the ninth plan period UGC has been providing financial assistance to universities for bearing the cost of innovative programmes in some emerging areas like environmental energy, biotechnology, electronic and financial assistance to set up study center or cells for women studies, organize extension work and training work in the areas of gender equity, girls' education, population issues etc.

Let us now discuss the role of another statutory body which regulates the higher education institutes for technical education.

Check Your Progress

Note : a) Space is given below for writing your answers.

b) Check your answers with those given at the end of this unit.

3. Mention few coordinating bodies which get their mandate from entry 66 of the constitution.

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4. What are the functions of UGC?

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13.4.2 All India Council For Technical Education (AICTE)

Role of AICTE

An all India Council for Technical Education was established in 1945 on the recommendations of Central Advisory Board of Education (CABE). Entrusted only with an advisory role in the initial stage, it was granted statutory status in 1988 through an Act of Parliament. This was based on recommendations of NPE – 1986. The main functions of AICTE for the improvement of the technical education system are: (Kaur. K. 2003)

- Survey the entire field of technical education in consultation with provincial governments.
- Greater emphasis on design oriented teaching, teaching of design methodologies, problem solving approach.
- Greater exposure to the industrial and manufacturing process.
- Exclusion of outmoded technologies and inclusion of new appropriate emerging technologies.
- Greater input of management education and professional communication skills.

The main tasks of AICTE as envisaged in the IX and subsequent plans are: (Kaur. K. 2003)

- Planning Growth and Resolution of Technical education;
- Human Resource Development;
- Quality Assurance and Excellence;

- Promotion of R&D linkages with industry, National Labs and R and D institutions;
- Institutional Trust and upgradation;
- Rural Development Programmes;

AICTE has made efforts to improve the quality of technical education in the country. In order to make Indian industries internationally competitive, there should be convergence of educational institutions, industries and research institutions. The engineering curricula should be suitably modified, periodically in keeping with the emerging global developments in the technical education.

Let us examine the organizational structure of AICTE as an apex body for coordinating, supporting and developing engineering and management education.

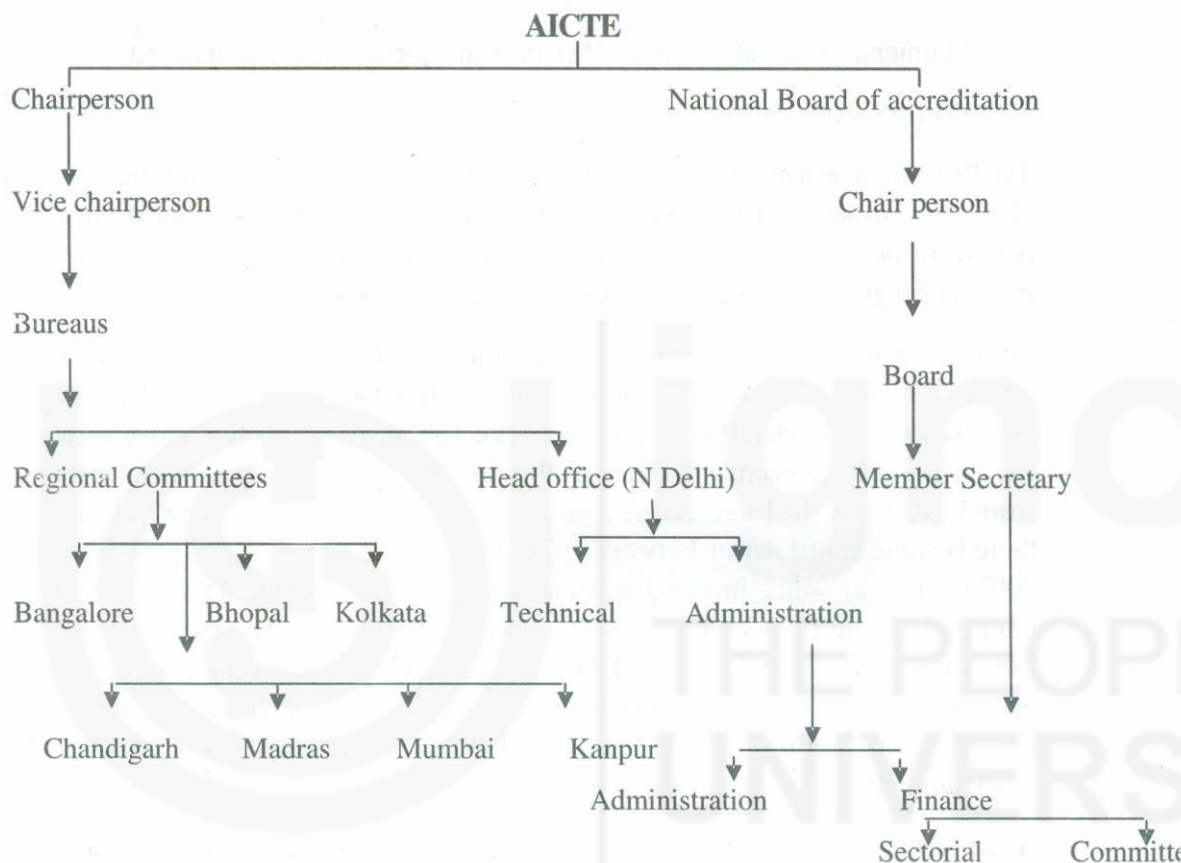


Fig.13.2 : Organisational Structure of AICTE

Source : Kour, K. (2003)

The statutory body of the AICTE consists of the Council with 51 members. The Executive Committee with 21 members, seven Regional Committees and ten All India Boards of Studies.

It is also pertinent at this stage to examine the role of another apex body, in the area of open and distance education, i.e. the Distance Education Council.

The Country has developed the open and distance learning system through the establishment of Indira Gandhi National Open University and State level Open Universities, along with Institutes/Directorates/ Departments of Open and Distance Learning.

The IGNOU was set up in 1985 through an Act of Parliament and has established the Distance Education Council (DEC). DEC is a statutory authority within the IGNOU Act, which provides development funds placed at its disposal by the Central Government.

You have now got an idea of the basic management structure of these apex bodies which regulate and coordinate standards of higher general and technical education in the country. Now you should also familiarize yourself with the processes adopted through these bodies to generate resources and funds, for efficient management of these institutions.

13.5 MECHANISMS OF GENERATING GRANTS

Finances for Highest Education come from a number of sources. As discussed in the earlier section, the sources are the statutory mechanisms of the Central and State Governments, student fees etc.

In this section we shall discuss the mechanisms to generate grants in the context of higher education. The mechanism for grants entails two sets of operations :

- i) Maintenance Grants or Non – Plan or Non – Development grants and
- ii) Plan or Development grants.

The Plan Grant provides for growth, diversification and innovations, while the non-plan grants sustain the development activities. All recurring activities during the plan period are taken up as maintenance activities after the plan is over. Hence the non – plan budget grows in size after the completion of every plan.

The major part of the funding in higher education comes from the states. Only Central Universities receive their maintenance grant from the UGC, rest are funded by State Governments. The Central Government funds the agriculture universities, the technical universities and engineering facilities of other universities receive development grant from UGC while the Engineering colleges get such assistance from AICTE and there is some coordination between UGC and AICTE in this respect (IGNOU, 2003). There are some 'Institutes of National Importance' like the IIT's which are managed by the IIT Council presided over by Ministry of Human Resource Development and have an independent status. IGNOU is the only central university getting both the non-plan and plan grants from the Ministry of Human Resources Development. Medical colleges, however, have no satisfactory arrangement for financial support and are associated with MCI.

Apart from this, all universities collect fees from students and in addition many universities are funded by trusts, philanthropic groups and industry for specific purposes. Government colleges receive funds from the respective governments in the form of grants-in-aid for maintenance and development purposes. Because of this most of the colleges and universities operate with tight budget and incur deficits.

13.6 THE CONSTRAINTS INVOLVED

The UGC is the main instrument of the government to coordinate and implement the programmes of higher education and research. Yet it faces several constraints which hamper the effectiveness of institutions. These are (P.Rani. Geetha , 2002):

- Role of UGC in relation to State governments not clearly defined.
- UGC has not deterred States from establishing institutions which are economically unfeasible and are academically unviable.
- There is a dearth of resources due to which it cannot support the State run Universities and bulk is spent on Central Universities.

- Innovations and experimentation in universities not possible with existing resources.
- Policies for assistance to state institutions do not encourage planned development and many institutions have to wait for long periods to become eligible for government assistance.
- Lack of specific guidelines about affiliation of institutions.

In view of these problems there is a need to evolve mechanisms which could reduce the pressure of number on the university. One way could be by restructuring and diversifying secondary education. The courses at +2 stage could be more vocational, so that the rush for university level could be reduced thereby ensure an increase in the percentage of students enrolling in higher education.

Check Your Progress

Note : a) Space is given below for writing your answers.

b) Check your answers with those given at the end of this unit.

5. Highlight at least two main tasks of AICTE

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6. Discuss three constraints which hamper the smooth and effective functioning of UGC.

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13.7 CONSIDERATION FOR MANAGEMENT OF RESOURCES

Let us now examine some considerations for planning for financing of institutions of higher education.

One of the crucial tasks confronting an educational institution is the efficient management of its resources. In institutions where resources are plentiful, expansion of its activities and programmes is feasible and sometimes it goes unchecked. However institutions with limited resources, need to use them judiciously for attainment of institutional goals.

The planning process entails the following steps:

- Long-term Planning: These are concerned with long term prospects and vision/mission of an institution (broadly up to fifteen to twenty years).
- Strategic planning – Strategic planning looks five to ten years ahead. It charts a definite course based on strong indicators of what the institutional environment will be like in those years.

- Operational planning – Works within the timescale of two to five years during which operational plans are made.
- The budget – Detailed plan for the immediate period i.e. one year (Rumble, 1986).

This has been shown in Fig.13. 3

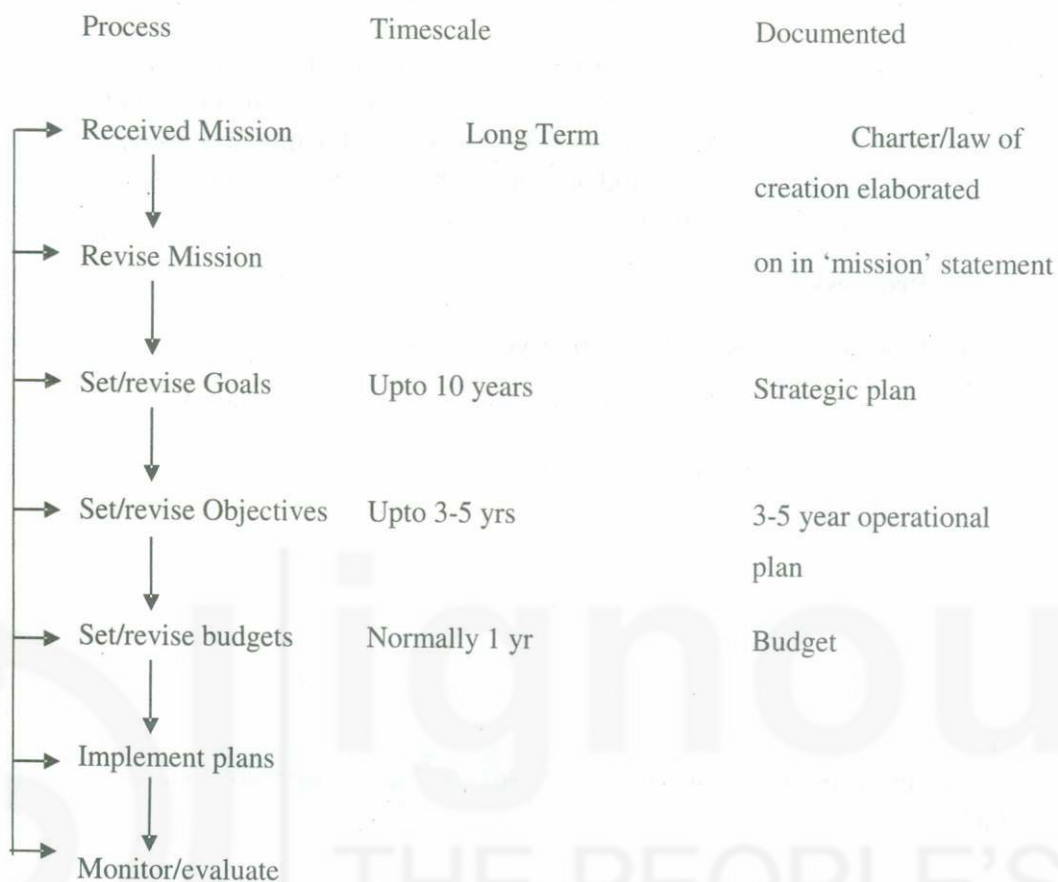


Fig. 13.3: Levels of Planning and their Timescales

Source : Rumble, G(1986) : *The Planning and Management of Distance Education*.

We can explain these levels of planning with the example of distance education systems. As a specific case, The Indira Gandhi National Open University, has stated as its mission in Article 4 :

..... to advance and disseminate knowledge by a diversity of means, including the use of any communication technology, to provide opportunities for higher education to a larger segment of the population and to promote the educational well being of the community generally;

Such mission statements help to formulate and define the goals, more rigorously, and explicitly. The institution can be identified and differentiated from other educational institutions at the same level (Rumble G: 2006) on the basis of the mission statements.

More specific Strategic objectives derived out of the broader goals of the institution become the focus of **strategic planning**.

According to Rumble (1986) mission statements can be linked to planning goals through cascade structures as done in most American Colleges. This is also applicable to IGNOU and is shown in Table 3.

Table 13. 3 : Cascade Structures of mission statements and goals

Mission :

- to provide education at university and professional levels.
- ... by distance means
- ... to meet the needs of non traditional students
- to contribute to the educational well being of the community in general.

Goals :

Academic Programs	Students Characteristics	Communications and teaching strategy
1) To provide education in the liberal arts and sciences at degree level.	1) To provide courses for adults.	1) To teach by distance means.
2) To Provide education in the liberal arts and sciences of interest to the community.	2) To provide part time education	2) To exhibit and develop new communication technologies for this purpose.
3) To provide professional and vocational education.	3) To provide courses to students unable to attend conventional educational institutions.	3) To favour those technologies best able to support home based learning and courses.
4) To provide in company courses on a contract basis.	4) To provide learning materials suitable for use by independent learners and community based groups.	

(Sources : Rumble, G. 1986 : *The Planning and Management of Distance Education*, pp 145)

The mission of the institution established through a legal statement is translated into specific goals, on which the long term planning is based. The **strategic plan** takes into account specific objectives related to the type of academic programmes and the nature of target group to be benefited by them and the academic and physical infrastructure required for the same.

However, it is agreed that the goals as well as objectives should be realistic and realizable. But the fact is that the stated goals lack specificity in term of the time period and the amount of work that needs to be put into the mentioned activity, while the objectives will have these specificities. For example, consider the goal statement: To develop need based programmes for the rural populace.

To make specific choices about the time period and method of achieving specific objectives, **operational planning and budgets** have to be prepared. The operational plans have to be consistent with the funds available, and have to specify the activities and operations involved. For example.

- To develop an appreciation course on environment in the year A.
- To translate courses I, II & III of the certificate Programme in Waste Management in Hindi Language in the years X and X + 1

Operational plans are thus concerned with specific programmes of action and timeframe. Like developing programmes/courses, instructional kits, organizing physical and academic infrastructure etc.

Operational plan according to Rumble (1986) “**should make explicit the links between planned volumes of activity and staffing levels, productive and delivery capacities, and space and accommodation constraints.**” He further adds, “**The operational plan should be set within the context of the short to medium term financial situation. The first year of the operational plan with normally correspond to the immediate budget year.**”

Check Your Progress

Note : a) Space is given below for writing your answers.

b) Check your answers with those given at the end of this unit.

7. What are the four stages involved in the planning process undertaken by a HE institution?

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8. Discuss two considerations for formulating a strategic plan by an institution?

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13.8 APPROACHES TO BUDGETING

We shall deal with budgeting briefly to understand its significance for infrastructure management. Let us first examine the approaches to budgeting for an educational institution. Depending on the prevalent economic climate budgeting can be classified as –

13.8.1 Incremental – Occurs when resources are plentiful, budgetary baselines are adhered to and budgetary provisions are increased for development and expansion activities.

13.8.2 Revenue – Occurs when resources are tight but not likely to fall below the baseline and financial future of the organization is predictable.

13.8.3 Zero – based – Occurs when resources are scarce and the budget is subject to review.

13.8.4 Supplemental – There is not even an agreed annual budget. The budget is built up as and when items are agreed up on by a central authority. Such type of budgeting is commonly seen in the third world countries. (Rumble, G.1986).

Budgeting has a direct bearing on the management of infrastructure of an institution. Let us see in general, what a budget is ? A budget is a statement of the money that is

planned to be spent, it is followed by a financial analyses, which is or statement of the money which has been spent.

The expenditure incurred in educational institution is classified as (Rumble, G 1997)–

- human resources – staff on payroll
- premises and accommodation – purchase of building, rent, insurance
- Equipments and furniture – fixed assets eg. – land, building, grounds, garden, furniture etc.
- Stocks, supplies, consumables and expenses – or inventory of goods and raw materials.

The details on each of the above heads varies depending on the needs and activities of the institution concerned **Institutions** with scarce resources need prior identification of activities and programmes so that proper means of costing can be developed. Whereas in institution with abundant resources can work with even crude financial forecasting models. Rumble (1986) gives the example of British Open University in the latter case.

Hence planning for resources requires planners to assess the likely costs of activity (depending on particular programmes) and also the time scales involved. Attention should also be paid to the existing political climate and also ensure that those governmental and non – governmental agencies that provide the resources always focus on the needs of the institution (Rumble, G. 1986).

13.9 IMPACT ON RESOURCE GENERATION MEASURES

Let us now study the impact of some national and global development which impact resource generation in higher education.

There is a worldwide crisis in the financing of higher education and the severity is more in the developing countries. Developed countries have benefited by the impact of globalization, whereas the developing countries are poorly equipped to adapt to the changing scenario. In the latter case, the higher education system is not developed adequately for the creation and use of knowledge.

In India the global reforms packages were introduced in 1991. There was a resultant financial squeeze on the public exchequer on the education sector in general and higher education in particular. Higher education system of a country is a mirror if it's academic excellence and an agent for its economic growth. However, the trend is that priority accorded to tertiary education is on the decline (Rani. Geetha P).

There is a shift of government resources from the higher education sector to primary education, for accomplishing the long cherished goal of universalisation of primary education. Pointing out the need to supplement government resources for higher education.

Table 13.4: Share of education expenditures in GDP and Revenue expenditure

	1981-82	1985-86	1990-91	1995-96	1999-00	2001-02
Total Education	2.49	3.00	3.59	3.60	4.22	4.18
Elementary	1.09	1.39	1.58	1.44	1.58	1.66
Secondary	0.81	0.92	1.10	0.98	0.94	0.98
Higher	0.38	0.42	0.36	0.37	0.47	0.43
% of Revenue Expenditure in						
Total Education	9.09	11.11	9.23	13.34	17.01	14.46
Elementary	3.98	5.14	4.06	5.32	5.44	5.34
Secondary	2.94	3.42	2.82	3.61	3.80	3.40
Higher	1.39	1.59	0.94	1.35	1.88	1.49

Based on new series of GDP with base 93-94 = 100

Source : Analysis of Budgeted Expenditure on Education, various issues.

The approach paper to the Tenth Five Year Plan and Tenth Plan document says, "Since budget resources are limited, and such resources as are available, need to be allocated to expanding primary education, it is important to recognize that the universities must make greater efforts to supplement resources from the government" (Govt. of India, 2001, 2002-2007 in Rani Geetha, P.).

The sources of income for higher education in India are mainly – government fee from students and non-government sources like philanthropy, industries etc.

The dependence on government sources has increased and income from student fees has decreased (Table 13.5). The decline in revenue generation from other sources also shows a downward trend.

At this point let us examine, the actual grants released by the UGC to Colleges and Universities and compare it with the actual expenditure incurred on education during the 10th plan period.

Table 13.5: Actual Expenditure on Education during the 10th Plan
Rupees in crore

Year	Plan grants	Non-plan grants	Total grants
2002-03	1909.00	2704.00	4613.00
2003-04	1938.19	2802.11	4740.30
2004-05	2187.03	2973.59	5160.62
2005-06	2561.38	3267.10	5828.48
2006-07 (Upto 31 st December (2006)	2336.37	2500.30	4836.67
Total	10,931.97	14,247.10	25,179.07

Table 13.6: Actual Grants released by the UGC to University and Colleges during the 10th Plan

Rupees in Crore

Year	Plan grants	Non-plan grants	Total grants
2002-03	559.64	1126.26	1685.90
2003-04	614.08	1133.89	1747.97
2004-05	751.33	1192.24	1943.57
2005-06	808.74	1389.82	2198.56
2006-07	1269.80	1460.70	2730.50
Total	4003.59	6302.91	10,306.50

(Source for Table 13.5 and 13.6: Ahmed. S (2008), "Ahmed. S (2008) : Funding to Universities and Colleges by the University Grants Commission during the 10th Plan, University News, 46th March 03-09 pp10-11")

An analysis of the figures in Table 13.5 & Table 13.6 reveal that during the 10th Plan period the total expenditure on education was Rs 25,179.07 crores of which Rs 10,931.97 crores was plan and Rs 14,247.10 crores was non-plan grants. Out of the total expenditure on education Rs 10,306.50 crores (Rs 4003.59 crores under plan grants and Rs 6302.91 crores under non-plan grants) were provided to institutions of higher education in India. The trends reveal that funds provided to universities and Colleges are insufficient. In order to achieve that target of becoming a developed nation by 2020. Funding from the government resources should increase [Ahmed. S., (2008)].

It is apparent that the public exchequer cannot meet the growing demands of higher education. Hence the search for alternative sources is being intensified, particularly in the recent years.

Table 13.7 : Sources of income from higher education

	Government	Fees	Others	Rs. in Crs.
1950-51	49.4	36.8	13.8	114.38
1960-61	53.5	34.8	11.7	344.38
1970-71	61.0	25.5	13.5	1118.28
1980-81	72.8	17.4	10.8	3766.71
1986-87	75.9	12.6	11.5	9011.98

Source: Education in India Vol II (S)

A comparison of the enrolment trends in higher education in India, with other developed countries shows only 7% of the relevant age cohort in India. In other countries 92% of the 17-24 age group are enrolled for higher education in the US, 52 percent in UK and 45 percent in Japan. The comparison is shown in Table 13.6

Table 13.8: Gross Enrolment Ratios in Higher Education in Developed And Developing Countries

World Total (1997)	17.4	Developing countries (1997)	10.3
Developed countries (1997)	51.6	Asia (1997)	11.1
USA (1995)	92	Korea (1997)	68
Canada (1995)	88	China (1997)	6
UK (1996)	52	India (1997)	7
Australia (1997)	80	Less developed countries (1997)	3.2
Japan (2002)	45 *	Africa (1997)	6.9

*Source: UNESCO (1999) * Altbach and Ogawa (2002)*

In spite of the low enrolment trends in India, the government resources are not adequate to fund higher education. Several policy measures and directives have been put forth to augment government resources and work towards equity and social justice, for the aspirants of higher education in the country. According to the approach paper to the Ninth Five Year Plan, "emphasis will be placed on consolidation and optimal utilization of the existing infrastructure through institutional networking and through open university system. Grants-in-aid will be linked to performance criteria to improve quality and inject accountability. Fees will be restructured on unit cost criteria and paying capacity of the beneficiaries. Additional resources will be generated by involving industry and commerce and through contribution from community" (Govt. of India, 1997, pp.82, in Rani Geetha. P).

According to a world bank report, three areas of reforms have emerged to strengthen provision and management of resources in higher education namely: (Johnstone, B.D., 1998)

- Supplementation of government revenues with non-governmental revenues.
- Reform of public sector financing.
- Radical change (restructuring) of the universities and other higher education institutions.

Let us now understand through examples in each category, the implementation of reforms.

1. Supplementing government with non-government revenues

Five agencies have been identified which can share the cost of higher education -

- a. Substantial increase in tuition fees
- b. Introduction of student grants and loans
- c. Privatisation of higher education
- d. Encouragement of entrepreneurial activity by faculty
- e. Encouragement of philanthropy

i) Increase in Tuition and Fees

As has been the practice since many years in developed countries, several other countries are also shifting the cost from the tax payers to parents and students through increase in tuition fees. Johnstone, has cited the example of the following two countries:

- i) Australia – US\$ 3300 for social science, US \$4700 for science and US \$ 6500 for health.
- ii) New Zealand – The average tuition fee in institutions is US \$ 2300.

Chile is the only country in Latin America which recovers a large portion of its student costs through student fees. Fees were introduced in Chilean higher education institution as a result of financial reforms in 1981. However in Argentina, the 1995 higher education law decrees that the decision of charging fees rests with the universities (Johnstone, B.D., 1998). The government of India has set up various commissions and committees on resource generation through fees. The issue of resource mobilization for central universities was examined by the **Punnayya Committee** set up UGC. Similar committee was set up for technical education under the chairmanship of Dr.D.Swaminadhan recommendations of Punnaya Committee to look into the unit cost of higher education under Dr.M.V.Pylee, to review the norms of maintenance grants for Delhi Colleges (Under the chairmanship of Dr.Ananda Krishnan).

All these commissions have recommended an upward revision of fees within reasonable limits (Rani, Geetha P) various committees recommended that institutions should raise the fee levels in such a way that at least 15 to 25 percent of the annual recurring cost per student is recovered from the student in the form of fees and from other sources at the end of ten years. Government should in course of time shift the funding of universities to a system of students funding (UGC, 1993; 1999; 2000).

ii) Student loans

Many countries in the developed and developing world have accepted the scheme of student loans as a popular means of cost recovery. The student loan programme

in most countries provide a mechanism to meet the aspirations of poor students for upward mobility. In most of the student loan schemes, the students have to repay the loan once they are employed. Loan systems are in place to facilitate students and thereby shift the cost from government to the students. However, student loan systems have not succeeded in effectively shifting these costs. Several factors influence loan recovery, for example, rate of interest, repayment period, rate of recovery etc.

The student loans project has been supported by the world bank in many countries. It has signed students loan projects in Venezuela (1992), Jamaica (1996) and in Mexico (1998). Improving the efficiency and viability of existing student loan programmes while broadening their coverage is a major challenge for developing countries. Despite the poor performance of many system, the positive experience of countries like Columbia and the Dominica Republic for example, show that it is possible to design and administer financially sustainable programmes if effective collection programmes, appropriate interest rates, and income contingent schemes, can be made operational (Johnstone, B.D. 1998).

iii) Private initiatives

In recent years, the role of private sectors have played an important role at the level of tertiary education, particularly in Asia, and Latin America, in former Soviet Republic and Eastern Europe. A historic development of private higher education was seen in Romania, after a law in 1990 made it possible for 70 non-governmental and private institutions to be created. Almost all of them claimed university status and accounted for one-third of the total enrollment in higher education (Johnstone, BD, 1998). A world Bank report cites the example of several countries where the demand of private initiatives has had an impact on tertiary level education.

"In Argentina the number of students in the private sector has increased 76% between 1985 and 1994. China and India are also allowing and / or encouraging private educational institutions in order to meet the differentiated and growing demand for higher education. In Kenya the function of private educational institutions is not so much to absorb excess demand, as it is to enhance quality." (Johnstone, BD, 1998).

In India, a committee headed by M. Ambani and K. Birla and appointed by the Government. strongly recommended to recover full costs from students even in public higher education institutions through hike in fees and introduction of self financing courses and seats. Another suggestion of the committee report was to shift resources of the government from higher to primary and secondary education and that higher education should be managed by the private sector alone. It recommended the 'user pays principle' and provision of loans and grants to economically and socially backward sections of society (Ambani – Birla 2001).

iv) Entrepreneurial activities / Partnerships

The universities across the world are getting increasingly entrepreneurial in the recent years. Institutions at the tertiary level of education are developing linkages with industry and potential employees. This has led to technology transfer, apprenticeship schemes etc. Let us elaborate with a few examples as discussed by Johnstone, B.D. (1998).

- In Mexican Universities, there is a trend to augment government subsidies by entrepreneurial schemes which earn extra income and involve faculty and students in it. Some of the departments are beginning to generate income on their own through the sale of services, specialized courses etc. Departments have an interest in this because they keep 80 percent of the locally generated income.

- In Argentina also, between 1991 & 1996, the resources generated by the Universities increased from 7% to 14% of the total budget. This is significant because during that period state funds increased to 52%. This shows that universities in Argentina have made an effort to increase their budget by generating resources of their own.
- Due to reforms at the tertiary education level, universities in China have begun to generate their own resources. This is reflected in the substantial increase of income 4% in 1978 to 14% in 1992. Shanghai recorded a business volume of Y 1 billion, through 50% higher education institutions running 700 enterprises. Peking university organised short term training courses in the law department for imparting training to enterprising in newly adopted laws.

In India also has different types of private institutions thrive especially some engineering and management institutions that are affiliated to conventional universities. For example such universities are found in the states of Tamil Nadu, Karnataka and Andhra Pradesh. However there are some non – affiliating institutions also and are geared to the needs and demands of the national and international corporate sector. These private institutions in India fully depend upon student payments and fees are exorbitant.

v) Encouragement of Philanthropy

Some philanthropic organisations and agencies contribute to meeting the government expenditure on higher education. In some countries such organisation, have significant share in augmenting the resources.

13.10 IMPACT OF ICT AND ODL

The developing countries all over the world are experiencing the impact of Information and Communication Technology and Open and Distance Learning. The positive impact of these developments is that it will help to make higher education more cost effective and more accessible to the hitherto unreached segments. The negative impact is that it can deter developing nations from adopting it because of its high initial investments although these are known to reduce unit cost in the long run.

In the last two decades ODL has rapidly expanded in Bangladesh, China, India, Indonesia, Korea, Pakistan, Sri Lanka, the Philippines, and Thailand. For example, China has set up a network of provincial universities and television university for distance education. India has 3 million part-time students enrolled in correspondence courses, in addition to the 4 million regular full-time students. Thailand has established two open universities and several regional universities to augment Bangkok's four prestigious national universities. Distance education and open learning programs can be effective in increasing access at modest costs, especially for the underprivileged groups that are usually poorly represented in university enrollments. They can also be designed with a regional or multinational clientele. For example, UNISA, the Open University of South Africa, draws 15,000 of its 120,000 students from neighboring countries(Johnstone.B.D.,1998).

Check Your Progress

Note : a) Space is given below for writing your answers.

b) Check your answers with those given at the end of this unit.

9. What is zero based budget?

10. Mention three areas of reforms which have emerged to strengthen provision and management of resources in higher education by world bank report.

11. Mention one positive and one negative impact of ICT and ODL in the developing countries?

13.11 LET US SUM UP

In this unit you were introduced to the basic concepts underlying the need for infrastructure management in institutions of higher education. You got an idea of the organizational structure prevalent in the institutions that generate these resources. The mechanisms for generating resources in higher education through governmental and non-governmental agencies were discussed with reference to the developing countries in general and India in particular. The role of some apex bodies in the country, like UGC and AICTE, which coordinate, monitor and regulate standards of higher education in the country was discussed. Resource allocation for tertiary level education in the country through the five year plans was analyzed. Some considerations for management of resources through goal based planning and its importance was explained with the help of case studies. Cost recovery measures which supplement government mechanisms for resource generation were discussed with examples and experiences of different countries across the world.

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13.13 UNIT END ACTIVITIES

- 1) Visit to an educational institution and collect the information regarding resources of finance. Make a point of view and analyzing your idea.

13.14 ANSWERS TO CHECK YOUR PROGRESS

- 1) a) Government grants.
b) Students fees.
c) Private donors such as industries.
- 2) a) Restructuring tuition fees towards the higher side
b) Augmenting non-governmental resources, like, industry, commerce and

- community contributions
- 3)
 - i) Medical Council of India.
 - ii) Bar Council of India.
 - iii) Nursing Council of India.
 - iv) Indian Council for Agriculture Research.
 - v) Pharmacy Council of India.
 - vi) Institute of Architects.
 - vii) Institute of Accountancy.
 - 4)
 - i) Give advice to any university for improvement of its educational standard
 - ii) Advise the central or state Governments on allocation of any financial grants to the university.
 - iii) Advise any authority on the establishment of a new university.
 - 5)
 - a) survey the entire field of technical education in consultation with provincial governments
 - b) Greater emphasis on design oriented teaching , teaching of design methodologies, problems solving approach.
 - 6)
 - a) Paucity of resources , due to which major chunk is spent on central universities and state universities are not supported
 - b) Existing resources not sufficient to carry out innovations and experimentations.
 - 7)
 - a) Long term planning (upto fifteen to twenty years)
 - b) Strategic planning (upto five to ten years)
 - c) Operational planning (upto two to five years)
 - d) Immediate plan or Budget (one year)
 - 8)
 - a) Specific objectives—based on type of programs to be offered by the institution
 - b) Nature of target group to be benefitted
 - 9) When resources are limited and the budget is subject to review.
 - 10)
 - i) supplementation of government revenue with non-governmental revenues.
 - ii) Reform of public sector financing
 - iii) Radical change of universities and higher education institution
 - 11)
 - Positive impact—Higher education becomes more cost effective and is accessible to larger numbers
 - Negative impact—High initial costs of investment can act as deterrents for the developing nations

UNIT 14 MANAGEMENT OF PHYSICAL RESOURCES

Structure

- 14.1 Introduction
- 14.2 Objectives
- 14.3 Physical Infrastructure Planning
 - 14.3.1 Concepts Underlying Planning of Physical Infrastructure
 - 14.3.2 Process of Planning for Physical Facilities
- 14.4 Need and Importance of Physical Facilities
 - 14.4.1 Need for Buildings
 - 14.4.2 Multidisciplinary Task
 - 14.4.3 Increasing Numbers
 - 14.4.4 Addressing Quality Concerns
 - 14.4.5 Functional Specifications
 - 14.4.6 Physical Comfort
 - 14.4.7 Deciding the Size of Furniture, Rooms and School Sites
 - 14.4.8 Determining the Quality of Construction
 - 14.4.9 Ensuring Safety
- 14.5 Role of Technology
- 14.6 Let Us Sum Up
- 14.7 Unit End Activities
- 14.8 References
- 14.9 Answers to Check Your Progress

14.1 INTRODUCTION

In the previous unit you studied about the importance and need of infrastructure management in educational institutions. The infrastructural resources from various institutions and the general management structure prevalent in them were discussed. The budget preparation for financial management was outlined in the institutional context. You also understood how the expenditure on infrastructural resources is categorized in budgets and also about the impact of global developments, information technology revolutions on the provisions for and management of infrastructural resources.

In this unit we will classify the infrastructural resources in educational institutions and focus primarily on management of physical resources. You will learn about the nature of physical resources generally used in institutions and basic concepts underlying the management of these resources.

14.2 OBJECTIVES

After going through this unit you will be able to:

- describe the concepts of management of physical infrastructure;
- explain the basic consideration in managing material resources of an educational

- explain the need of physical facilities for education;
- list the basic elements of material resources in an educational institution;
- list out basic data required for creating physical facilities in an educational institution; and
- elaborate the impact of technology in planning physical facilities.

14.3 PHYSICAL INFRASTRUCTURE PLANNING

It was only after the early twentieth century that educators began to give serious thought to a relationship between learning and instructional spaces within a building. Prior to this, educational institutions were rudimentary structures providing a covered space to teachers and learners. Several studies of that era have revealed that educators arrived at a relationship between the teaching spaces and the quality of instruction provided. This resulted in the beginnings of planning for educational facilities. After World War II, large number of educators and architects took up educational facility planning as a professional activity. Since then, the classroom methodology and innovations therein have been impacting the design and management of educational facilities. (Castaldi, 1994).

In India the increasing student numbers at all levels of education-primary, secondary and higher education, is posing tremendous challenge for educational planners and administrators. The need is for systematic planning and decision making for better management of educational institutions. All aspects of management have to be considered for smooth functioning of the institution, i.e. planning and management of physical facilities, manpower and finances. Let us examine some concepts underlying planning of physical infrastructure.

14.3.1 Concepts Underlying Planning of Physical Infrastructure

Physical infrastructure, in the context of education implies the teaching learning space and equipments necessary for effective teaching-learning process. This includes, classrooms, libraries, laboratories, furniture, social space, IT networks and other support needs, like special provisions for disabled etc (Rose, G.M., 2006). It is important to understand some basic concepts which determine the planning and management of physical facilities in educational institutions.

● The Concept of Balance

The educational planners should consider each educational goal in the proper perspective. The learning experiences should be listed out by the curriculum developers and these should be based on the institutional goals. The curriculum designers should focus in a balanced way, on different learning areas, without giving too much emphasis to one at the cost of the other. For e.g. school planners should ensure that the emphasis on humanities or social studies does not affect the provisions for the sciences, or over emphasis on the library facilities at the expense of sports provisions. The institutional planners should test the curriculum for this balance, before finalizing the building and other physical requirements of institutions.

● Concept of Educational Efficiency

Different types of learning experiences are needed for achievement of educational goals. Planners should be careful and ensure that only such learning experiences are included that to achieve educational goals effectively and efficiently, i.e. learning is effective using minimal resources of energy, time and money, maximally.

- **Concept of Gradualism**

Teaching methods in educational institutions evolve, gradually, over a period of time. School and college buildings should have provision for these gradual changes in teaching practices. Hence architects should design buildings with this fact in mind so that innovations can be instituted without disturbance to the existing systems.

- **Concept of Reversibility**

It may happen that a new practice may prove ineffective or inappropriate at a later stage. As discussed earlier, planners should not only provide for moving in the direction of change but should also provide for reversing the direction whenever the need arises.

- **Concept of Constructability**

This concept deals with the problem of excess building capacity, which educational providers may be confronted with, when enrollment patterns show a decline. When such a situation arises the excessive facility could be used for extra educational purposes. For example if the school enrollment drops at a future stage, the school facility may be used by some government, some private agency or for some other compatible educational activity in the extra portion.

- **Concept of Equity of Educational Opportunity**

When plans are formulated it should be ensured, that schools and colleges within a particular area are provided with equality of educational opportunities. Some of the long range planning should provide for modernization of existing educational facilities.

- **Conceptual Institutions Planning**

Conceptual planning for an educational institution is an important aspect of planning for educational facilities, since it deals with creative and imaginative processes. It is defined as "a creative intellectual activity that precedes and contributes to educational specifications. It is the process whereby fundamental educational concepts are formulated, developed, expressed, evaluated and incorporated in the design." Conceptual planning should involve careful evaluation of the plan in relation to psychological principles of learning, administration and educational policies.

- **Curriculum-oriented Planning**

The architects of educational buildings should be informed about the curriculum and the learning experiences likely to be provided to learners. For example, simply telling the architect that space is required for a physics or chemistry laboratory will be insufficient. Instead specifications about student activities, experiences and time, if provided, will help the architect to relate these with spatial requirements. For example, in the case above, some useful inputs to the architect would be that – 20 % of time 35 students watch demonstrations, by the instructor, 20 students for 10% of time use consumables like gas, electricity, chemicals, etc.

- **Planning for People**

The inclusion of human aspect in planning for educational facilities is a new dimension and is called *ergonomics*. For all purposes the emphasis is on functional planning, i.e. a focus primarily designing buildings and creating facilities to achieve the intended goals. However, it is also important to plan for the needs of the people – physical, psychological and social, so as to ensure their health and safety.

Planning for educational facilities should be based on the fundamental principles of learning and their of course, competent applications. Planners would design infrastructure which is supportive of effective learning. Yet, Roth, an International Authority on schools, feels that, school buildings are “faulty” since they are not based on “sound pedagogic principles”. The instructional elements should not be obscured by the glamour of technology and must not ignore the essential applications of learning principles.

After examining some basic concepts underlying the planning and management of physical facilities of an educational institution, we need to look into the process of planning for infrastructure.

(Acknowledgement: The section 14.3.1 is abstracted from, “Educational Facilities: Planning Modernisation and Management”, Castaldi Basil, 1994).

Check Yours Progress

Note : a) Space is given below for writing your answers.

b) Check your answers with those given at the end of this unit.

- 1) Enumerate at least 5 concepts which educational facility planners should consider.

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- 2) Explain any one of the above concepts with an example.

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14.3.2 Process of Planning for Physical Facilities

The process for planning of physical infrastructure of educational institutions depends on its stages of development. The first consideration in the context of establishing a new institution would be to acquire land. This would be followed by decisions about construction of the building, which would then need to be equipped and furnished appropriately and adequately, in keeping with the goals of the institutions. However in established institutions, the planning for infrastructure facilities implies better utilisation of existing provisions. Here we shall discuss about the creation of these physical facilities and their management.

The process of planning for creation of physical facilities in schools, colleges and educational institutions involves long-range planning. The decisions in the context of creating these facilities depend upon several factors like:

- The expected student enrollment

- The number of departments/divisions/faculties
- The expected number of teachers
- The expected ratio of number of students to teachers by faculties.

The planning is done with the projection of maximum expected intake. However, at the initial stages, when the numbers are low, it may appear to be underutilized. This should not be construed as poor planning, if low enrollment is restricted to only the initial stages.

Let us examine the basic considerations underlying planning for material resources:

- **Planning for space**

It is the most important consideration in the initial phase. Since decisions are to be taken regarding – space for various activities like, instruction, administration, laboratory, library, staff-rooms, sports and games, student activity rooms – like student union offices, student welfare activities, staff quarters, student hostels, space for cultural activities – auditorium, conference halls etc.

Let us elaborate by taking the example of instruction. While planning and creating physical facilities for instruction, the planners have to consider, the size of the classrooms, and whether the sizes have to vary, depending on method of instruction – seminar, tutorial, group discussions. Again this will be decided at the level of curriculum planning; where in the method of instructional delivery is decided. Another consideration for instructional space would be with regard to clustering of activities. For example space allocation would be required for activities other than teaching like, laboratory work, library and these would need to be furnished accordingly. These details for instructional and related learning needs would be included in the blueprint for building construction.

Proper planning of physical infrastructure requirements is essential for their effective utilisation so that the learning activity becomes innovative and relevant for the learners.

- **Determinations of materials facilities required**

We should have a clear understanding from start about the types of material resources required for undertaking various activities in the educational institutions. By and large the most important activity undertaken is imparting instruction. From early times there has not been much change in the methods adopted for imparting instruction and generally the ones followed are –

(i) Lecture Method (ii) Seminar Method (iii) Conference or tutorial method and (iv) Laboratory Method. Very few innovative methods are adopted and the change if any has been largely due to the intervention of communication and information technologies.

- **Specification of facilities required**

The materials required for effective functioning of institution, need to be specified, the specifications should be in the context of their utility, use and procedure. If the specifications are not appropriate, there is possibility of the material resources being either under utilized or faulty utilisation, i.e. not being used where they are most intended to be used.

- **Determination of quality**

All kinds of material resources are available, some of which may have high quality

and others may be sub standard. Hence choosing and procuring materials of good quality is essential for their proper utilisation for maximum benefits. However in developing countries like India, there is a resource crunch which has direct bearing on the quality of materials and their optimum use. Good quality materials will ensure their utilisation over prolonged periods without frequent replacements, which will also reduce wastage of resources.

● Quantifying needs as per requirement

A major consideration in the management of material resources and facilities is the quantification on the basis of per capita requirement. In a vast country like India, which has undergone unprecedented expansion in education, material facilities may not be provided to all at one point of time. Hence with the given material resources the management is required to improvise the use of resources for the benefit of the institution and proper sharing of each unit of the resources. For this proper facility, planning, proper time-table and proper space utilisation is required, for quantification of per capita facility requirements there is need to ensure time management and space utilisation in terms of per capita hour need.

● Development of per capita requirement indicator

Material requirement indicator is defined as the amount of material facility required to produce a given amount of output. The combinations of various material facilities are put together in an input matrix and over a period of time this has to be measured, in order to find the extent to which the various input combinations have influenced the outputs. This process is time consuming but must be undertaken especially since facilities are in short supply and demands are increasing.

This material utilisation chart can be prepared as indicated in the Table – 14.1 below

Table 14.1: Material Utilisation Chart

Type of activity	Material given	Norm requirement	Required	Gap between given and norm	Gap between given and requirement	Under utilized	Effectively utilized	Remarks
Academic								
1)	Teaching learning process							
2)	Library activity							
3)	Laboratory activity							
4)	Any other related curricular activities							
Extra Curricular								
1)								
2)								
3)								
Games Curricular								
1)								
2)								
3)								

Cultural activities 1) 2) 3)
Extension Education 1) 2)

Source: Planning and Management of Higher Education (MES-104, Block-2), IGNOU, 2003

14.4 NEED AND IMPORTANCE OF PHYSICAL FACILITIES

There is a lot that planners should know regarding the physical infrastructure for education. Almost 10 to 25 percent of the education budget is spent on land purchases, building construction, furnish wings and maintenance of the above. Hence planners need to ensure the cost effectiveness of such capital investments for education. Providing a good physical infrastructure for education reflects the political will of the governments to provide community services.

After World War II it was increasingly felt among the industrialized nations and also the poor countries that education was a basic right. This was expressed through the United Nations Declaration of Human Rights and led to massive programmes of school construction around the world (United Nations, 1968). This led to emergence of the concept of an educational facility planner, wherein it was envisioned that architects and educationists should work as part interdisciplinary teams for creation of physical facilities for education. A lot of research was carried out and documented so that guidelines have emerged which could be applied to countries across the globe (UNESCO, 1997).

Let us now examine the need and importance of physical facilities in the context of providing good quality education.

There is a mixed opinion about the importance of physical facilities for education. Some feel that well equipped institutions signal a message of political support for education. Others feel that spending on physical infrastructure takes away the major chunk of resources from the teachers' salaries and from learning material. However the importance of proper physical facilities cannot be diminished even if one were to look at teaching-learning from the Gandhian perspective or Tagore's Shantiniketan – where learning was imparted in the natural surroundings, under trees etc.

14.4.1 Need for Buildings

The need to provide shelter for education is as important as we need shelter for domestic activities and for protection from natural elements. Outdoor learning was possible in India, during and before the years of its independence, but not any longer. Recent research indicates that the “no-building” solution is unsatisfactory for an emerging and developing economy. Further, data reveals that Indian schools without their own buildings, which conduct classes under trees or borrow buildings to run schools, tend to have very low attendance and poor academic performance (Govinda, Varghese, 1993). Since topography climatic conditions vary across the globe, schools without buildings cannot be considered.

14.4.2 Multidisciplinary Task

Educational buildings can be considered as 'machines for learning', echoing the statement of a famous architect, Le Corbusier, who said that a dwelling unit should be a 'machine for living'. Educational machines for learning consist of the buildings, surrounding area, furniture inside, which are specially designed to accommodate their specific functions like, delivering lectures, organizing discussions, various approaches to teaching-learning – group study, discovery method, individuals learning. This implies that physical facilities will need to respond to a variety of criteria, like it will have to cater to specific functions, be cost effective, be structurally sound and attractive. Hence the physical facility managers will need to be organized as a multidisciplinary team, which will also include furniture designers, engineers, building cost specialists, educational economists and town planners. Their collective efforts will be to facilitate achievement of the objective as cited by Guy Oddie for the OECD in 1966: 'it is axiomatic that an effective school building investment policy will succeed in building the right kind of schools in the right places at the right time and at the right cost'.

14.4.3 Increasing Numbers

The need for educational space is increasing due to five factors: growing population, in most countries; acceptance of providing basic education to all seeking it, i.e., children, youth and adults and the number of years comprising basic education is also rising. Traditional classroom methods like lecturing are being replaced by active learning methods and the technology revolution has popularized life long learning thereby attracting adults back to schools.

On the other side there are two factors that contribute to the reduction in demand for educational space. These are –

- Countries with decreasing birth rates experience decrease in the school age population. As a consequence there are empty teaching spaces especially in rural areas.
- Those countries which have successfully launched educational programmes through distance education or home schooling, i.e. off-campus programmes, are able to cut down substantially the space needed for schools with full-time attendance.

Access to education is being enhanced by resorting to non-formal techniques, especially for those who have missed out on formal education. Typically these programmes are organized on 'found' space which has other primary uses, be it living rooms as in the case of Bangladesh (Ahmed, et. al., 1993) or Rajasthan, India (Lok Jumbish, 1997). An innovative practice adopted by the Literacy Caravan of Senegal, Cameroon and other countries, is the organization of an educational fair. This brings together teachers and learning materials to rural areas, thereby motivating the community towards literacy. This enterprise is adapted for the African region and is supported by UNESCO clubs and the UNESCO office in Dakar. (UNESCO, 1997).

14.4.4 Addressing Quality Concerns

Educational facility planners have to focus their attention on providing the most appropriate physical environment for education, based on concepts of quality learning.

Before we proceed to the issues of creating facilities for quality learning, let us examine the quality aspect from the cover of the individual.

It is important for educational planners to identify those factors which have a direct bearing on the achievement of learners. A study by International Institute of Educational Planning (IIEP) at Paris, with the cooperation of the Ministry of Education and Culture in Zimbabwe revealed that- all things being equal- pupils could not be expected to learn effectively if the classroom was not equipped with basic items such as a blackboard, sitting and writing facilities for all pupils and basic storage facilities for books and teaching aids. Several other research studies conducted in developing countries, the low achievement levels of learning can be attributed to the poor and inadequate facilities in school (Heynemann, 1980). In an investigation conducted in Nigeria (Urwick and Janaidu, 1983), it was conducted that facilities like buildings, separate classrooms, furniture etc. determine the organization of teaching-learning and influence learner achievement. In a study in India by Varghese, 1995 it was reported that existence of sound physical facilities like desks and school buildings determine the success of a school.

Fuller (1990) argues that the evidence of physical facilities being the determining factor for student success is more convincing for developing countries than for developed ones, like UK and USA. However Cash (1993), has revealed through a study that there are cases in USA, where in comparable environments students who attend well maintained schools which have a good appearance have higher achievement than those which are poorly maintained.

The point that is being emphasized is that although it is not the physical infrastructure but the teachers and instructional material which affects learning, yet a fully and well equipped educational building has a positive impact on learner achievements.

However the state of physical facilities in the least developed countries is very alarming. A pilot survey conducted by UNESCO and UNICEF in 14 Least Developed Countries (LDCs), using a methodology developed by IEA (Schbicher et al, 1995) is present in the Box 14.1 below -

Box 14.1. The conditions of primary schools in fourteen LDCs

Learning involves some very basic inputs that are not enjoyed by large numbers of children in LDCs. Half the pupils in the pilot survey schools had no textbooks. In no country did every classroom have a useable chalkboard. Only half the first graders in Nepal, for example, had something to write with ... While enrolment has risen since 1990 for both boys and girls in the countries surveyed, the study found that in most, school conditions such as teacher housing, toilets, classroom supplies, electricity or building conditions had actually deteriorated. In three-quarters of the countries, 35 to 90 per cent of schools were seen as requiring either major repairs or rebuilding...

Asked to explain why children were not enrolled in school, Heads most often invoked physical and socio-economic reasons. Schools may not have enough places for everyone or be located too far away from home. As many other studies have shown, parents feared for their daughters' safety...

The average in most countries was one square meter of classroom space per student. To cope with limited space, schools run shifts or multi-grade classrooms. Although 80 per cent of children were in schools of only one shift, some schools, such as those in Nepal and Zambia, had four to five shifts, with schools in urban areas generally running more than those in rural ones...

Although half of the participating countries and an average of 40 pupils per teacher, instructors commonly had handled huge classes- 67 pupils per teacher

on average in Bangladesh and nearly 90 per teacher in Equatorial Guinea ... In half the participating countries, grade 1 classes comprised more than 55 pupils, with Equatorial Guinea reporting classes of 110 ... Only seven out of thirteen countries had sitting places for up to two-fifths of the children in grade 1 classrooms. The situation was similar for writing places. In other words, even if children had a place to sit on the floor, there was possibly no room for them to write ...

For grade 1, actual hours of instruction per year ranged from 397 hours in Bangladesh to 993 in Togo. In the final grade of primary school, the actual hours ranged from 704 in the Maldives to 1,064 in Bhutan ...

Some parents refused to let their children attend schools where sanitation facilities were poor. Often, the toilets were unusable because they had not been cleaned. This appears to be an acute problem in both urban and rural areas in nearly one-third of the countries. Even the most modern well-equipped schools were lacking in piped water, electricity, a school garden, a first-aid kit, or a canteen. Well over one-third of classroom in several countries have either inadequate ventilation or lighting ...

In many countries, 40 per cent or more of pupils attended schools needing major repairs or complete rebuilding, according to the school heads. Between 60 to 90 per cent of children in one-third of the countries were in schools without any regular maintenance. In some cases, parents took care of maintenance, in others; work was financed with the school's funds ...

In some African countries, one-third of the pupils attended temporary schools, especially in rural areas ...

School Heads felt that teacher housing, toilets, classroom furniture and supplies had deteriorated in the last five years ...

Source: Schleicher, A., et al., 1995., in; "Physical Facilities for Education: What Planners Need to Know", John Beynon, IIEP, UNESCO, 1997.

14.4.5 Functional Specifications

Designers of educational buildings need to understand the needs and limitations of their clients. They have to follow certain guidelines also called '**architectural briefs**' or '**architectural programmes**'.

These include data on –

- Architectural aspects
- Environmental norms
- Cost limits
- Building materials and
- Construction techniques to be used.

The educational specifications include –

- Instructions on the numbers of spaces required
- Sizes of the instructional spaces
- Use to which these spaces will be put
- Required equipment

Let us take an example of a construction project in Canada. This is an illustration of the use of educational specifications in a developed country.

Box 14.2 Educational specification for a History-Social Sciences Department in a secondary school

A. Context

A short description of why the study of history is included in the curriculum

B. General user requirements

1. Size. An indication that a 2,000 student school would have 1,300 students taking classes in this department with a maximum of 220 present at a given time. The corresponding room requirements in square feet would be:
Large-group area 2200
Medium-group area 1400
Seminar rooms (4 @ 150 square feet) 600
Teacher preparation area 360
Storage 300
Total 4,900 square feet
2. Layout. In this case, the major requirement was that the seminar rooms be acoustically isolated and that the partitioning allow for room rearrangement in due course. Typically an educational specification would indicate which rooms should be directly accessible to others.
3. Special resource collection. Considering that the [central] information resource centre cannot be completely stocked for the department's needs, shelving for both print and non-print materials must be supplied in the storage area of the history-social sciences complex.

C. Specific user requirements

1. Large group area. An area of 2,200 square feet is proposed to permit three groups to join together for presentations in an 'open space' arrangement which could be subdivided by moveable partitions (panels hanging from rails) that could be easily moved to subdivide a large space.
2. Medium group area. This would be a standard classroom, preferably adjacent to the large group area and separated from it by moveable partitions.
3. Seminar rooms. These rooms would have two functions: discussion by groups of 10 to 15 students (extensive use of audio-visual materials to be foreseen), and parent-teacher conferences.
4. Teacher preparation area. This room would be used by teachers to prepare lectures and to arrange field visits. Furniture and equipment would include tables, chairs, telephone and access to the school-intercommunication system.

Storage and display. Closed storage for rare materials and audio-visual equipment; open storage for reference materials that would be freely used by students. All instructional areas to have adjustable shelving to store materials currently in use. Storage to provide for display on tack boards as maps, globes, old documents, artifacts and special collections.

A UNESCO team conducted a study (Hutton and Rostron, 1971) of 100 secondary schools in 14 countries across the world and they surveyed the educational spaces

Educational planners have to decide the approximate space required for educational activities, which they have to foresee and define. For example certain spaces need not be very elaborate and expensive at lower levels of school, like laboratories. (Caillods, et.al., 1997). According to a UNESCO (1997) report in Sri Lanka teachers have very little space, whereas in Maldives the teachers' room is larger than a regular classroom.

Check Yours Progress

Note : a) Space is given below for writing your answers.

b) Check your answers with those given at the end of this unit.

3. Mention few infrastructures required in the context of educational planning.

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4. Explain the concept of constructability.

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14.4.6 Physical Comfort

Ergonomics or 'human engineering' is the study of the human body and how it carries out specific tasks and responds to external conditions like sound, light, temperature etc. Hence drawing from the principles of ergonomics it is essential that students get the basic level of physical comfort in order to concentrate on their studies. Technical norms on acoustics, thermal comfort and illumination for the task of learning have been developed for global use, and where necessary adapted to specific geographic regions. The most integrated approach to these carried out by UNESCO with developing countries of Asia in mind (Asia Regional Institute for Building Research, 1972) and by Villery who relates these to secondary schools round the world (1984).

Planners and designers have devised norms which state the proportions of the human body and the positions in which the body is most comfortable for learning. This is dealt with in a field of study called 'anthropometrics' which is a branch of ergonomics. It is applied to education as it is concerned with the comfort of using furniture for specific educational activities. These norms have emerged from researches conducted in the US in the 1950s, UK in 1970s and in UNESCO.

Let us examine some aspects of applying anthropometric data to education and the challenges they pose

- Designers have to consider diverse age groups ranging from 4 years old children to grown up adults.
- Variations in average height of individuals in same age which results mainly due to different nutrition levels (in 1981 an average 14 year old Laotian male was 143 cm tall while his Singaporean counterpart was 162 cm).

Difference in average standing heights of a specific age group, over a period of time. According to a report by UNESCO, eating habits overall several generations may

change resulting in consequent change of average standing heights of a specific age group. For example an average 14 year old Japanese male was 148 cm tall in 1950 but 163 cm in 1980 (Gua Lin, 1984). A recent report indicates that 14 year old Maldivian males averaged 134 cm in 1974 and 157 cm in 1997 (Kishanigami, 1997).

Six steps are considered characteristic for designing anthropometrically comfortable school furniture

- Selecting a sample of children for measurement.
- Measurement of standing heights of persons in the sample.
- Applying body proportions to determine critical dimensions of furniture.
- Sizing furniture.
- Allocating furniture types according to age and sex of users and
- Matching seat heights to table top sizes. Furniture designers need to be very well versed with all the above six steps. However steps 1, 2 & 5 are of particular significance to planners steps 3 and 4 are described in Box 14.3.

Box 14.3 Furniture sizing

Selecting a sample of children for measurement

Two sampling techniques exist. Method 'A' below gives accurate results which are specific to a country. However, arriving at an average standing height requires considerable time and resources. Method 'B' will give approximate results but is much easier to implement.

Method A. The designer may measure the standing height of a sample of children or each of the 5 to 17 years age-group. Those who are processing the data should ensure that the population from which the random sample is taken includes all socio-economic age-groups in the country. A sample giving a reasonable degree of reliability must be chosen. Random samples of sizes 300 to 500 children for each year of age have been used. [From the analysis of this data] a curve showing the [average] standing height versus age relationship is obtained from the population of that country.

Method B. The standing heights of a random sample of 100 children in one of the age group are measured. Then the average height is compared with data from [other countries].

Measurement of standing height of persons in the sample

A measuring scale is drawn on or attached to wall of the classroom. Each child is measured standing barefoot with his back against the wall. He has to stand erect and look straight ahead, making four points of contact with the wall; the back of his head, his shoulders, his buttocks and his heels. Using a right angle square, the teacher places the straight edge on top of the child's head and the other straight edge against the measuring scale on the wall. The height of the student is taken as the reading on the underside of the horizontal edge. Measurements should be made by the teacher to the nearest centimeter.

Source: Guat-Lin, 1984, in "Physical Facilities for Education: What Planners Need to Know". John Beynon, UNESCO, 1997

14.4.7 Deciding the Size of Furniture, Rooms and School Sites

Planners may not be required to decide the sizing up of furniture and other physical

facilities, but they have to define the age groups that will use the facilities. One size can serve learners' upto a three years age span, it is typical for four sizes of furniture to be produced to serve ages six to eighteen. Decisions need to be taken about how different furniture sizes will ensure comfort to all learners. UNESCO, Bangkok has defined three groups of countries (designated I, II, III) which have children of similar standing height. This is illustrated in table 14.3 below.

Table 14.3: Furniture sizes suitable for standing height and age ranges by group of country

Standing height (cm)		corresponding age range in each group (M:Male, F:female)			
Furniture size	Range	Midpoint	Group I	Group II	Group III
A	115	108	-	-	6-8 M+F
B	115-130	123	6-9 M+F	6-10 M+F	8-12 M+F
C	131-146	139	9-12 M+F	10-13 M+F	12-14 M+F
D	147-162	155	12-14 M 12+F	13-16 M 13+F	14+17 M+F
E	163-179	171	14+M	16+M	

Source: Guat.Lin, 1984, in UNESCO, 1997.

The ratios presented in the figure are useful for designers and also for administrators to place orders for the manufactured items. Furniture sizes generally of two sizes are chosen – one for primary and intermediate education and other for secondary level.

Room sizes depend on furniture sizes, teaching methods used, subject matter taught the number of learners and their possibilities to see and watch the materials presented by the teacher considering the multiple parameters involved. There is not a single norm for all situation; infact norms can be devised based on specific needs.

When it comes to the issue of determining the site area and the allocation of functions to be served of the institution, the planners and designers must arrive at a consensus. The architects will check the suitability of the land for construction and will get the soil quality checked as also access to utilities.

14.4.8 Determining the Quality of Construction

All over the world there is a tremendous increase in the school-age population, which has created a concern for increasing the educational space. All countries have allocated some share the available resources to this demand for constructions increased educational spaces. Some countries like Malaysia, Maldives, and Myanmar have approached international funding bodies like World Bank, UNICEF etc to obtain financial support, while other like Indonesia, Thailand financed their own construction (UNESCO, 1997). All these projects have resulted in addition of new spaces and facilities in buildings. However the mistake that were made and which need to be avoided have been summarized in the following Box 14.4.

In one country the programme was based on building, furnishing and equipping one complete five classroom school with a teacher's office and a storage room (capacity 150 in single shift) in every village. Subsequent visits revealed that the programme was rigorously executed, even in communities where there were far fewer than 150 children of school age. The consequence was that in many villages capacity grew more than did enrolment.

In another country the Minister of Education insisted that each of 19 new primary schools be identical to avoid any political controversy between administrative regions which could argue that they were not being treated equally. The result was that only a few regions had a school complex that corresponded to the student population. In others, the buildings were either too large or too small. Once the available funds were transformed into coral stone, lime mortar and teakwood roof trusses, there was no way to redistribute resources.

One country had proudly maintained a modest but steady capital budget for the construction of new schools for 20 years after independence. When a burgeoning population growth outstripped the government capacity to support all needed construction it turned to international finance agencies to supplement government funds. As the need for more space increased government abandoned all pretenses of paying the construction from its own funds and thus ended up relying exclusively on externally supported, and externally supervised, projects for all primary school construction.

In a fourth country a visit to a reconstructed existing school indicated a trebling of enrolment to a point where class sizes had exceeded all reasonable limits (in many school there were upwards of 100 pupils in grade 1). Questioning of the pupils revealed that a large portion of the new students had moved from a nearby neighboring school with derelict and unsafe buildings.

Source: "Physical facilities for Education: What Planners Need to Know", John Beynon, UNESCO, 1997

14.4.9 Ensuring Safety

An important factor that determines the quality of construction of a building is its adherence to safety parameters. The planners, administrators and designers need to work out a comprehensive maintenance programme to bring a certain number of buildings, say 20 per cent of the total stock, up to safety standards each year. UNESCO has drawn up guidelines for designing schools to reduce accidents (Saini, 1988).

It is important to construct buildings which are secure against disasters like fires, earthquakes, strong winds, heavy rains and floods. Generally during natural disasters, like earthquake etc, more damage to human life and property is from the falling and flying debris. However with the advanced twentieth century technology, educational buildings are being designed with safety factor in mind. In the developed countries, national agencies prepare maps showing sites at risk, wind speeds & flood frequency which physical planners consult, before approving school sites. UNESCO has provided guidelines that are globally applicable regarding specific needs of educational building for resisting earthquakes, strong winds, fires (Vait Loo, 1976; Arya, 1987; Biogas, 1976 and 1989; Macks, 1996). Planners need to follow these guidelines as well as local building codes, for all new constructions. Constructing a safe new

building is likely to enhance construction costs between 2 to 10 per cent. Another area of concern is the existing stock of school-college buildings.

These have to be evaluated for their resistance to natural disasters and protect them accordingly for example to protect a building against floods is to build it on high ground, non erodable material is advisable for construction, foundations should be deep, hard finishes such as tile and painted cement plaster may be used, use of wood should be avoided.

Check Yours Progress

Note : a) Space is given below for writing your answers.

b) Check your answers with those given at the end of this unit.

5. Mention few methods which are used in teaching learning process.

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6. What is Ergonomics or human engineering ?

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7. What are the four factors on the basis of which building are judged?

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8. Point out few factors of planning for creation of physical facilities in schools.

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14.5 ROLE OF TECHNOLOGY

The information and communication technology revolution has taken place at phenomenal speed. It has transformed all sectors of the economy. The revolution is not one, but several, starting with large computer, followed by PCs, microprocessors, internet and now wireless links. It is also believed that the ICT revolution is a revolution in learning. It invites every body to learn and make good use of the technology. Being a revolution in learning it has transformed available technologies. The means

and methods of studying, the educational operations, the manner of investment and expenditure of resources. In the context of education, the ICT infrastructure determines the institution's ability to deliver teaching and learning effectively. Technology has impacted every aspect of teaching-learning, including the physical facilities which support its delivery. Educational history of providing shelter for educational activities can be traced back to almost 2,500 years to the era of Socrates who taught under the shade of trees. There have been significant developments in the field of education since then, particularly in the last 150 years. The concept of providing access to education to all, i.e. of democratizing education and providing opportunities for life long learning have taken deep roots. Several innovative schemes have been undertaken to gauge the impact of technology on the instructional methods and whether machines can replace books and teachers. Research studies like Trump plan of the United States in 1950s and in Bangladesh with the Bangladesh Rural Advancement Committee (BRAC) scheme of 1990s (Ahmed et al, 1993), have experimented, to redefine class sizes and devise innovative educational practices. In spite of several such schemes and reported success of a few pilot schools, most school system are still hinged around teachers and textbooks rather than the processor of learning. It is observed that any fundamental change in the educational system, experiences tremendous resistance. Hence the present system of educational physical facilities will remain for a long time. Of course changes will take place as trends evolve towards increasing access to learning to all age groups. A rational planning of physical facilities requires a sound statistical base, which is still lacking, even at the international level.

Computer revolution

Computers are now a part and parcel of the educational infrastructure even in the poor and remote areas. Every school needs to have at least one computer. Computers have also revolutionized the working of engineers and architects. Computer-aided designs (CAD) have been introduced for generating building layouts and cost estimates. This is advantageous for educational and physical facility planners as they can see three dimensional presentations. This technology exists in developed countries and is also pervading developing countries; construction techniques have evolved towards greater use of industrialized materials rather than locally produces material. Decentralization of administration is impacting the management of physical resources in a major way. The number of qualified educators, architects and engineers is increasing in the developing countries, which is adding to the available resource pool to work on cost effective educational buildings and furniture. It is expected that with such a professional resource pool information will be transmitted through professional associations such as the International Union of Architects Working Group on Educational and Cultural Spaces or the Council of Educational Facilities Planners International the advent of internet has facilitated transfer and exchange of vast amounts of information across the world. However the challenge is that such easily accessible information should be responsive to request for information based on sound research.

14.6 LET US SUM UP

Physical resources for education are classified as premises, buildings, furniture & construction. In this unit we examined some basic concepts underlying the management of these physical resources in educational institutions. The need and importance of physical facilities was discussed. Here we elaborated various aspects which the physical facility planners have to bear in mind, for effective teaching-learning in the institutions factors that contributed to demand for educational space and infrastructure

and the quality issues were dealt with. Some examples and case studies illustrated the direct relationship between well equipped educational institutions and high achievement levels of students in them. The need and importance of providing educational specification for educational planners and designers was discussed with an example. The concepts of physical comfort based on principles of ergonomics and the application of anthropometric data were also dealt with quality concerns ensuring safely parameters while planning building construction were highlighted. A checklist of data has also been provided which is a kind of educational building inventory. The unit concludes with a brief description of the role of information and communication technology on the process of physical facility planning in the developed and developing world. The influence of computers and the teaching-learning process globally and the corresponding impact on managing facility provisions is discussed.

14.7 UNIT END ACTIVITIES

1. Visit to an educational institution and list its different physical resources and write a report analyzing the availability and utilization of these resources.

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14.9 ANSWERS TO CHECK YOUR PROGRESS

1.
 - a) The Concept of Balance
 - b) Concept of Educational Efficiency
 - c) Concept of Constructability
 - d) Concept of Gradualism and
 - e) Concept of Equality of Educational Opportunities

2. Constructability : Constructability deals with the problems of excess of building capacity. For example: if the school enrollment drops at a future stage, the school facility may be used by some government or some private agency or other compatible educational activity in the extra portion.
3. Physical infrastructure in the context of education implies the teaching learning space and equipments necessary for effective teaching learning process. This includes classrooms, libraries, laboratories, furnitures, social space, IT network etc.
4. The concept deals with the problem of excess building capacity which educational providers may be confronted with when enrollment pattern show a decline. When such a situation arises the excessive facility could be used for extra educational purpose.
5. a) lecture method, (b) Seminar Method, © Conference or tutorial method, (d) Laboratory method
6. Engonomics or human engineering is the study of the human body and how it carries out specific tasks and responds to external conditions like sound, light, temperature etc.
7. The four factors on the basis of which building are judges:
 - a) Functionality.
 - b) Construction
 - c) Aesthetics
 - d) Cost
8.
 - i) The number of departments, division and faculties.
 - ii) The expected number of teachers.
 - iii) The expected student enrollment.
 - iv) The expected ratio of numbers of students to teacher by faculties.

UNIT 15 UTILISATION OF INFRASTRUCTURAL RESOURCES

Structure

- 15.1 Introduction
- 15.2 Objectives
- 15.3 Optimum Utilisation of Physical Resources
- 15.4 Space Utilisation
 - 15.4.1 Need to Measure Space Utilisation
 - 15.4.2 Strategic Role of Utilisation: Balancing Different Perspectives
- 15.5 Flexibility in Utilisation
 - 15.5.1 Short-term flexibility
 - 15.5.2 Long-term flexibility
- 15.6 Utilisation of Library
 - 15.6.1 Organisation of a Library
 - 15.6.2 Infrastructure facilities in the Library
 - 15.6.3 Library Management
- 15.7 Laboratory Management and Utilisation
 - 15.7.1 Personnel Management
 - 15.7.2 Laboratory Equipment Procurement
 - 15.7.3 Time and Space Management
 - 15.7.4 Safety Management
- 15.8 Maintenance of Physical Resources
 - 15.8.1 Role and Responsibilities of Personnel in Maintenance of Facilities
 - 15.8.2 Maintenance Budget
- 15.9 Impact of Technology on Utilisation of Physical Infrastructure Resources
 - 15.9.1 Emerging Instructional Methodology
 - 15.9.2 Impact of ICT on Educational Facility Planning
- 15.10 Let Us SumUp
- 15.11 Unit End Activities
- 15.12 References
- 15.13 Answers to Check Your Progress

15.1 INTRODUCTION

Physical facilities in education need to be considered as a capital asset. However, the management of physical facilities in educational institutions can pose a problem for planners because education is always in a state of change. It becomes a challenge for planners to accommodate the new and varying forms of education and devise appropriate physical infrastructure as per changing needs. In the previous unit, you read about the creation of such physical infrastructure and their management. Some concepts underlying the planning and management of these physical resources was discussed. It was established that a direct relationship exists between the physical facilities provided and the achievement levels of the students. The unit also highlighted the need to ensure quality and safety parameters while planning the building and

other infrastructure. In this unit you will study about the utilisation of the infrastructural resources. You will agree that it is important to put the facilities of an institution to multiple uses. There is also a need to use these resources optimally through innovative techniques of institutional management and planning. This can substantially reduce the recurring and non-recurring cost per student.

A general observation is that material facilities have not always been optimally utilized for discharge of educational activities. The reasons cited are that often the facilities provided are not relevant to the educational programmes offered, the infrastructure is not adequate, or if provided are not efficiently and effectively used. It is also likely that many times the physical facilities are not according to the programme specifications, enrolment (present and future) and geographical surroundings. Sometimes the users do not find the infrastructure well provided to be aesthetically and intellectually motivating or exciting.

It is imperative that facility planners give due attention to such aspects. Proper utilisation of infrastructure must be ensured so that goals and objectives of the educational activities are effectively and efficiently achieved. These aspects are dealt with in this unit to give you an understanding of the concepts underlying optimal utilisation of infrastructure resources.

15.2 OBJECTIVES

After going through this unit you will be able to:

- explain the need for optimum utilisation of infrastructural facilities of an institution;
- describe the importance of maintenance of physical resources in institutions;
- explain the basic considerations involved in the utilisation of material resources;
- describe the components of utilization of library resources;
- identify the issues of utilisation of laboratory resources; and
- assess the impact of ICT on management of physical resources.

15.3 OPTIMUM UTILISATION OF PHYSICAL RESOURCES

It is often stated that, the resources available for education are meager and there is an urgent need to make large investments in education. A review of the educational system reveals not so much a lack of resources as the under utilisation of the existing ones. If we examine the status of utilisation of existing physical resources – building and equipment, you will agree that they are grossly under utilized.

Studies made by the education commission show that majority of the educational buildings are utilized for only five to six hours in a day. The rooms in the buildings show different patterns of utilisation in institutions. Very often several rooms lie vacant and unused for days together. The laboratories and libraries which should ideally be used throughout the year, including the vacations are used sparingly, sometimes only for a few hours during the week, on working days. Most of the educational buildings hostels and infrastructure remain unutilized because no vacation projects are ever organised. It is found that sometimes even costly equipment remains unutilized and goes waste, due to lack of a proper plan for utilisation. A proper plan should be worked out to utilize the infrastructure intensively and optimally.

Let us take some examples, which illustrate how existing infrastructure in an educational institute can be utilized for optimum benefit, with very little additional investment. You will agree that school going children belonging to the poorer segment of society do not get proper study conditions. They are deprived of textbooks, study materials, requisite stationery which are the basic requirements for a meaningful program of study. Most often they do not even get the minimum space, because of their poor living conditions, where they can study peacefully. In order to improve the performance levels and keep such learners motivated to continue studying, the learning materials and proper learning conditions should be provided. They also need a quiet place where they can study peacefully and undisturbed. In one instance, the building of a secondary school is designed in such a way that a number of beds are built into the wall, as in a railway compartment. These are folded so that the classrooms are also used as dormitories. The additional expenditure incurred was very little about Rs. 50 per bed. As a result of this arrangement, the poor children of the area who attend school were invited to live in the building. They come to school after supper at 8.00 p.m., study there till 10.00 p.m. or 11.00 p.m. and again in the morning. They return home at 10.00 a.m., for meals and return to school by 11.00 a.m., when it is regular school time. They remain in school till about 5.00 p.m., play till about 6.00 or 6.30 p.m. and then go home for supper. These children are under the guidance and supervision of one or two teachers, who are given remuneration. Students also have access to a library equipped with requisite textbooks. Such an innovation has shown a magnificent improvement in the student's attainment levels, at a small additional expenditure of Rs. 20 per child per year.

Another interesting case is of a vacation programme being experimented by some secondary schools in Bombay. The school is attended by children of poor parents who cannot send their children outside the city, during vacations. Lack of space at home, compels these children to wander out in the streets during daytime and idle their time. As an innovative step, the head masters of these schools have converted the school building to a hostel during the summer vacation, to fulfill the needs of such children who constitute a major percentage of the enrolment. The children who seek this facility are allowed to spend their entire time on the school campus. Teachers are present to guide and supervise them all through their study, play and recreation activities. Such an enterprise has proved quite beneficial in terms of student achievement, in increasing their motivation and enthusiasm. The additional expenditure is only on the remuneration of teachers and cost of materials which works out to be Rs. 10/- per student for the whole vacation time. Poor countries like India, which are caught in a vicious circle because of low investment in education, have to ensure intensive utilisation of available resources, within the investments made. The planning at the policy level should ensure a better return from existing facilities and new investments should be permitted only when the existing facilities are maximally utilized.

From the foregoing examples, it is clear that there are several ways by which the ever increasing demand for additional financial resources can be decreased. One way is to optimize the use of non-monetary or physical resources in education. Physical resources may thus be optimally utilised in one of the following ways –

- (i) The infrastructural facilities of the institution could be put to multiple uses – double or triple shifts. The morning and day shifts could be used for formal education and the evening shifts for non-formal education or tutorials etc. The library may also be used for different categories of learners. This way non-recurring expenditure per student can be reduced.

- (ii) Innovative techniques of institutional planning and management can optimise utilization of physical resources. Use of non-formal channels of learning, in a complementary, supplementary or integrative mode can reduce the recurring and non-recurring expenditure to a great extent.
- (iii) Another method is to raise the student teacher ratio; to reduce the recurring expenditure on education teachers should be imparted proper training to learn techniques of dealing with large numbers.

(Above section abstracted from source: www.education.nic.in/cd50years/)

Let us now examine some aspects to be considered for proper utilisation of physical resources in educational institutions. Some of the important considerations are:

1. Space utilisation
2. Internal flexibility
3. Utilisation of library resources
4. Utilisation of laboratories
5. Maintenance operations

Check Your Progress

Note : a) Space is given below for writing your answers.

b) Check your answers with those given at the end of this unit.

1. Justify the statement that educational resources are grossly underutilized.

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2. Illustrate with one example how school infrastructure can be optimally utilized to benefit the children from poor sections of the society.

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15.4 SPACE UTILISATION

Space utilisation means an assessment of how much space is being utilised, whether it is being utilized optimally or being utilized at all. Study conducted by UK Higher Education Space Management Group (SMG) has defined space utilisation as:

“Space utilisation is a measure of whether and how space is being used. The utilisation rate is a function of a frequency rate and an occupancy rate. Frequency rate measures the proportion of time that space is used compared to its availability and the occupancy rate measures how full the space is compared to its capacity. Utilisation rates can be assessed in terms of both actual use and predicted use”.

The utilisation studies also assess the size of estate that is affordable, which is linked to the type and amount of space that is required on the basis of information provided by utilisation studies, decisions can be made about type and scale of facilities required. The results of such studies also address issues pertaining to effective use of resources underutilised and directed elsewhere for better utilisation. The study has evolved a standard formula to calculate space utilisation (Good Practice Guide: 1996);

$$\frac{\% \text{ frequency} \times \% \text{ occupancy}}{100} = \text{space utilisation}$$

where:

- Frequency is the number of hours a room is in use as a proportion of total availability (as per the schedule for the week).
- Occupancy is the average group size as a proportion of total capacity for the hours a room is in use.

Utilisation can be calculated on the basis of observation of the way space is actually being put to use. Alternatively it can also be worked out on the basis of projected use, i.e. based on assumptions of how space will be used, in a new building or planned use according to a timetable.

A report on space utilisation entitled 'The Management of Space in Higher Education Institutions in Wales' (1996), prepared by the UK. National Audit office strongly suggests conducting space utilisation surveys, to give an objective measure of the efficiency with which the estate is used. It stated:

'Space like time is money. If your institution is typical, servicing and maintenance of accommodation is the second largest cost it has to bear. Without efficient space management, the resources tied up in your institution's estate are not used to best effect. Reducing estate costs by using space more efficiently can release funds for other more important activities.' (SMG, 2006)

15.4.1 Need to Measure Space Utilisation

The study conducted on the HEIs also discusses the need to measure space utilisation. The reasons cited are:

- i) ensuring that space needs match space provisions;
- ii) providing a sound basis for space allocations or for planning new buildings;
- iii) monitoring efficient space utilization;
- iv) identifying the under utilized and over utilized areas;
- v) arriving at the difference between timetabled use and actual use;
- vi) keeping record of changes occurring over time; and
- vii) demonstrating good practice.

The finding of this study can also be applied to management of space utilisation in educational institutions anywhere in general. The report provides a discussion on the strategic role of space utilisation.

15.4.2 Strategic Role of Utilisation: Balancing Different Perspectives

It is agreed and accepted that space in an educational institution should be utilised optimally and efficiently. However when examined from a broader perspective the facility managers have to strike a balance between the differing interests, needs and the demands. This is explained through a Balanced Score Card approach (Kaplan R. and Norton D, 2006) to strategic management of different perspectives of space utilisation within an organisation. These are as follow:

- Customer perspective
- Financial perspective
- Business perspective (internal management)
- Innovation and development perspective

The key factors impacting space utilisation are represented in fig 15.1

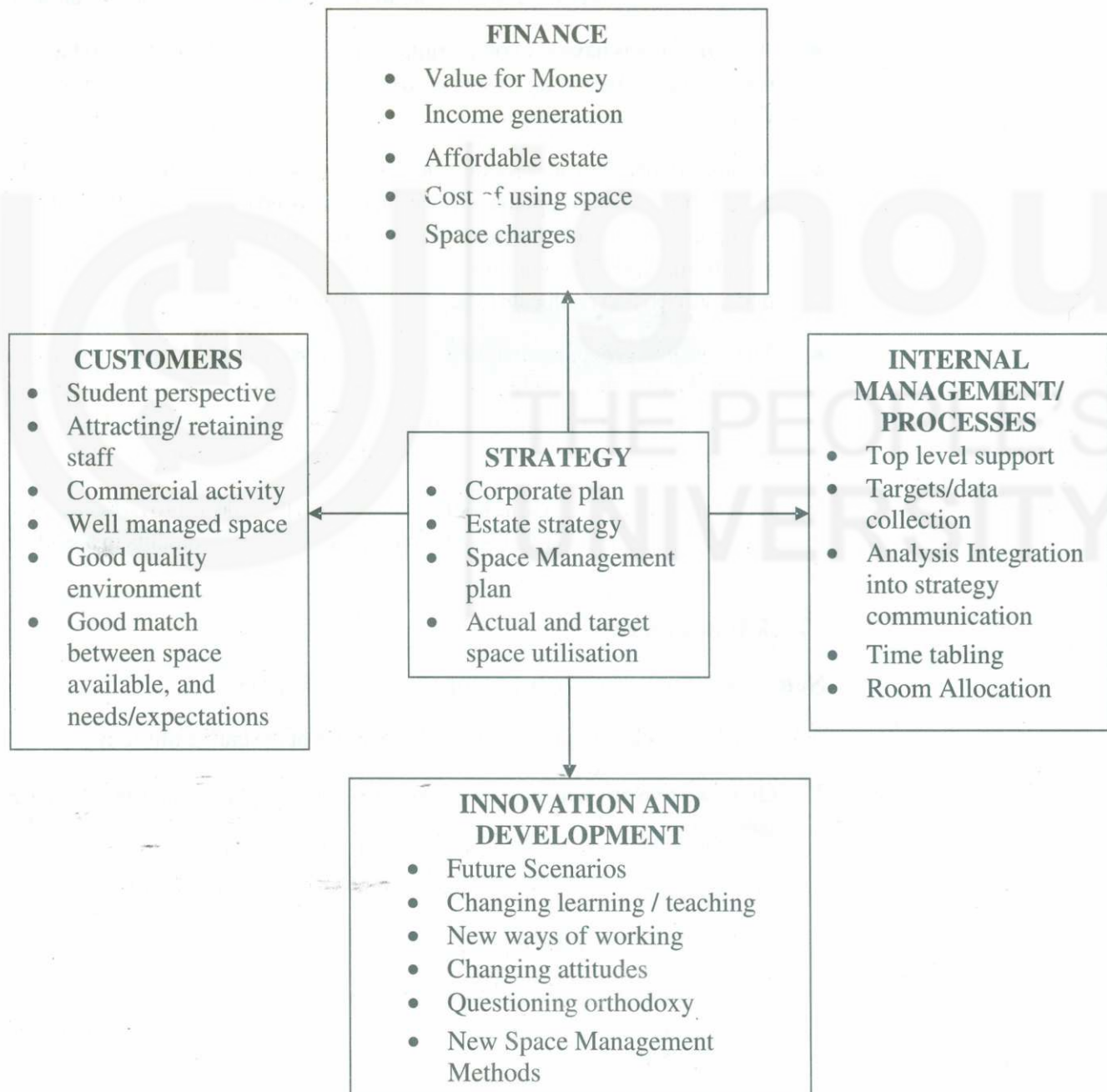


Figure 15. 1: Key factors affecting space utilisation: a balanced score card approach (UK. Higher Education Space Management Project, September 2006).

From the balanced score card it can be concluded that utilisation is just one of the many factors affecting the type and quantity of space to be provided. It should be borne in mind that efficiency and effectiveness of space cannot be managed without periodic analysis of utilisation, carried out at all levels of the institution. Annual utilization surveys should be carried out and the obtained data should be reviewed in the light of targets set.

We can also examine another case of Space Management, allocation and utilisation in James Cook University (JCU). The policy provides guidelines for management of space utilisation in the University. Various aspects of management space utilisation which the policy outlines are as follows: –

- Responsibility for Management and utilisation of allocated space is allocated to University authorities like Pro Vice Chancellor/Heads of Faculties or Divisions.
- A Coordinator is in place to monitor the quantum of space allocated with the space actually required. He will ensure that space allocation is proportional to the need and requirements so as to maximize equity for all students and all staff.
- All departments have to evolve a timetabling system on the basis of a standard one (Celcat Timetabling System), so that teaching spaces are allocated to all faculties, for optimal utilisation.
- An important criterion is monitoring space utilisation for which bench marks are established of acceptable utilisation rates based on a combination of seat occupancy levels and frequency of use. An additional role entrusted to the facility managers through this criterion is to find out the spaces which are underutilized and reallocate in accordance with university norms.
- There are also provisions in the space utilisation policy of JCU to place requests for additional space bearing in mind the changes that may occur over periods of time. Such changes may include expansion in the number of teaching programmes faculty members, creation of new disciplines etc.

Management of space utilisation should be directed to provide improved services to the students, which will enable them to maximize their achievements in a student centred learning environment.

Check Your Progress

Note : a) Space is given below for writing your answers.

b) Check your answers with those given at the end of this unit.

3. Give two reasons why an educational institution needs to measure its space utilization.

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4. Enumerate the key factors that impact space utilisation.

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15.5 FLEXIBILITY IN UTILISATION

Physical facilities in educational institutions should be such that they cater to the future needs also. They should be able to accommodate new and ever-changing forms of education. This is possible if the educational institutions adopt a flexible approach in creation and maintenance of the physical infrastructure.

15.5.1 Short-term Flexibility

Built in spaces in educational buildings can be put to a variety of uses during the day. The classrooms can be partitioned to accommodate a variety of class sizes. The short term flexibility gained popularity in the US and Europe in 1960s and 1970s respectively. Short-term flexibility was achieved by constructing new buildings and remodeling existing ones with mechanically moveable partitions. During the school days, these partitions can be opened to combine several standard classrooms to make a room bigger in size for larger numbers or subdivide the big classrooms into spaces suitable for small group discussions. An alternative view is that while such an arrangement does increase utilization rates, but it involves high initial costs and maintenance cost. It would be economically more feasible to build special purpose spaces for large and small groups and ignore their low utilisation.

15.5.2 Long-term Flexibility

The concept of long term flexibility is translated into practice by industrialized countries and it offers substantial returns. According to a report by the IIEP, "Industrialised countries have learned that replacing load bearing internal walls with structural frames and internal partitions of inexpensive materials, permits them to make affordable rearrangements, when curriculum and teaching methods reforms require a new arrangement of spaces. As technology advances in developing countries and structural frames become more economical. This approach is increasingly cost effective for them." [IIEP. <http://www.unesco.org/iiep>].

In developing countries the considerations are different when decisions about flexibility in provisions of physical infrastructure are made. A major consideration is class size. For example, the number of students in the lower classes is more than in the higher classes. Hence the accommodations need to be planned as per actual enrolment rather than theoretical projections. This implies that real enrolments should be considered. The second aspect to be considered is the provision of flexibility in using space, at affordable cost by the developing countries. A proposal made to Guinea in Africa by UNESCO's Dakar Office, was to provide furniture in classroom, that had desks fixed to the ground, but with mobile seats. In Africa mobile furniture has shorter life than fixed furniture. Depending on the affordability and need the institutions should exercise flexibility in the utilization of material resources and such decisions should be taken at the planning stage. In the subsequent sections we shall discuss management of specific resources and their utilization like Libraries and Laboratories.

Check Your Progress

Note : a) Space is given below for writing your answer.

b) Check your answer with those given at the end of this unit.

5. A major consideration for educational facility planners in a developing country is 'class size' while deciding the extent of flexibility. Discuss briefly (in about 50 words).

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15.6 UTILISATION OF LIBRARY

The school library and its staff are important school assets, and should be taken as an educational investment. In fact libraries have a history of development which is synonymous with the development of educational institutions. Libraries are the depositories of human knowledge and information for centuries. Libraries are considered as temples of knowledge, and have a tremendous role to play as disseminators of knowledge, and help immensely to develop the spirit of inquiry, initiative, scientific temper, conceptual clarity and linguistic skills of learners.

There are research studies which provide evidence that quality school library programs, positively affects student achievement. Some of these are (Spence, 2005):

- That student achievement increases in accordance with the level of teacher librarian staffing, size of the collection and library budget.
- Other factors that directly impact student achievement are, cooperative planning between teacher librarians and teachers, identifying materials for teachers, teaching information, literacy skills to students, in-service training of teachers, and managing an information portal.
- In a study involving a survey of over 13,000 students, 99.44 percent of respondents indicated that school library services had assisted their learning.

Hence administrators of educational institutions at all levels must support libraries in the best interest of students. It has been reported that quality library media programmes can enhance student achievement and informed, committed libraries can help principals enhance their own administration practice (Spence, 2005).

Since libraries constitute an important instructional component, it is necessary that these services are properly organized, managed and utilised for effective teaching learning process.

15.6.1 Organisation of a Library

Library has a unique organisational and management structure, and is considered an institution in itself in the context of higher learning. The role and functions of all the members are interlinked. Let us examine the organization of a library in a college, to understand its use as a valuable learning resource.



Fig 15.2: Organisational structure of a College Library

These functionaries are involved in the activities of the library. There is also a committee called library committee to take stock of the library operations and give recommendations for better functioning. The structural organization of the library system is generally as shown below:

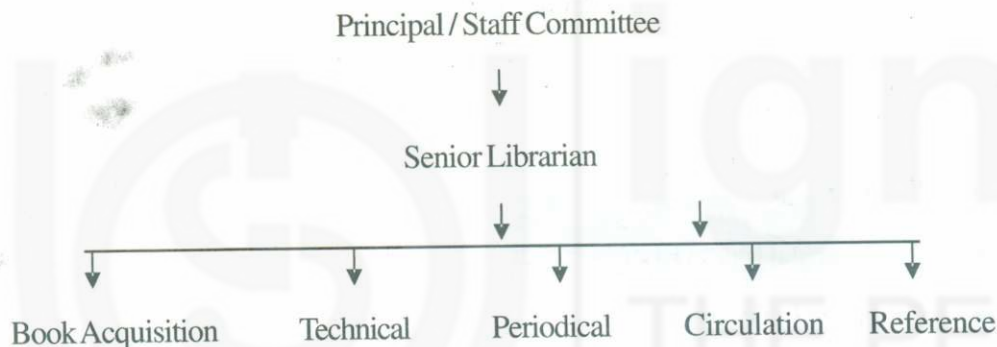


Fig 15.3 : Structural Organisation of Library System

Source: Aspects of Institutional Management- 3, Block-2, MES-104, IGNOU, 2003

Let us now discuss the physical aspects of the library which are crucial for its proper utilization. We can categorize them as the following:—

- Infrastructure facilities, i.e. buildings, rooms, auditorium etc.
- Equipment
- Books, journals, periodicals, audio-video materials etc.
- Miscellaneous consumable items

15.6.2 Infrastructure facilities in the Library

A library must be a source of inspiration for its users. In the context of higher education a library building should be attractive, spacious, and well equipped. The building should be architecturally sound, harmonious with nature and accessible to its readers. The infrastructure which catering to the present needs should also have scope for future expansion. Space distribution and utilization, as also discussed earlier, is an important aspect. Castaldi (1987) has suggested an ideal space allocation provision for each library as:

- thirty square feet of floor space for each reader using the library;

- one hundred feet of floor space for each staff member using the library and
- fifteen volumes per square foot of floor space for keeping the shelves in the library.

Some infrastructure facilities are linked to the service sections, which contribute to better provisions. These components are the following:

- Administrative Office
- Book Stock Rooms
- Acquisition Department
- Catalogue Department
- Process Department
- Circulation Department
- Periodical Section
- Reference Section
- Display Section
- Newspaper and Magazine Section
- Store Rooms
- Common Rooms
- Reading Hall
- Audio-visual Media Room
- Language Laboratory
- Browsing Section
- Photocopying etc.

(i) Equipments

Library services have to be rendered through usage of certain equipments for efficient and smooth utilization, a library should be well equipped with technical equipment and furniture mentioned below:

- Bookshelves, almirahs and stacks
- Catalogue box
- Reading chairs and tables
- Book display board
- Periodical and Newspaper stands
- Trolley
- Computers
- Audio-visual components
- Reprographic equipments

- Energy equipments
- Proper light arrangements – windows and electric lights should be placed in a manner so as to facilitate comfortable reading for library users.

ii) Essential Items

A library stands for some essential items like the following:

- Books
- Journals
- Magazines
- Periodicals
- Reference Materials
- Audio visual media-films, slides, CD-ROMs, software etc.

iii) Miscellaneous Consumable Items

The miscellaneous items of a library are given below:

- Library index cards
- Paper
- Adhesives
- Maintenance Materials
- Toiletries

15.6.3 Library Management

Proper and efficient management of a library system is effected through the execution of its various functions. Functions of a library can be broadly categorized as –

- Administrative
- Technical
- Cataloguing and
- Circulation

(i) Administrative Functions

The administrative functions guide the overall functioning of a library, through policy decision and directions. Library administration coordinator controls and regulates other departmental work.

(ii) Technical Functions

- a) The main technical function of a library is acquisition of books. Selection of books is based on a decision taken in consultation with the librarian and other academic of the institution.
- b) The other function is acquisition of library materials to preserve the acquired books, like book shelves, racks etc.
- c) Placing order for the required materials.

- d) Repair and maintenance of library equipment and
- e) Handling petty cash.

(iii) Cataloguing Functions

The catalogue department is a crucial section of the library that classifies and arranges books in a particular order either author wise or subject wise, which is called processing of books.

The description of books may as per the following features – name of author, title of the book, place of publication, publisher, date of printing, number of pages.

(iv) Circulation Functions

The functions included in this category are:

- delivery of books to borrowers
- collection of books from borrowers
- stock maintenance, restoration and shelving of books
- keeping account of fines, missing books etc.

(v) Reference Services

The reference services extended by the library are:

- informing and assisting users about collection of books and resources
- locating the resources
- answering requests for information
- loaning out reference materials
- borrowing materials from other sources for students and faculty

vi) Browsing Services

New arrivals – books and other journals should be displayed for browsing by users.

vii) Creating of Departmental Library

The main library should extend help and support for creation of departmental libraries in the institution. It should assist in selection of books and materials and also in organizational aspects, involving both students and teachers of the respective departments.

Libraries can be used either on the open shelf system or closed shelf basis for which special requests have to be made or a mixed mode as is in existence at most of the institutions of higher learning in the Indian context.

An important aspect of utilization of library resources is the management of human resources of the library. To optimize utilization of a library, its resources should be integrated into the curriculum. This will enhance development of information literacy. The School Library Association of South Australia has defined the role statement of Teacher Librarians. The teacher librarians have a dual responsibility as teachers and information specialists and be the leaders for such an information literacy program.

SLASA (2003) has provided a model to define the role and responsibilities of a teacher librarian. These include:

1) Teaching and Learning

- Facilitate students' learning by helping them to seek, critically evaluate, synthesize and present information
- Initiate learners into usage of resources and technologies
- Promote collaborative learning, group work, alongwith subject and class teachers, focusing on individual learner needs.

2) Leadership

- Sound professional knowledge and approach, keeping updated about the current trends and practices in education.
- Focus on the institutional goals, policies and needs.
- Facilitate knowledge management process, school's ICT plans an advocate the need for students to be information literate.

3) Curriculum Involvement

- Be part of the curriculum team and should be informed about latest curricular development and documents.
- Promote student information literacy across the curriculum
- Strengthen efforts to integrate Information and Communication Technology in the Curriculum.

The other roles described for the Teacher Librarian are management functions, Literature promotion and facilitating access to several other resources-print, electronic, to ensure that the library becomes a multi-functional resource centre and a focal point for student learning.

Another important aspect of the efficient functioning of the library is training of library staff. Excellent library resources can remain unutilised or underutilised in the absence of trained personnel. Training of librarians and other staff should provide academic inputs, to enable them to disseminate information to the users. Teachers should motivate students to correlate classroom teaching with reading and reference materials in the library to maximize learning. This will enable both teachers and learners to keep abreast of the latest developments in their areas of expertise and also inculcate the right attitude toward utilisation of library facilities.

The Kothari Commission (1964-66) has emphasized the role of human resources in the context of library development, stating, "The object of library planning is not to build a collection of books unrelated to class-work, laboratory research and conference room. The object is rather to relate book selection, organization of books, conditions of access and all library activities to the daily needs and activities of the academic community, both professionals and students." (IGNOU, 2003)

After discussing the various aspects of management of library as a resource for maximum utility to its users i.e. students and teachers, we shall now examine another important physical resource in the educational system and that is the Laboratory.

Check Your Progress

Note : a) Space is given below for writing your answers.

b) Check your answers with those given at the end of this unit.

6. Describe briefly the organizational structure of a college library.

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7. Enumerate three functions of the reference section of a library.

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15.7 LABORATORY MANAGEMENT AND UTILISATION

Laboratory work or practical work has tremendous significance in the teaching-learning system, particularly in the context of Science, Technology and other related fields of study. However practical work is in separate from natural science teaching at every level – primary, secondary and tertiary. Experimental work is the basic method of science and this should be reinforced. Science is not just about verifying rules and laws, but learning science should develop a scientific temper in the individual i.e. the skill of observation, data collection, its analysis and interpretation.

The fundamental objectives of any laboratory activity in the teaching-learning process can be enlisted as:

- teaching manipulative skills to enhance a learner's motor and observation capabilities;
- teaching application of basic scientific theories to practical problems;
- improving the understanding of various methods and procedures of scientific enquiry;
- explaining the process of natural phenomena in a scientific manner;
- designing and planning an activity;
- cultivating a professional and scientific attitude and
- identifying and measuring the actual utility of current researches in science.

These objectives will provide the basis for management and organization of laboratory resources.

The objectives of laboratory based learning should be visualised in the larger perspective of real life situations. It cannot be confined to the four walls and should create a process of interaction between knowledge and information generators and receivers. This interaction with the basic purpose of knowledge generation can be achieved through the following steps:

- re-organisation and updating the curriculum
- orientation of the teachers and laboratory-supporting staff

- developing linkages with community – involving students with community based problems and projects.
- linkages can be established with development agencies, to identify problems and work on their solutions through laboratory work.

For optimum results and to foster the spirit of creativity and innovation, laboratories should be properly managed and its resources properly utilized. The laboratory management involves the following aspects (Ahmed, 1983):

- Personnel management
- Procurement and maintenance of laboratory equipment
- Procurement, storage and stock-keeping of consumables
- Management of laboratory time and space
- Training and orientation of laboratory personnel
- Financial Management and
- Management of safety

15.7.1 Personnel Management

The personnel usually employed for laboratory management are – subject teachers, demonstrators, laboratory assistants, attendants and students. All the personnel involved interact closely with their own levels of knowledge and skills. This coordinated interaction among them determines the effectiveness of the experiment undertaken.

Let us examine the role of each of the personnel involved to bring about proper utilization of laboratory resources.

Teachers

The teacher has a crucial role to play in the success of the practical based learning. A teacher should possess specific skills and capabilities so as to link their theoretical knowledge to the practical activities in the laboratory. This will also lead to efficient management of all laboratory activities. Teachers should be able to present information to students, question, explain and motivate students. Besides they should be able to train and instruct demonstrators and technicians about the experiment and lab requirements.

Demonstrators

The demonstrators should be well equipped academically and professionally for correct and efficient demonstration of experiments. According to Broan and Atkine, 1988, the skills which demonstrators should have are:

- observing students at work,
- anticipate and recognize major difficulties in understanding,
- give brief clarifications and explanations of processes and procedure,
- give directions, ask questions which guide students,
- be encouraging and supportive of students and
- know situations where students need or do not need help.

Laboratory Assistants/Technicians

The Laboratory assistants and technicians play an important role in preparing and setting the laboratory for carrying out the experiments. They are the actual manager of the laboratory. Their professional and technical expertise should be developed through periodic training, to keep them updated about the usage and maintenance of all equipments and articles.

Students

Students are the target group who are to ultimately use the laboratories for gaining the requisite skills and knowledge. For optimum utilization of the laboratory equipment and materials for scientific experiment it is important to know the extent of their motivation and preparedness. Individual differences of students should be borne in mind, while organizing practical sessions for them. The laboratory management should aim to improve the students' experimental aptitude, as also their academic achievement in the science subject. The management system should keep the student motivated and enthused for learning.

15.7.2 Laboratory Equipment Procurement

Material and equipment has to be procured for laboratories. The requirements vary according to the need and nature of the subject. The specifications depend on the type of experiment to be performed and process in Indian educational system is still traditional and unchanged.

The procurement process has two aspects:

- (i) equipment is procured according to specification of needs of various experimental programmes and
- (ii) equipment is procured to replace the obsolete ones or which are broken or under repair.

The procurement of materials is organized through a committee which decides the quantity and quality of the items. When the equipment is required on a large scale and correspondingly high expenditure is involved, then tenders are invited from the manufacturing companies/firms. After advertising, the lowest quotation is selected for placing orders.

Maintenance of the procured equipment is also important since proper maintenance can enhance the life span of the equipments and materials. Proper care and upkeep of the laboratory infrastructure is essential, by keeping an account of their state and maintaining a checklist. Personnel have to be engaged for maintenance and repair of the laboratory equipment.

15.7.3 Time and Space Management

A laboratory is used by a diverse group of learners at different times during the day. Hence time management for using the laboratory is of great significance. In order that the laboratory infrastructure is utilized to its full potential by all groups of learners, the timings should be staggered. Usage of equipment can be alternated between the groups, this being accessible to all.

Another aspect of time management is the location of the laboratory in the campus. At the design stage it should be ensured that students do not waste much time, in reaching the laboratory, i.e. the distance between the class-rooms and labs should be minimal.

Along with time management, space management and its utilisation plays a crucial role. Space utilization for educational purposes has been discussed in the earlier sections. However it would be pertinent to highlight the different aspects of space utilization in the context of laboratory activities. It has the following six major aspects:

- Space utilisation as per laboratory requirements/specification
- Space utilisation in terms of working and available time
- Utilisation per student unit
- Utilisation of space per laboratory programme
- Utilisation of space in terms of apparatus and equipment installation capacity
- Utilisation of space for further purpose or programmes

15.7.4 Safety Management

An important dimension of laboratory usage is the safety management. Some materials, especially certain chemicals need to be kept safely and handled with care and precaution. The demonstrators and technical staff should have prior knowledge about such materials and the methods of safe handling. Even the students should be instructed by the teachers and demonstrators about the precautions and safety measures that they need to adopt for conducting such experiments.

The basic precautions that one must be aware of before conducting the laboratory experiments are the following:

- Careful handling of fragile equipment like glassware
- Precautions while using chemicals and electrical appliances
- Fire extinguishers to be installed at requisite places
- First aid boxes readily available.

Acknowledgement: Section : 3.7 abstracted from Unit-8 (Aspects of Institutional Management-3), Block-2, MES-104, IGNOU,2003.

Such details could be provided to all concerned through concise booklets or summarized in handouts.

Check Your Progress

Note : a) Space is given below for writing your answers.

b) Check your answers with those given at the end of this unit.

8. Discuss at least three objectives of laboratory teaching –learning activity.

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9. Enlist two precautions to be observed in the conduct of laboratory experiments.

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15.8 MAINTENANCE OF PHYSICAL RESOURCES

As soon as the educational institution becomes operational, i.e. the school administrators, teachers and student begin to function, its aging process starts. The materials and surfaces begin to deteriorate at their own pace, and the wear and tear sets in. Since the wear and tear is a natural and inevitable phenomenon, resulting from usage, a maintenance programme should be in place.

According to Harrison, in Castaldi. B, (1994),

“The School Custodian is co-responsible with the principal for a building worth many thousands of dollars, its care and operation, and indirectly responsible for the priceless lives relate to the proper operation of the school plant.”

It is a fact that the contribution of the personnel involved in maintaining a comfortable and healthful environment in the institution building goes unnoticed. An alert and proactive custodian can save a lot of resources for future maintenance, by paying attention to small wear and tear and restoring it for normal usage. This workforce also plays a significant role in the educational process by creating and maintaining an environment conducive for learning.

Let us now examine the role and responsibilities of the personnel involved in maintenance of buildings and other infrastructure for teaching-learning.

15.8.1 Role and Responsibilities of Personnel in Maintenance of Facilities

Educational institutions must have a facilities maintenance mechanism in place. According to Castaldi (1994):

“A good facility maintenance programme requires commitment from board, administration, staff and community that maintenance of facilities is a high priority and must be provided each year with adequate funding.”

Size of Workforce

All school or college personnel share a responsibility in the basic upkeep of the institution. Adequate number of staff should be engaged, for regular operations. It should also be ensured that maintenance personnel do not get overworked very often it is observed that a small sized workforce is employed for maintenance with complete disregard to the size of the teaching-learning area, numbers of students and teachers and the overall load of all educational activities provisions should be made in accordance with the size of the building, the conditions of the infrastructure whether it is old, requires replacement or repair. If it is a new building, but overcrowded or overused then more personnel may need to be assigned for adequate maintenance.

15.8.2 Maintenance Budget

The administration of educational institutions is responsible for providing funds for supplies, cleaning and maintenance of equipments and normal wear and tear. Generally a school or college budget accords very low priority to this aspect of infrastructure utilization. Very often because of limited resources, the expenditures on maintenance are usually deferred to a later date. However, timely maintenance proves beneficial in the long run.

The budget should allocate sufficient funds for procuring the supplies which are efficient and least damaging for example cleaning agents, paints, tiles to be used laboratory equipment and chemicals, furniture, electrical appliances and other material items of the institution. A competent custodian should be hired and generally such activity is assigned to the central purchase unit of the college, which caters to the needs of all aspects of physical infrastructure. Wear and tear of the mechanical equipment should also be kept in mind. Ideally there should be a programme of planned replacement of worn out infrastructure. A maintenance plan should be developed which can be made more cost-effective through use of computerized database management system.

Check Your Progress

Note : a) Space is given below for writing your answers.

b) Check your answers with those given at the end of this unit.

10. What are the two important aspects of maintenance of facilities that an institution must ensure?

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11. Describe the role of the workforce in facility maintenance in an institution.

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15.9 IMPACT OF TECHNOLOGY ON UTILISATION OF PHYSICAL INFRASTRUCTURE RESOURCES

It is a common practice for educational planner, to make provisions according to existing practices. The possible innovations and other new methods are seldom considered, which are likely to improve the educational practices with rapid advancement in information and communication technologies, some classroom teachers are on the constant look out for and even design imaginative and exciting practices to keep the learners enthused and improve their performance. It is because of this that the curriculum is in a state of constant flux and change. However in the Indian context, the curriculum is quite rigid and leaves little room for changing concepts and practices. To plan educational buildings and infrastructure, with a scope for innovation and creativity of teachers and learners, the planners should have the following attributes—

- should be endowed with creative ability
- should be knowledgeable to distinguish between such educational practices which will be long lasting and those which will be short lived
- should have an understanding of the existing curricular and co-curricular practices and know which infrastructures features are best suited to execute them

- choose such features that are best suited to the philosophy of the users of the educational system.

Let us examine how technological advancements have impacted the creation and utilization of educational facilities. The design of educational facilities reflects the educational thinking and architectural facilities at the time when school facilities are proposed, planned, conceived and constructed. The resultant educational infrastructure reflects the prevailing architectural concepts, educational practices, and promising curricular innovations. A well planned educational facility also has scope for foreseeable educational concepts of the future.

Educational infrastructure particularly the instructional devices have evolved and new additions made over a period of time. A teaching aid of the early times was the slide projector, followed by the movie projector. Today the educational systems utilize very sophisticated devices which range from programmable ones to fully automated ones. They are designed in a user-friendly manner are light weight compact and easier on maintenance and upkeep. The new technology supplements the older systems for e.g. the overhead projector has replaced the chalkboard.

Whatever the electronic or technological device, their potential is not yet fully exploited by the educators. Educators particularly in the developing countries, are aware of their potential and its superior capabilities of impacting the teaching-learning process. However due to resource constraints, lack of proper training and orientation are unable to adapt the end-users i.e. teachers and students toward its full usage. To utilize the communication technology and infrastructure to its full potential, the school administrators and educationists should provide opportunities for training the staff and provide the requisite staff, equipment and necessary software.

Computer is an invaluable information and communication tool for students. It has the capability of and perfects suited for controlling the operation of a wide variety of teaching devices currently available. Computers can be programmed to display a series of interactive instructional materials for instant use by the student in a logical and prearranged sequence. It can also be programmed to trigger a videotape player, a television set, an audiotape player, a movie projector, and films strips and slides properly interspersed in the teaching-learning sequence at the proper time as designed in the curriculum.

The potential of technology for educational practices is unlimited. The facility planners have to keep abreast of the developments in educational technology and exploit them for educational benefits.

15.9.1 Emerging Instructional Methodologies

Software, also termed as "Courseware" is being developed to cover vast curricula in many educational fields. Learning systems have been created in the developed countries called Integrated Learning Systems (ILS) and Integrated Instructional System (IIS), which work directly with school districts to create school programs in keeping with their needs. The advent of technologies like-television satellites, cable television, fibre-optics transmission lines are providing path breaking educational capabilities, un-thought of in the earlier times. With these advanced technical devices, it is possible to disseminate ILS programs, over large geographical areas and provide enrichment instructional programs. These educational programs are also transmitted through satellite technologies or over fiber-optic lines and can be received by microcomputers in homes and schools.

It would be pertinent at this point to examine the different phases of ICT revolution

and the challenges it poses for educational planners. According to a report by Hernes G(2002) the ICT revolution is not one but has evolved through five stages. The first revolution after world war two was the computer, the applications of which gradually advanced from use in academic research to weather forecasting ticketing for travel and several forms of accounting. The second ICT revolution occurred in the 1970s when processors on a chip and magnetic discs were constructed which paved the way for creation of the Personal Computer (PC). In 1981 IBM launched the first PC in the markets, which is now a household article, at least in the developed world. The computer revolution is a continuous process with its applications and use expanding by the day. The third phase of ICT revolution is the emergence of Microprocessors. These are embedded in an ever widening range of products like, video players, credit cards, cameras, remote controls, etc .and its capacity is ever increasing. The internet is the fourth revolution and dates back to the late 1960s. It was first used by the US Department of Defense for a communication network (ARPANET). Subsequently, several academic institutions in the US set up their academic networks, which became a part of the internet. Several such networks emerged in Europe and CERN in Geneva was crucial in the development of the World Wide Web, in 1990. This led to surfing on the net and use of modem for the PC. The most significant aspect of the fourth revolution was the building up of social networks by users through the computer. The possibilities of linking without lines were opened up by the discovery of mobile phones which is the fifth product of the ICT revolution. Mobile phones are multifunctional devices that are used not just for talking, but for exchanging messages, booking movie tickets and diverse other uses. "Linking without lines now takes place not just inter-continentially via satellites, but also via high frequency short range radio transmitters covering a specific area or cell (hence the name "cellular phones") and inside buildings by "Bluetooth" and infrared-light".

A major impact of the ICT revolutions is their emergence as necessities –PCs and their multiple innovative uses. Another impact is globalization. The components come from all over the world- chips from Asia, software from America, mobile phones from Europe. The world is now interconnected through instant communications due to satellite technology. The internet and World Wide Web link the world providing the dynamic and interactive network. "Now the passport to the world citizenship has become '@'" (Ref. Gudmund. H. 2002).

15.9.2 Impact of ICT Revolution on Educational Facility Planning

Learning technologies have also been impacted by the ICT revolution. The methods of studying, school procedures, organization of resources, etc. have been transformed by the impact of ICT. Computers have been in use for teaching-learning since 1966 (by John Hopkins University). However the web technologies are being increasingly used by educational institutions for posting course materials, communicating assignments, and providing round the clock access to teachers and experts in diverse subject areas. Learning materials are now readily accessible to distance learners as well as to conventional learners in their classrooms. This new technology has transformed the delivery mechanisms of learning institutions but has altered the perceptions about education as a system. This transformation in teaching learning methodologies has two aspects:

1. It removes the constraints of time and space for educational provisions- access to learning is provided from any place, any time.
2. Training and material can be tailored based on individual needs and can be self-paced.

ICT poses tremendous challenges to the facility planners in education. They can be broadly categorized into two: challenge of equity and challenge of quality.

Issues of equity- This poses the question of access to the ICT resources within the developed and developing countries. There is wide disparity in terms of accessibility in these two regions. For example in Norway 50% of the people have access to the internet and 80% have mobile phones. On the other hand telephones are available to only half the world's population. In many countries all the telephones are in the capital city only. Electrification is yet to be achieved in many villages in the developing countries. Hence a major challenge for educational planners is to provide access to such technology to the millions of poor uneducated and unreached populations. Equitable access to ICT for education is not just about who the users are but also who produce the educational material. Educational material is produced by some countries and they are "net-based education providers". The education material is freely accessible through the net. Some countries also develop and promote programmes for foreigners by distance education methodology through the net. The WTO is considering proposals for trading "education products" as a commodity from one country to another. This opens up further opportunities for students since education is freed from national controls and paves the way for globalization of education.

Issue of equity can be addressed from two aspects :

- a) equitable access to students as consumers, where the poor countries are at a disadvantage.
- b) Equitable provision of content in which the poor have little to contribute.

Issues of Quality

Rapid changes are taking place in technology and so training cannot be a once and for all affair. Knowledge has to be constantly updated in order to keep pace with the changes and latest developments. The educational systems have to be so planned so that learners are familiarized with latest technologies. Planning and designing such systems is a challenge for educational planners both on the intellectual and economic front.

The technology driven learning method should be appropriate and economical too. In this age of virtual interactivity educational planners should make adequate provisions for interpersonal interactivity, peer relations and stay connected in the face to face mode as well. Educational content should be relevant, enable the learners to solve problems, develop abilities of perception, empathy and excellence. "Education after all means to lead out, within and beyond one's present confines by bringing out latent abilities and talents." Educational planners have to consider that students cannot be left to their unguided personal search but have to be led out.

Learning should be ICT assisted, because merely posting content on the web does not ensure quality teaching or its effective use. Teachers have to be made knowledgeable and skilled through training. Planners have to arrange for continuous experimentation and innovations in an ever changing environment.

Acknowledgement: This section has been abstracted from Hernes Gudmund (2002): *Emerging Trends in ICT and challenges to Educational Planning*, in *Technologies for Education, Potentials, Parameters and Prospects* (ed), UNESCO, Paris.

Educational planners should create conditions for technology utilization so that the digital divide could be minimized. The benefits of new technologies should be reaped by the developed world to empower and enable those who are marginalized and disadvantaged.

Check your progress

Note : a) Space is given below for writing your answers.

b) Check your answers with those given at the end of this unit.

12. State at least two qualities which educational facility planners must have.

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13. What are the two major impacts of ICT revolution on the teaching – learning process?

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15.10 LET US SUM UP

In this unit we discussed:

- The need for optimum utilization of infrastructural resources of an institution.
- Measurement of space utilization and key factors impacting it.
- Utilisation and management of institutional resources, like, libraries and laboratories.
- Role of personnel in the maintenance of physical facilities in an institution.
- Impact of technology on the instructional systems and the challenges it poses for effective facility management for educational planners.

15.11 UNIT END ACTIVITIES

1. Visit a college library. Prepare a format for assessment of different components of the library, i.e., facilities available, physical aspects, staff employed (full time, part-time, etc), arrangement for students and other considerations for effective functioning of the library.

15.12 REFERENCES

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15.13 ANSWERS TO CHECK YOUR PROGRESS

1. Educational buildings are used for only a few hours in the day, whereas they can function on a shift system, thereby increasing access to more numbers. During holidays and vacations classes could be organized as per needs of students or the premises could be used for group work, projects, camps etc.
2. Children from the lower economic strata can be provided educational opportunities in urban schools. Since school space and staff are unutilized after one shift, these can be used to organize classes for such needy children at very little extra cost. Teachers can be appointed on a voluntary basis or with some extra remuneration.
3. These are:
 - a) to provide a sound basis for allocating spaces for various components and also for planning new structures
 - b) to take stock of under utilized and over utilized areas in the institution.
4. These are
 - a) Finance
 - b) Customers
 - c) Innovation and development
 - d) Internal management processes
 - e) The clientele/customers, i.e., students
 - f) Strategy/ different plans
5. Class size is an important consideration, for educational facility planners in developing countries because there is a difference in the numbers of students in the lower classes than at the tertiary level. Hence long term flexibility considerations are difficult to incorporate.

6. The library is headed by a senior librarian who reports to the principal of the college. The senior librarian is supported by junior librarian, library assistants and library attendants.
7. These are:
 - Informing and assisting users about collecting books and resources
 - Locating resources
 - Answering requests for various types of informations
8.
 - a) to teach manipulative skills
 - b) to develop scientific temper
 - c) to teach application of scientific theories to practical situations
9.
 - a) careful handling of fragile equipments.
 - b) precautions while using chemicals and electrical appliances.
10.
 - a) Size of workforce
 - b) Provision of maintenance budget
11. Appropriate number of personnel should be engaged for maintenance and upkeep of physical infrastructure. All the staff should feel responsible and display ownership towards the facilities. If the staff employed is not proportionate to the size of the area to be managed or if the institution is understaffed then staff will get overworked and efficiency will decrease.
12.
 - a) They should be creative.
 - b) They should have the ability to distinguish between long lasting and short lived educational practices.
13.
 - a) Increased access to education because constraints of time and space are removed.
 - b) Instructional material can be designed to meet individual learner needs.

MES-044 Institutional Management

Block-1 Management of Curriculum

- Unit-1 Classroom Management (Instructional Management)
- Unit-2 Curriculum Transaction
- Unit-3 Management of Evaluation
- Unit-4 Management of Academic Resources
- Unit-5 Management of Curricular & Co-curricular Programmes & Activities

Block-2 Management of Financial Resources

- Unit-6 Educational Finance: Meaning, Importance and Scope**
- Unit-7 Cost and Budgeting**
- Unit-8 Accounting and Auditing**
- Unit-9 Resource Mobilization**

Block-3 Management of Human and Administrative Resources

- Unit-10 Management of Student Support System
- Unit-11 Management of Administrative Resources
- Unit-12 Management of Human Resources

Block-4 Management of Infrastructure

- Unit-13 Concept, Importance, Need
- Unit-14 Management of Physical Resources
- Unit-15 Utilization of Infra-structural Resources

Block-5 Total Quality Management

- Unit-16 Quality Control, Quality Assurance and Indicators
 - Unit-17 Tools of Management
 - Unit-18 Strategies for Quality Improvement
 - Unit-19 Role of different Agencies
 - Unit-20 Quality Concerns and Issues for Research
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