

system

Meaning of the Term 'system'

The term "system" signifies a connotation of wholeness, interrelationships between parts or elements and self-regulation. Here it is explained more clearly in the light of some well-known definitions:

- R.L. Ackoff (1971):** A system is the set of interrelated and interdependent elements.
- A.K. Jalaluddin (1981):** A system may be defined as a dynamic, complex, integrated whole consisting of a self-regulating pattern of interrelated and interdependent elements organized to achieve the predetermined and specified objectives.
- Crawford Robb (1973):** A system is a systematic organization of the elements that operate in a unique way.

On the basis of these definitions the characteristics of a system may be summarized in the following ways:

1. A system is a general term applicable to many fields including instruction and education.
2. It is a dynamic and integrated whole. It is not merely a sum total of its parts or elements.
3. It represents a complex but systematic organization of interrelated and inter-dependent parts or elements.
4. In a system, all the parts or elements have their respective roles which have to be specified in relation to each other and in relation to the purposes to be achieved by it.
5. A system, as a whole, functions more effectively and achieves better results than any subsystem/part or combination of the effects of individual parts.
6. A system is a self-governing, self-maintaining, and self-regulating structure.
7. The functioning of the system is aimed to achieve the specific purposes or stipulated objectives.

In this way, the term system may be understood as *a self-maintaining and self-regulating device consisting of interrelated and interacting elements or self-governing systems operating as a whole to achieve the predetermined purposes or goals with utmost efficiency, economy and productivity.*

Types of Systems

The systems may be classified into two broad categories: natural systems and man-made systems.

1. The natural systems, like solar system, and human body system, are the creation of nature or biological mechanism. Mostly, their functioning is beyond the control of man and, therefore, their behaviour cannot be predicted or determined precisely.

2. The man-made systems or man-machine systems, like telephone system, refreezing system, and education system, are deliberately designed or devised systems. The elements and the functioning of these systems are quite controllable, therefore, their behaviour can be predicted and determined precisely.

Parameters of a system

Any system may be described in terms of four basic parameters: (i) input, (ii) process, (iii) output, and (iv) environmental context.

1. **Input** refers to what is put into a system.
2. **Process** is what goes on in a system.
3. **Output** is the product of a system and
4. **Environmental context** refers to all those conditions, factors and constraints related with the physical and social environment in which the system operates. A system cannot operate beyond the limits and boundaries of its environmental context and constraints.

These basic parameters of a system can be diagrammatically represented in Fig. 18.1.

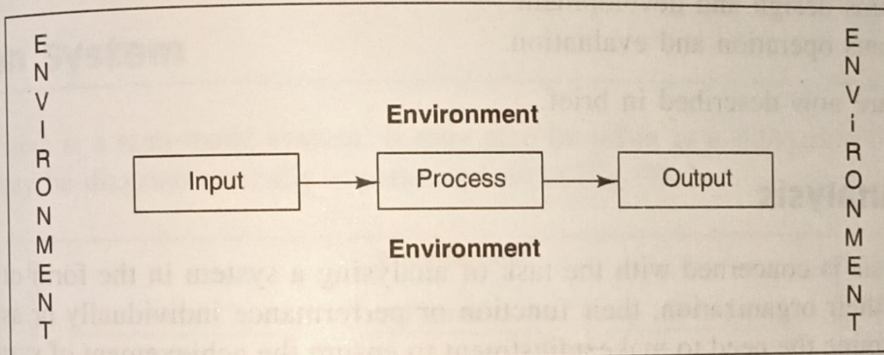


Figure 18.1 Parameters of a system.

Their nature and working can be better illustrated through the following example:

The Atlas cycle factory at Sonapat in Haryana is a man-machine system. Its goal is reproduction of cycles. All the workers, technical and management personnel, machines and materials are its components or elements. Here, the men and material employed in the production of cycles may be referred to as inputs. What is going inside the factory for converting material into the product may be referred to as process and the production of cycle and its accessories, etc. as outputs. The factory operates in a definite social and physical environment and is controlled by these environmental constrains.

Systems Approach

Systems approach is a technique based on the systems concept and its basic parameters for understanding, predicting and controlling the operation of a system in a given environment

to achieve the predetermined objectives in an intelligent, efficient and economic way. In this approach, a problem is taken into account in its totality and attempts are made to solve it in the context of the (i) predetermined objectives and (ii) functioning of its interrelated parts and the whole system under given environmental constraint.

In its basic functioning, the system approach tries to have a reasonable control over inputs, process, outputs, and the environmental constraints. A system is maintained if it meets the requirements of the system objectives, and if it does not, it is modified. Consequently, there arises a need for adjustment either in the contents of the inputs or in the process, or both. Also there may be a need for change and development in the existing norms under which the whole system operates. In this way, various modes of adjustment involving parameters, components and functioning of the system are tried and the most feasible one is retained for getting the best results.

Steps Involved in Systems Approach

There are three major steps involved in a systems approach:

- (i) System analysis
- (ii) Systems design and development
- (iii) Systems operation and evaluation.

These steps are now described in brief.

System Analysis

System analysis is concerned with the task of analysing a system in the form of identifying its elements, their organization, their function or performance individually or as a whole in order to determine the need to make adjustment to ensure the achievement of system, namely inputs, process, outputs, and environmental constraints. It helps the designer of the system identify the constraints that interfere in the attainment of system objectives. Through this analysis, the appropriateness of the system objectives in view of the structure and functioning of the system may also be properly evaluated.

Systems Design and Development

Whereas the system analysis is concerned with analysis, the systems design and development is related with the task of synthesizing. Here, attempts are made to design and develop the system on the basis of the finding of the former.

The following are the main activities undertaken in this step.

- Determination of the objectives of a system.
- Selection of appropriate devices, methods, strategies and approaches.
- Formulating a scheme of comprehensive programmes for the working of the system in relation to its parameters and the stipulated objectives.

Systems operation and evaluation is concerned with the actual operation of a system and its evaluation in terms of the stipulated objectives for providing necessary feedback to bring desirable improvement and modification in the structure and functioning of the system. If the outputs of a system meet the expectations or requirements of the stipulated objectives or norms, the system can be allowed to carry on. The need for bringing necessary alternation or improvement in the system is felt, if there is a discrepancy between the two. It can be done in some of the following ways:

- Manipulating the elements or inputs of the system.
- Pulling the functions of elements or inputs.
- Controlling the process and interaction among the elements of the system.
- Manipulating the environmental constrains of the system.

In this way, the system may be restructured, reorganized and its functioning may be re-planned, and re-operated in view of achieving better results. These processes are continued till the aim of getting best results in terms of the stipulated objectives with greater economy, precision and accuracy is not achieved.

Education System

Education system is a man-made system. It may also be taken as a subsystem of the society in itself. It may be diagrammatically represented as in Fig. 18.2.

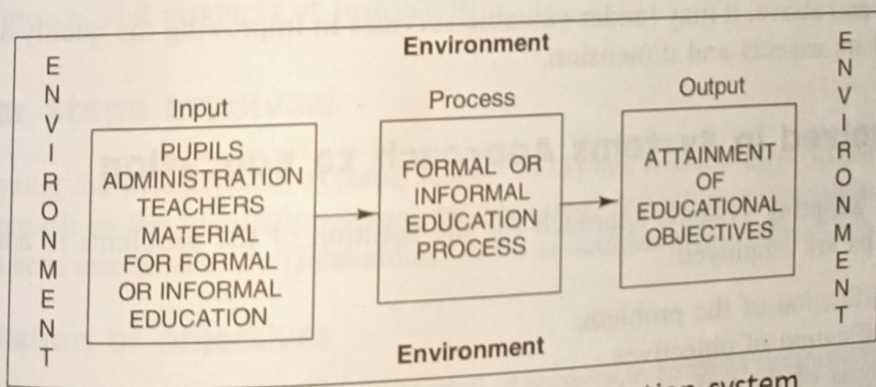


Figure 18.2 Structure of the education system.

On the same lines, the school system (a system of formal education through an educational institution) may be treated as a subsystem of the education system or a system complete in itself. It may have instructional (related with the cognitive development of pupils) and co-instructional system as its subsystem. However, both the instructional and co-instructional systems, may exist and function quite independently as a complete system in themselves.

System Approach to Education

As emphasized earlier, system approach refers to a well-thought technique or rational approach for designing, controlling and using a system for realizing the system objectives in the best possible ways. Its application in the field of education will surely make the system of education self-maintaining with its basic parameters operating scientifically on the principle of feedback and equilibrium. As a result, the systems approach to education is likely to solve various educational problems related with the organization and management of the process and products of education. The purpose served by systems approach in education may be summarized now:

1. It can effectively improve the instructional system.
2. It can bring efficiency in the school administration and management.
3. It may help in seeking the maximum effective utilization of the men and material resources.
4. A systematic educational planning (institutional, regional or national) in terms of long-range goals and specific short-range objective can be done by it.
5. It may help in improving the examination and evaluation system.
6. Improvement in the organization of co-curricular activities and other educational aspects of bringing conative and affective development of the pupils can be brought.
7. It may help in maintaining, controlling and improving the guidance services of the schools.
8. It may help in improving the training and development programmes, e.g. the training of teachers (pre-service and in-service) may be effectively improved.
9. It may prove an invaluable means for designing, controlling and improving the systems of non-formal and adult education.
10. Over and above, it may render valuable services in improving the quality of education in all its aspects and dimension.

Steps Involved in Systems Approach to Education

Generally, in adopting systems approach for the solution of the problems in education, the following steps are employed:

1. Identification of the problem.
2. Specification of objectives.
3. Analysis of the task involved in achieving the objectives.
4. Systems analysis—analysis of the input and constraints of the system in the context of the stipulated objectives.
5. System design and development—by generating alternative strategies (change in input, process or constraints).
6. Identification of preferred solution in a given context.
7. Operation and implementation of preferred solution.
8. Evaluation of the effectiveness of the performance in terms of the specified objectives.
9. Providing feedback in the light of the evaluation for bringing necessary improvement and modification.

Instructional system

The instructional work and activities being given inside a teaching-learning situation may be seen to work as a subsystem of the education system. However, in a particular teaching-learning situation, it may be found to work as a self-regulatory and independently functioning system along with its different constitutes or parameters as depicted in Fig. 18.3.

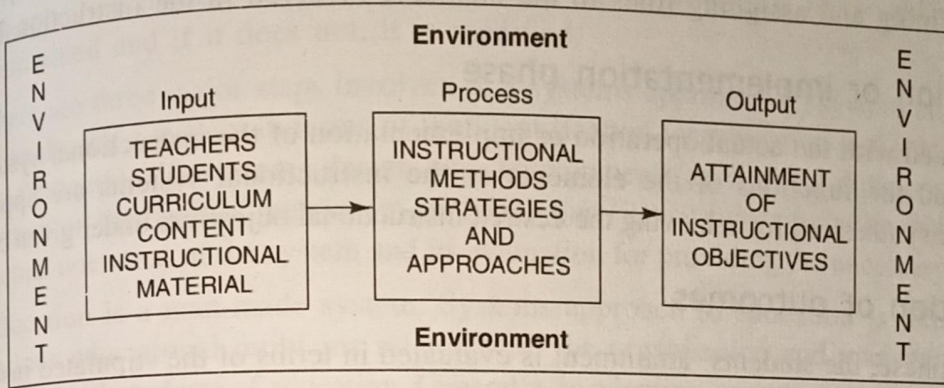


Figure 18.3 Structure of an instructional system.

systems Approach to the Instructional System

Systems approach to instructional system helps in understanding, controlling and improving the structure and functioning of the system in view of the effective realization of the instructional objectives. It helps in providing the best possible solution to the problems related to the planning, process and products of instruction.

Phase or Steps Involved

After analyzing the instructional system, Robb (1973) has marked three major phases in the system approach to the instructional system: planning, execution and evaluation. Now this number has been increased to six (Jalaluddin, 1981), as outlined below with a slight modification:

1. Formulation of objectives

This phase involves specification of instructional objectives in terms of the expected behavioural outcomes.

2. Pre-assessment of student-entering behaviour

In this, attempts are made to assess the entry behaviour or initial performance of the student with the help of suitable criterion.

3. Designing and development of the system

In the light of the instructional objectives and student-entering behaviour, what is to be

considered appropriate in terms of inputs is planned and designed in the development of an instructional system. It may involve the following aspects:

- Analysis of the task related to instruction.
- Devising suitable teaching strategies or methods.
- Selection of appropriate media and material.
- Selection and organisation of appropriate contents (learning experiences).
- Defining and assigning roles to the elements involved in the instructional system.

4. Operation or implementation phase

It is concerned with the actual operation or implementation of the instructional system. Here, the roles and the functions of the elements or the instructional systems are appropriately integrated or synthesized for achieving the desired instructional objectives under given conditions.

5. Evaluation of outcomes

Under this phase, the students' attainment is evaluated in terms of the stipulated instructional objectives on the basis of the post-test scores.

6. Improvement of the system

It is concerned with the improvement of the system on the basis of feedback from evaluation results aimed to improve its effectiveness in terms of specified objectives.

Thus, the technique of systems approach may be properly applied to understand, predict and control the elements and basic parameters of the educational system and its subsystems in a given situation to achieve specified objectives in the most economical and scientific ways. It provides opportunities to modify and improve the system as best as possible in the light of the evaluation of the outputs and outcomes in relation to inputs, processes, environmental constraints and stipulated objectives. A teacher may thus be able to develop a suitable instructional design in terms of planning and execution of his teaching task based on the feedback provided by the system approach.