

Unit 1.4 Cybernetics

Meaning, Use in the development
of Instructional design

Cybernetics

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- ✓ The term has been derived from a Greek Word *kybernetes* meaning steersman
- ✓ a person who provides the control system for a boat or ship.
- ✓ Steersman is able to regulate the working of his vehicle according to the communication (feedback)



Father of Cybernetics

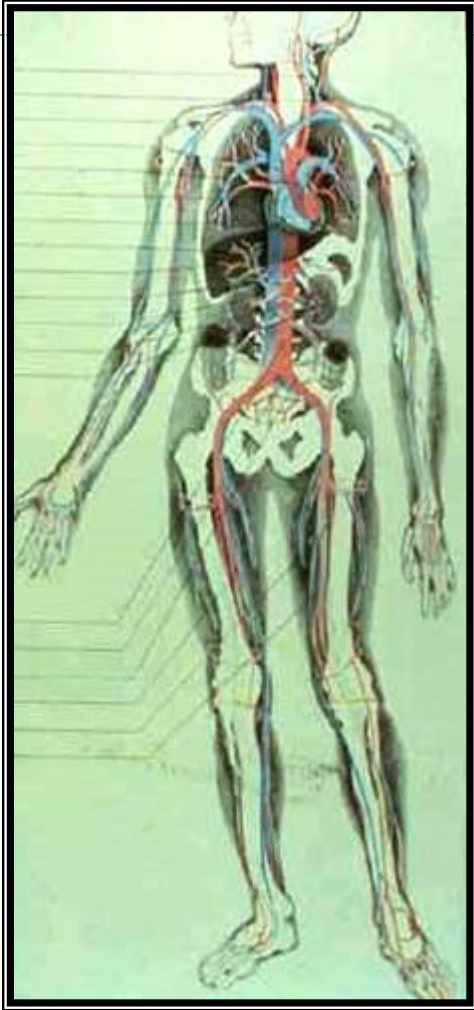
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This word was coined in 1948 and defined as a science by **Norbert Wiener**, who was born in 1894 and died in 1964. He became known as the Father of Cybernetics.



Human Body – Feedback Leading to System Regulation

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The human body is one of the richest sources of examples of feedback that leads to the regulation of a system.

For example, when your stomach is empty, information is passed to your brain.

Feedback – Corrective Action

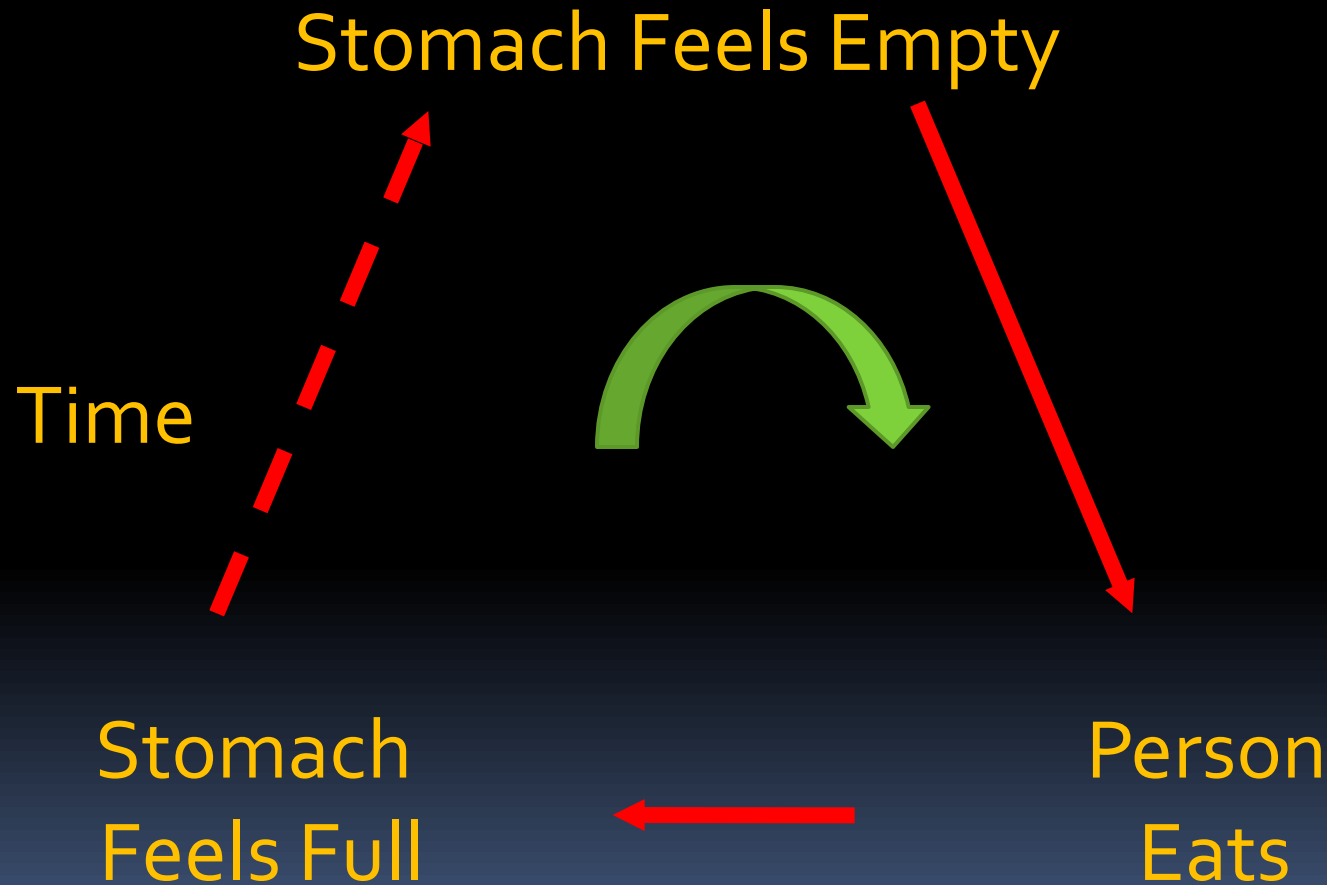
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When you have taken corrective action, by eating, your brain is similarly notified that your stomach is satisfied.



Feedback – Hunger Example

In a few hours, the process starts all over again. This feedback loop continues throughout our lives.



Cybernetics = Regulation of Systems

Cybernetics is the science of the regulation of systems.

Definition of Cybernetics

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- ***The science of communication and control that can help in building as a self-regulatory automatic feedback system similar to that found in animal, men and machines.***
- It stands for self- regulatory automatics system
- It is a science of communication and control
- It can modify its operation in the light of the feedback received by it through its output.

Cybernetics in education

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- Teacher is the steersman of the teaching-learning process
- He has to take along with him the pupils for reaching a set goal by steering out a learning path.
- The instructional system he/she chooses must be appropriately controlled.
- While working with system, if he gets feedback that the system is working properly in terms of output, it will be steered with no change.
- But if he gets communication that there is something wrong with the system, he will try to set it right.

Cybernetics in education

- He may have to bring changes in his own method of teaching, the size or quality of the content, or learning experiences, interaction with the students, etc. and again the system is put to work after being corrected.
- This is how a system is controlled by receiving proper communication and feedback about its functioning in right or wrong way.
- Our human body system are good examples of such regulatory system

Theoretical Ideas and Principles of cybernetics

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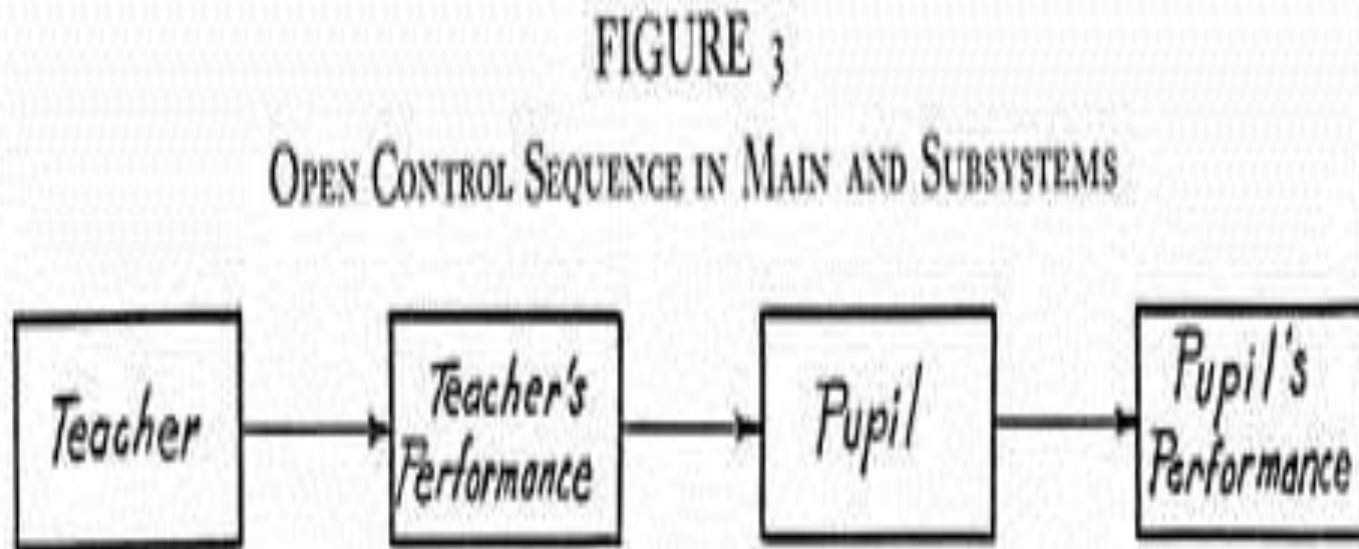
- 1. Any system has three basic elements – input, process, and output.**
 - The system needs something in the shape of men and material resources for its initial functioning. It is the input.
 - The process unit that works for modifying the input
 - Output is the unit for discharging the result of the process

2. The system can be classified as an open loop system and a closed loop system

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Open loop system:

It is not a self- corrective automatics system because it is not able to communicate and provide feedback about its working.



Closed Loop System

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Here the output system can be effectively returned as input for controlling the future output. It acts as feedback

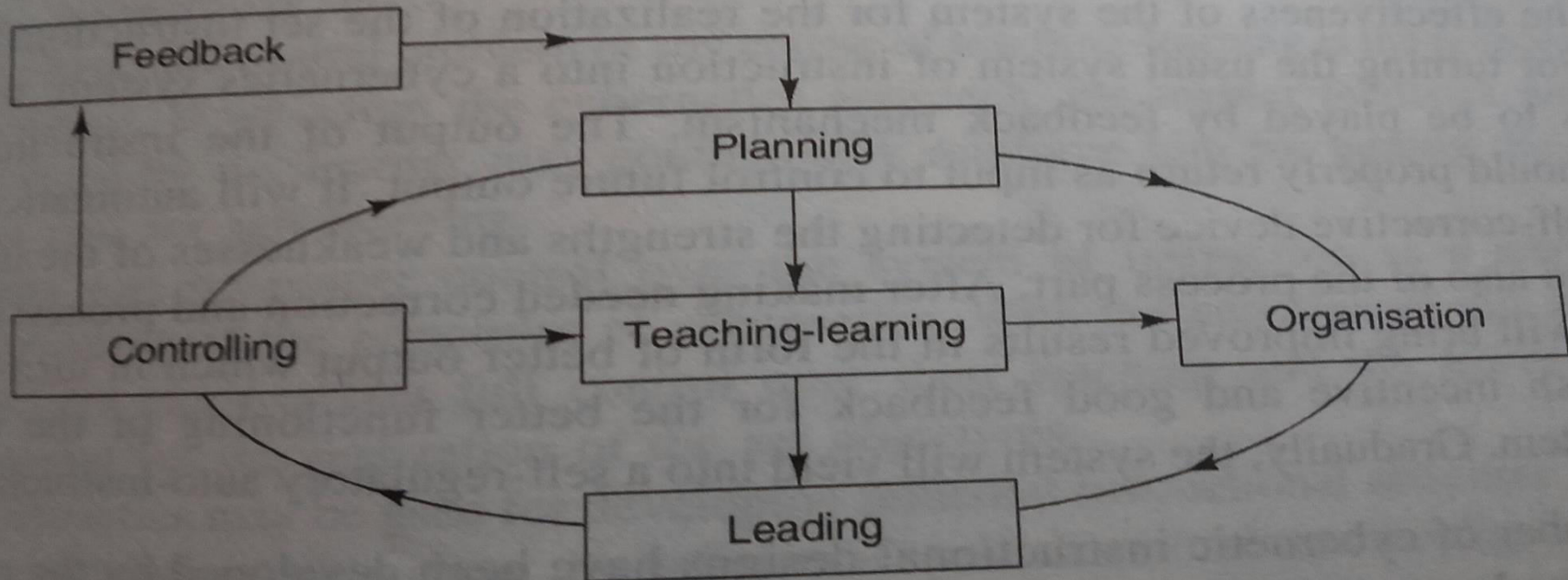


Figure 24.1 A closed loop system of cybernetics.

Closed loop system

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- Cybernetics stands for the closed loop system
- effective and dynamic feedback is available only in the closed loop system and it is the central nerve of the cybernetics approach.
- It is the communication machinery that alerts the system for adopting self-corrective device, control its working and making further necessary improvement in its functioning

3. The feedback mechanism in a cybernetics system

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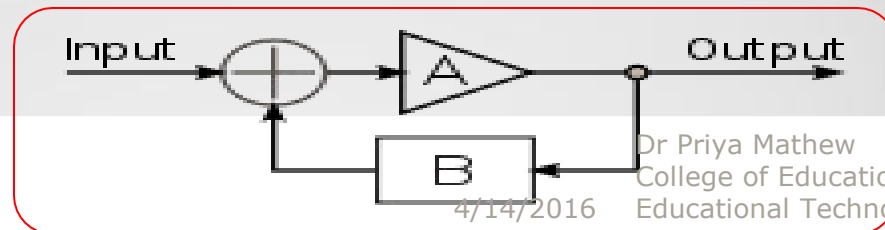
The feedback mechanism is responsible for the following three main functions:

- a. Generating actions of the system towards a goal
- b. Comparing the effect of this action with the most appropriate way and detecting deficiencies/errors to meet the goals.
- c. Utilizing the deficiency/error signals to redirect the system

The feedback mechanism is responsible for running system in a proper way and providing clues for bringing desirable improvement in it for effective realization of the objectives.

Use of Cybernetics in the development of Instructional Designs

- Cybernetics theory and mechanism can be properly applied to the process of instruction for making it a self-regulatory, self -corrective and auto-instructional system.
- How does it Happens????????????????????
- The teaching or instruction as a system have three major elements- input, process and output



Input elements of the instructional system

- The learning experiences (in the shape of set curriculum, syllabus, etc)
- their needs and entry behaviour
- the objectives of teaching
- the teacher
- the instructional methods
- the material and material resources
- the teaching – learning environment


Process part

- The actual instructional work will be carried out by involving and making use of the input material – human and physical.

Output part of instructional system

The outcomes of the instructional process in the form of

- students' responses
 - their gain in knowledge
 - acquisition of skills,
 - change in attitude, and interest, etc.
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- It will throw light on the effectiveness of the system for the realization of the set instructional objectives.



How to turn the usual
system of instruction to
cybernetics system ????

- The main role is the feedback system
- The output of the instructional process should properly return as input to control future output.
- It will automatically work as self-corrective device for detecting the strengths and weakness of the input elements and also the process part.
- After making needed correction and processing it afresh, it will bring improved result in the form of better output.
- Again this output will provide fresh incentive and good feedback for the better functioning of the instructional system.
- Gradually the system will yield into a self-regulatory auto-instructional system.

Example for cybernetics instructional designs

- Keller Plan or personalized System of Instruction (*Refer Chapter 21 in Essentials of Educational Technology by S.k Mangal & Uma Mangal*)
- Programmed learning materials
- Computer assisted instruction
- Micro teaching

Keller Plan

- The learning material is divided into units
- Each unit is comprehensive and meaningful to be completed in a week's duration
- The course included in the unit consists of :
 - The teacher –generated reading material
 - A study guide with an approach plan based on stated behavioral objectives
 - four sets of evaluation material (equivalent in terms of testing and difficulty level)

Procedure in Keller Plan

- Students go through the reading materials with own pace.
- Take the help of study guide for their independent study.
- The study guide may suggest them original texts, articles, sources, reading materials, activities to be done, etc.
- After going through a unit they have to be evaluated
- On their request they are to be given randomly one of the four test
- The result of the test are transferred to them by concerned tutor.
- The output work as input in the form of proper feedback for bringing self-correction and improvement to the individual learner.

Application and advantages of Cybernetics in Education

- Principles of cybernetics is applied to classroom instruction as well as individual instruction
- The teaching and instructional process can be made self-regulatory and auto-instructional by properly adopting the mechanism of feedback.
- The regular feedback received by the learner may reinforce him for getting due motivation and zeal for self-learning
- Enable the teacher to understand fundamental mechanism that controls learning
- Principle is used for providing remedial instruction or individualized instruction material.

Application.....

- Teacher education program can be improved by employing the mechanism of feedback devices for modification of teacher behaviour.
- The innovative practices such as micro teaching, simulated teaching, interaction analysis, etc. are based on theory of feedback
- Input, process, and output helps teacher to better understand and analyse teaching in scientific manner and helps them in their self-improvement
- Teaching activities can be made highly structured and well organized.