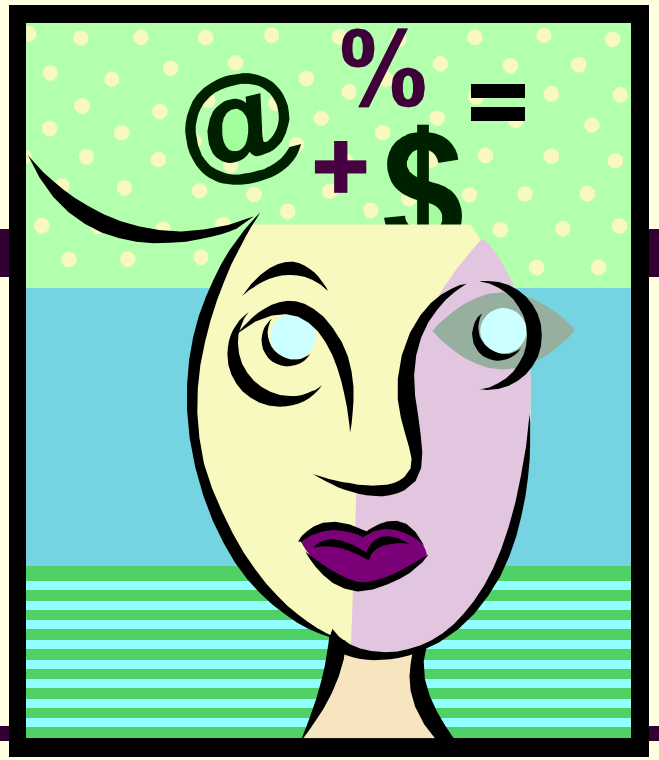
Integrating Educational Technology into Teaching

Learning Theories and Integration Models



Two different views on teaching and learning

- Objectivists
  - Behaviorist learning theory
  - Information-processing branch of the cognitive learning theories
- Constructivist

Objectivists

Knowledge has a separate, real existence of its own outside the human mind. Learning happens when this knowledge is transmitted to people and they store it in their minds.

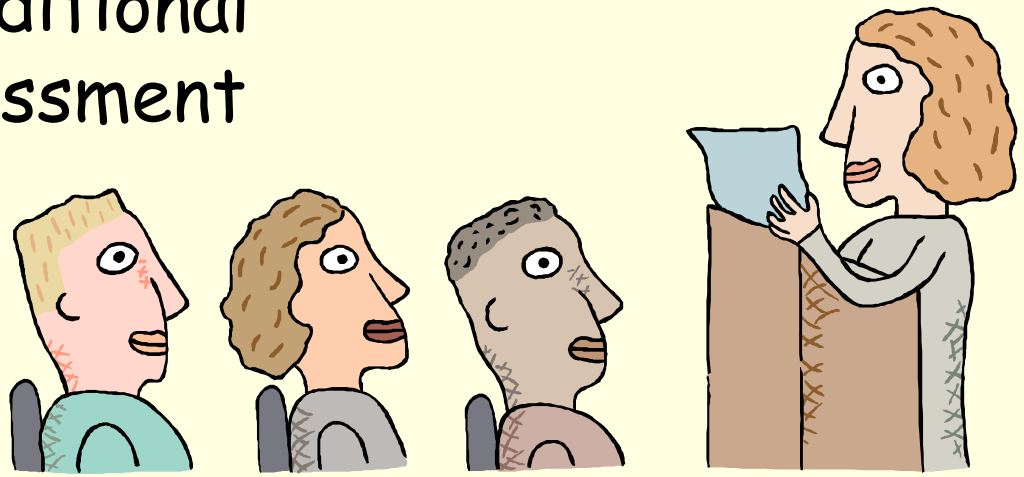
- Learning is transmitted knowledge
- Teaching should be teacher-directed, systematic, and structured.
- Constructivist approaches are inefficient.
- Discovery learning is too unstructured and unsystematic.

Directed Instruction Characteristics

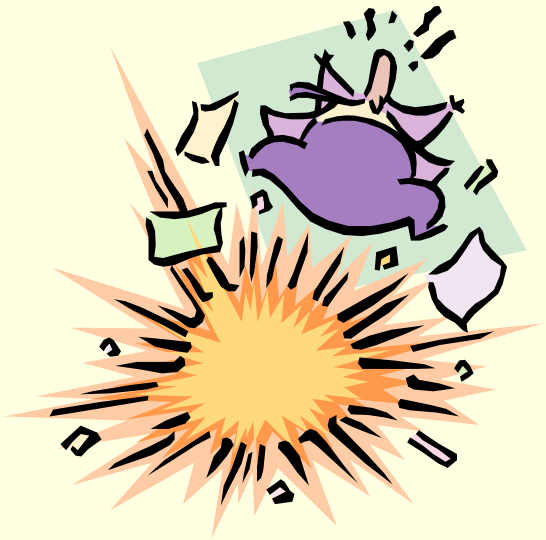
- Focus on teaching sequences based on prerequisite skills
- Clear objectives with matching test items

Directed Instruction Characteristics

- Stresses individualized work
- Emphasizes traditional teaching & assessment methods



Criticism



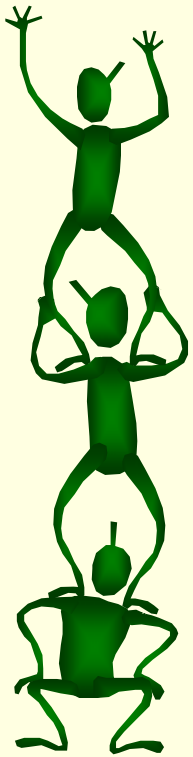
- Students Cannot Do Problem Solving
- Activities Unmotivating
- Students Cannot Work Cooperatively
- Students cannot apply skills

Characteristics of the **Constructivist** learning model

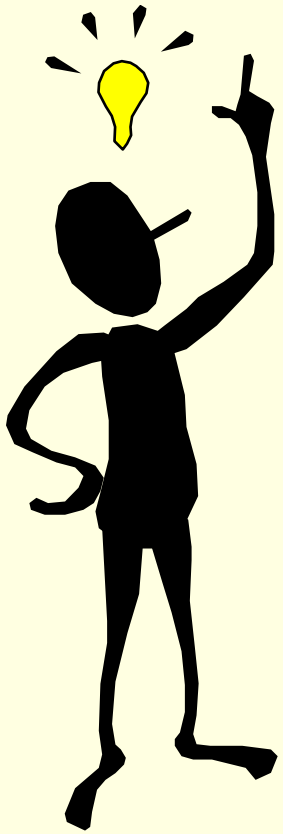
1. Focus on learning through posing problems, exploring possible answers, and developing products and presentations.
2. Pursue global goals that specify general abilities such as problem-solving and research skills.
3. Stress more group work than individualized work.
4. Emphasize alternate learning and assessment methods: a. exploration of open-ended questions and scenarios b. doing research and developing products c. assessment by student portfolios d. performance checklists, and tests with open-ended questions

Theoretical Foundations

Directed Instruction



Learning Theories



- Behaviorism: Skinner
- Information-processing: Atkinson & Shiffrin
- Teaching Guidelines: Gagné
- Instructional Design System Approaches

Behaviorism
B. F. Skinner

Skinner’s theory is based upon the idea that learning is a function of change in overt behavior. Changes in behavior are the result of an individual's response to events (stimuli) that occur in the environment.

Skinners and others viewed the teacher’s job as modifying the behaviour of students.

Behaviorism
B. F. Skinner

Situations which can shape behaviour:
Behaviour modification techniques in classroom management

- Positive reinforcement
- Negative reinforcement
- Punishment

Programmed instruction

Programmed instruction is characterized by clearly stated behavioral objectives. It forms the basis of effective drill and practice and tutorial courseware

Behaviorism

Implications for Technology Integration

- Development of drill and practice software (To increase the frequency of correct answering in response to stimuli.)
- Tutorial software (Programmed instruction. It gives students an efficient path through concepts they want to learn)

Information Processing

Atkinson and Shiffrin (1968)

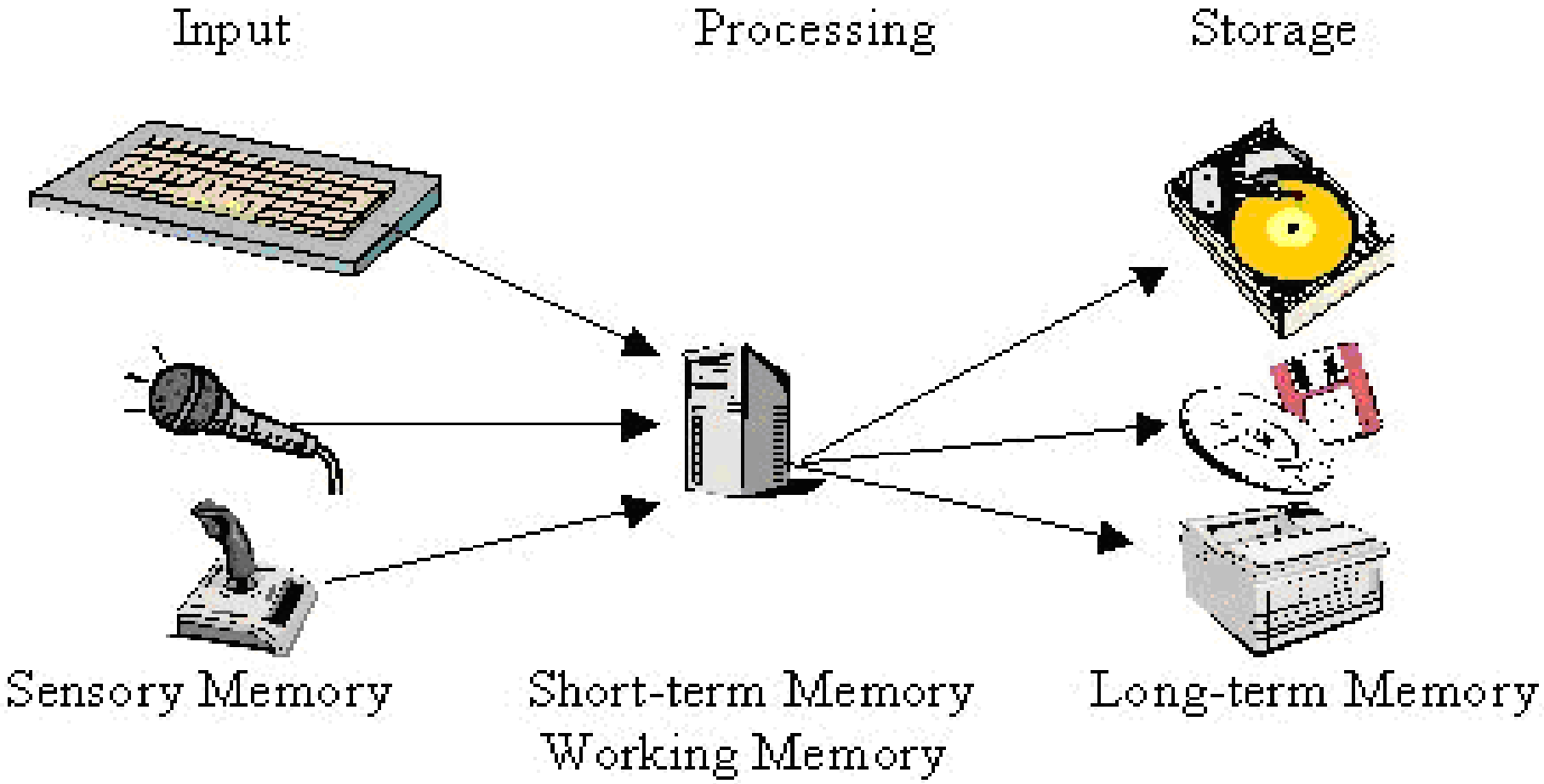
Developed from a branch of cognitive psychology that focused on the memory and storage processes that make learning possible. They viewed the process of learning in humans similar to that of how a computer processes information.

Information Processing

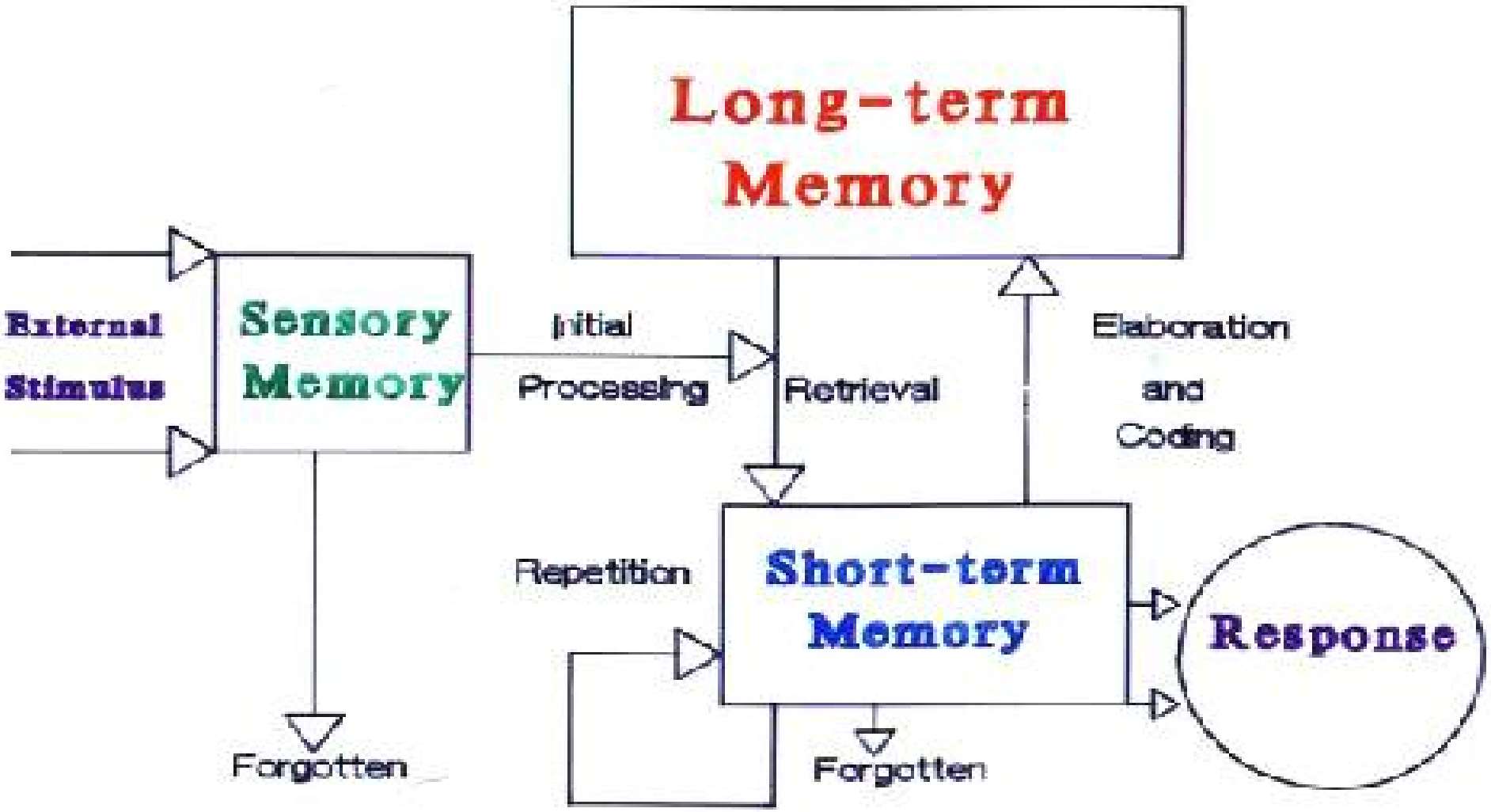
Atkinson and Shiffrin (1968)

- Sensory Registers (The part of memory that receives all the information a person senses)
- Short-term-memory (STM) (The part of memory where new information is held temporarily until it is either lost or placed in long term memory)
- Long-term-memory (LTM) (The part of memory that has an unlimited capacity and can hold information indefinitely)

Information Processing



Information Processing



Information Processing
Implications for Technology Integration

1. Guided the development of artificial intelligence applications
2. Much drill and practice software is designed to help students encode and store newly learned information into long-term memory.

Gagné Principles

Gagné built on the work of behavioral and information processing theorists by translating principles from their learning theories into practical instructional strategies that teachers could employ with directed instruction.

- Events of instructions
- Types of learning
- Learning Hierarchies

Gagné Principles

Events of instructions

1. Gaining attention
2. Informing the learner of the objective
3. Stimulating recall of prerequisite learning
4. Presenting new material
5. Providing learner guidance
6. Eliciting performance
7. Providing feedback about performance
8. Assessing performance
9. Enhancing retention and recall

Gagné Principles
Types of learning

- Intellectual skills
- Cognitive strategies
- Verbal information
- Motor skills
- Attitudes

Gagné Principles
Learning Hierarchies

- Lower level skills provide a necessary foundation for higher level ones.

Gagné
Implications for technology Integration

The nine events of instruction can be used to plan lessons using each kind of instructional software (drill, tutorial and simulation).

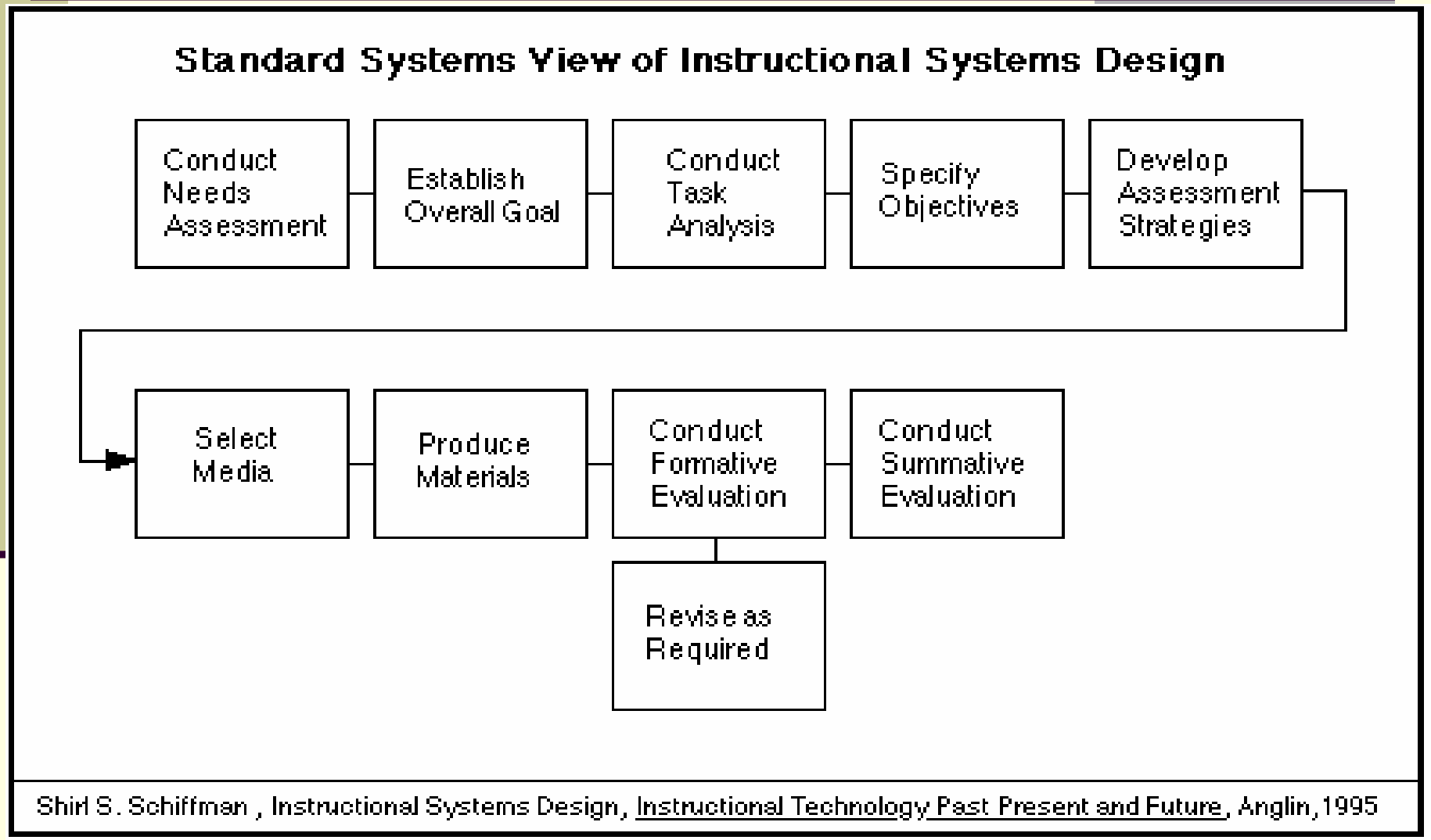
Systematic Approach

Instructional Systems Design (ISD) is a systematic approach that examines instruction, identifies ways to teach, and evaluates results. The ISD process translates general principles of learning and instruction into plans for instructional materials and learning.

Instructional-Design Theory

An instructional design theory is a theory that offers explicit guidance on how to better help people learn and develop. The kinds of learning may include cognitive, emotional, social, physical and spiritual.

Systematic Approach



Systematic Approach

Reigeluth's Elaboration Theory

Reigeluth's Elaboration Theory help users "select and sequence content in a way that will optimize the attainment of learning goals" . Instruction should be organized in increasing order of complexity for optimal learning.

Epitomizing means finding the simplest version of the task that is to be taught that is still representative of the entire task.

Elaborating means teaching students increasingly complex versions of the task.

Systematic Approach

When teaching a procedural task, the simplest version of the task is presented first; subsequent lessons present additional versions until the full range of tasks are taught. In each lesson, the learner should be reminded of all versions taught so far (summary/synthesis). A key idea of elaboration theory is that the learner needs to develop a meaningful context into which subsequent ideas and skills can be assimilated.

Systematic Approach
Implications for technology Integration

Most directed models for using technology resources are based on systems approaches

ASSURE and ADDIE models

Theoretical Foundations

Constructivism

Constructivism

Constructivists believe that humans construct all knowledge in their minds by participating in certain experiences; learning happens when one constructs both mechanisms for learning and his or her own unique version of the knowledge, colored by background, experience, and aptitudes (Sfard, 1998; Willis, 995).

Constructivism (continued)

Constructivist goals focus on students' ability to solve real-life, practical problems, and its method calls for students to construct knowledge themselves rather than receiving it from knowledgeable teachers .

Characteristics of the **Constructivist** learning model

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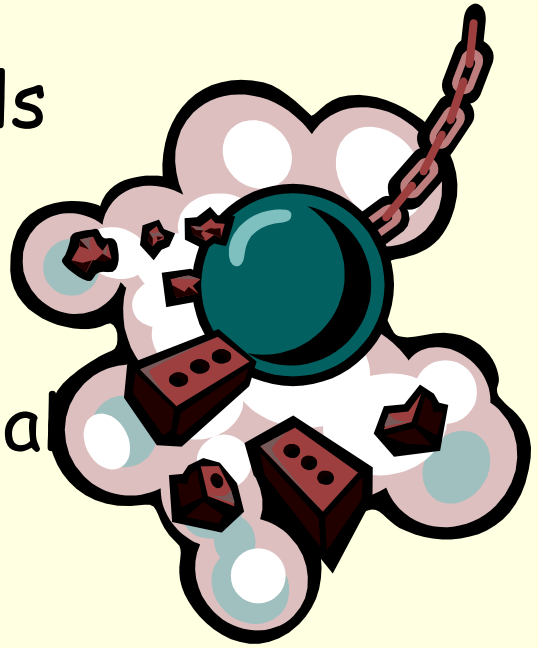
Criticism

- How to Certify Learned Skills
- Need for Prior Knowledge
- Which Topics Suit Methods
- Transfer of Skills to Practical Situations



Learning Theories

- Social Constructivism: Dewey
- Scaffolding: Vygotsky
- Stages of Development: Piaget
- Discovery Learning: Bruner
- Multiple Intelligences: Gardner

Social Constructivism
Dewey

Centre student instruction around relevant, meaningful activities.

- Curriculum should arise from students' interest
- Curriculum topics should be integrated rather than isolated from each other
- Education is growth rather than an end in itself
- Education occurs through its connection with life, rather than through participation in curriculum
- Learning should be hands-on and experienced based, rather than abstract

Social Constructivism
Implications for technology Integration

- Internet – used to help students communicate with each other and learn more about their society.
- Cooperative learning – using technology to facilitate cooperative learning

Scaffolding Theory
Vygotsky

Vygotsky felt that **cognitive development** was directly related to and based on social development. Key elements of his theory were:

- **social impact**
- **zone of proximal development.**
- **scaffolding**

Scaffolding Theory
Implications for technology Integration

Many of the more visual tools, from logo to virtual reality, are used under the assumption that they can help bring the student up from their level of understanding to a higher level by showing graphic examples and by giving them real-life experiences relevant to their individual needs.

Child Development
Piaget

Piaget's theories were based on **cognitive development and functioning**. He believed that all children go through 4 stages of cognitive development and not all at the same ages. The 4 stages and ages that they typically occur in are:

- **Sensorimotor(birth-2)**
- **Preoperational(2-7)**
- **Concrete Operational(7-11)**
- **Formal Operational(12-15)**

Piaget's Theory
Implications for technology Integration

Many technology-using teachers feel that using visual resources such as logo and simulations can help raise children's developmental levels more quickly than they would have occurred through maturation, thus children who use these resources can learn higher level concepts which they would not have been able to understand until they reached a higher level of maturity.

Discovery Learning
Bruner

This is an approach to instruction through which students interact with their environment. He was interested in children's stages of **cognitive development**. He described development in three stages:

- **Enactive** Stage (from birth to about age 3)
- **Iconic** Stage (from about age 3 to about age 8)
- **Symbolic** Stage (from about age 8 upwards)

Discovery Learning
Implications for technology Integration

Many of the more **"radical constructivist"** uses of technology employ a discovery learning approach. For example, rather than telling students how logic circuit works, a teacher might allow students to use a simulation that lets them discover the rules themselves.

Multiple Intelligence Gardener

Howard Gardner is a **constructivists** that attempts to define the role of **intelligence in learning**. Gardner's eight intelligences are:

- **linguistic** (writer, journalist, poet),
- **musical** (composer, pianist, conductor),
- **logical-mathematical** (scientist, mathematical, doctor,)
- **spatial** (artist, sculptor, graphic artist),
- **bodily-kinesthetic** (dancer, athlete, watchmaker),
- **intrapersonal** (self-aware/self- motivated person),
- **interpersonal** (psychologist, therapist, salesperson),
- **naturalist** (botanist, biologist).

Multiple Intelligence
Implications for technology Integration

- Supports group work
- Good tool for visual learners

Integration Strategies

Directed Models

- Provides Skill Remediation
- Provides Mastery & Fluency
- Provides Systematic Self-instruction

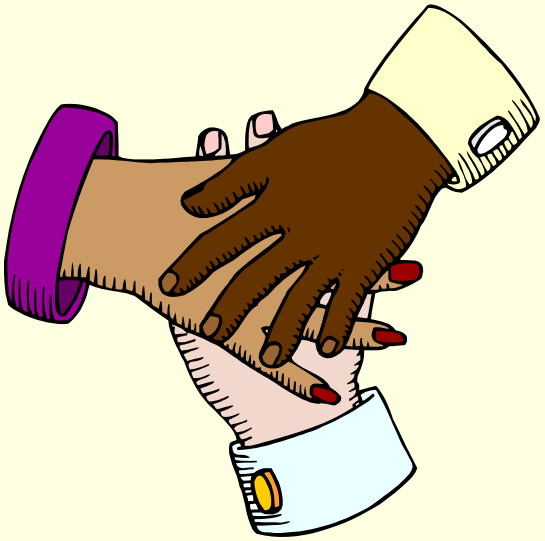
Constructivist Models

- Fosters Creativity
- Fosters Inductive Thinking & Problem Solving
- Fosters Metacognition

Constructivist Models

- Increases transfer of knowledge to problem solving
- Fosters group cooperation
- Allows for multiple & distributed intelligences

Both Models



- Increase motivation
- Optimize learning resources
- Remove logistic hurdles to learning
- Foster communication skills and information & visual literacy

Technology Integration Planning model

Phase 1: Determining the “Relative advantage” – Why use Technology?

Phase 2: Planning Assessments – What are appropriate assessment strategies?

Phase 3: Planning Instruction – What are appropriate integration strategies?

Phase 4: Logistics – How do I prepare the classroom environment and instructional materials?

Phase 5: Evaluating and Revising Integrating Strategies- How do I know its working?