



Learning Theories



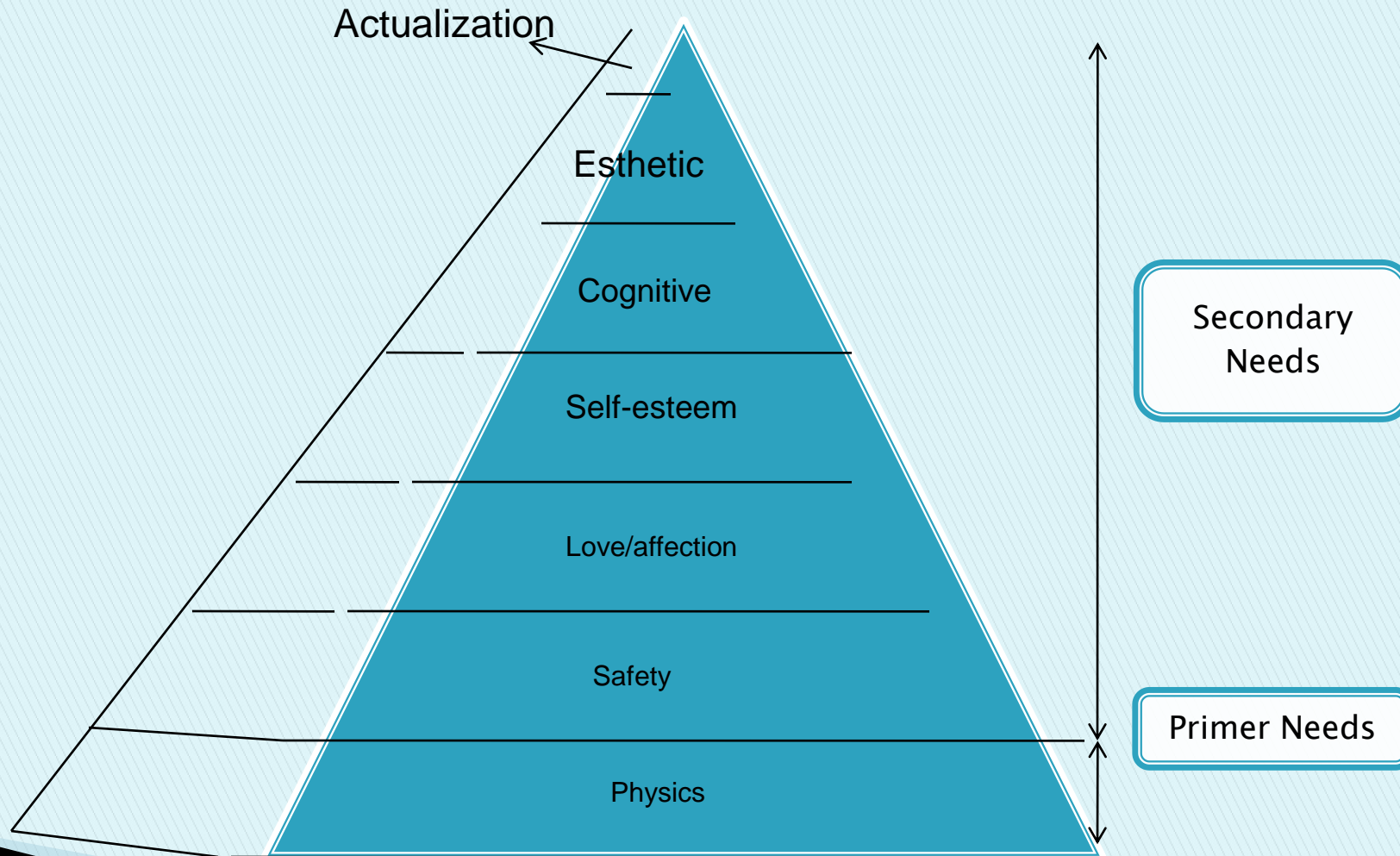
Definition of Learning

- ❑ **Learning is an** alteration of behavior as a result of individual experience. When an organism can perceive and change its behavior, it is said to learn.
- ❑ “Learning is a relatively permanent change in a behavioral tendency and is the result of reinforced practice.” (Kimble & Garmezy, *Principles of General Psychology*, 1963:133)
- ❑ Learning is a persisting change in performance or performance potential that results from experience and interaction with the world (Marcy P. Driscoll)

What is Learning Theory

Learning theory is a set of laws and principles about learning (Marcy Driscoll)

Example: Hierarchy of Maslow



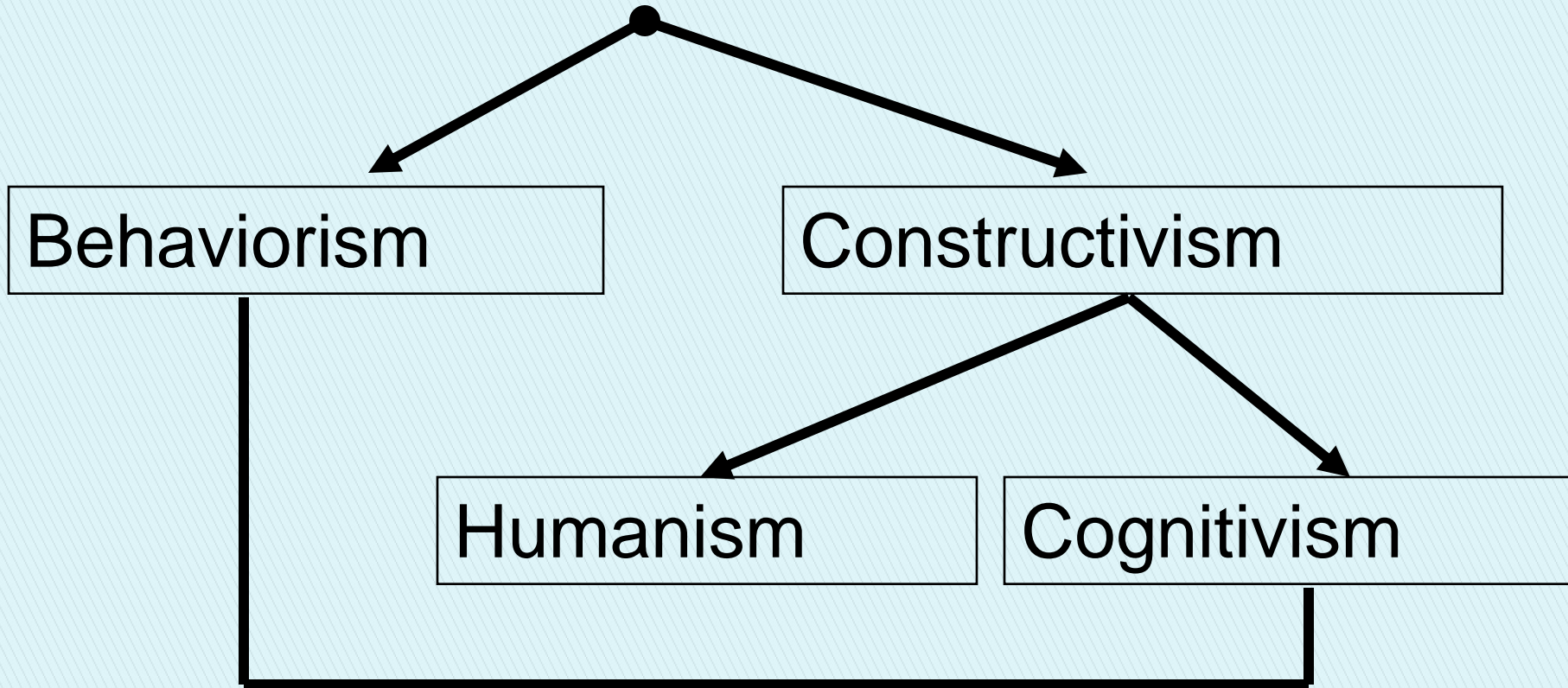
Why Study Learning Theories?

- Understand the rational (theories) behind common teaching practices
- Theories as guide and inspiration for different teaching techniques
- Theories provide language of the teaching profession; discuss education issues with colleagues

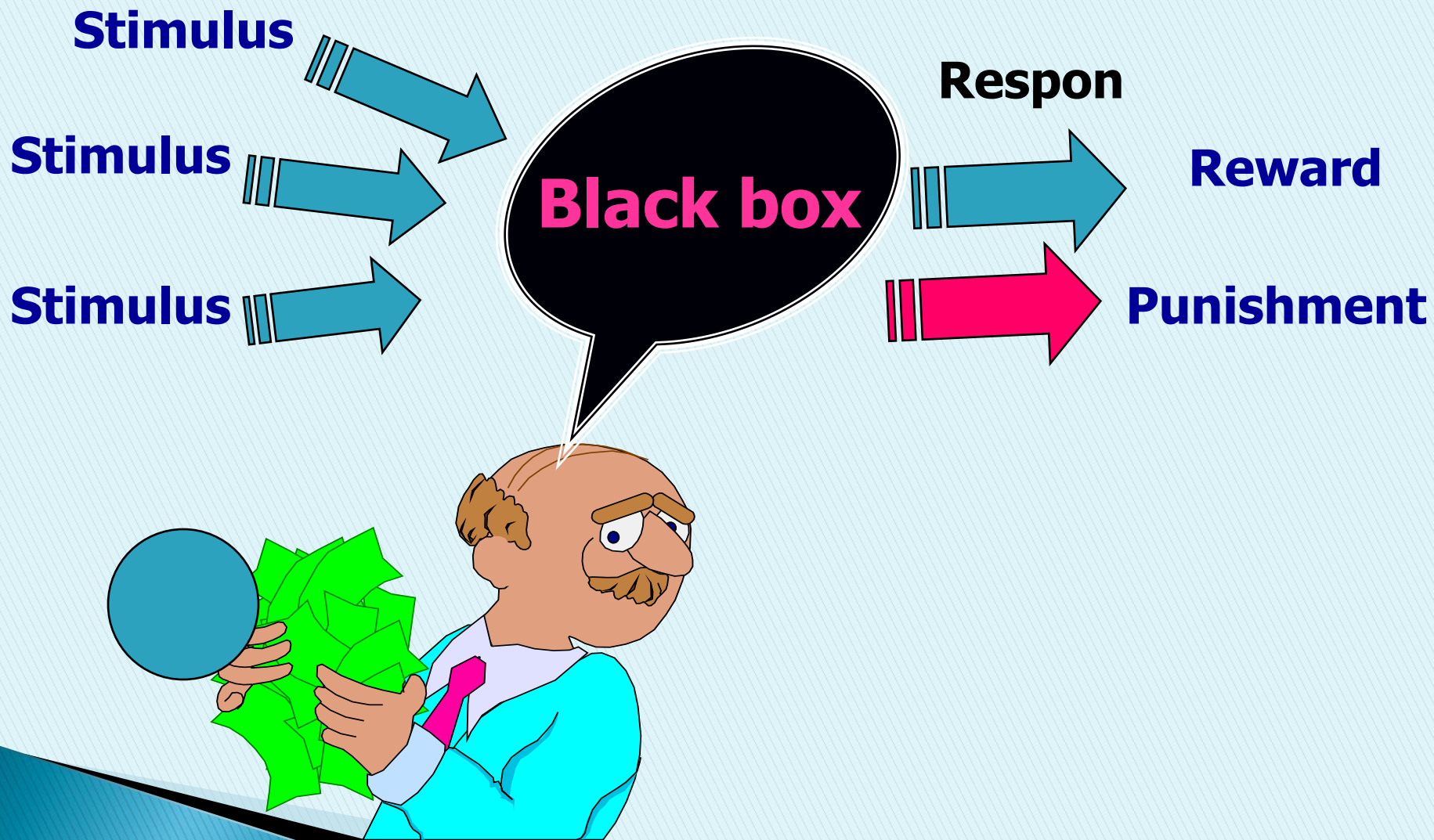
Major Learning Theories

- ❑ Behavioristic theories
 - Classical behaviorism
 - Pavlov's classical conditioning
 - Thorndike's instrumental conditioning
 - Watson's behaviorism
 - Neobehaviorism
 - Guthrie's S-R theory
 - Hull's S-R theory
 - Skinner's operant conditioning
- ❑ Constructivistic theories
 - Gestalt psychology
 - Piaget's developmental psychology
 - Ausubel's theory of meaningful learning

Learning Theories

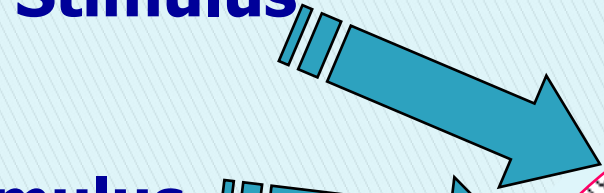


Behaviorism

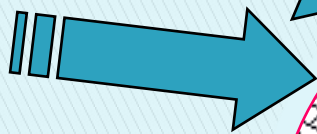


CONSTRUCTIVISM

Stimulus



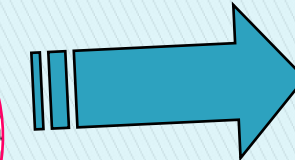
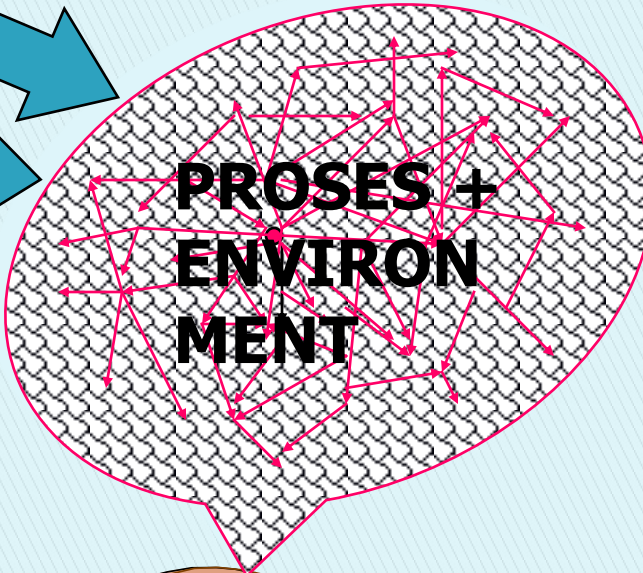
Stimulus



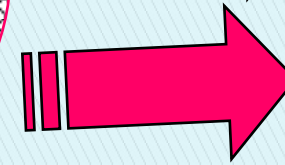
Stimulus




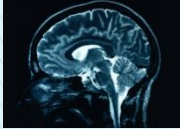
**PROSES +
ENVIRON
MENT**



Respon



Behaviorism vs Cognitivism

Attribute	Behaviorism 	Cognitivism 
Behaviors	The end in themselves- the only observable truth	Evidence pointing to brain activity- learning
Activation of Prior Knowledge	Irrelevant	Essential
Teachers role	Provide stimulus	Prepare environment

BEHAVIORISME

TEORI BELAJAR BEHAVIORISME

Study tentang

p b m

Tingkah laku teramati

Latihan berulang/*drill*

Belajar: S - R

Motivasi ekstrinsik

Belajar jika:

- ada stimulus
- siap mental

Hasil belajar:

- *Well-structured knowledge*
- *Basic skills*

- *Teacher-centered*
- *Direct instruction/Active teaching/*
Mastery teaching

Behaviorism

- ❑ Not much interested in how people “think” mentally
- ❑ Primarily concerned with observable behavior, I.e., what happens before and after learning
- ❑ In this sense, behavioral instruction (direct instruction, programmed learning, etc.) is mostly concerned with what the teacher does

Behaviorism Keys

- ❑ **Deterministic**- The way you act is determined by external stimuli provided by the culture in which you live.
- ❑ **Observable**- Over time the individual develops a “behavioral repertoire” (Steinberg, 1980) that can be used to predict behavior.
- ❑ **Controllable**- Desirable behaviors can be brought about by incentives or rewards; undesirable behaviors can be eradicated by consequences or punishment.

Behaviorism: Traditional

Scenario

- Teacher explain and demonstrate how to perform a rule, e.g., $34 + 47 = 81$
- Pupils listen and pay attention
- Pupils practice rule with other examples
- Teacher rewards those who can do
- Teacher re-explain to those who make mistakes

Behaviorism: Traditional

Behaviourism: Traditional

Stimulus → Response

$12 \times 12 = \dots$

$13 \times 12 - 12 = \dots$

Behaviorism: Traditional

- ❑ Traditional chalk and talk method:
explain → practice → feedback
- ❑ Based on behaviourism: learning consist of change in observable, measurable behaviours based on stimulus (S) and responses (R)

Ivan Pavlov

Ivan Petrovich Pavlov (1849–1936)

- ❑ Russian physiologist and Nobel laureate, best known for his studies of reflex behavior.
- ❑ He was born in Ryazan', and educated at the University of Saint Petersburg and at the Military Medical Academy, Saint Petersburg; from 1884 to 1886 he studied in Breslau (now Wroclaw, Poland) and Leipzig, Germany. Before the Russian Revolution he served as director of the department of physiology at the Institute of Experimental Medicine (part of the present Academy of Medical Sciences), Saint Petersburg, and professor of medicine at the Military Medical Academy.



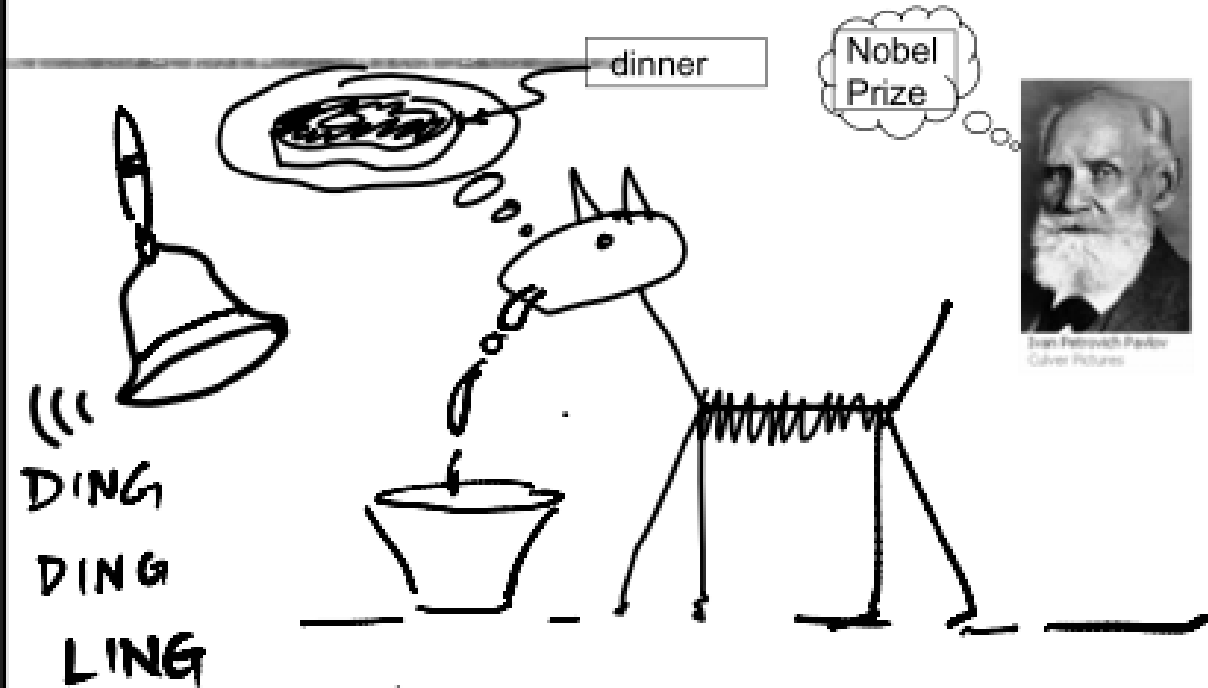
"Next time there's a
revolution, get up
earlier!"
Ivan Pavlov

Ivan Petrovich Pavlov

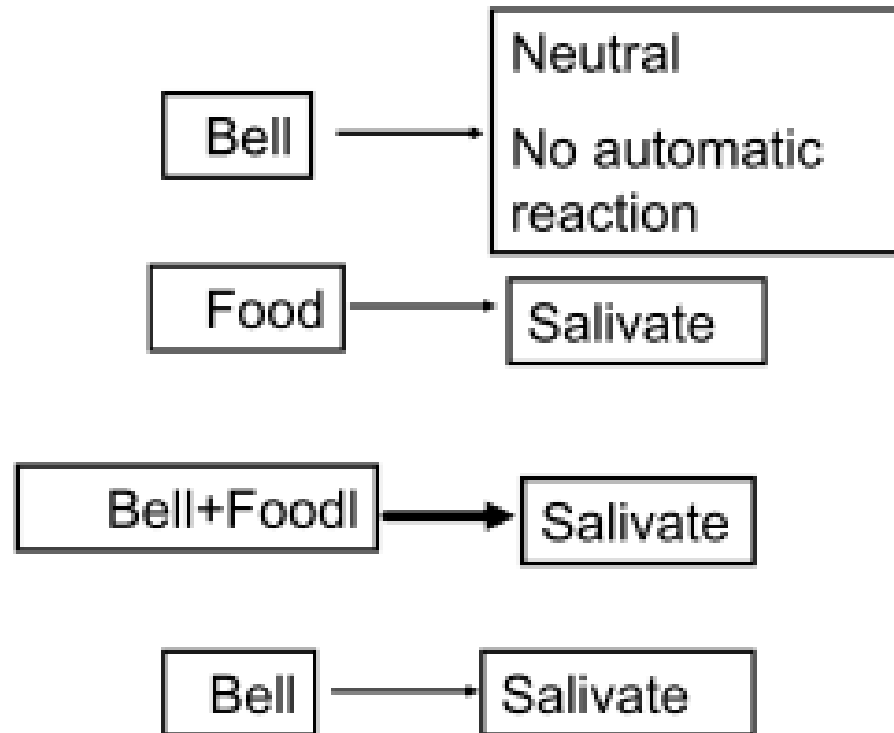
- ❑ In spite of his opposition to Communism, Pavlov was allowed to continue his research in a laboratory built by the Soviet Government in 1935.
- ❑ Pavlov is noted for his pioneer work in the physiology of the heart, nervous system, and digestive system. His most famous experiments, begun in 1889, demonstrated the conditioned and unconditioned reflexes in dogs, and they had an influence on the development of physiologically oriented behaviorist theories of psychology during the early years of the 20th century.
- ❑ His work on the physiology of the digestive glands won him the 1904 Nobel Prize in physiology or medicine. His major work is *Conditioned Reflexes* (1926; trans. 1927).

Ivan Pavlov and Dog

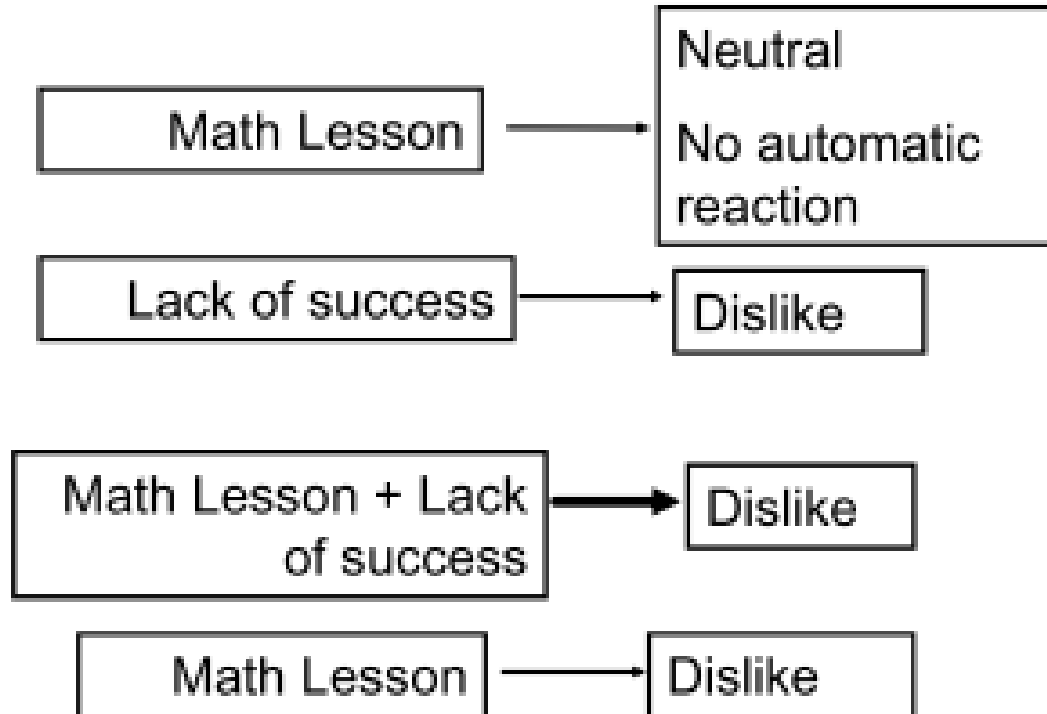
Ivan Palvov (and dog)



Pavlovian Conditioning



Palvovian Conditioning



Implications

Try connect mathematics and its teaching and learning with something that generate positive feelings – pride, pleasant, fun, enjoyable, sense of achievement, etc.

Behaviorism

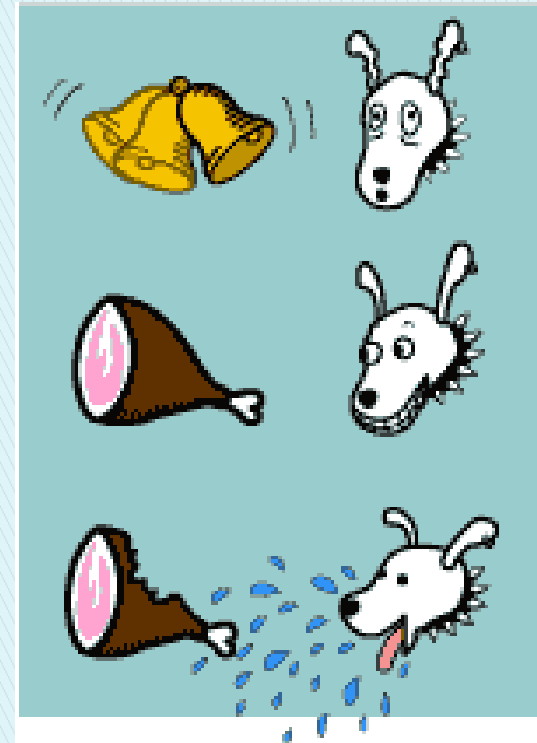
Key Players:

1. Pavlov (and Watson) – Classical Conditioning
2. Thorndike – Connectionism
3. Skinner – Operant Conditioning
4. Bandura – Observable Learning and Modeling
5. Gagné – Hierarchical Learning

Pavlov

(1849 – 1936)

- Pavlov was the first to demonstrate Classical Conditioning.
- He is best known for his experiment with salivating dogs.
- Classical Conditioning
 - Eliciting an unconditioned response by using previously neutral stimuli.
 - Unconditioned stimuli create reflexes that are not “learned,” but are instinctual.
 - Neutral and unconditioned stimuli are introduced at the same time. Unconditioned stimuli are gradually removed, and the neutral stimuli elicit the same reflex.



"Pavlov's Drooling Dogs." [Online image] 1 February 2009.
<http://http://nobelprize.org/educational_games/medicine/pavlov/readmore.html>

Watson

- ▶ Behavior berarti tindakan (action) yang dapat dilihat dan diamati dengan cara yang obyektif
- ▶ Belajar adalah proses membentuk hubungan S-R
- ▶ Kekuatan hubungan S-R tergantung pada frekuensi ulangan adanya S-R
- ▶ Pentingnya drill dalam pembelajaran

Torndike

- ▶ Hubungan S–R diperkuat oleh reinforcement (pujian/ganjaran)
- ▶ Dalam menjelaskan suatu konsep, guru hendaknya mengambil contoh yang sering dijumpai dalam kehidupan sehari–hari.
- ▶ Metode pemberian tugas dan metode latihan (drill and practice) akan lebih cocok.
- ▶ Dalam kurikulum, materi disusun dari yang mudah–sedang–sukar sesuai dengan tingkat kelas, dan tingkat sekolah.

Skinner

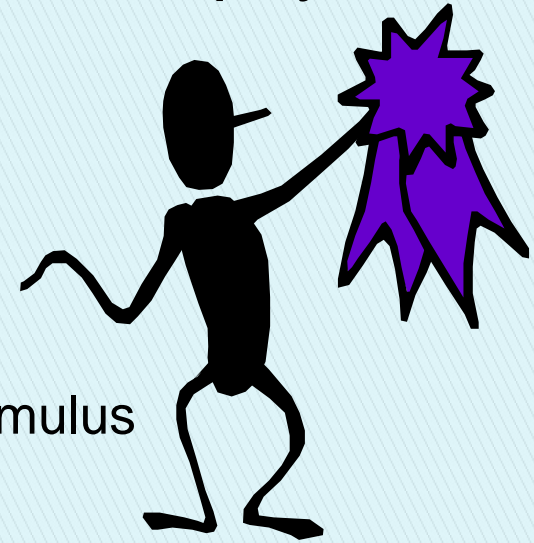
- ▶ Teori operant conditioning
- ▶ Tingkah laku tidak hanya respon dari stimulus, tetapi suatu tindakan yang disengaja

- ▶ Replaced behaviorism as dominant philosophy in 1960's

- ▶ 1. Criticisms of Behaviorism:

Did not explain:

- language learning
- why people respond differently to the same stimulus
- reinforcement can reduce motivation



- ▶ 2. Popularity of newly discovered theories of Piaget and Vygotsky in the 50's and 60's

KONSTRUKTIVISME

Tokoh-tokoh konstruktivisme

- ▶ Kognitivisme: Koffka, Kohler, Wetheimer, Ausubel, Piaget, Bruner, dan Dienes;
- ▶ Humanisme: Vygotsky

Pandangan Konstruktivisme:

Belajar adalah:

- **proses aktif dan konstruktif yang terjadi di lingkungan luar kelas**
- **mengubah informasi menjadi proses mental**
- **membangun pengetahuan dan pengertian dari pengalaman pribadi**
- **mengaitkan pengetahuan baru dg pengalaman lama (asimilasi)**
- **membangun pengetahuan baru dr fenomena lama (akomodasi)**
- **proses kognitif untuk memecahkan masalah dunia nyata, menggunakan alat yang tersedia dalam situasi pemecahan masalah**
- **bersifat situasional, interaktif**
- **bekerja dengan teman dalam konstruksi sosial yang berarti bagi dirinya**
- **proses pribadi terus-menerus untuk memonitor kemajuan belajar**

Pandangan Konstruktivisme (lanjutan):

Pengetahuan:

- merupakan interpretasi manusia terhadap pengalamannya tentang dunia**
- bersifat perspektif, konvensional, tentatif, evolusioner**
- ada di dalam pikiran manusia (bukan di buku teks)**
- pengetahuan/konsep baru dibangun:**
 - + bertahap dari waktu ke waktu**
 - + dalam konteks sosial**
 - + interaksi dengan konten**
 - + dengan mengintegrasikan info lama dg info baru**
 - + dengan kesadaran ttg apa yang dipelajari (metakognisi)**

TEORI BELAJAR KOGNITIVISME

Studi tentang

p - b - m

**Proses/
perubahan kognitif**

**Belajar:
interaksi/adaptasi dg
lingkungan**

**Belajar:
Asimilasi – Akomodasi –
Ekuilibrium**

Perkembangan kognitif

Hasil belajar:

- *Perkembangan struktur kognitif*
- *Life skills*
- *Adult role behaviors*
- *Self-regulated learning*

Pembelajaran:

- **Konstruktivisme**
- **Diskoveri-inkuiri**
- **PBL**
- **Kontekstual/STS/Salingtemas**

Teori Gestalt: Koffka, Kohler, Wetheimer

- ▶ Hukum pragnanz: organisasi psikologis selalu cenderung untuk bergerak ke keadaan penuh arti.
- ▶ Hukum kesamaan: hal-hal yang sama cenderung akan membentuk Gestal (kesatuan)
- ▶ Hukum keterdekatan: hal-hal yang saling berdekatan cenderung membentuk kesatuan
- ▶ Hukum ketertutupan: hal-hal yang tertutup cenderung membentuk kesatuan
- ▶ Hukum kontinuitas: hal-hal yang kontinu atau berkesinambungan akan cenderung membentuk kesatuan

Ausubel (Meaningful instruction – pembelajaran bermakna)

- ▶ Bahan pelajaran akan lebih mudah dipahami jika bahan itu dirasakan bermakna bagi siswa
- ▶ Kebermaknaan: sesuai dengan struktur kognitif, sesuai struktur keilmuan, memuat keterkaitan
- ▶ Seluruh bahan (ihtisar/resume/rangkuman/ringkasan/bahan/peta)
- ▶ Peta konsep adalah bagan / struktur tentang keterkaitan seluruh konsep secara terpadu / terorganisir (herarkhis, distributive/menyebar)

Jean Piaget

(Teori Perkembangan Kognitif)

- ▶ merupakan teori konflik sosiokognitif yang berkembang menjadi aliran konstruktivistik
- ▶ kemauan belajar anak banyak ditentukan oleh karsa individu
- ▶ keaktifan siswa merupakan faktor dominan keberhasilan belajar
- ▶ kemandirian merupakan jaminan ketercapaian hasil belajar yang optimal
- ▶ penataan lingkungan bukan penentu terjadinya belajar, tetapi mempermudah belajar

Lanjutan Piaget

- ▶ bisa berakibat kontraproduktif, budaya individualistik dan sokratik (self-generated knowledge – individualistic pursuit of truth), unggulan budaya barat
- ▶ teori psikogenesis: pengetahuan berasal dari individu, posisi siswa terpisah dengan interaksi sosial, penciptaan makna / pengetahuan akibat kematangan biologis, primer (individu) – sekunder (sosial).
- ▶ mengutamakan interaksi dalam kelompok sebaya, bukan yang lebih dewasa

Lanjutan Piaget

- ▶ Klasifikasi perkembangan kognitif: sensory motor, pra operasional, operasional konkrit, dan operasional formal.
- ▶ Asumsi: konsep tersusun dalam jaringan laba-laba yang disebut skemata, konsep terkait akan terhubung: perlunya mengkaitkan pengetahuan baru dengan yang sudah ada, pengetahuan prasyarat memudahkan siswa memahami konsep.
- ▶ Perubahan struktur kognitif melalui adaptasi yang berimbang (equilibrasi): dengan proses asimilasi dan akomodasi

Jerome Bruner (perkembangan mental, kebermaknaan)

- ▶ enactive (manipulasi obyek langsung)
- ▶ iconic (representasi gambar)
- ▶ symbolic (manipulasi simbol)

Dienes (Permainan)

- ▶ Dengan permainan siswa menjadi lebih tertarik dan tidak bosan terhadap bahan pelajaran yang diberikan

George Polya

(Problem solving/ pemecahan masalah)

- ▶ Prosedur: memahami, merencanakan, melaksanakan, mengecek
- ▶ Ciri: siswa tertentang, tidak ada prosedur tetap, ada usaha
- ▶ Model: tidak rutin, soal cerita, soal terapan
- ▶ Strategi: penemuan terbimbing (guided discovery), investigasi, multiple solution, multiple methods of solution
- ▶ Pengembangan: Higher Order Thinking (kritis, kreatif, analitik)

Lanjutan Polya

- ▶ Proses: persiapan (koleksi, informasi, pengamatan, penyelidikan, pendapat)
- ▶ Analisis (definisi, klasifikasi, evaluasi)
- ▶ Inkubasi (pengendapan dalam pikiran)
- ▶ Iluminasi (munculnya ide baru tak terduga)
- ▶ Usaha sadar menjawab / menyelesaikan

HUMANISME

TEORI BELAJAR HUMANISME

Landasan teori

p b m

- Menentang sistem otoriter
- Memandang siswa dari sudut siswa

Pendekatan PBM:

- Berpusat Siswa (fasilitatif)
- Pendidikan Multikultural
- Belajar Sosial (Bandura)
- Scaffolding (Vigotsky)

Belajar:

- Mengubah lingkungan
- Motivasi intrinsik
- Bebas dari ancaman
- Terarah/tujuan sendiri
- Bermakna bagi diri sendiri

Pembelajaran:

- Modeling
- Belajar Kooperatif
- STS/Kontekstual

Jean Piaget (1896 – 1980)



Jean Piaget
THE BETTMANN
ARCHIVE



4 Stages of Piaget's Theory of Cognitive Development

- **Sensori-motor (0 – 2, approx)**
- **Pre-operational (2 – 7, approx)**
- **Concrete operational (7 – 12, approx)**
- **Formal operational (> 12, approx)**

Our primary school pupils are concrete thinkers.

Concrete Operational

- **Thinking related to physical objects and events.**
 - **Conservation: mass (8+), displacement volume (13+).**
-

Conserve Volume



Concrete thinkers should be able to conserve volume.

Concrete Operational

- **Reversal thinking, e.g.,**
 $2 + 7 = 9$, so $9 - 2 = 7$
 - **Transitivity: e.g.,**
if $a > b$, $b > c$, then $a > c$.
 - **Sociocentric: become aware of the views of others.**
-

Manipulatives

- **From concrete, familiar experiences to abstract concepts. Show link between concrete and abstract.**
 - **“Manipulation of materials is crucial. In order to think, children in the concrete operational stage need to have objects in front of them that are easy to handle,**
 - **or else to visualize objects that have been handled and that are easily imagined without any real effort.”**
-

Manipulatives

Use multi-sensory activities.
I hear and I forget.
I see and I remember.
I do and I understand.



Readiness

- **Development cannot be accelerated; fail to learn because pupils not ready for the concept. Controversial!**
 - **Different from Bruner's 3-modes, which apply at any age.**
-

Time Factor

- Give more *time* to move to a higher stage.
 - “If we were willing to lose a bit more time and let the children be *active*, let them use trial and error on different things, then the time we seem to have lost we may have actually gained.
 - Children may develop a *general* method that they can use in other areas.”
-

Key Message

Pupils are *not* empty vessels

for teachers to fill in
mathematics rules ...



**Make learning an
active process.**

Final Remarks

- **Use a variety of theories when you plan lessons.**
 - **Find out how well these theories work for your lessons.**
 - **You will become a wiser and better teacher!**
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