

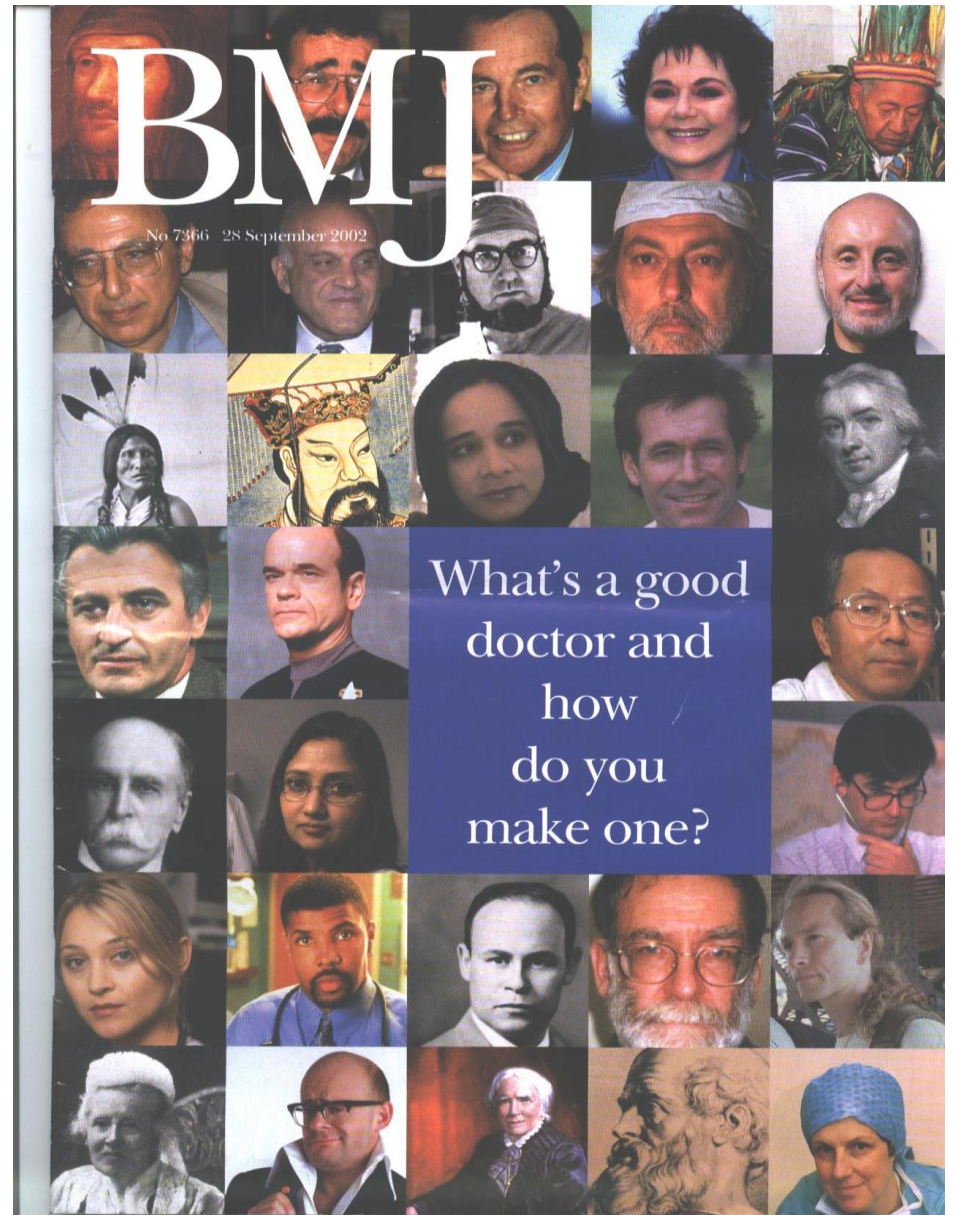
Clear and attainable  
learning outcomes are  
a prerequisite for  
teacher and student  
satisfaction



Richard Marz

[richard.maerz@meduniwien.ac.at](mailto:richard.maerz@meduniwien.ac.at)

# What is a doctor?





# Tomorrow's Doctors, GMC, 2009

- Students are responsible for:

# Tomorrow's Doctors, GMC, 2009

- Students are responsible for:
  - Their own learning, ...

# Nürnberger Trichter



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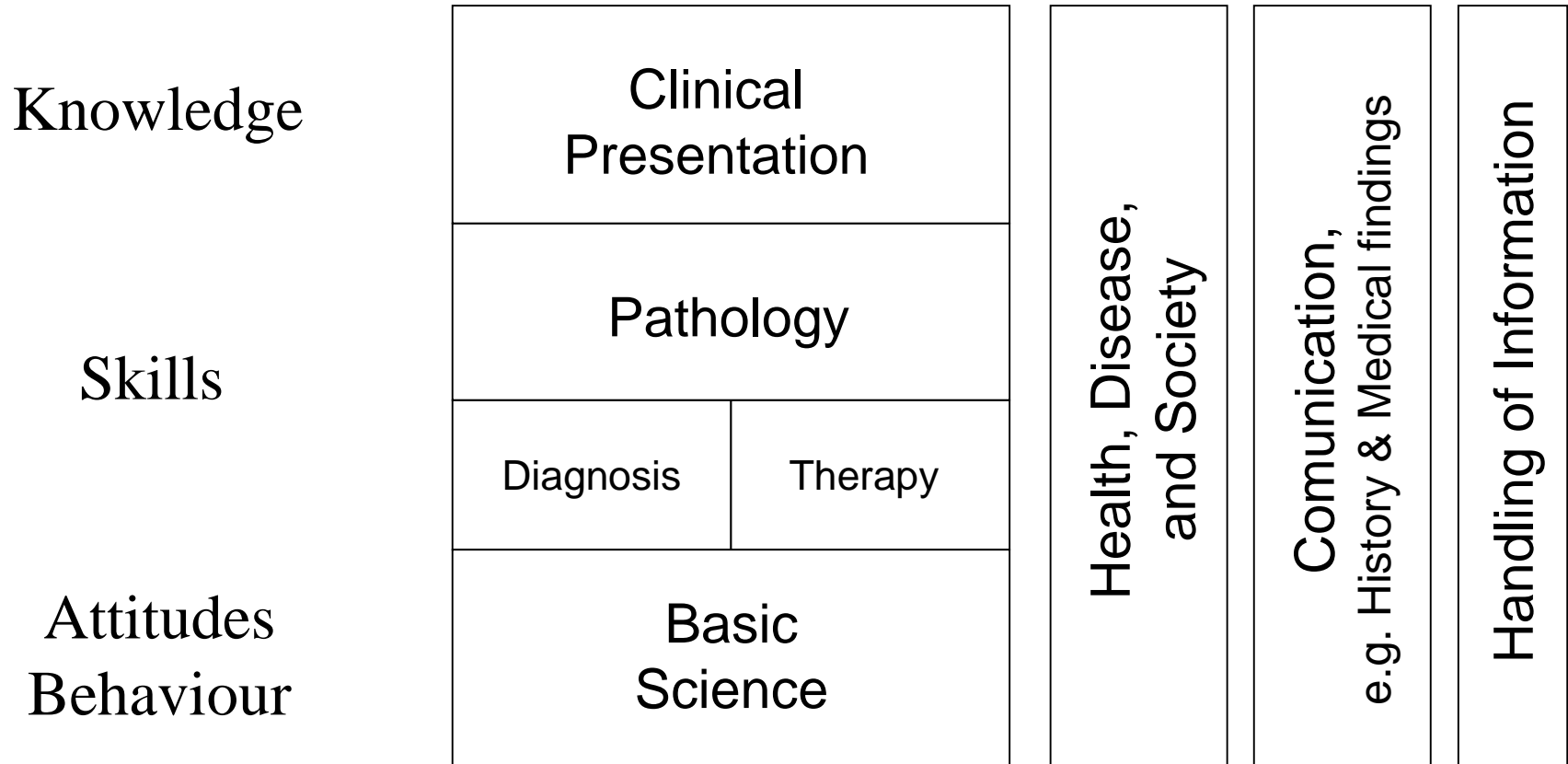
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- **Medical schools are responsible for:**

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- Medical schools are responsible for:
  - Managing the curriculum and ensuring that appropriate education facilities are provided in the medical school and by other education providers.

# Contents of a Medical Curriculum



# Professionalism

# Importance of Educational Objectives / Learning Outcomes

# Importance of Educational Objectives

- Clearly spell out expectations for faculty and students
- Help organize learning and teaching
- Basis for evaluation

# Quality Criteria for Educational Objectives

- ✓ **Precise**
- ✓ **Observable**
- ✓ **Measurable**
- ✓ **Realistic**



# Elements of an Objective

At the end of the course/session/lecture participants/learners should be able to ...

**Behavior/  
Action**  
one word

**Content  
Reference**

**Perfor-  
mance  
Standard**

E  
X  
A  
M  
P  
L  
E

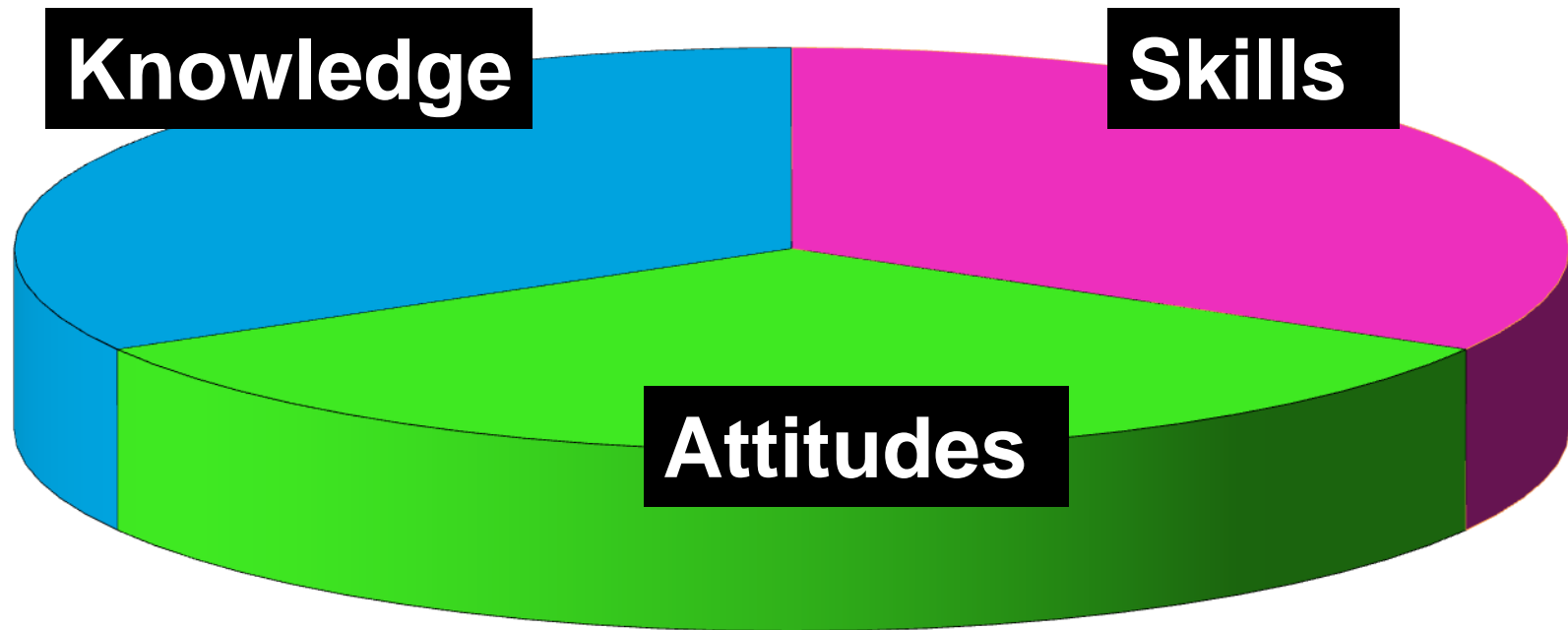
Select

teaching  
methods

that fit the  
goals &  
objectives

precise, observable, measurable, realistic

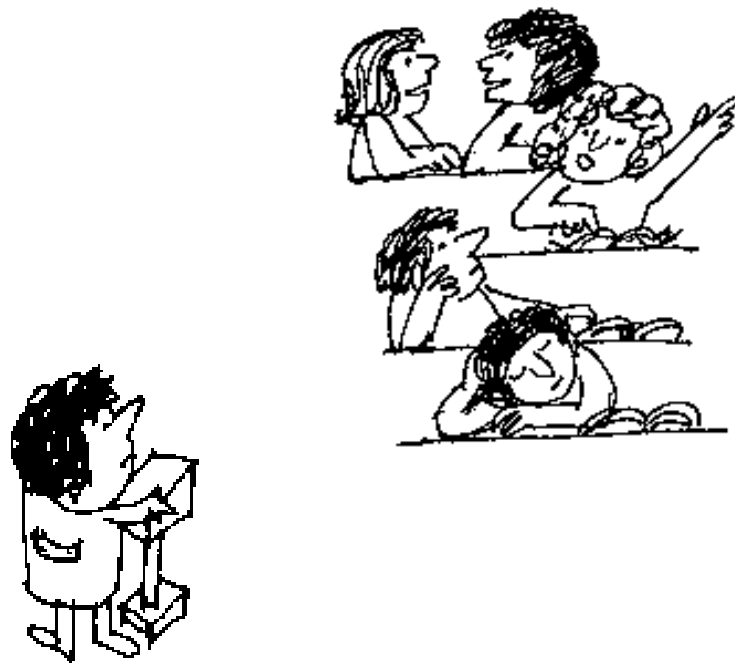
# Types of Objectives



*If attitudes  
aren't taught,  
they are caught!*



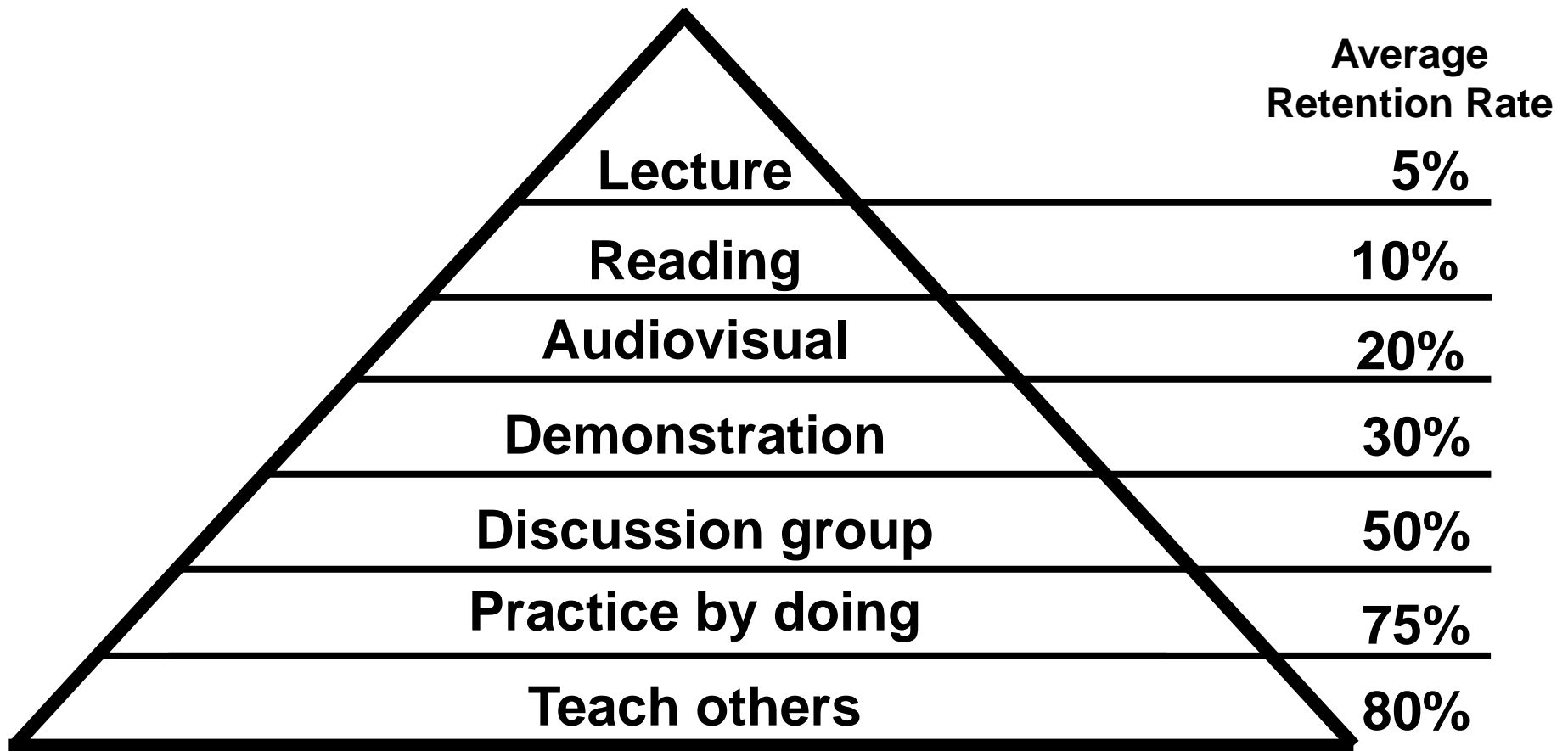
# Evidence on teaching and learning



# Assumption

Teaching = Learning

# The Learning Pyramid



National Training Laboratories, Bethel, Maine, USA

# How should we plan a learning experience?

# *Step One: Identify Learning Objectives*

Think of a learning objective in your course.

How do you usually address this learning objective?

What kind of problem or activity do you usually assign?

- Typical end-of-chapter problem?
- A reading?
- Other?

**Courtesy of Deborah Allen, *University of Delaware***





# *Types of Learning Objectives*

## **Content-oriented: subject specific**

- Basic knowledge and understanding of specific concepts, techniques, etc. in the discipline

# *Types of Learning Objectives*

## **Content-oriented:** subject specific

- Basic knowledge and understanding of specific concepts, techniques, etc. in the discipline

## **Process-oriented:** global skills

- Effective communication: oral and written
- Acquiring and evaluating information
- Working effectively with others
- Higher order, critical thinking

# *Sample Learning Objectives*

*Jane Lamb, Clothing in Contemporary Society*

- Examine how psychological, social, economic, and technological forces influence today's fashions
- Explain the role of different businesses in developing, producing, and distributing apparel products
- Depict how an apparel product moves from concept to design to production to distribution to consumer
- Judge value and quality of apparel products

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- Depict how an apparel product moves from concept to design to production to distribution to consumer
- Judge value and quality of apparel products
- Develop skills for professional success (analytical thinking, communication, decision-making, teamwork)

# *Sample Learning Objectives* (partial list)

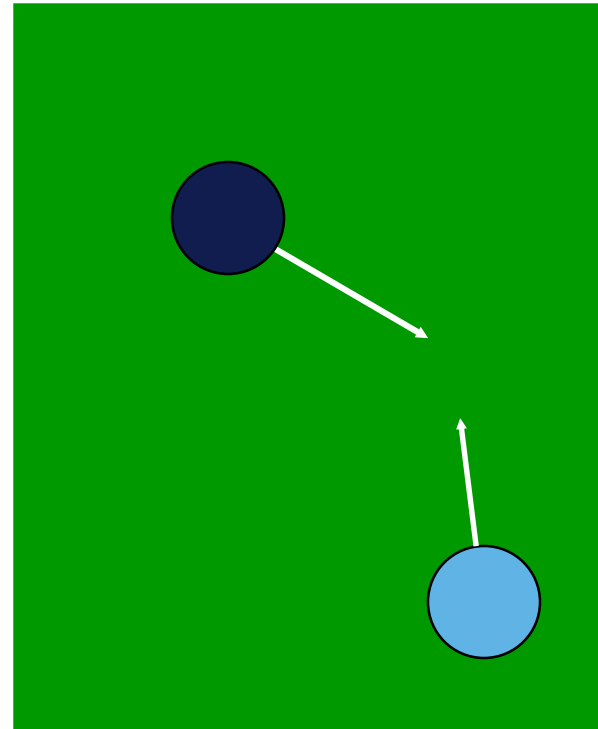
*Flo Schmieg, Molecular Biology of the Cell*

- Students will have learned to retrieve and share information with others
- ...be able to draw conclusions from scientific data
- ...be able to construct a laboratory report in manuscript format
- ...be able to evaluate scientific claims using substantiated criteria

# *Example from Physics: Solving Problems Using Conservation of Momentum*

**Traditional examples:**

- **Pool balls colliding**
- **Bullets hitting blocks of wood**



# *Example from Physics: Traditional End-of-Chapter Problem*

A 1500kg car traveling east with a speed of 25m/s collides at an intersection with a 2500kg van traveling north at a speed of 20m/s. Find the direction and magnitude of the velocity of the wreckage after the collision, assuming that the vehicles undergo a perfectly inelastic collision (they stick together).



Serway and Faughn. 3rd ed. College Physics,  
Saunders, 1992.

*Step 1:*

*Identify and Write Learning Objectives*

*Step 2:*

*Create helpful problems or activities*

- Identify several learning objectives; consider both content and process goals.
- How might these learning objectives be addressed? What kind of problem or activity would be helpful?



# *Step Three:*

## *Identify Real-World Context*

- Find a realistic application of the concept
- Outline a scenario

### **Ideas:**

- Add story-telling to a problem: *motivation*
- Require students to go beyond rote learning, and to do research
- Include decision-making, analysis, or both

# *Consider the Following Problem Types:*

## **Explanation or Analysis Problems**

*‘What is going on here?’*

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## **Decision or Dilemma Problems**

*‘What would you do?’ ‘What do you think?’*

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## **Explanation or Analysis Problems**

*‘What is going on here?’*

## **Decision or Dilemma Problems**

*‘What would you do?’ ‘What do you think?’*

## **Task-Oriented Problems**

*Doing an activity or carrying out a project -  
for example, interviewing patients or  
designing a brochure.*

# *Example from Physics: Traditional End-of-Chapter Problem*

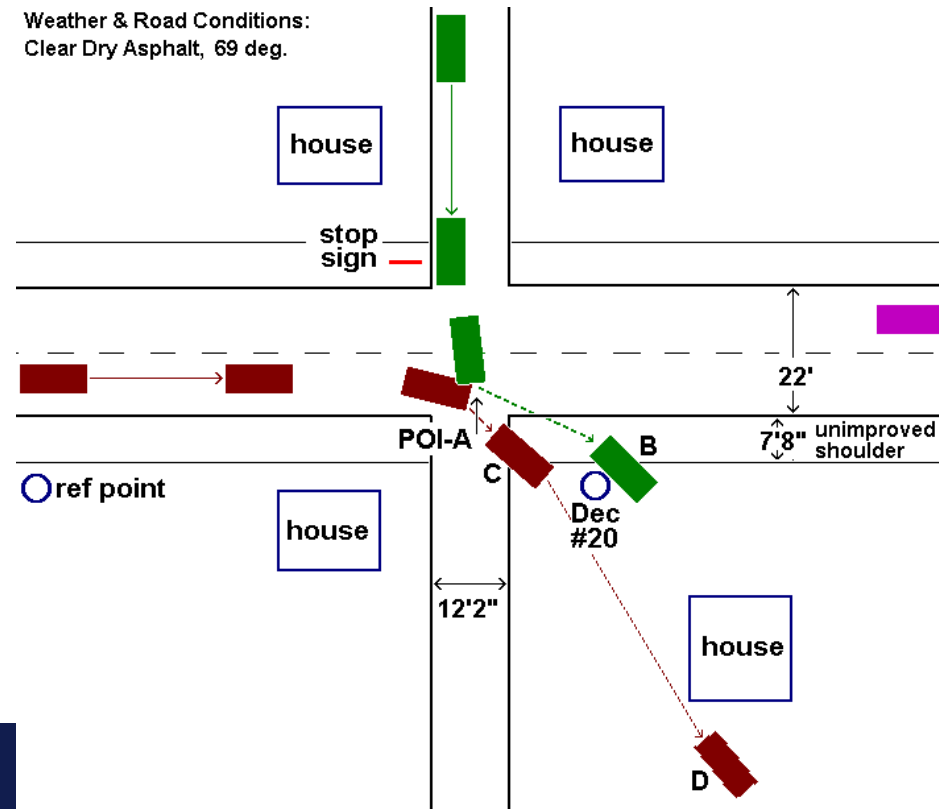
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# A Traffic Accident

- Based on police sketch
- Students need to make assumptions and approximations
- Information given gradually throughout the problem





## A Day in the Life of John Henry, Traffic Cop



### Part 1.

At 13:20 on the last Friday in September, 1989 a frantic call was received at the local police station. There had been a serious automobile accident at the intersection of Main Street and State Street, with injuries involved. Lt. John Henry arrived at the scene 10 minutes after the phone call and found that two cars had collided at the intersection. In one car, the driver was unconscious and in the other car both driver and one passenger were injured.

After the emergency vehicles transported the injured to the hospital, Lt. Henry's responsibility is to investigate the accident in order to determine whether one of the drivers (or both) are responsible. With the severity of injury in this accident, the investigation is critical because there may be a fatality involved.

### Questions:

1. What questions does John Henry have to answer in this investigation? What measurements does he need to take? What data should he collect? What other information does he need to record in order to aid the investigation? What physics principles will John Henry need to use in order to help analyze the data and answer his questions?



## A Day in the Life of John Henry, Traffic Cop



### Questions:

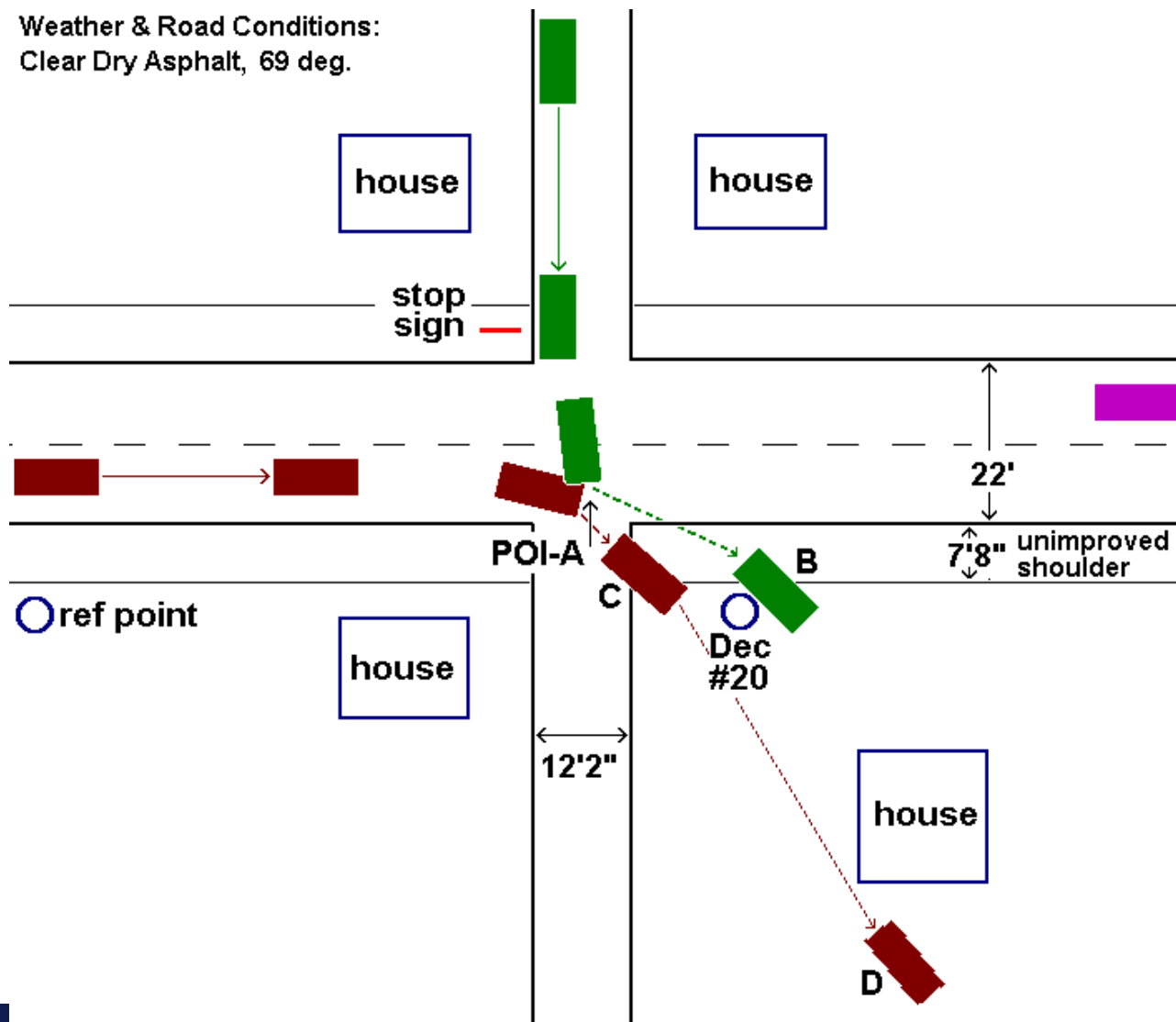
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- What questions does John Henry have to answer in this investigations?
- What measurements does he need to take?
- What data should he collect?
- What other information ...

Questions serve as „scaffolding“ (Jerome Brunner)

Weather & Road Conditions:  
Clear Dry Asphalt, 69 deg.



# A Day in the Life of John Henry, Traffic Cop

## Part 2.

Refer to the attached sketch. Main street, a thoroughfare, has a 45 mile per hour speed limit. State Street also has a 45 mile per hour limit, but has a stop sign on either side of the road. Vehicle 2, which weighs 5800 lbs, skidded for 24 feet before coming to a stop next to the utility pole, marked Dec #20. Vehicle 1, which weighs 2060 lbs, showed no skid marks after the impact and came to a rest next to the house on the corner. Looking at the impact areas of the cars, it was clear to Lt. Henry that the cars impacted at right angles, hitting the front right bumper of vehicle 2 and the front left bumper of vehicle 1. After impact, they initially were traveling in the same direction. Lt. Henry noted that the weather was clear and sunny, 69° and the roadway was dry.

Before John Henry got any further in his analysis, he was informed that driver who was unconscious at the scene of the accident died at the hospital.

## Questions:

4. Can you make an educated guess about which driver died based on the evidence so far? Justify your answer.
5. Why would John Henry note the weather and the condition of the road?
6. Why did vehicle 1 travel further than vehicle 2?



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- Can you make an educated guess about which driver died based on the evidence so far?
- Justify your answer.

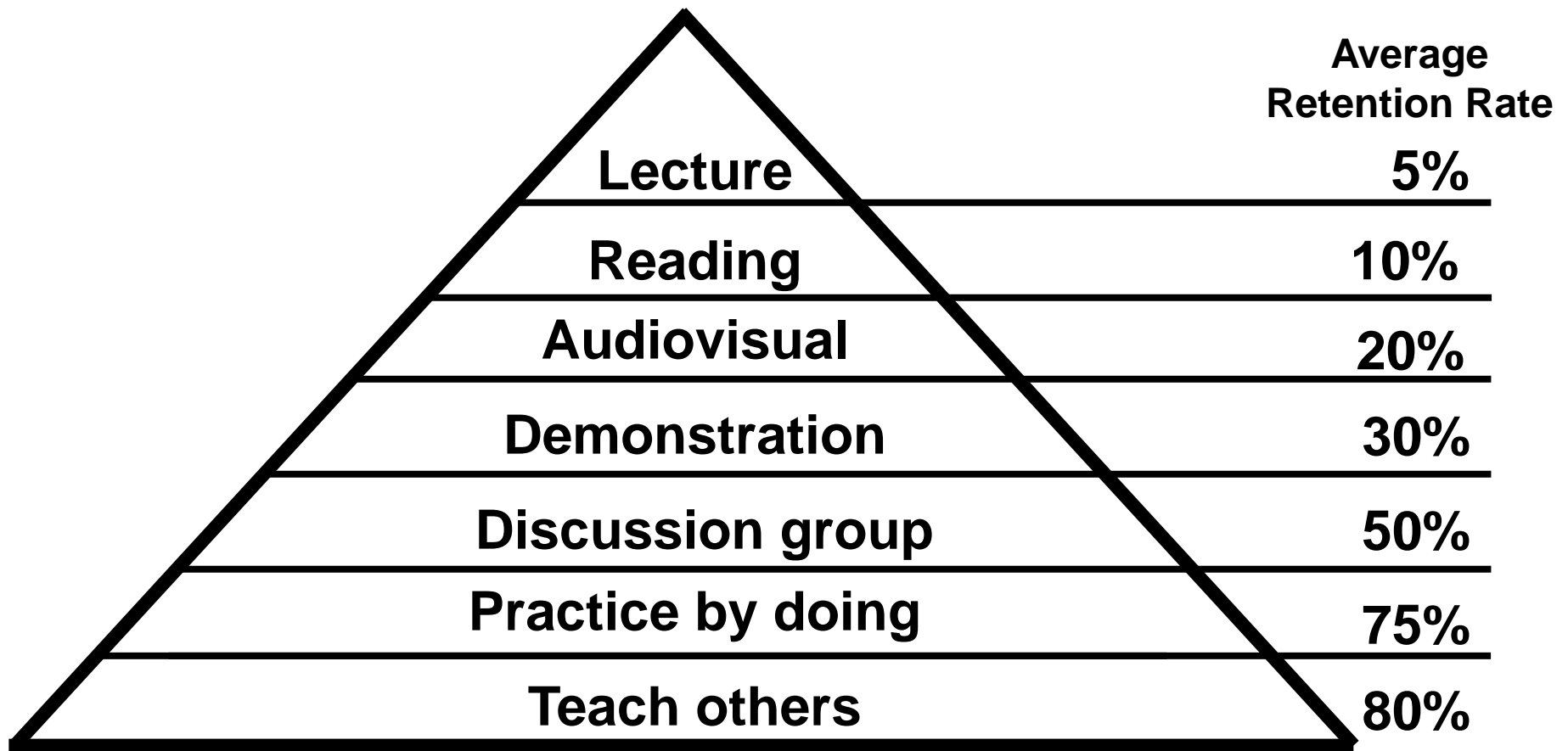
## **Part 2. (contd.)**

John Henry has to determine whether the driver of vehicle 2 ran the stop sign and/or if the driver of vehicle 1 was speeding. Outline a procedure that Lt. Henry can use to answer these important questions. Be sure that your reasoning is sound, since he will have to testify in court on the evidence.

### **Question:**

7. Does John Henry have all the information he needs to determine the velocities?

# The Learning Pyramid



National Training Laboratories, Bethel, Maine, USA



# Possible Ground Rules

- ...
- ...
- important to articulate thoughts
- ...
- ...
- ...

# Johari Window Luft & Ingram (1955)

	Known to self	Not known to self
Known to others	Known	
Not known to others		

# Johari Window Luft & Ingram (1955)

	Known to self	Not known to self
Known to others	Known	Discovery through Discussion
Not known to others		

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# Johari Window Luft & Ingram (1955)

	Known to self	Not known to self
Known to others	Known	Discovery through Discussion
Not known to others	Discovery through Discussion	“Unknown unknowns”

 Cees van der Vleuten  
University of Maastricht, 1999

Education is governed  
by tradition and intuition

Most faculty members consider  
themselves educational experts

The purpose of an education is to  
fill vessels and to light fires ...

The purpose of an education is to  
fill vessels and to light fires ...

Today we fill the vessels so full,  
they overflow and put out the fire

General Medical Council (GMC), Tomorrow's Doctors, GB, 1993



# 50 Reasons Not To Change



Factual information must be kept to the essential minimum that students need at this stage of medical education.

General Medical Council (GMC), *Tomorrow's Doctors*, 1993, 2003

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**Less is More**

# The job of the teacher ...

# The job of the teacher ...

... is to make the task of decision-making so intense, ...

# The job of the teacher ...

... is to make the task of decision-making so intense, ... so that the student can only escape by thinking.

**T** **h** **a** **n** **k**

**Y** **o** **u!**





# An Experiment on Transfer

*Group 1:* Read the problem -  
Was given solutions

*Group 2:* Read the problem -  
Attempt to problem-solve

*Group 3:* Read the problem -  
Attempt to problem-solve -  
Was given solutions

# Did transfer take place?

- Group 1:* Read the problem -  
Was given solutions  
**No transfer - 10% success**
- Group 2:* Read the problem -  
Attempt to problem-solve  
**Spontaneous transfer - 50% success**
- Group 3:* Read the problem -  
Attempt to problem-solve -  
Was given solutions  
**Informed transfer - 75% success**

# A Day in the Life of John Henry, Traffic Cop

## Part 3.

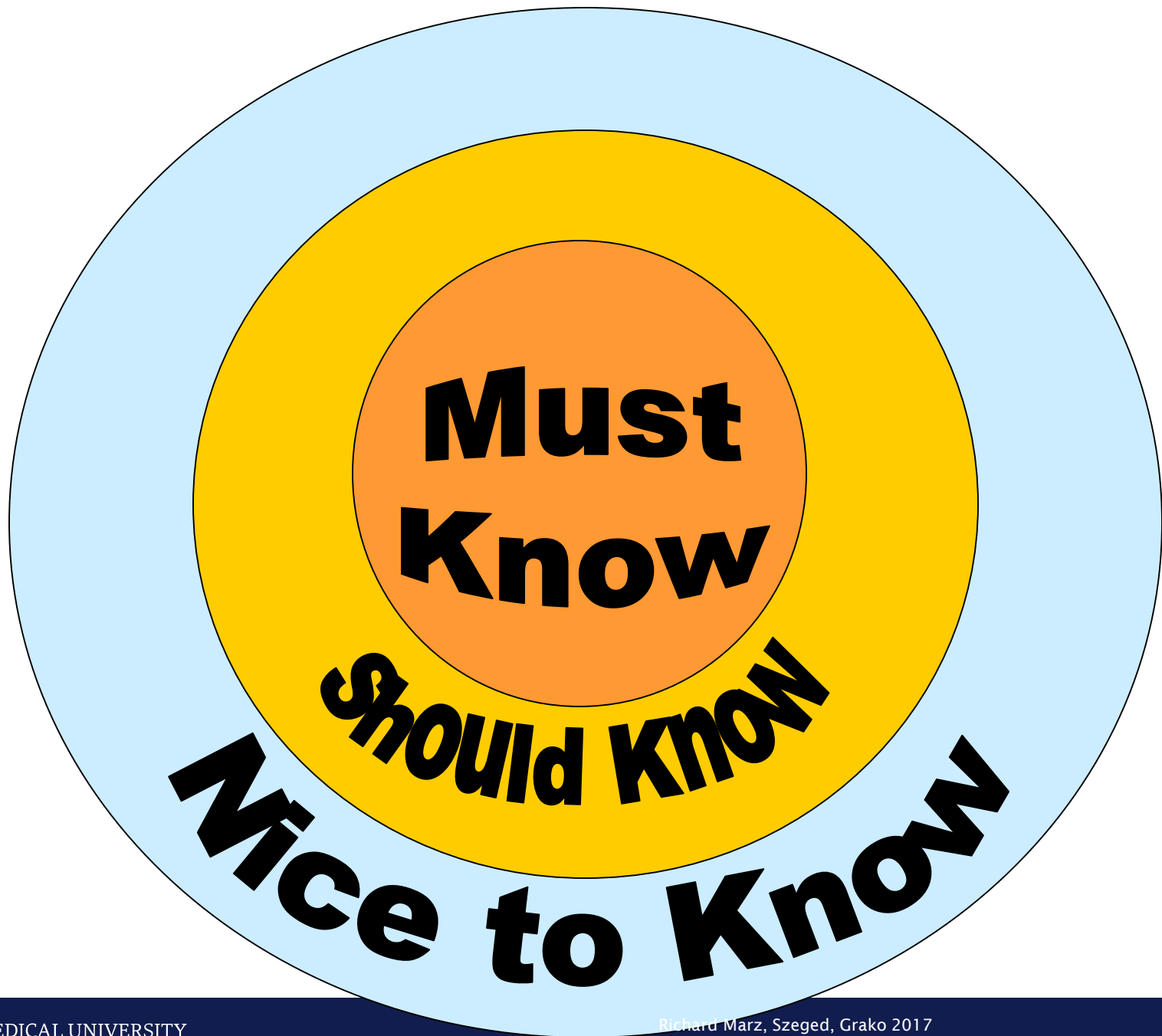
Lt. Henry used a drag sled to determine that the coefficient of friction between the tires and road was 0.60. He can't use the drag sled to determine the coefficient of friction between the tires of vehicle 1 as they roll over the roadway and grass.

## Questions:

8. Does he need this information? What procedure can he use to find out this information?
9. Using your outlined procedures, find the velocities of the two vehicles just prior to impact and estimate the coefficient of friction between the rolling tires of vehicle 1 and the roadway and grass. Be sure to state any assumptions that you make and justify them.
10. During the collision, which vehicle delivered the greater force of impact? Justify your reasoning using physics principles.
11. How can Lt. Henry determine the speeds of both vehicles just before they applied their brakes? What further information will he need?

# Adult Learning Principles

- **Learning is a process that is initiated by, and occurs in the learner**
- **Learning is the discovery of the personal meaning and relevance of ideas**
- **Learning is a consequence of experience**
- **Behavioral change occurs as a result of practice and feedback**
- **The process of learning is emotional as well as intellectual and behavioral**



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