

Creative and Scientific Thinking

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CRE252

Information Technology Department

Lecture 1



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Thinking Scientifically

Chapter

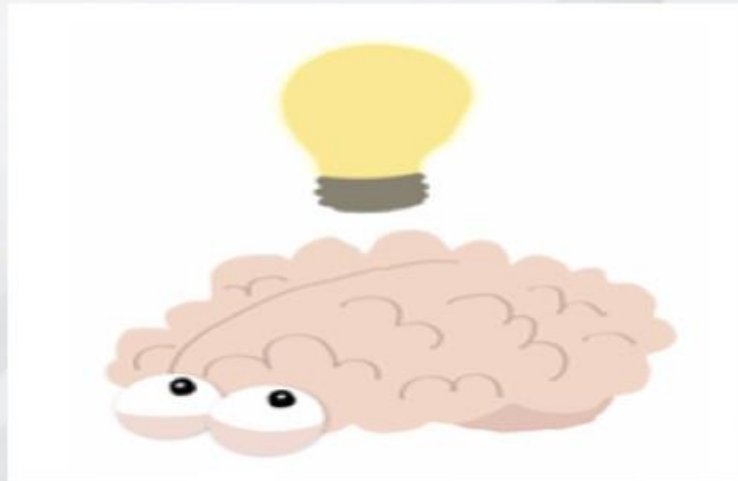
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Learning Objectives:

- Define thinking and scientific thinking
- Define Science
- State the main goal of Science
- Differentiate Science from Technology
- Define Scientific Method
- Describe the steps in Scientific method

One of the main functions of human mind is

..... THINKING



What is a Thinking?

- Thinking is the activity of using your brain by considering a problem, or possibility of creating an idea.



Introduction : The Problem

- The Problem

- Everyone **thinks** ; it is our nature to do so.
- But much of our thinking, is biased, or partial.
- The **quality** of our life and that of what we produce, make, or build depends precisely on the **quality of our thought**.
- **Shoddy (careless) thinking** is costly, both in money and in quality of life.
- **Excellence in thought** , however, must be systematically cultivated.



Much of our thinking, is biased, or partial



Shoddy (careless) Thinking Is Costly, Both In Money And In Quality Of Life.



Excellence in thought , however, must be systematically cultivated:

The Pursuit of Excellence



Happiness
Fulfillment



ASSUMPTIONS WE NATURALLY MAKE

- *Our perception is a clear lens.*
- *Reasoning is mostly under our conscious control.*

WHAT REALLY HAPPENS: **BRAIN ILLUSIONS**



When the brain receives sensory inputs the unconscious mind interprets them and builds an explanation; quickly filling in gaps without us realizing it.

We wouldn't survive without this unconscious mechanism (too much information & too slow).

But... it also causes us to make errors. Our predispositions, natural mental shortcuts and narratives influence how we see, think and react.

Please read aloud what you see

Ca y u rea t is?

Can you read this?



**Helpful! Our brain
fills in the blanks.**

Please read aloud what you see

HUMPING TO CONCLUSIONS

IUMRING TQ GQNGIUSIQNS



Our brain fills in blanks here too, but it's a brain error.

We feel pretty sure, but we're wrong.

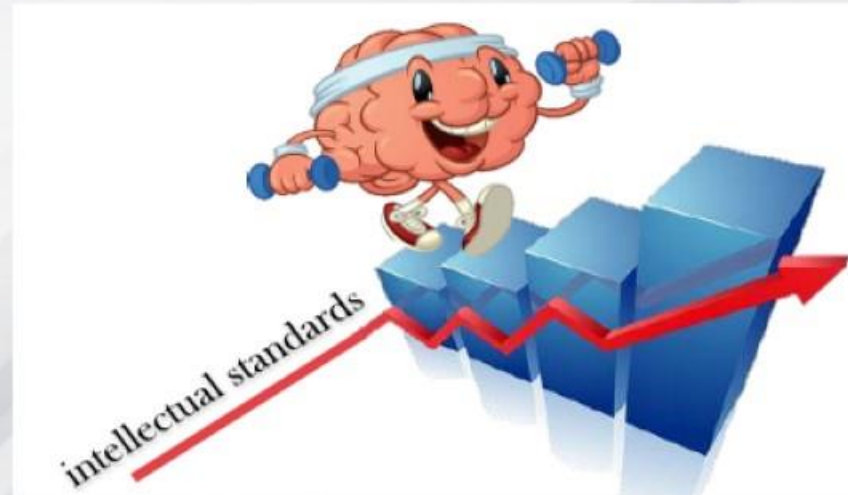
Introduction : The Solution

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The Solution:

- **Scientific thinking** is that **mode of thinking about any scientific subject**, content, or problem **in which the thinker improves the quality of his or her thinking.**
- by skillfully taking charge of the structures essential in thinking and imposing intellectual standards upon them.





A COUNTERMEASURE TO EVERYONE'S NATURAL BIAS

SCIENTIFIC THINKING

Scientific thinking is a routine of intentional coordination between what we think will happen (theory), what actually happens (evidence), and learning from the difference.



It's a skill for every day, at work & at home



Scientific Thinking is not just for professional scientists, but an essential & widely-applicable skill for everyone.

It's a "Meta Skill" – a universal way of thinking that can be used to avoid cognitive bias anytime we try to solve problems and achieve goals.

BUT THERE'S SOME MISMATCH

This classic way of teaching scientific thinking is a good start, but it doesn't transfer so well into everyday life



Why?

Rather than *investigating and trying to understand* – like professional scientists do – our work and personal lives involve *pursuing complicated goals*.

SCIENTIFIC THINKING IS *LEARNED* SKILL

**Scientific
Thinking**



~~Born~~

It's not our default mode.
We have those natural,
unconscious mental
mechanisms, especially
as adults.

Learned

OK... HOW?

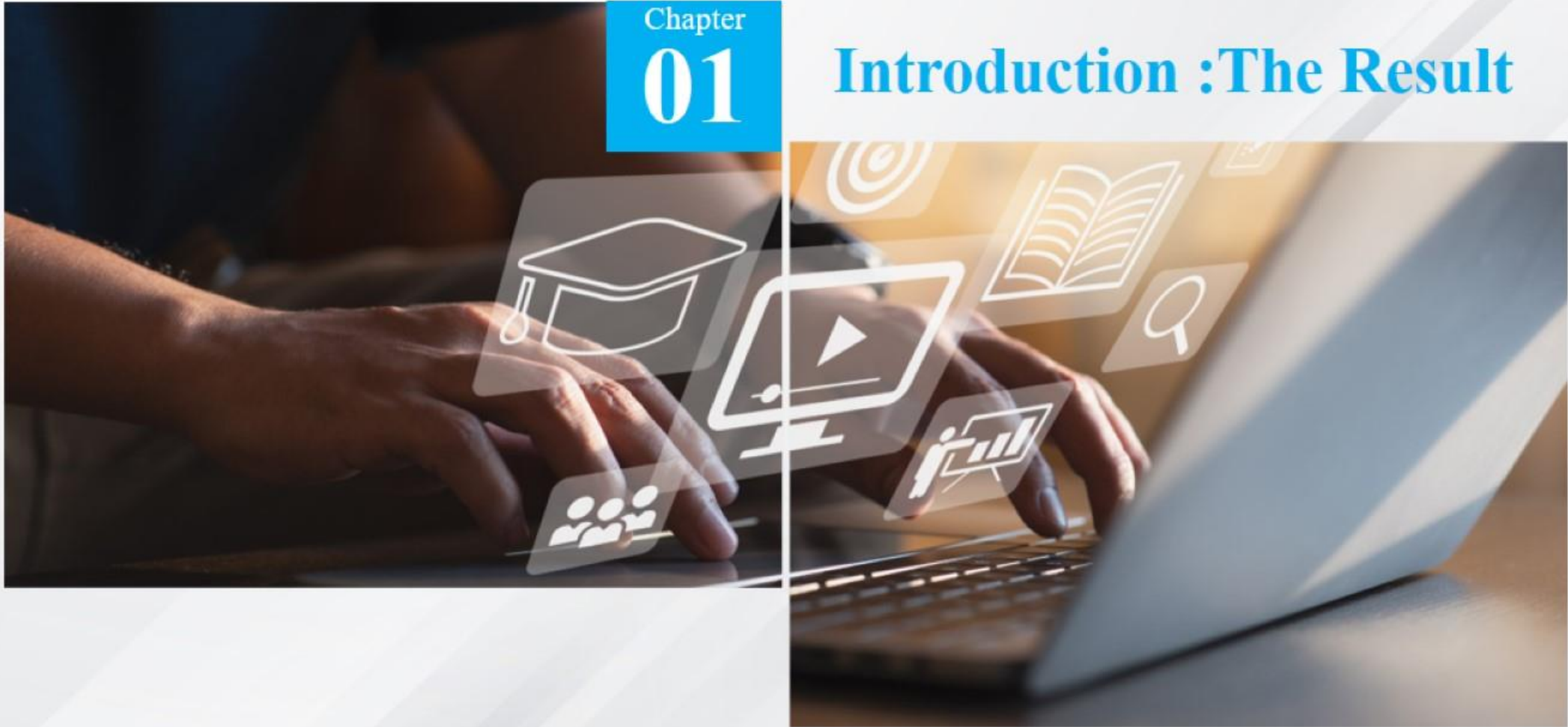
SO WHAT'S NEW HERE??



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Introduction :The Result



- **The Result:** A well cultivated scientific thinker
- Raises vital scientific questions and problems, formulating them clearly and precisely
- Gathers and assesses relevant scientific data and information, using abstract ideas to interpret them effectively;
- Comes to well reasoned scientific conclusions and solutions, testing them against relevant criteria and standards;

- Thinks open mindedly within convergent systems of scientific thought, recognizing and assessing scientific assumptions, implications, and practical consequences; and
- Communicates effectively with others in proposing solutions to complex scientific problems.

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What is a Science?



What is a Science?

- It is a method used by humans to try to make sense of the world in which they live.
- Is derived from the Latin word Scientia for knowledge.
- The state of knowledge.



What is a Science?

Oxford Advanced Learner s Dictionary

- Organized knowledge, especially when obtained by observation and testing of facts, about the physical world, natural laws and society; study leading to such knowledge.
- Branches of such knowledge:
 - the natural science, e.g. Biology and geology;
 - the physical science, e.g. Physics and Chemistry.

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Goal of Science



Goal of Science:

- Acquire **knowledge** about the world.
- To **explain the natural world as we observe it** as much as possible and to search for **ways of applying** such **knowledge** for the benefit of **humanity**.

Example:

- The popular phrase “Science tells us that smoking can kill you” really misleads.
- “Science” doesn't tell us anything; people tell us things in this case, people who have used scientific strategies to investigate the relationship of smoking to cancer.

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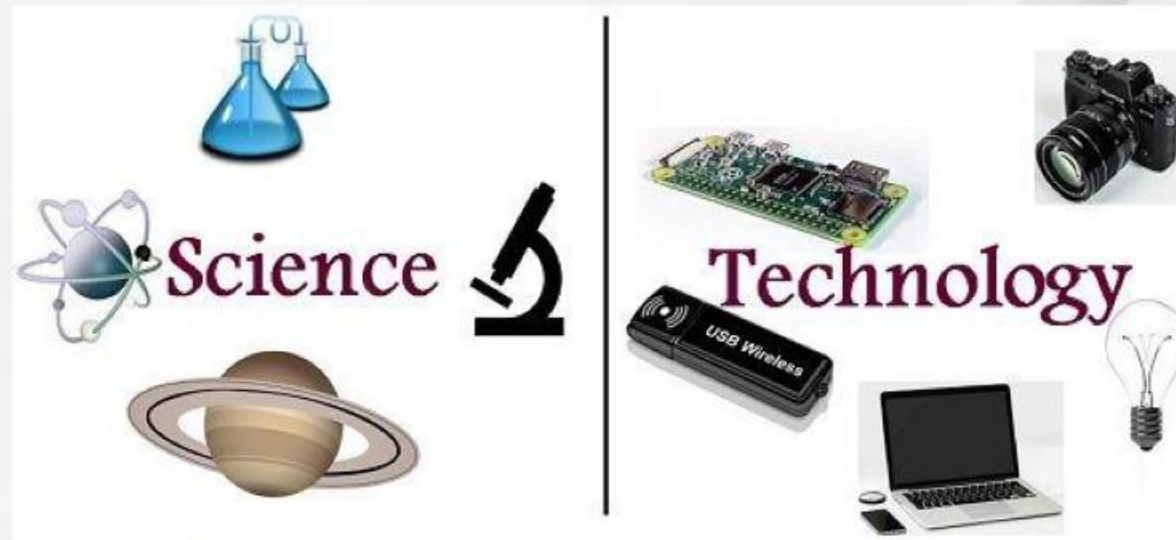
Science VS Technology



Technology :

- Originates from the Greek word “**tekhnologia**” and the Latin word “**techologia**”;
 - which means an **approach of doing something systematically**
- **Technology is the usage and knowledge of** tools, techniques, crafts, systems or methods of organization
- **Technology** is the application of Science to various tasks.

Differentiating Science and Technology



Differentiating Science and Technology:

Science and Technology are two different terms which have two different meanings

- **Science** is a knowledge that explains natural phenomena.
- **Technology** is a field that is closely related to the world created by human to develop systematic ways in controlling either the natural world or the man made world, as well as involving the process of doing something.

Differentiating Science and Technology (Cont.)

• Example of Science

- **Chemistry:** one molecule of water consists of two atoms of hydrogen and an atom of oxygen which is bonded by a covalent bond.



□ Example of Technology

- ▣ **Chemistry:** to find alternatives to fossil fuels, the technology to create energy from water by breaking water's covalent bond is being developed.

□ Example of Science

- **Biology:** some diseases are caused by genes that can be passed from one generation to another



□ Example of Technology

- ▣ **Biology:** through genetic engineering, genes which carry diseases can be identified

□ Example of Science

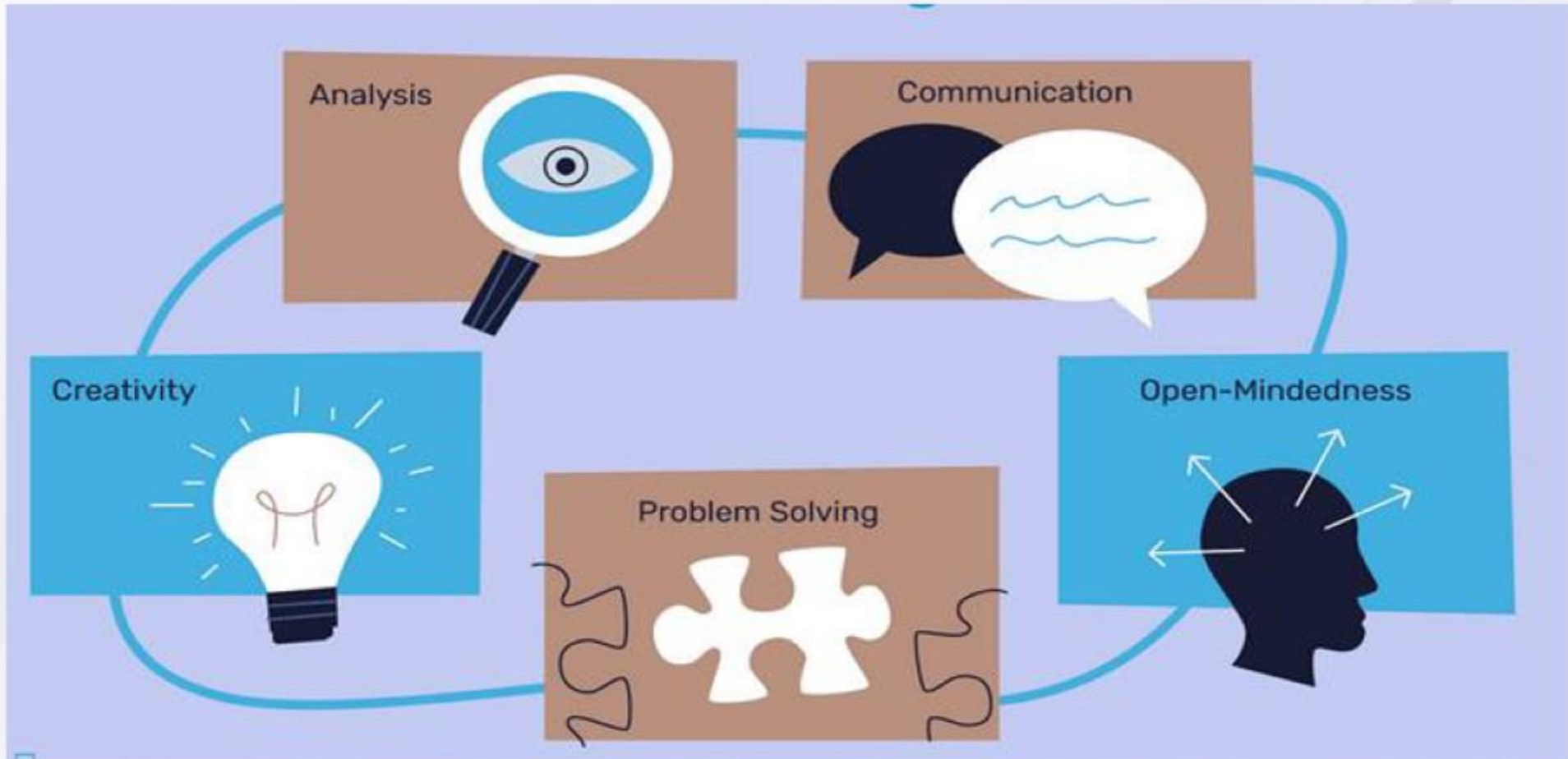
- **Physics:** objects fall to the ground because of the presence of gravity



□ Example of Technology

- ▣ **Physics:** Rocket and Jet technology have allowed mankind to defy gravitational pull to enable flight

Skills for scientific thinking



Thank You