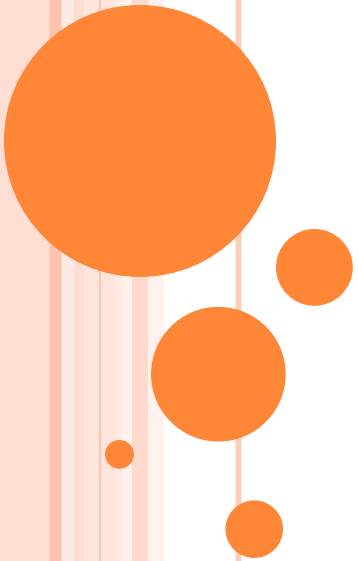
2. Thinking Scientifically (part 1)



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 or creating an idea.

Introduction :The Problem

- The Problem
  - Everyone thinks; it is our nature to do so.
  - But much of our thinking, is biased, distorted, 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 thinking is costly, both in money and in quality of life.
  - Excellence in thought, however, must be systematically cultivated.

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

Excellence in thought, however, must be systematically cultivated

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?

Ca y u rea t is?

Helpful! Our brain fills in the blanks.

Please read aloud what you see

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

- 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 inherent in thinking and imposing intellectual standards upon them.

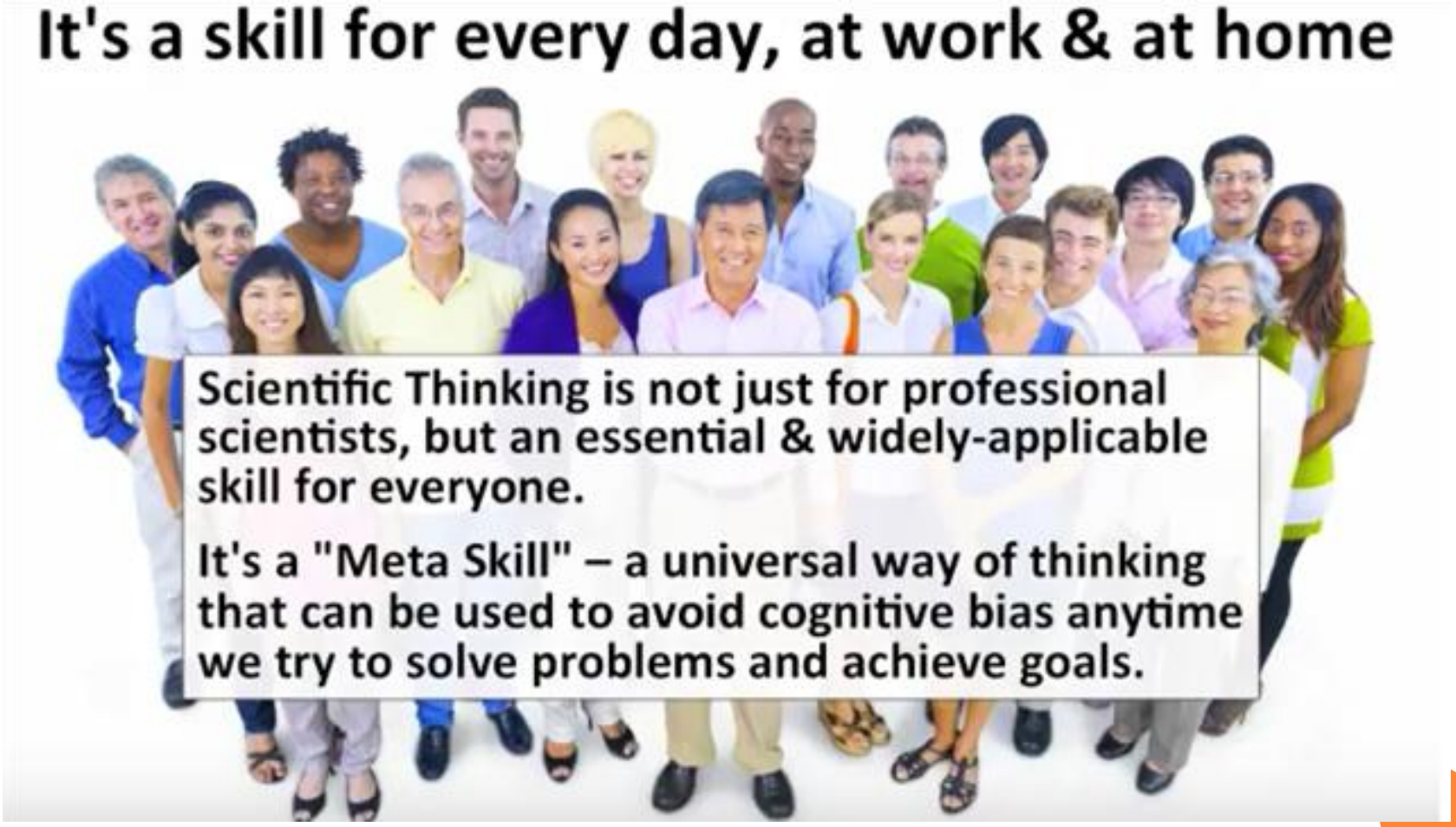
Scientific Thinking

A COUNTERMEASURE TO EVERYONE'S NATURAL BIAS

SCIENTIFIC THINKING 1 2

Scientific thinking is a routine of intentional coordination between what we think will happen (theory), what actually happens (evidence), and learning from the difference. 3

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



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?

1

2

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??

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.