CRITICAL THINKING

Cultivating Creativity & Innovativeness in the Classroom and Beyond

Eloisa P. Tinio 20170303

Gokongwei Brothers Foundation (GBF) Technical Training Center

JG Summit Group

JG Summit Leadership believes in giving back to society a portion of the honest profits derived from its business. While it does not subscribe to giving alms and mendicancy, it believes in helping people help themselves. Thus the strong thrust of the GBF towards education.

PHILIP T. TORRES

"Globalization is real and important. But it is not the central force driving economic change…The chief force reshaping manufacturing (*and business*) is

techno-logical change hastened by competition…"

More central is the "**skills revolution**. We are moving into a more **demanding cognitive age**."

COROLLARY: towards a more demanding cognitive age…**more will be expected of graduates; and even more will be expected of teachers and trainors**…

“ In order to thrive, people are compelled to become better at

ABSORBING

PROCESSING and

COMBINING information”

and

CONVERTING these into needed products and services.

“Information can now travel 15,000 miles in an instant.

But the most important part of information’s journey is the last few inches –

the space between a person’s eyes or ears and

the various regions of his brain.”

- **Does the individual have the capacity to understand the information?**
- **Does he or she have the training to exploit it?**
- **Are there cultural assumptions that distort the way the information is perceived?**

This cognitive age paradigm explained by David Brooks in *The New York Times* emphasizes

psychology, culture and pedagogy

which are **the specific processes that foster learning**.

The paradigm emphasizes ‘that different societies are being stressed in similar ways by

increased demands on human capital.’

‘If we truly understand that

we are living at the beginning of the **cognitive age**,

we are then focusing on **the real source of prosperity**.

And, hopefully, understand that our anxiety is not being caused by a foreigner – not by China, not by India, and not by globalization.’

As you can see, **education and training institutions** …

including the TVET system…

need to be **at the center of this development**.

Commonwealth Scientific & Industrial Research Organization (CSIRO)

on the Impact of the 4th Industrial Revolution on Work

" . . . while Australia's workforce is continually changing, the current period in history is characterised by a combination of forces likely to be associated with greater, faster, and different transitions than previously experienced."

POTENTIAL JOBS IN 2035

THE FOURTH INDUSTRIAL REVOLUTION

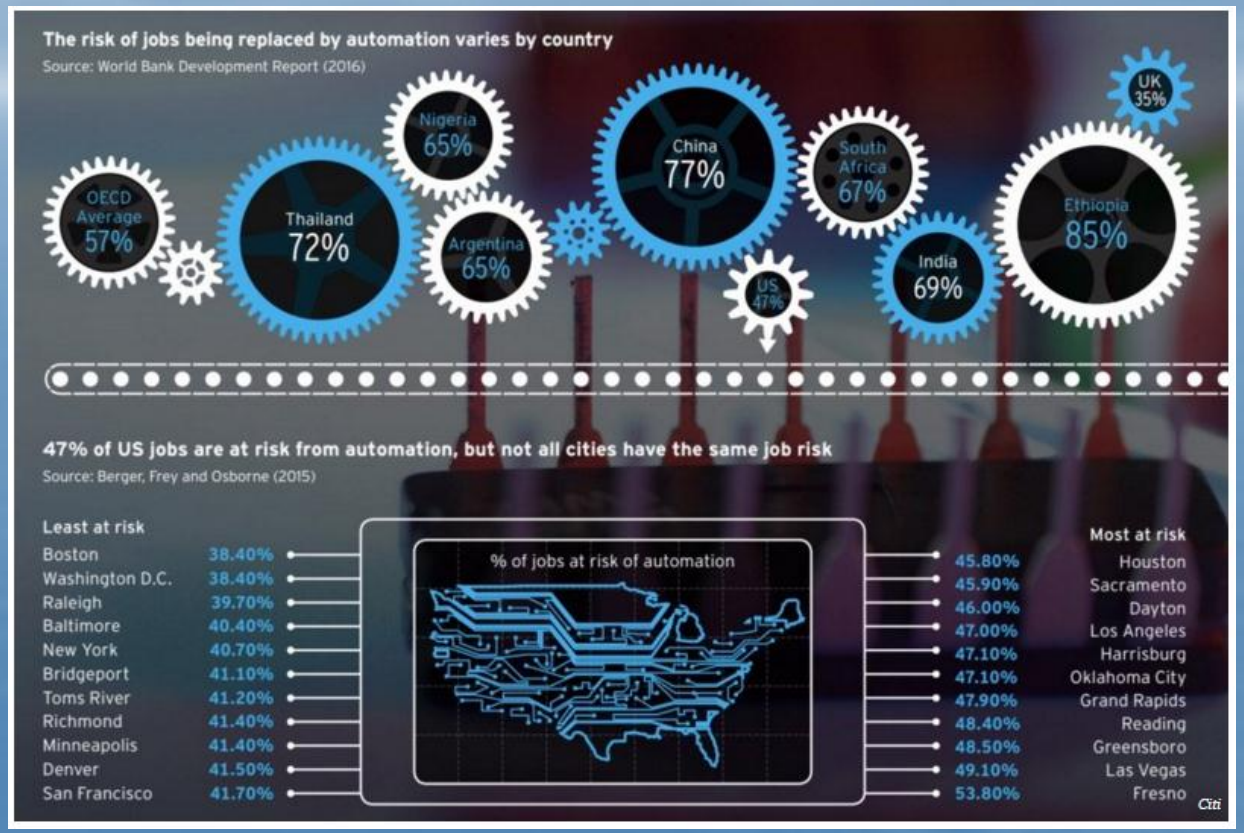
- “The **First Industrial Revolution** used steam power to mechanize production.
- The **Second Industrial Revolution** used electric power to create mass production.
- The **Third Industrial Revolution** used electronics and information technology to automate production.
- Now a **Fourth Industrial Revolution** is building on the Third. It is **characterized by a fusion of technologies that is blurring the lines between the physical, digital, and biological spheres**”

Professor Klaus Schwab of the World Economic Forum

https://www.weforum.org/focus/the-fourth-industrial-revolution

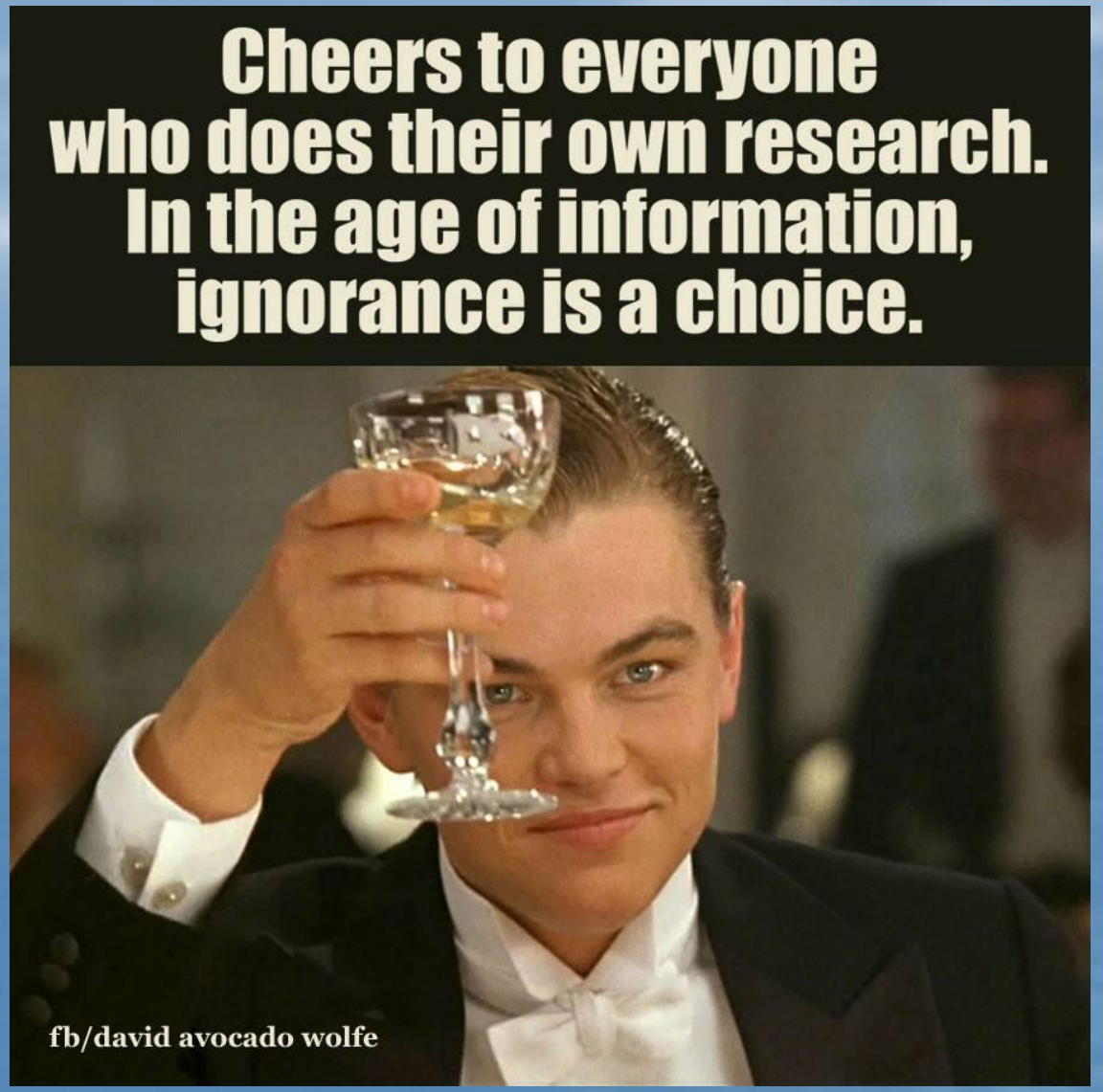
FORECAST

- **Automation** will see a change in the roles we are looking for, and the jobs we do
- **Complexity** will increase and **higher skills** will be demanded – even for **entry level tasks**
- Education systems will need to adapt and change **to equip the workers of the future with the skills** they need
- **Creativity** is an increasingly sought after **skill**
- Employment landscape in 2035 will work "to the advantage of tomorrow's **entrepreneur**"

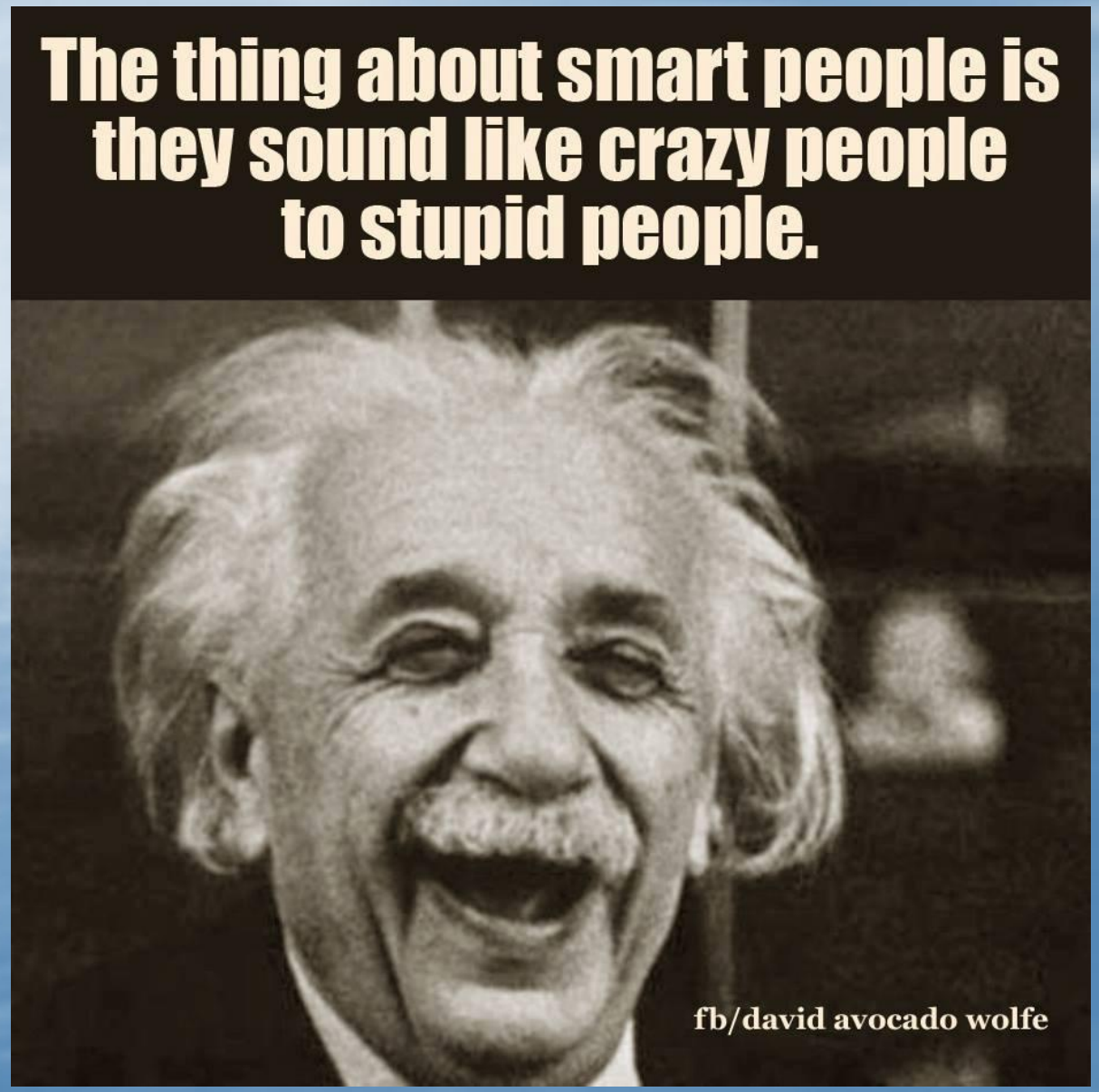


TASKS

- **READ** – copy into memory from an external source
- **MOVE** – copy from one part of memory into another part of memory
- **COMPUTE** – carry out a specified mathematical process
- **WRITE** – copy from memory to an external destination
- **PERFORM** – execute an identified set of pre-packaged routine commands (a module)



HUMAN-ONLY JOBS OF 2035



Given the demographic and technological changes now set in motion

- Unmanned and un-crewed vehicles will need a new workforce of **remote operators**
- Personalised preventative **health helpers**
- Increasing risk posed by cyber-crime will see a new profession of **online chaperones**
- Demand for **big data analysts** will continue to expand rapidly, along with specialisation of analyst roles

AS EARLY AS 2020

- The Fourth Industrial Revolution will have brought us advanced robotics and autonomous transport, artificial intelligence and machine learning, advanced materials, biotechnology and genomics.

- These developments will transform the way we live, and the way we work. Some jobs will disappear, others will grow and jobs that don't even exist today will become commonplace. What is certain is that **the future workforce will need to align its skillset to keep pace**.

ALREADY RIGHT NOW

- **Creativity** is fast becoming one of the top three skills workers need. With the avalanche of new products, new technologies and new ways of working, workers have to become more creative in order to benefit from these changes.
- **Emotional intelligence**, which may not be considered among the top 10 today, is one of the top skills needed by all.
- **Change won't wait for us**: business leaders, educators and governments all need to be proactive in up-skilling and retraining people so everyone can benefit from the Fourth Industrial Revolution.

Appropriate teacher support can allow students to function at the cutting edge of their individual development.

Multiple perspectives, authentic activities, real-world environments – these are just some of the themes that are frequently associated with constructivist learning and teaching.

Jonassen (1991)	Wilson & Cole (1991)
Jonassen (1994)	Paul Ernest (1995)
Honebein (1996)	Vygotsky (1978)

CONSTRUCTIVISM

CHARACTERISTICS OF CONSTRUCTIVIST LEARNING AND TEACHING

- **Multiple perspectives and representations** of concepts and content are presented and encouraged.
- Goals and objectives are derived by the student or in negotiation with the teacher or system.
- Teachers serve in the role of guides, monitors, coaches, tutors and facilitators.
- Activities, opportunities, tools and environments are provided to **encourage metacognition, self-analysis regulation, self-reflection & self-awareness**.
- The student plays a central role in mediating and controlling learning.
- Learning situations, environments, skills, content and tasks are **relevant, realistic, authentic, and represent the natural complexities of the 'real world'**.

CHARACTERISTICS OF CONSTRUCTIVIST LEARNING AND TEACHING

- Primary sources of data are used in order to ensure authenticity and real-world complexity.
- Knowledge construction and **not reproduction** is emphasized.
- This construction takes place in individual contexts and through social negotiation, collaboration, and experience.
- The learner's previous knowledge constructions, beliefs, and attitudes are considered in the knowledge construction process.
- **Problem-solving, higher-order thinking skills, and deep understanding are emphasized**.
- Errors provide the opportunity for insight into students' previous knowledge constructions.

CHARACTERISTICS OF CONSTRUCTIVIST LEARNING AND TEACHING

- Exploration is a favoured approach in order to encourage students to seek knowledge independently and to manage the pursuit of their goals.
- Learners are provided with the opportunity for apprenticeship learning in which there is an increasing complexity of tasks, skills, and knowledge acquisition.
- Knowledge complexity is reflected in an emphasis on **conceptual interrelatedness and interdisciplinary learning**.
- Collaborative and cooperative learning are favoured in order to **expose the learner to alternative viewpoints**.
- Scaffolding is facilitated to help students perform just beyond the limits of their ability.
- **Assessment is authentic and interwoven with teaching**.

The quality of the students in the future is determined by the role of teachers in today's schools. Until now the school is a social institution that is organized to develop the students – to prepare the future generations of the nation. Therefore schools and teachers are expected to develop and renew themselves continuously to be able to keep pace with the changes in the needs of students and society.

A teacher is an agent of change. Teachers are expected to play a role to bring about positive changes for the students and school.

CRITICAL THINKING

CRITICAL THINKING

- Is a general term that covers all thinking processes that strive to get below the surface of something by:
  - Questioning
  - Probing
  - Analysing
  - Testing
  - Exploring

CRITICAL THINKING

- Requires detective-like skills
- Persistence to examine and re-examine an argument
- Takes in all the angles
- Weighs evidence on every side
- Never takes something on ‘face value’
- Questions and thinks **independently** about an issue, however ‘authoritative’ a writer or thinker on the issue may be

CRITICAL THINKING

- Is about asking questions, getting under the surface, finding out what's really going on, testing things out
- Is a key skill in academic study
- **Helps make the individual a deep, rather than a 'surface' thinker** - able to think and argue independently, explore issues in depth, make connections between ideas and **relate them to real life**
- Improves memory, as the individual engages more closely with ideas
- **Helps the individual develop his own opinions**

SEEDS – CATALYSTS, PROCESSES

- **Where credit is due: Arroyo, not Aquino, raised PH economy** (by Andrea - February 3, 2017)
- **A Catholic Nun Perfectly Explains the Hypocrisy of the "Pro-Life" Argument** (by Eleanor Sheehan in PopSugar - February 4, 2017)
- **Economic managers buck legislated free tuition, set alternative** (ABS-CBN News Posted Feb 09 2017 10:41 AM | Updated as of Feb 09 2017 10:50 AM)
- **Trillanes kin got MRT-3 contract** (GOTCHA By Jarius Bondoc (The Philippine Star) | Updated June 10, 2016 - 12:00am)
- **DLSU prof slams int'l media: De Lima was not arrested for being Duterte critic but for coddling drug lords** (by Antonio P. Contreras 22 hours ago as of 20170225 5:35pm)
- **The AI Threat Isn't Skynet. It's the End of the Middle Class** (By Cade Metz 20170210 in Wired)

10 Common Fallacies
Everyone Should Know

Ad Hominem:
when someone attacks the person instead of the argument.
Ex: "Jenny's just a stupid blonde on unemployment. Why would you ever consider her strategy for getting a job."

Appeal to Authority:
when a statement is considered true because it's made by someone who is considered an "authority" on the topic. *Ex: "My doctor says taking St John's Wart everyday will make me less depressed. He should know, he's a doctor!"*

Appeal to Ignorance:
when a claim is considered true because it hasn't been disproven (or vice versa). *Ex: "Since you cannot prove that Aliens do not exist, then they must exist."*

Bandwagon Fallacy:
when a concept is considered true because lots of people believe it's true. *Ex: "9 out of 10 doctors agree that Medicine X is the best. So then Medicine X must be the best."*

Begging the Question:
when the statement is assumed true based on the statement itself. *Ex: "The Bible is the word of God, because it says so in the Bible."*

Loaded Question:

when a question contains the presumption of guilt. *Ex: "So when exactly did you stop hitting your wife?" (Assumes the person WAS hitting his wife).*

Non Sequitor:

when a statement's conclusion does not follow from its premise. *Ex: "If you don't buy this type of food, then you are neglecting your children's health."*

Red Herring:

when someone diverts the attention away from the topic to a NEW topic to throw you off and win the argument. *Ex: "So you think abortion results in lower crime rates. Well, we've all see what happened in Nevada with that abortion doctor who killed his patients with dirty equipment. You want that? You want to see patients killed in dirty clinics? Then go ahead and support abortion."*

Slippery Slope:

when it's assumed that a small step leads to a larger chain reaction of events resulting in a greater impact. *Ex: "If we legalize abortion, then next thing you know we'll be killing new born babies."*

Straw Man:

when someone ignores the argument and replaces it with a distorted or exaggerated version of that argument. *Ex: Person A: "Evolution states that humans developed over a long time from the same common ancestor as the gorilla."*
Person B: "Everyone listen to Person A. He's saying that we decended from baboons!!!"

The Ultimate Cheatsheet for Critical Thinking

Want to exercise critical thinking skills? Ask these questions whenever you discover or discuss new information. These are broad and versatile questions that have limitless applications!

Who

- ... benefits from this?
- ... is this harmful to?
- ... makes decisions about this?
- ... is most directly affected?
- ... have you also heard discuss this?
- ... would be the best person to consult?
- ... will be the key people in this?
- ... deserves recognition for this?

What

- ... are the strengths/weaknesses?
- ... is another perspective?
- ... is another alternative?
- ... would be a counter-argument?
- ... is the best/worst case scenario?
- ... is most/least important?
- ... can we do to make a positive change?
- ... is getting in the way of our action?

Where

- ... would we see this in the real world?
- ... are there similar concepts/situations?
- ... is there the most need for this?
- ... in the world would this be a problem?
- ... can we get more information?
- ... do we go for help with this?
- ... will this idea take us?
- ... are the areas for improvement?

The Ultimate Cheatsheet for Critical Thinking

Want to exercise critical thinking skills? Ask these questions whenever you discover or discuss new information. These are broad and versatile questions that have limitless applications!

When

- ... is this acceptable/unacceptable?
- ... would this benefit our society?
- ... would this cause a problem?
- ... is the best time to take action?
- ... will we know we've succeeded?
- ... has this played a part in our history?
- ... can we expect this to change?
- ... should we ask for help with this?

Why

- ... is this a problem/challenge?
- ... is it relevant to me/others?
- ... is this the best/worst scenario?
- ... are people influenced by this?
- ... should people know about this?
- ... has it been this way for so long?
- ... have we allowed this to happen?
- ... is there a need for this today?

How

- ... is this similar to _____?
- ... does this disrupt things?
- ... do we know the truth about this?
- ... will we approach this safely?
- ... does this benefit us/others?
- ... does this harm us/others?
- ... do we see this in the future?
- ... can we change this for our good?

Creativity is as much an attitude toward life as a matter of ability. We routinely witness creativity in young children, but it is hard to find in older children and adults because their creative potential has been suppressed by a society that encourages intellectual conformity. We begin to suppress children's natural creativity when we expect them to color within the lines in their coloring books.

When creative ideas are proposed, they are often viewed as bizarre, useless, and even foolish, and are summarily rejected, and the person proposing them regarded with suspicion and perhaps even disdain and derision.

CREATIVITY

CREATIVE WORK REQUIRES APPLYING AND BALANCING THREE ABILITIES

- **Synthetic ability** is what we typically think of as **creativity**. It is **the ability to generate novel and interesting ideas**. Often the person we call creative is a particularly good synthetic thinker who **makes connections between things that other people don't recognize spontaneously**.
- **Analytic ability** is typically considered to be **critical thinking ability**. A person with this skill **analyzes and evaluates ideas**. Without well-developed analytic ability, the creative thinker is as likely to pursue bad ideas as to pursue good ones. The creative individual uses analytic ability to work out the implications of a creative idea and to test it.
- **Practical ability** is the **ability to translate theory into practice and abstract ideas into practical accomplishments**. Good ideas do not sell themselves. The creative person uses practical ability to convince other people that an idea is worthy. Practical ability is also used to recognize ideas that have a potential audience.

WAYS TO DEVELOP CREATIVITY – THE PREREQUISITES

- **The teacher as role model**
  - Enthusiastic
  - Supportive of creative performance
    - Not judgmental
    - Encourages new ideas
    - Praises what works
    - Explains what doesn’t work
    - Believes in the student
  - Balances teaching content with how to think with and about that content
  - Shows students his own creative process to encourage studentsa in their own creative thinking

WAYS TO DEVELOP CREATIVITY – THE PREREQUISITES

- **Build self-efficacy**
  - Let every student know that he possesses the ability to meet all of life's challenges — his job is to decide how hard he will work to meet the challenges
  - The self-fulfilling prophesy – what holds a student back is usually a set of beliefs about his limitations
  - Design successes to lead the student to belief in himself

WAYS TO DEVELOP CREATIVITY – LEARNING BASIC TECHNIQUES

- **Questioning assumptions**
  - The impetus of **those who question assumptions allow for cultural, technological, and other forms of advancement**.
  - By enabling students to make their assumptions explicit, a teacher focuses attention on the limitations imposed by the assumptions.
  - Make questioning a part of the daily classroom exchange. It's more important for students to learn what questions to ask—and how to ask them—than to learn the answers.
  - Teach students how to ask the right questions (good, thought-provoking, and interesting ones) and lessen the emphasis on rote learning
  - Whether students continue to ask questions and challenge depends largely on how the teacher responds to their questions

WAYS TO DEVELOP CREATIVITY – LEARNING BASIC TECHNIQUES

- **Questioning assumptions**
  - **Level 1—Rejecting Questions** – punishing students for asking questions teaches them to stop asking questions and they learn less
  - **Level 2—Restating Questions as Responses**
  - **Level 3—Admitting Ignorance or Responding Directly** – students are given the opportunity to learn something or to realize that their teachers do not know everything, but these are not the best responses for fostering learning
  - **Level 4—Encouraging Information Seeking** – students learn that information can and should be sought, they are given the responsibility for learning and they learn how to learn.
  - **Level 5—Considering Alternative Explanations** – the teacher suggests ideas for the student to explore; or, better, the student and teacher generate ideas together

WAYS TO DEVELOP CREATIVITY – LEARNING BASIC TECHNIQUES

- **Questioning assumptions**
  - **Level 6—Considering and Evaluating Explanations** – students are encouraged to evaluate the explanations – students learn from the teacher's response not only how to generate alternative hypotheses, but also how to test hypotheses.
  - **Level 7—Considering, Evaluating, and Following Up** – the teacher encourages the students to gather information that might help determine a valid hypothesis – the students learn how to think and how to act on their thoughts

- Higher levels of response are not equally appropriate for all students—responses need to be developmentally appropriate. The more we use the higher levels as students grow up, the more we **encourage and assist students in developing cognitive skills**.

WAYS TO DEVELOP CREATIVITY – LEARNING BASIC TECHNIQUES

- **Defining and redefining problems**
  - Encourage creative thinking by having students
    - Choose their own topics for papers or presentations
    - Choose their own ways of solving problems
    - Sometimes choose again if they discover that their selection was a mistake
  - Giving students choices is the only way for them to learn how to choose
- An **important part of creativity is the analytic part—learning to recognize a mistake** – give students that chance and the opportunity to redefine their choices

WAYS TO DEVELOP CREATIVITY – LEARNING BASIC TECHNIQUES

- **Encouraging idea generation**
  - Environment for generating ideas must be relatively free of criticism
  - Identify and encourage any creative aspects of ideas presented
  - Praise students for generating many ideas, regardless of whether some are silly or unrelated
  - Encourage students to identify and develop their most unique ideas into high-quality projects
- Questions about marriage, family, and careers are best answered after thoroughly considering many ideas
- Teaching students to generate numerous ideas **enhances their creative-thinking ability** which benefits them now and in the future

WAYS TO DEVELOP CREATIVITY – LEARNING BASIC TECHNIQUES

- **Cross-fertilizing ideas**
  - Stimulate creativity by helping students to think across subjects and disciplines – **creative ideas and insights often result from integrating material across subject areas**, not from memorizing and reciting material
  - Coss-fertilizing draws on the students' skills, interests, and abilities, regardless of the subject – cross-fertilization motivates students who aren't interested in subjects taught in the abstract
  - Cross-fertilization helps students and teachers generate creative ideas for readings, reports, assignments, and assessments

CHARACTERISTICS OF SUCCESSFUL ENTREPRENEURS

- Motivation (self-motivated)
- Creativity (creative capacity to recognize and pursue opportunities) and persuasiveness (persuasive and persistent)
- Versatility (wearing several different hats, including secretary, bookkeeper and so on
- Superb business skills (naturally capable of setting up the internal systems, procedures and processes necessary to operate a business; skills, contacts and experience readily transfer to the business idea)
- Risk tolerance
- Drive (proactive; a doer -- someone willing to take the reins)
- Vision (deciding where the business should go)

CHARACTERISTICS OF SUCCESSFUL ENTREPRENEURS

- Flexibility and open-mindedness (open-minded and flexible in the face of change)
- Decisiveness (make decisions quickly and seize the moment; no room for procrastination or indecision)

Innovativeness is a firm’s propensity and capability to rapidly incorporate change in business practices through creation and/or adoption of new ideas, that add value in the form of increased competiveness and sustainability

Innovativeness is a characteristic relating to how early someone adopts an innovation in comparison to other community members

INNOVATIVENESS

CREATIVITY, INNOVATION, INVENTION

- Definitions
  - **Creativity** is the **capability or act of conceiving something original or unusual**
  - **Innovation** is the **implementation of something new**
  - **Invention** is the **creation of something that has never been made before and is recognized as the product of some unique insight**
- "If you have a brainstorm meeting and dream up dozens of new ideas then you have displayed creativity but **there is no innovation until something gets implemented**"
- **We need to develop creativity and turn it quickly into innovation**
- The introduction of a **common language for innovation — design thinking** — enables organizations to better measure milestones in their innovative efforts

CREATIVITY, INNOVATION, INVENTION

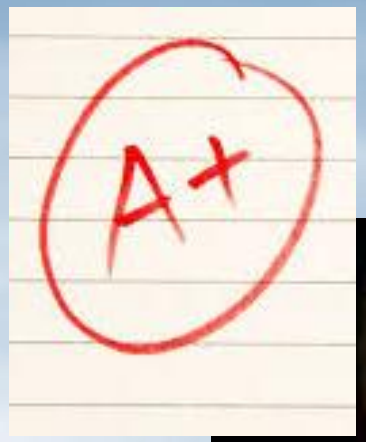
- Department of Trade and Industry in the UK
  - Creativity is about unleashing the potential of the mind to conceive new ideas
  - **Innovation is about introducing change** into relatively stable systems – concerned with the work required to make an idea viable
  - "In the UK, we've been looking in the wrong place for innovation because we thought it was invention. We have been looking to academia (who come up with novel ideas) when we should have been **looking to industry (who deliver novel ideas)**"

“There are schools that are teaching in the old-fashioned way which was of benefit in the beginning of the 1900s — but the needs are not the same, and we need something fit for the 21st century.“

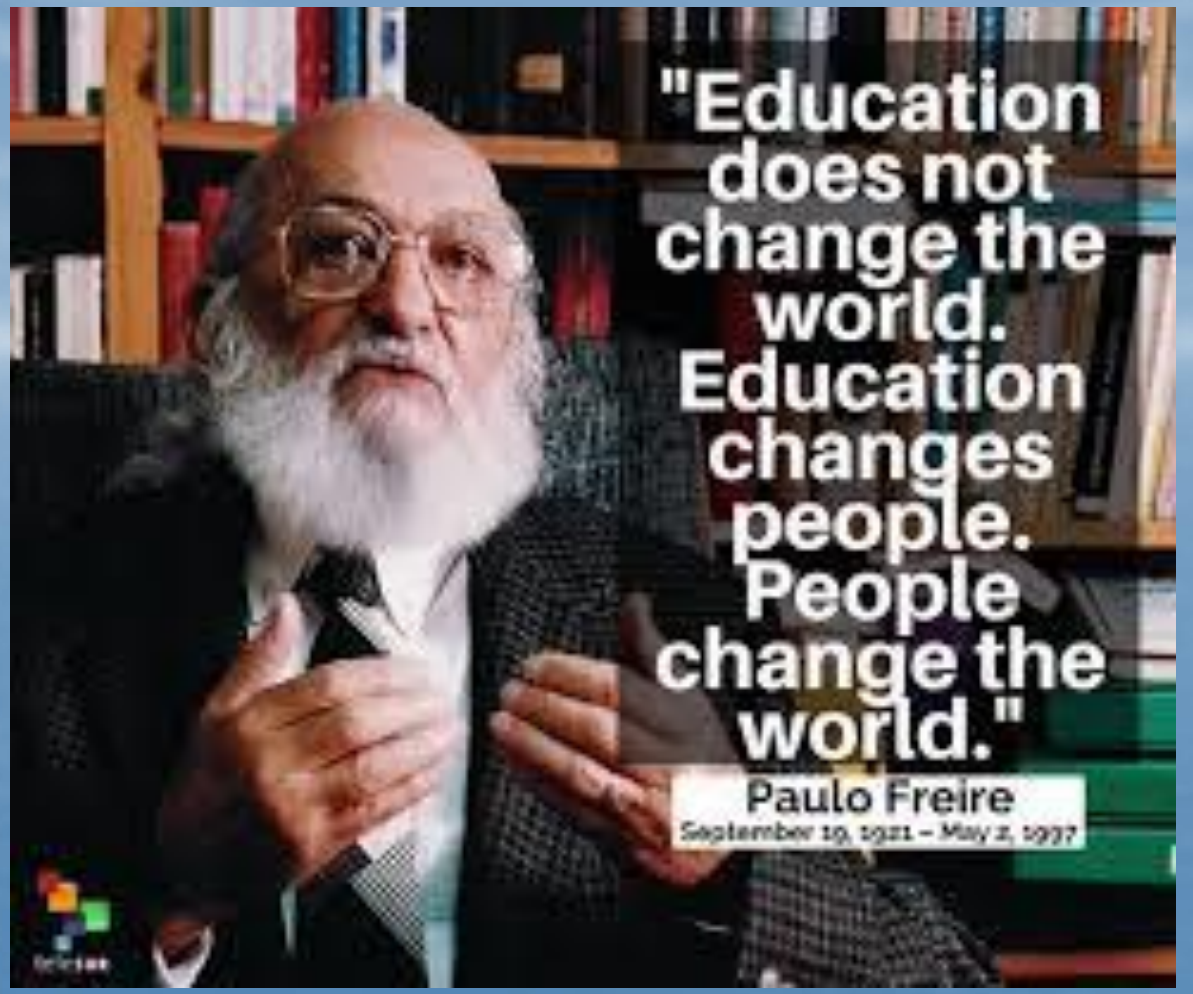
FINLAND

FINLAND

- To remove school subjects from the curriculum
- No more classes in physics, math, literature, history, or geography
- Students to study events and phenomena in an interdisciplinary format
- Students to work together in small groups to discuss problems
  - *Second World War* to be examined from the perspective of history, geography, and math
  - *Working in a Cafe* – students to absorb a whole body of knowledge about the English language, economics, and communication skills
- Require a great deal of cooperation among teachers of different subjects


A+


How do we evaluate our teachers?
We never speak of this.
It is irrelevant in our country.
Instead, we discuss:
"How can we help them?"
Pasi Sahlberg
Finnish Educator and Scholar


"Education does not change the world. Education changes people. People change the world."
Paulo Freire
September 19, 1921 – May 2, 1997

(was) Executive Director that prepared the PCS Information & Computing Accreditation Board (PICAB) for acceptance into provisional membership in the **Seoul Accord** (an international agreement for the mutual recognition of accredited computing- and information technology-related baccalaureate programs)

(is) Consultant to institutions preparing for evaluation by PICAB for possible accreditation in alignment with the Seoul Accord

Eloisa P. Tinio

ISO	**consultant**	PICAB
training		TVET
English language		
editor		**trainer**
writer		**speaker**
Learning Coach		

www.seoulaccord.org/signatories.php
+63-917-518-2027
etinio88@yahoo.com