



Promoting  
**STEM**  
through  
digital  
technologies

MSTeam

Accessing the Padlet:

[tinyurl.com/inset2016](https://tinyurl.com/inset2016)



You

## Promoting STEM through digital technologies | MStem

Welcome to the course! Proceed to task 1 by clicking here: <https://padlet.com/elainemuscat/umi7qdpjxjsg>

CLONE SHARE ⚙️ ⋮ 👤

Welcome to this course! Our aim is to create a space where we can share and learn together.

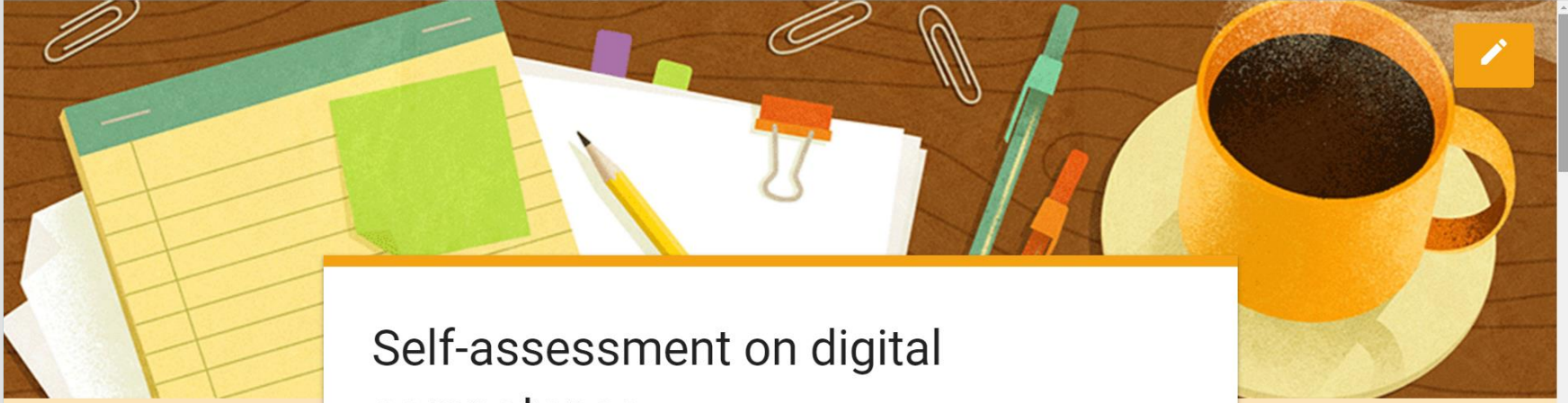


But before we start, click on the link below to take the online quiz on how tech savvy you are. For this quiz, we are using Google forms. Don't worry, your responses shall remain confidential! :-)

Take the online quiz here:  
<http://goo.gl/forms/Z8xge5NPliWb8G3W2>

# Google forms





## Self-assessment on digital competence

Let's see how familiar you are with some tech-related terms!

\*Required

What does MOOC stand for? \*

- Massive Open Online Community
- Massive Open Online Course















Technology has permeated every aspect of our lives.

Our students are digital natives.

Are you ready to be part of it?

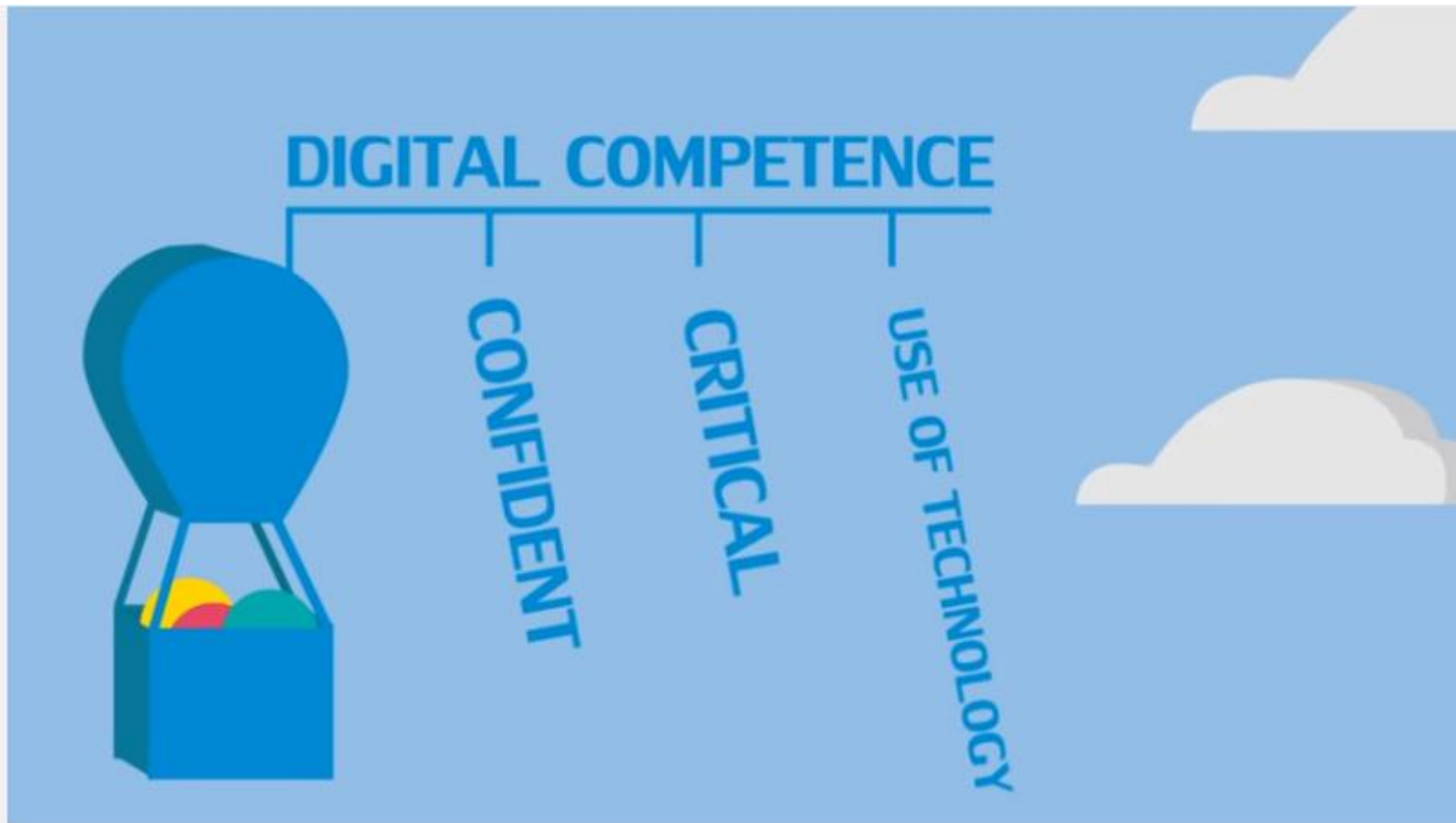
What does it mean to be digitally competent?

Are we aware of the added-value that technology can bring to the learning process?



Avoid the sub-optimal use of technology

# The impact of digital technologies:



# A digital agenda for Europe 2020

“**Digital Competence** is the set of knowledge, skills, attitudes that are required when using ICT and digital media to perform tasks; solve problems; communicate; manage information; collaborate; create and share content; and build knowledge effectively ... for work, leisure, participation, learning, socialising, consuming, and empowerment. “

*(Ferrari, 2012)*

To summarise



Digital Competence

Digital competence is the set of knowledge, skills, attitudes



Learning domains

that are required when using ICT, digital media and tools



Tools

to perform tasks; solve problems; communicate; manage information; collaborate; create and share content; and build knowledge



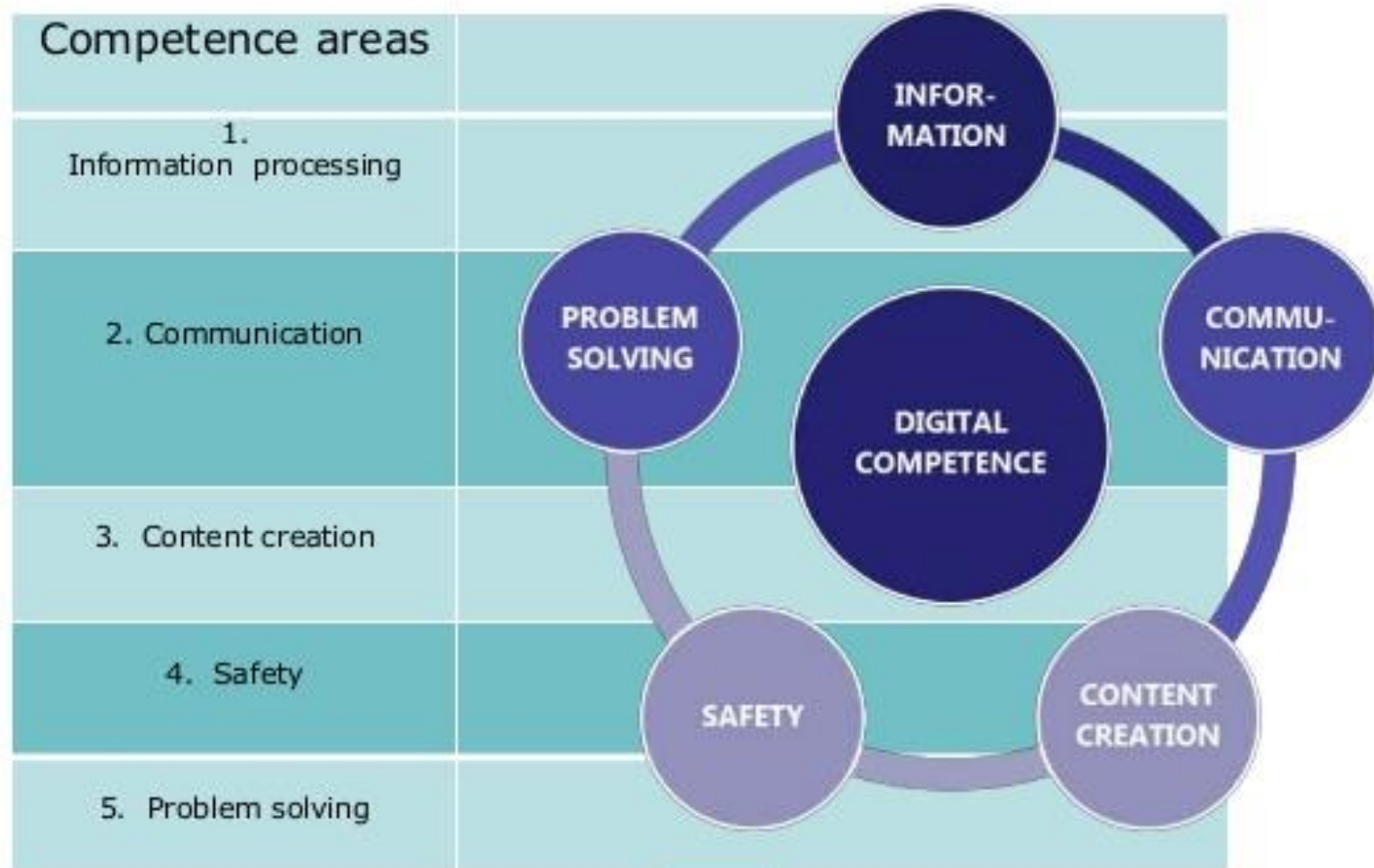
Competence areas

for work, leisure, participation, learning, socialising, consuming & empowerment



Purpose

## Digital Competence framework





**SCIENCE**

**TECHNOLOGY**

**ENGINEERING**

**MATHEMATICS**

**S**

STEM education is an **interdisciplinary** approach to learning that removes traditional barriers separating the four disciplines of science, technology, engineering and mathematics and integrates them into **real-world, challenging and relevant** learning experiences for students. Students develop important **STEM** skills which they need for life.

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# The 21<sup>st</sup> Century Skills (The 4 Cs)



## COLLABORATION

working with a group to achieve shared goals



## CREATIVITY

new ways of solving problems and developing new ideas



## CRITICAL THINKING

making a decision or forming an opinion by exploring various ideas and sources of information



## COMMUNICATION

listening and sharing ideas effectively using a variety of tools, such as media and technology



I'm a 21st century learner and I am a ...

...problem solver

...critical thinker

...collaborator

...communicator

# Developing Digital Competence and the 21<sup>st</sup> Century Skills



## 8 KEY COMPETENCES

Communication in the mother tongue



Communication in foreign languages



Mathematical competence and basic competences in science and technology



Digital competence



Learning to learn



Social and civic competences



Sense of initiative and entrepreneurship



Cultural awareness and expression



## 7 TRANSVERSAL SKILLS



Critical thinking



Creativity



Initiative



Problem-solving



Risk assessment



Decision-taking



Constructive management of feelings

21ST  
CENTURY  
EDUCATION!

aitsl

0:05 / 3:40

▶ ⏩ 🔊 ⚙️ 📺 🗖

The image shows a video player on a laptop screen. The video content is a title card with an orange-to-yellow gradient background. A dark silhouette of a hand is pointing towards the text '21ST CENTURY EDUCATION!'. The text is arranged in three lines: '21ST' in dark brown, 'CENTURY' in a lighter brown, and 'EDUCATION!' in white. In the bottom right corner of the video frame, there is a small green and white logo for 'aitsl'. Below the video frame is a dark brown control bar containing a play button, a next button, a volume icon, a progress indicator showing '0:05 / 3:40', a settings gear icon, a full screen icon, and a refresh icon.

# Learning in the 21<sup>st</sup> century...

Learning tasks to encourage working at the **upper end** of Bloom's Taxonomy. (from mere recall to getting creative)

Shifting from **low cognitive** work to **high level cognitive** work.

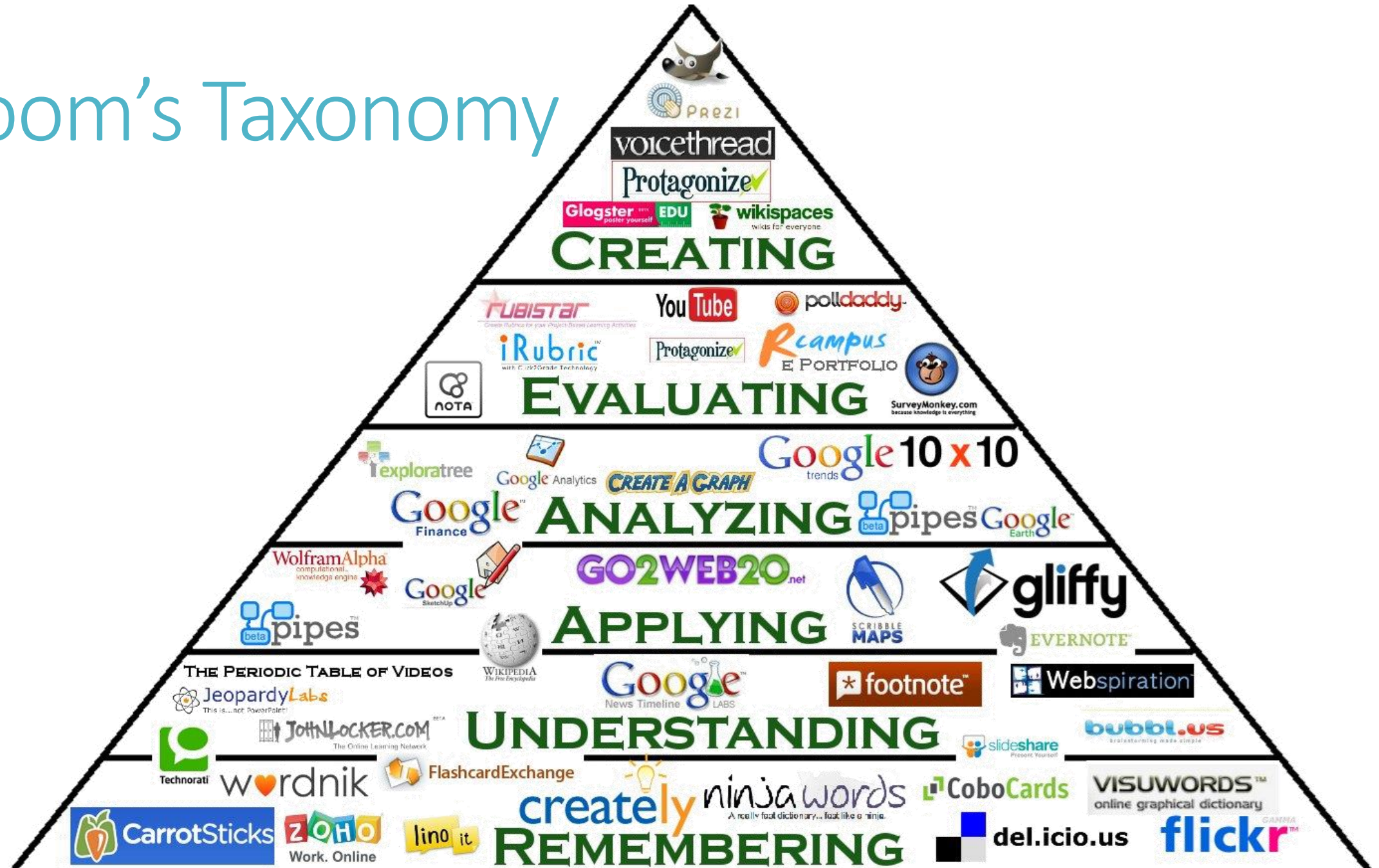
The learners are **communicating** and **producing** information.

Technologies are the **enabling** factor to be able to support the 21<sup>st</sup> century skills.

Accessing learning and becoming lifelong learners entails being **digitally skilled**.



# Bloom's Taxonomy



# Tablet & Web 2.0 Tools Based on Bloom's Taxonomy



## CREATING

animating, videocasting, storytelling, video editing, podcasting, collaborating, audio recording/editing, publishing, filming, programming, directing,



## EVALUATING

critiquing, networking, posting, collaborating, conferencing, moderating, blogging, reviewing, simulation, commenting, monitoring, wiki-ing



## ANALYZING

surveying, structuring, mashing, deconstructing, outlining, organizing, linking, media clipping, video conferencing, relationship mind mapping, graphing



## APPLYING

presenting, interviewing, illustrating, editing, demonstrating, sharing, replying, podcasting



## UNDERSTANDING

word processing, annotating, categorizing, tweeting, subscribing, explaining, advanced searches, commenting, video conferencing, filtering



## REMEMBERING

mind mapping, searching, listing, tagging, bookmarking, describing, social networking,



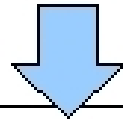
# LOTS

## Lower Order Thinking Skills

Knowledge Acquisition

*Remembering*

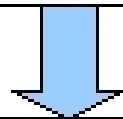
*Understanding*



Knowledge Deepening

*Applying*

*Analysing*



Knowledge Creation

*Evaluating*

*Creating*

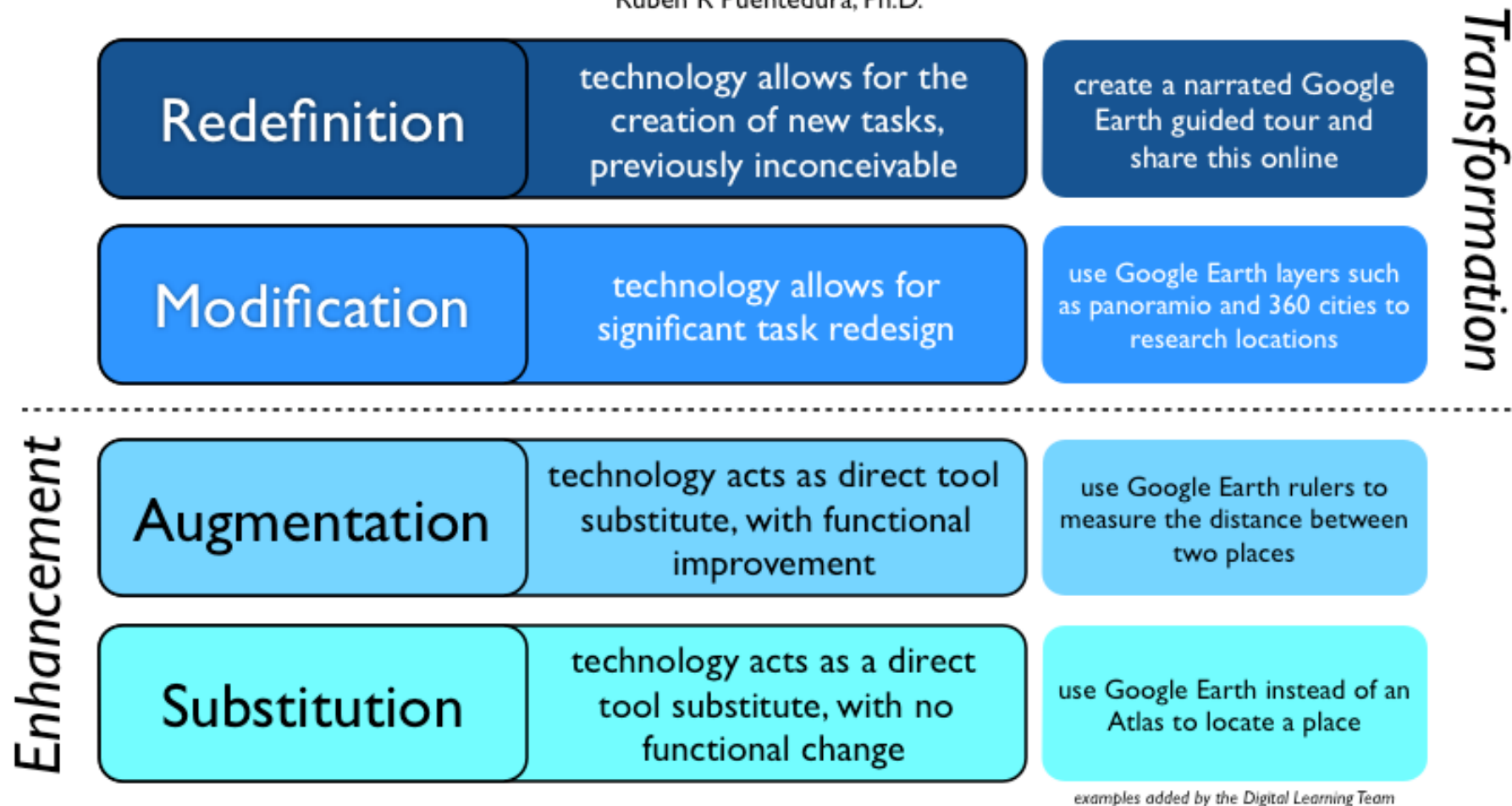
# HOTS

## Higher Order Thinking Skills

# The SAMR Model

*enhancing technology integration*

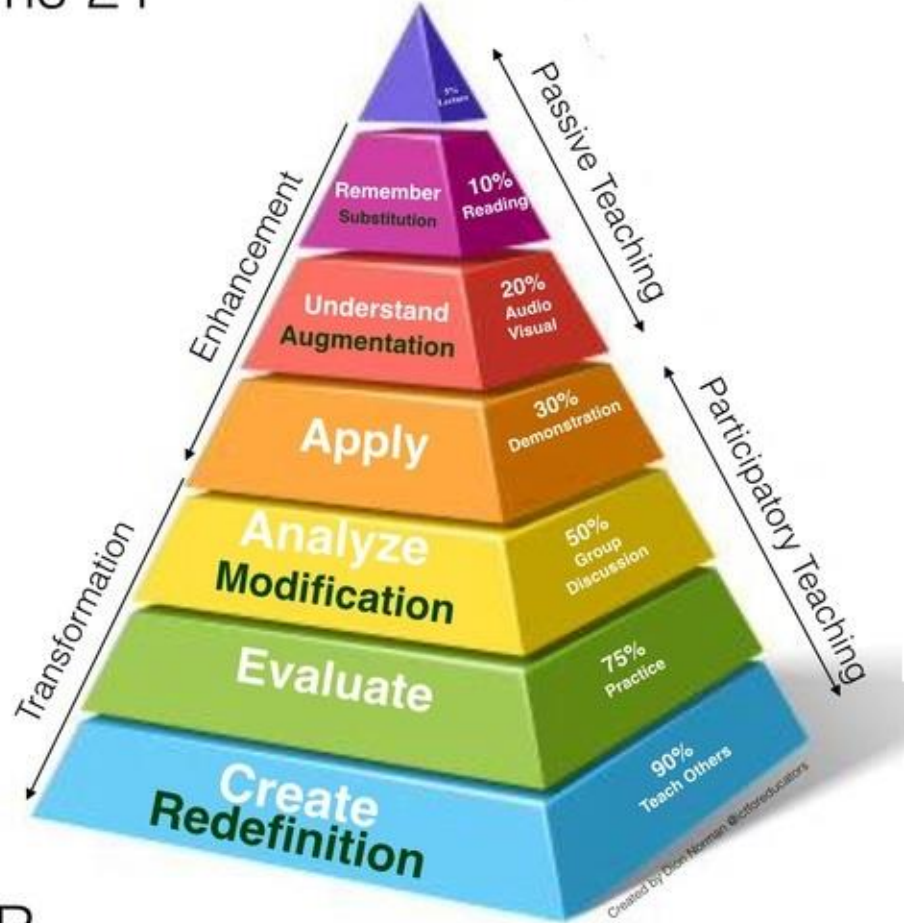
Ruben R Puentedura, Ph.D.



*examples added by the Digital Learning Team*

Blooms 21

Bringing it all Together



Learning Pyramid

SAMR

# Bridging the gap – upskilling to be **es**killed

Teachers need to be able to help students become **collaborative, problem-solving, creative** learners through using ICT so that they will be effective citizens and members of the workforce.

ICT has **pedagogical added value** when it supports individualized learning, formative assessment, and collaborative and project-based learning.

Adding 21st-Century technologies to 20th-Century teaching practices will not improve the effectiveness of teaching.

# Bridging the gap – upskilling to be **es**killed

It is not enough for teachers to have ICT competencies and be able to teach them to their students. Teachers need to be able to help students become **collaborative, problem-solving, creative** learners through using ICT so that they will be effective citizens and members of the workforce.

# Pedagogical settings to foster the 21<sup>st</sup> century skills

Project-based learning (teaching across subjects)

Problem-based learning (connected to the real world)

Inquiry-based learning (constructing understanding)

Flipped classroom model (collaborating in class)



https://padlet.com/elainemuscat/umi7qdpjxjsg

You

CLONE SHARE ⚙️ ⋮



## Task 1: Discuss briefly what classroom challenges are you facing or do you anticipate to face when integrating digital technologies?

Proceed to task 2 by clicking the link here: <https://padlet.com/elainemuscat/l74q06rny826>



System tray icons including network, volume, and language (ENG).





**Evaluating and Creating:** App allows for creation of new tasks, previously inconceivable. (redefinition)

Create a personal 'Tal-Linja' account to be able to view your transaction history, search for bus stops and their location on google map, access real time information on buses and their arrival at each bus stop.

**Applying, Analysing and Evaluating:** App allows for significant task redesign (modification).

Top up you card and check balance while access a journey planner as to minimum transfers and shortest walks to arrive to destination with an estimated time of arrival.

**Understand and Applying:** App acts as a direct tool substitute with functional improvements (augmentation).

Allows you to plan a journey any time, from any destination to another.

**Remembering:** App acts as a substitute for time-table leaflets, with no functional change.

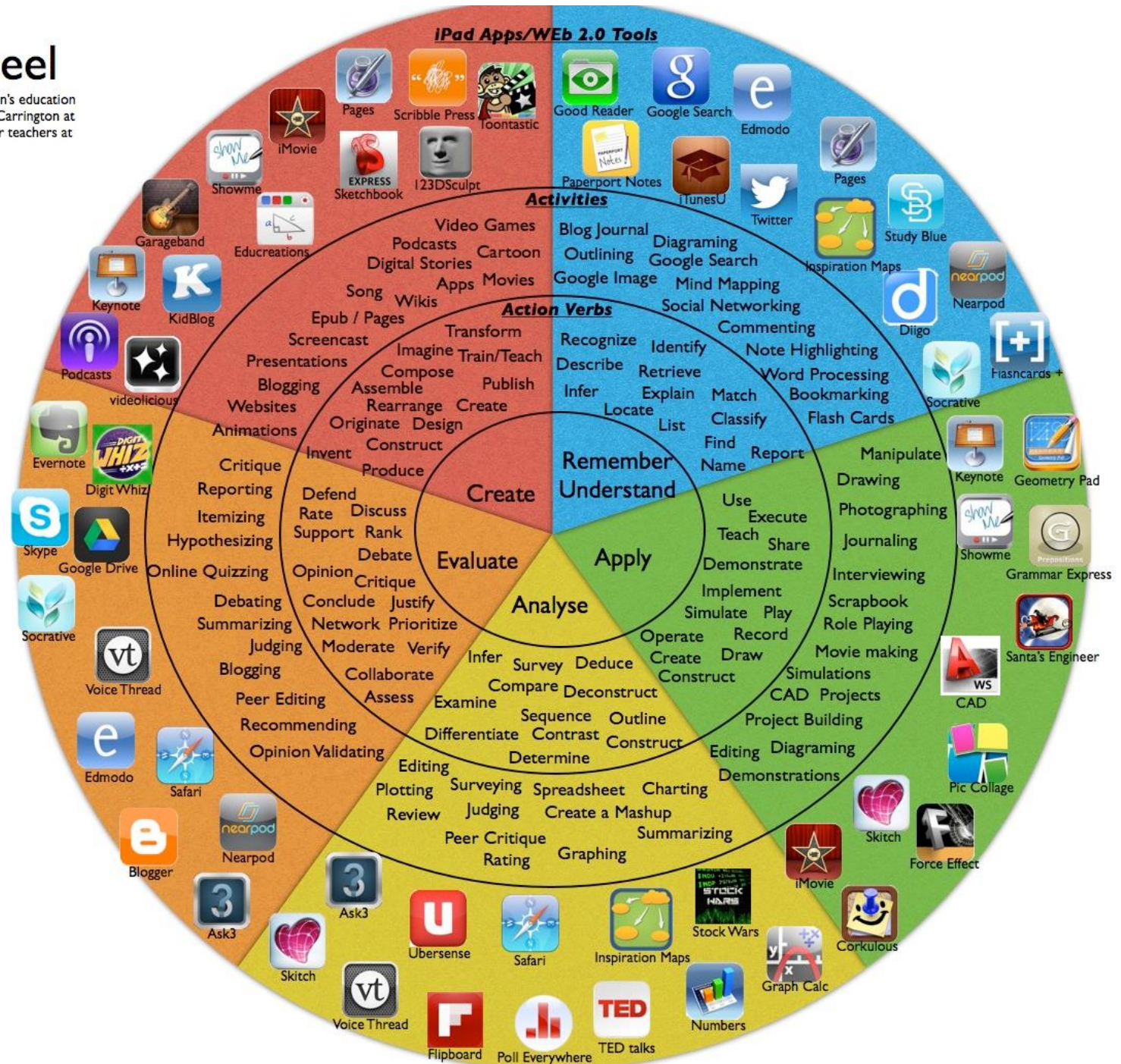
Bus routes information    Time table information    Service Information

# BLOOM'S TAXONOMY & POWERPOINT

<p><b>CREATE</b></p>	<ul style="list-style-type: none"> <li>– <b>PLAN</b> a professional presentation on a cause as a group</li> <li>– <b>COMPOSE</b> a music video using images and background music</li> <li>– <b>DESIGN</b> a PowerPoint theme for a mock organization or product</li> <li>– <b>INVENT</b> a new feature for PowerPoint</li> </ul>
<p><b>EVALUATE</b></p>	<ul style="list-style-type: none"> <li>– <b>CONVINCE</b> someone of an argument with only 3 slides</li> <li>– <b>APPRAISE</b> PowerPoint as a platform for presenting information</li> <li>– <b>CRITICIZE</b> a PowerPoint for its design and aesthetic</li> </ul>
<p><b>ANALYZE</b></p>	<ul style="list-style-type: none"> <li>– <b>COMPARE &amp; CONTRAST</b> information by creating a Venn diagram using shapes and text-boxes</li> <li>– <b>SURVEY</b> friends and family and present the data using charts</li> <li>– <b>IDENTIFY</b> what a professional presentation looks like on PowerPoint</li> </ul>
<p><b>APPLY</b></p>	<ul style="list-style-type: none"> <li>– <b>PREPARE</b> for papers, debates and projects with slide outlines</li> <li>– <b>ILLUSTRATE</b> ideas using shapes and diagrams</li> <li>– <b>COLLECT</b> articles and sources with relevant information on each slide to create a PowerPoint of research for a paper or project</li> </ul>
<p><b>UNDERSTAND</b></p>	<ul style="list-style-type: none"> <li>– <b>CLASSIFY</b> objects by organizing slides</li> <li>– <b>SUMMARIZE</b> texts with a limited amount of bullet points</li> <li>– <b>GIVE EXAMPLES</b> of classroom concepts with images and text</li> <li>– <b>DEFEND</b> an argument with a presentation</li> </ul>
<p><b>REMEMBER</b></p>	<ul style="list-style-type: none"> <li>– <b>LABEL</b> diagrams using shapes and text-boxes</li> <li>– <b>DEFINE</b> vocabulary with definitions on each slide</li> <li>– <b>DESCRIBE</b> objects and key events with images and text</li> </ul>

# iPadagogy Wheel

Originally discovered on the website of Paul Hopkin's education consultancy site [mmiweb.org.uk](http://mmiweb.org.uk) adopted by Allan Carrington at the University of Adelaide and further modified for teachers at Zeeland Public Schools.



Group Task 2:

(10")

Choose one **digital tool** or **app** and fill in the provided template to explore ways how the tool can be used to extend understanding across the different levels of Bloom's Taxonomy.

Group Task 3

(10")

As a group, explore the shared practices, to see to what extent we are using the **Bee-Bots** to reach different levels of understanding (according to Bloom's Taxonomy).





Group Task 3

(15")

You are given a **Pro-Bot** and some tasks to complete as a group. Once you manage to complete the tasks, create a different task for your students which allows for **problem-solving** and **creativity** while exploring maths skills and concepts.

Group / Pair Task 4

(15")

The **Pro-Bot** allows students to develop logical thinking and to practice **coding** or basic programming. Another digital tool to explore is **ScratchJr**. In the coming minutes, we invite you to learn about this digital tool and to document how you are learning about it on Padlet.

# Why promote STEM and the 21<sup>st</sup> century skills?

Here's to the crazy ones, the misfits, the rebels, the troublemakers, the round pegs in the square holes... the ones who see things differently -- they're not fond of rules... You can quote them, disagree with them, glorify or vilify them, but the only thing you can't do is ignore them because they change things... they push the human race forward, and while some may see them as the crazy ones, we see genius, because the ones who are crazy enough to think that they can change the world, are the ones who do.



**Steve Jobs**  
American entrepreneur  
and inventor  
(1955-2011)



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