Promoting Critical Thinking

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Definition

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Definition

Critical thinking is a process which entails:

- identifying the assumptions that frame our thinking,
- checking out the degree to which these assumptions are accurate and valid,
- looking at our ideas and decisions from several different perspectives, and
- taking informed actions.

(Brookfield, 2012, p.1)

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Why critical thinking?

When we are skilled in critical thinking, we are able to:

- Raise vital questions and problems, formulating them clearly and precisely
- Gather and assess relevant information, using abstract ideas to interpret it effectively
- Come to well-reasoned conclusions and solutions, testing them against relevant criteria and standards

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Why critical thinking?

When we are skilled in critcal thinking, we are able to:

- Think open mindedly, recognizing different systems of thought, assessing their assumptions, implications and practical consequences.

- Communicate effectively with others in figuring out solutions to complex problems

Adapted from: Paul & Elder (2009)

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Why critical thinking?

- Being able to think critically is considered to be a vitally important skill in the engineering workplace (Cooney et al, 2008).

- The quality of students' and engineers' thinking determines the quality of what they design, produce or make (Adair & Jaegar, 2016).

- Graduates who think critically are better placed to take actions that are well grounded in evidence and that are more likely to achieve the results intended (Brookfield, 2012, p.157).

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Sources:
https://www.realworldholidays.co.uk/blog/2016/07/11/travel-adapters-south-america/
http://gradegroup.ru/argentina-plug-socket/

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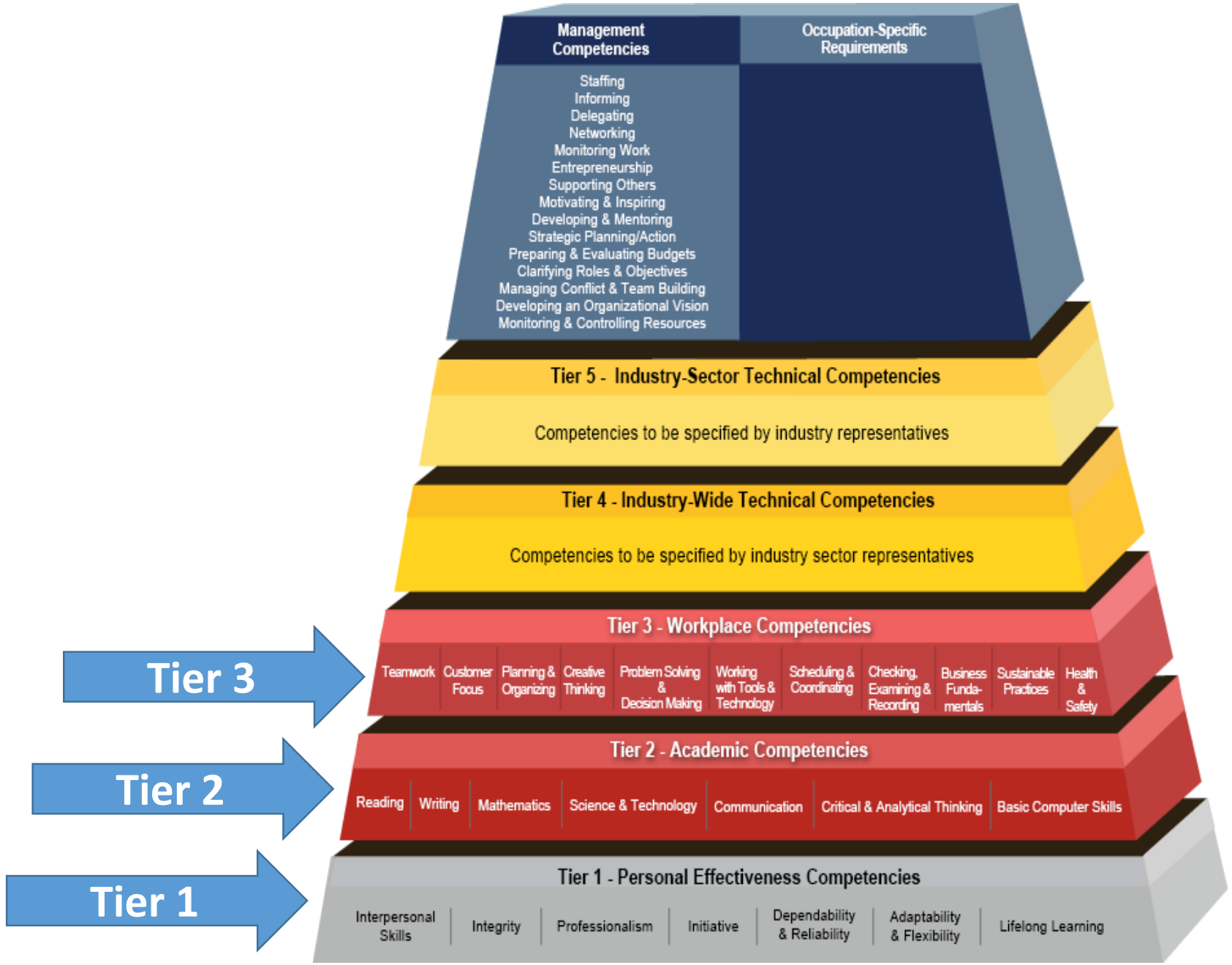

(ETA, 2017)

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Engineering Competency Model

Tier 1

Personal Effective Competencies

interpersonal skills, integrity, reliability and dependability, professionalism….

Tier 2

Academic Competencies

reading, writing, maths, basic computing, communication, **critical and analytical thinking…..**

Tier 3

Workplace Competencies

teamwork, planning and organization, **problem-solving** and decision-making, working with tools and technology, business fundamentals…….

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Competency model

Tier 4: Industry-wide technical competencies

Tier 5: Industry-sector technical competencies

Tier 6: Management competencies and organization-specific requirements

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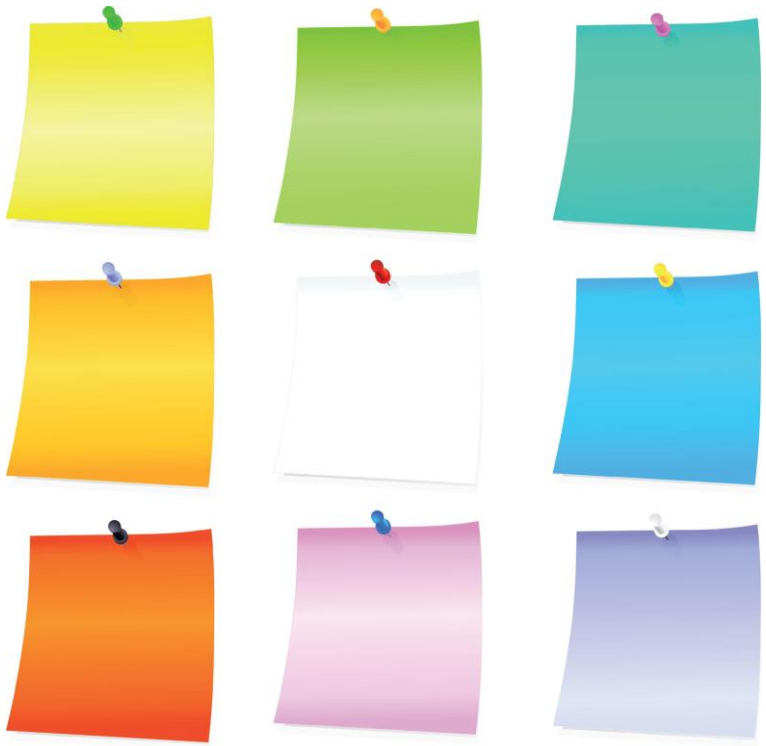
Activity 1

Task:

At your table, discuss and answer the questions on the next slide.

Put your answers on the post-its provided

Place them in the relevant quadrant on the board.



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Activity 1_Questions

- To what extent is critical thinking included in graduate profiles/outcomes at your institution?
- How is critical thinking taught/implemented in your degree programmes? Explicitly, in the form of dedicated courses? Implicitly, in content courses?
- Which methods/approaches are used?
- Does your university perform any standarized testing of critical thinking skills? If so, which kind?

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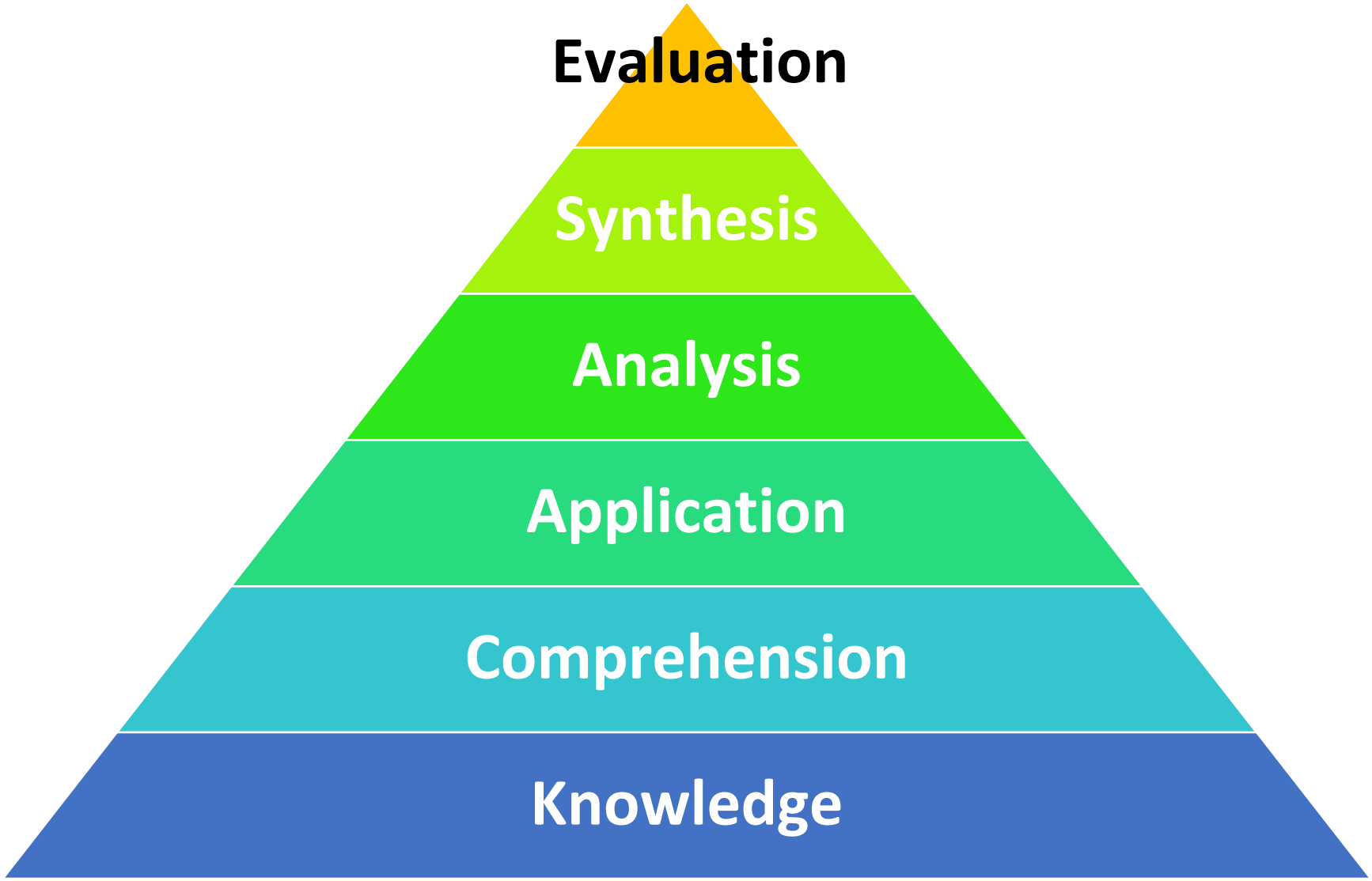

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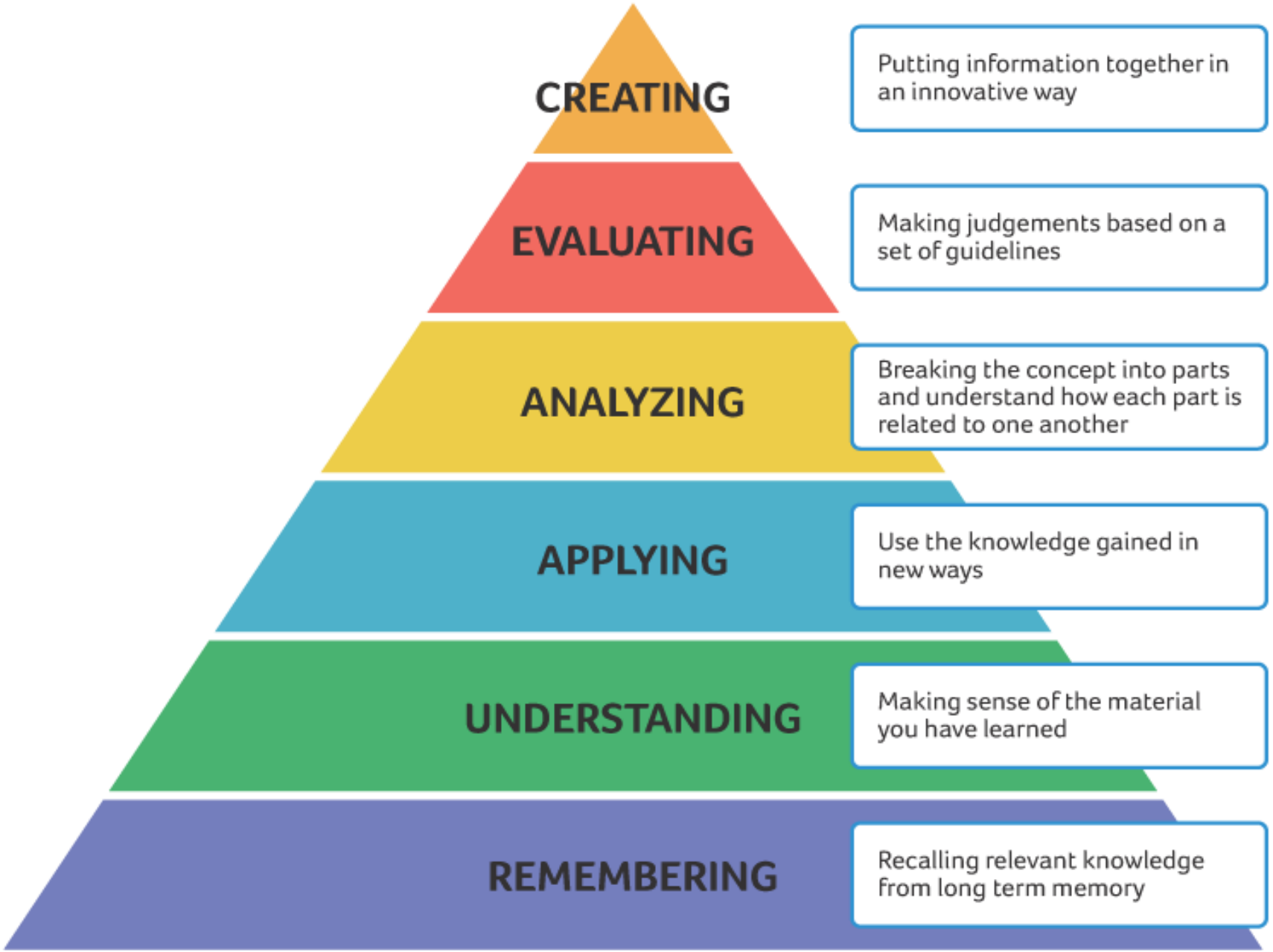

(Kurt, 2016)

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EVALUATION	Uses/develops a model to explore/rate different designs/operating parameter effects
SYNTHESIS	Combines gravity, air resistance and propulsion forces to predict net force on an object
ANALYSIS	Dissects the forces involved in the free fall of an object
APPLICATION	Solves simple problems with F = ma
UNDERSTANDING	Understands that increasing the force linearly increases acceleration of an object
KNOWLEDGE	Is aware that F = ma

(Lewis et al., 2014)

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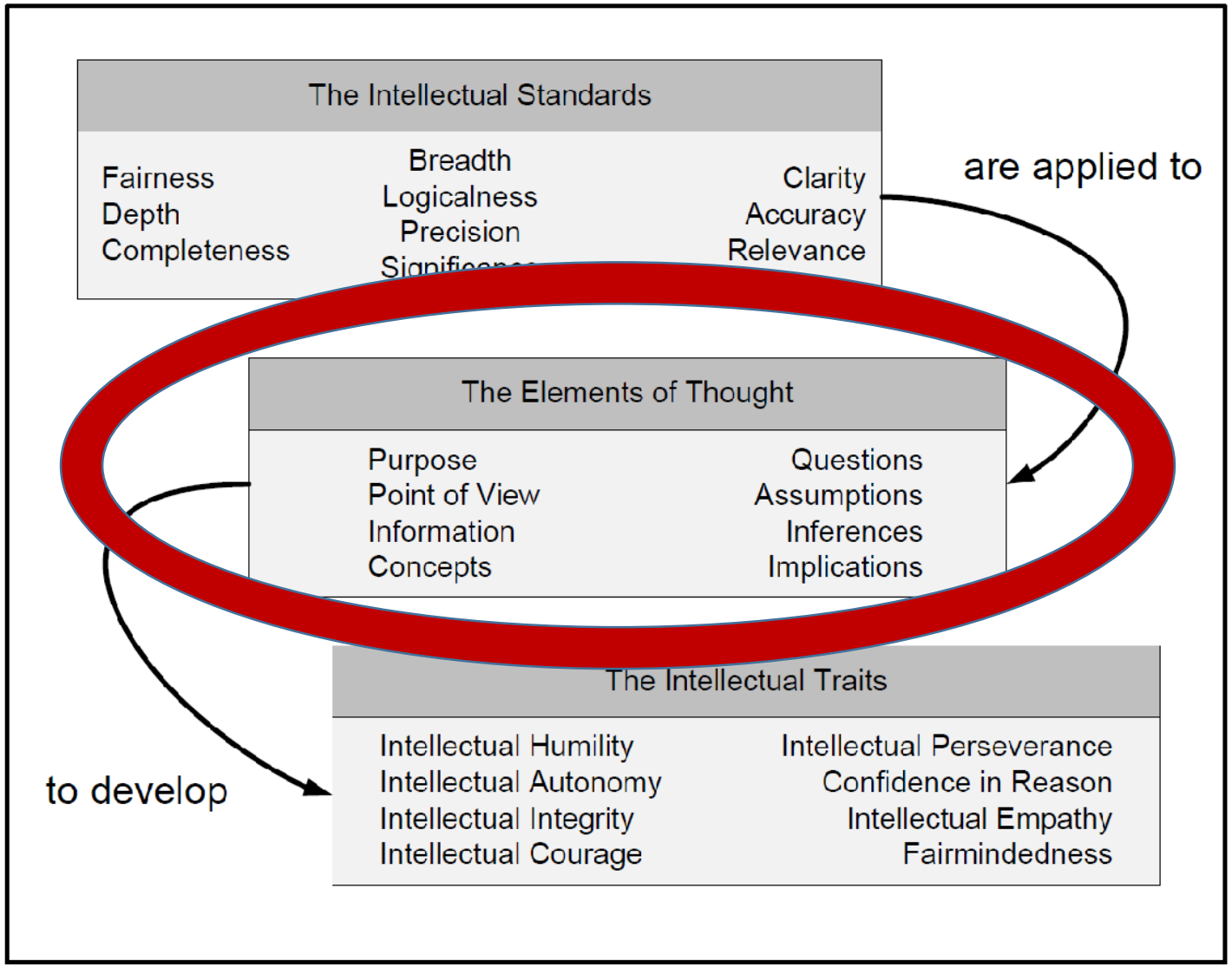
Paul-Elder Framework



(Lewis et al., 2014; Paul & Elder, 2009)

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Checklist for critical thinking_questions

1 All reasoning has a PURPOSE:

Can you state the main purpose clearly?
What is the objective of your reasoning? Is it realistic?

2 All reasoning is an attempt to figure something out, to settle some QUESTION, to solve some PROBLEM:

What questions are you trying to answer?

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Checklist for critical thinking_questions

Activity 2

- Go to https://unlpcriticalthinking.wordpress.com/
- Open the Virtual Handout.
- Formulate questions based on the topic statements (3 – 8).

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Checklist for critical thinking_questions

3 All reasoning is based on ASSUMPTIONS:

What assumptions are we making? Are they justified?

4 All reasoning is done from some POINT OF VIEW:

What is your point of view?
What other points of view should be considered?

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Checklist for critical thinking_questions

5 All reasoning is based on DATA, INFOMATION and EVIDENCE.

Is your point of view supported by relevant data?
Have you gathered sufficient data?

6 All reasoning is expressed through, and shaped by, CONCEPTS and THEORIES.

What key concepts are guiding your reasoning?
What alternative explanations might be possible?

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Checklist for critical thinking_questions

7 All reasoning contains INFERENCES or INTERPRETATIONS by which we draw CONCLUSIONS and give meaning to data:

To what extent do the data support your conclusions?

Are there other reasonable inferences that should be considered?

8 All reasoning leads somewhere or has IMPLICATIONS and CONSEQUENCES

What key concepts are guiding your reasoning?

What alternative explanations might be possible?

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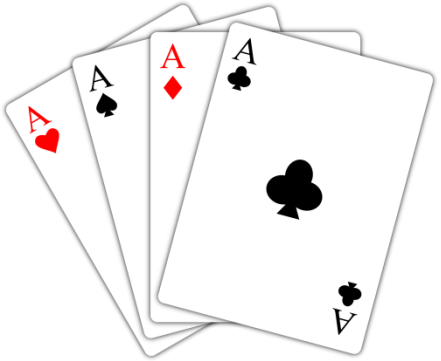
Five Tricks



Instructions

- Sit around a table
- Form groups of four
- Read the handout
- Play some practice rounds

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Five Tricks

spades

hearts

diamonds

clubs

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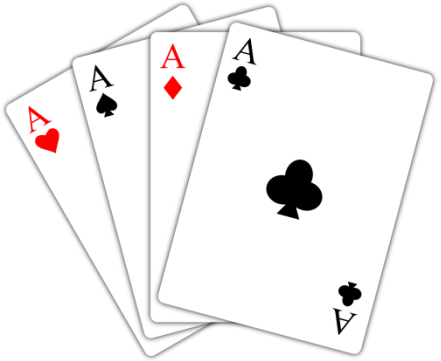
Five Tricks



Gag order

- NO: talking
- NO: written words
- YES: gesture
- YES: pictures

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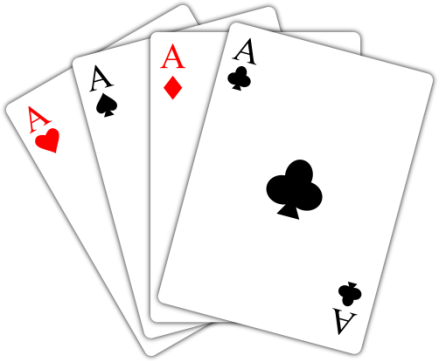
Five Tricks



Tournament

- Play *Five Tricks*
- Play several games
- Keep score
- Stop when the time runs out

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Activity 2

Feedback:

1. What was the purpose of the activity?
2. What problem needed to be solved?
3. What assumptions did you make?
4. What was your point of view? Was it the same as each of the other tables?
5. What information/evidence was available? What were you missing?
6. What guided your reasoning?
7. Which conclusions did you draw?
8. What were the consequences (of your conclusion)?

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Implementation

- Commit to the very long run
- Reach for deep commitment
- Establish a team can that move the process forward
- Provide ongoing faculty workshops
- Fund the programme
- Link assessment to critical thinking

(Elder, 2010)

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Final Information

Please complete ASCENT evaluations at:

- https://goo.gl/NWhsp8

Workshop documents available at:

- www.unlpcriticalthinking.wordpress.com
- www.unlpteamwork.wordpress.com

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