

Critical Thinking Workshop

Various concepts and frameworks presented during the workshop can be found here for reference. These include the Paul-Elder model of critical thinking, the ETA's tiers of thinking, engineering design questions and an example for mechanical engineering. In addition, you will find a virtual handout, a link to an interview with Daniel Kahneman (Fast & Slow Thinking) and the full script to download.

The Paul-Elder Model:

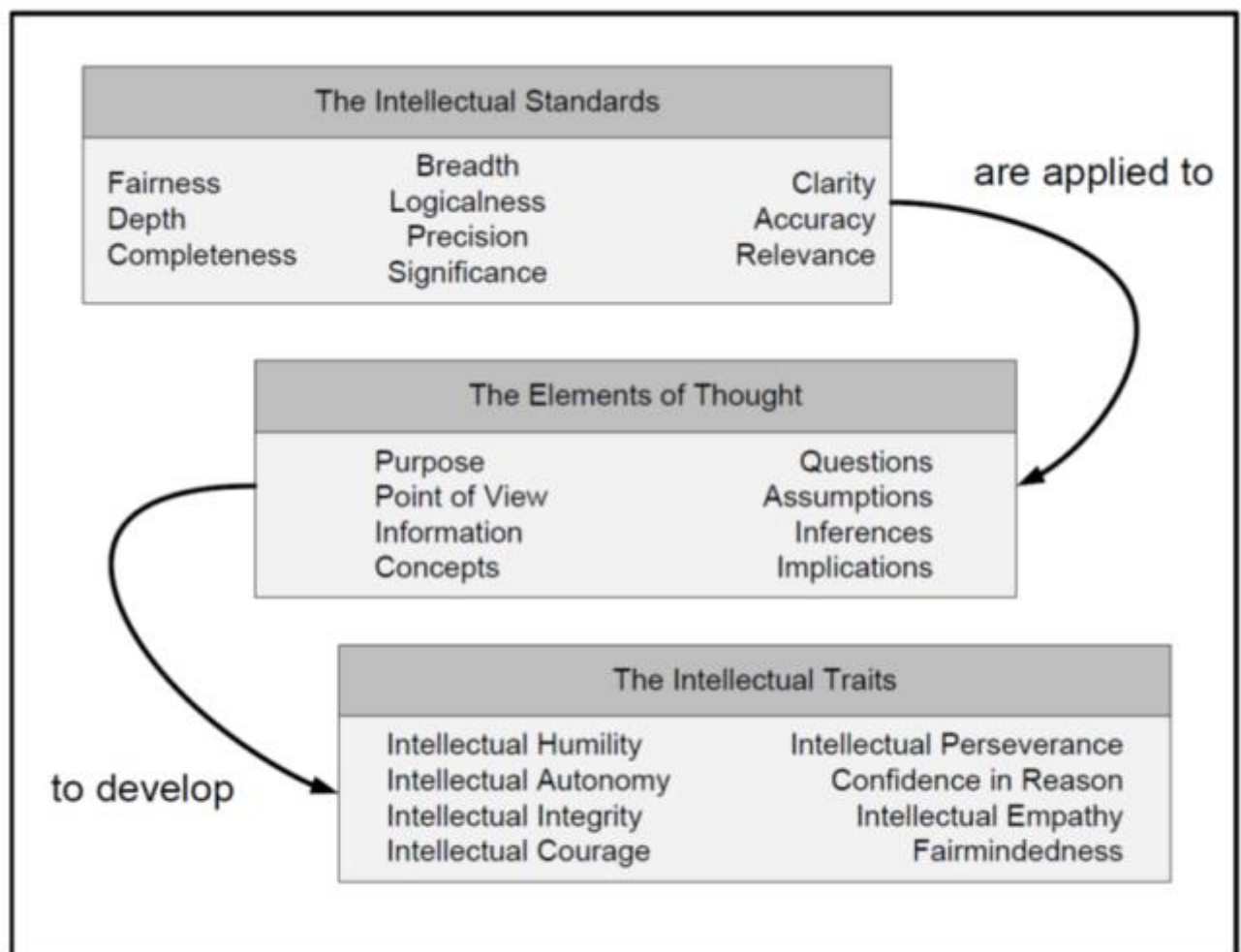


Figure 3: The Paul-Elder framework of critical thinking (Lewis et. al, 2014; adapted from Paul & Elder, 2002)

Engineering Design Questions:

Table 1: Examples of engineering design questions associated with intellectual standards (adapted from Paul & Elder, 2008; Adair & Jaeger, 2016)

Intellectual Standard	Question
Clarity	Have assumptions been clearly defined?
Accuracy	How have simulation models been validated?
Relevance	Does the design address the requirements?
Logicalness	Are the design decisions based on appropriate analysis?
Breadth	Have alternative approaches been considered?
Precision	What are the accepted tolerances?
Significance	What are the design drivers?
Completeness	Is there room for further development?
Fairness	Are vested interests influencing the design?
Depth	How far have the complexities of the system been accounted for?

Mechanical Engineering Example:

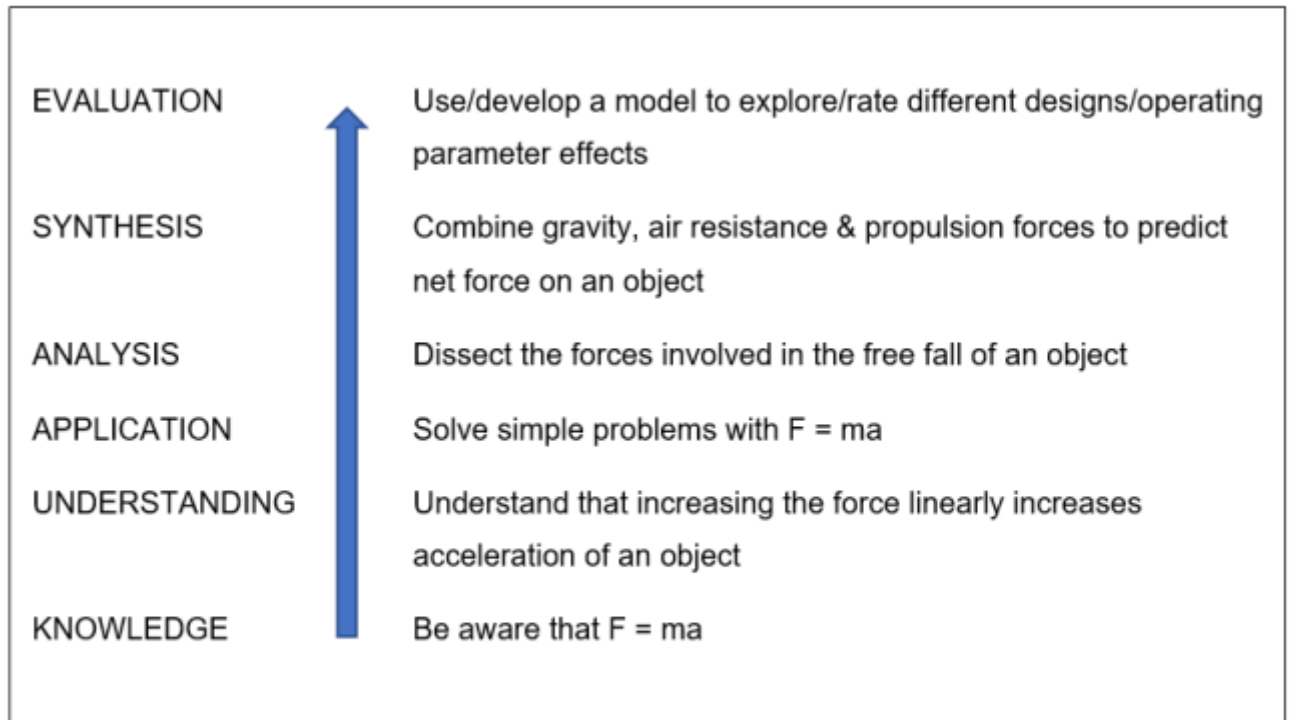
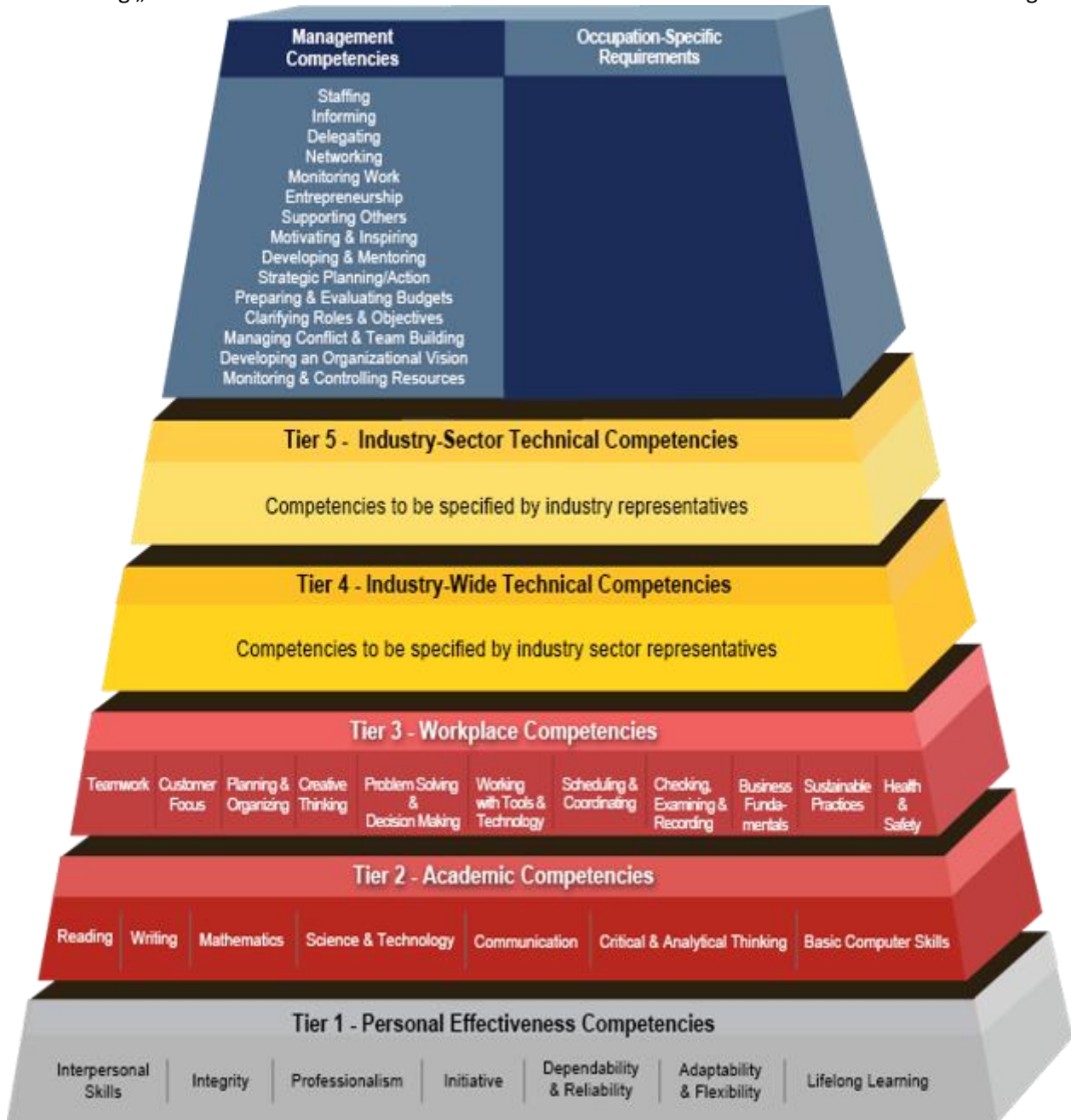


Figure 2: Mechanical engineering example using Bloom's Taxonomy, adapted from Lewis et al. (2014).



ETA's Teirs of Thinking (2017)

Thinking Fast & Slow

Kahneman, Daniel (2011). *Thinking Fast and Slow*. New York: Farrar, Straus & Giroux.

Interview with Daniel Kahneman: <https://m.youtube.com/watch?v=CjVQJdlrDJ0>