

Teaching for Thinking

University of Queensland, November 2026

Dr Peter Ellerton – University of Queensland Critical Thinking project

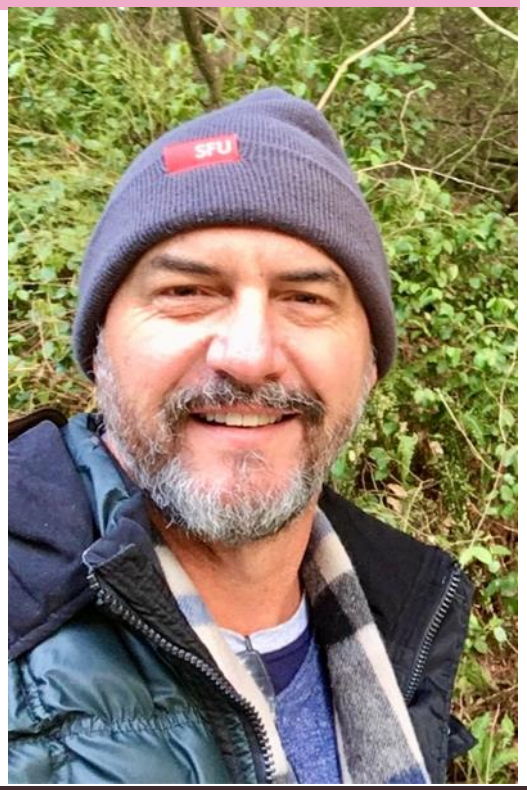
+ DR PETER ELLERTON +

Affiliations and research focus

- Curriculum Director, University of Queensland Critical Thinking Project
- Senior lecturer in Philosophy, Affiliate Academic in Education
- Senior Research Fellow, Centre for Critical and Creative Thinking
- Fellow of the Rationalist Society of Australia

Research focus

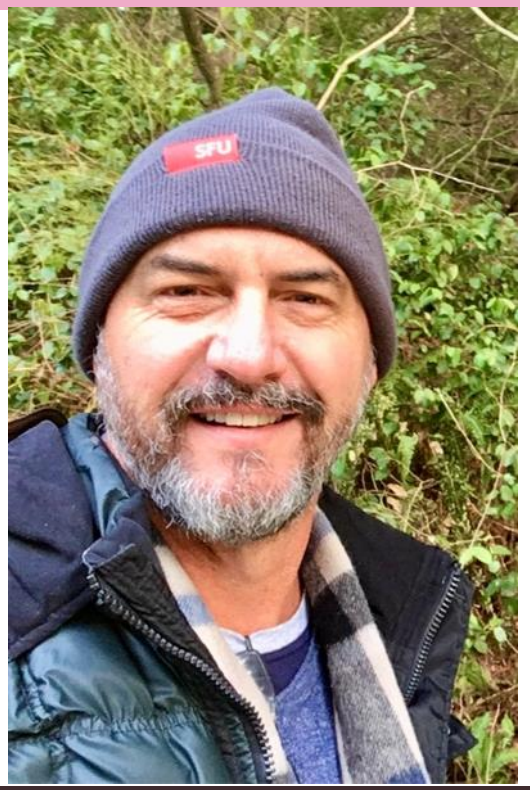
Teaching critical thinking, Public reasoning, Public understanding of science, Collaborative reasoning

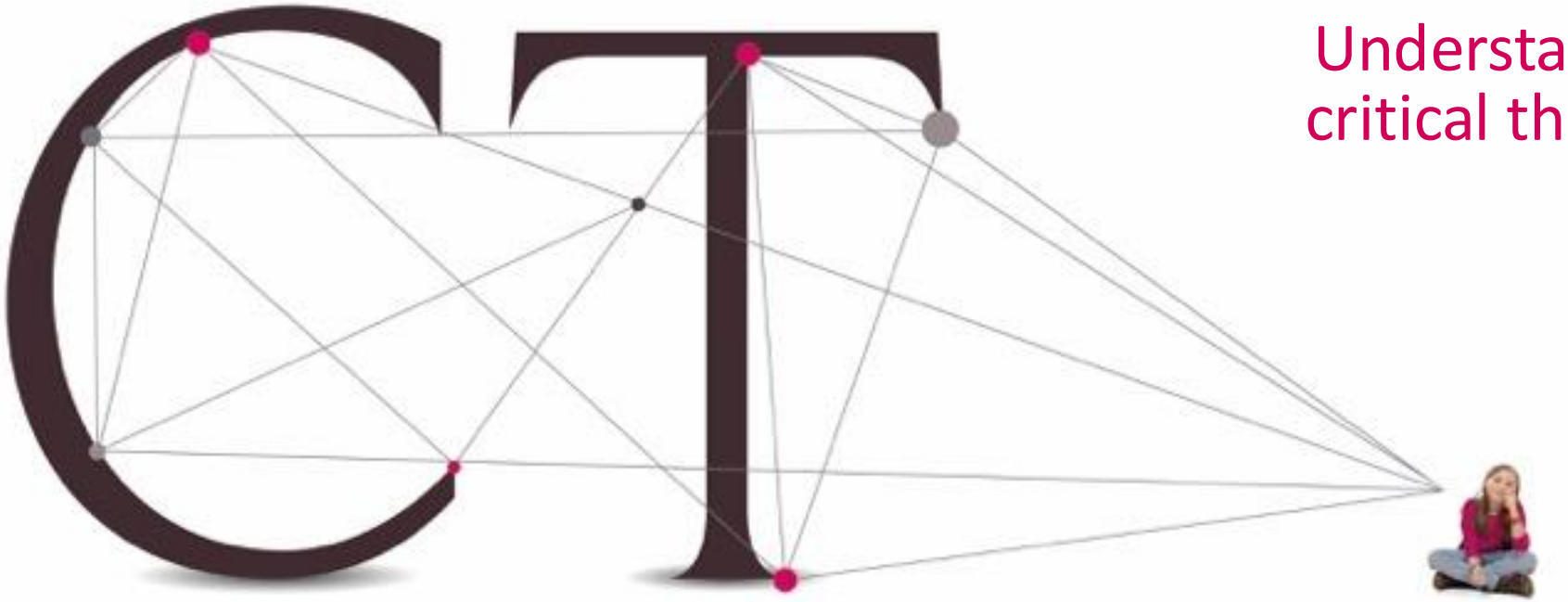


+ DR PETER ELLERTON +

Educational consultancy

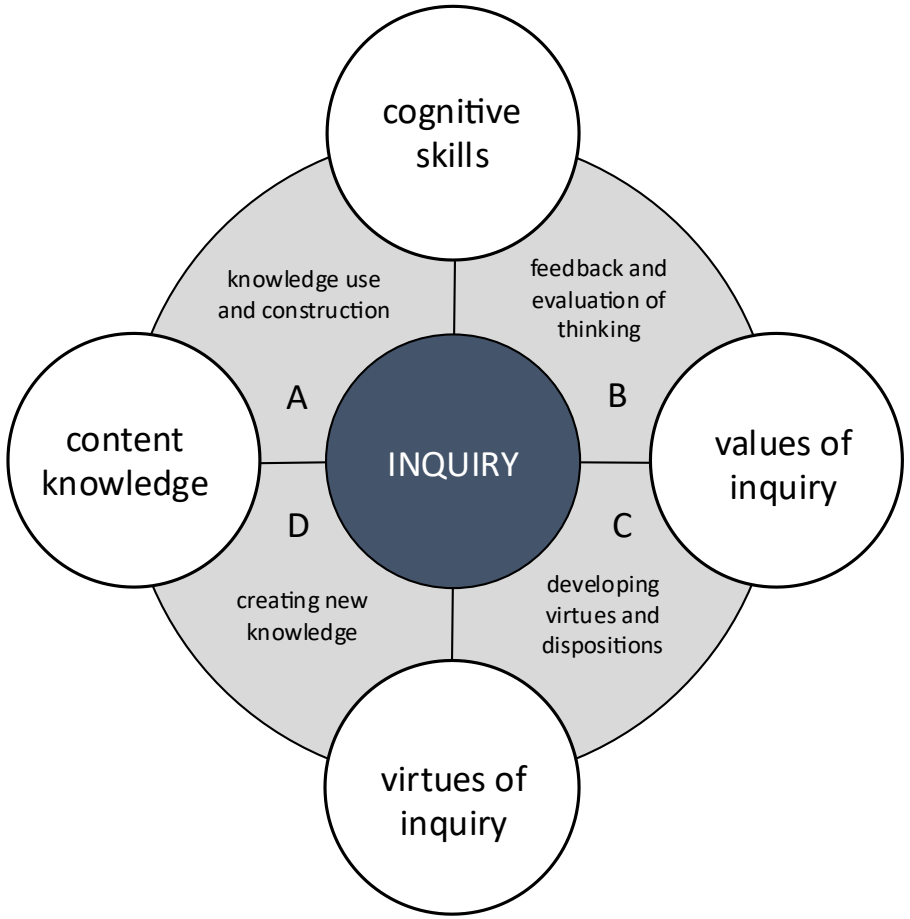
- European Commission Joint Research Centre
- University of California Los Angeles
- Australian Curriculum and Assessment Authority
- International Baccalaureate Organisation
- NSW Department of Education
- Queensland Curriculum and Assessment Authority
- Queensland Police Service
- Australian Institute of Police Management





Understanding critical thinking

Pedagogical expertise in Teaching for Thinking (T4T)



Content Knowledge: discipline area, year level, curriculum based

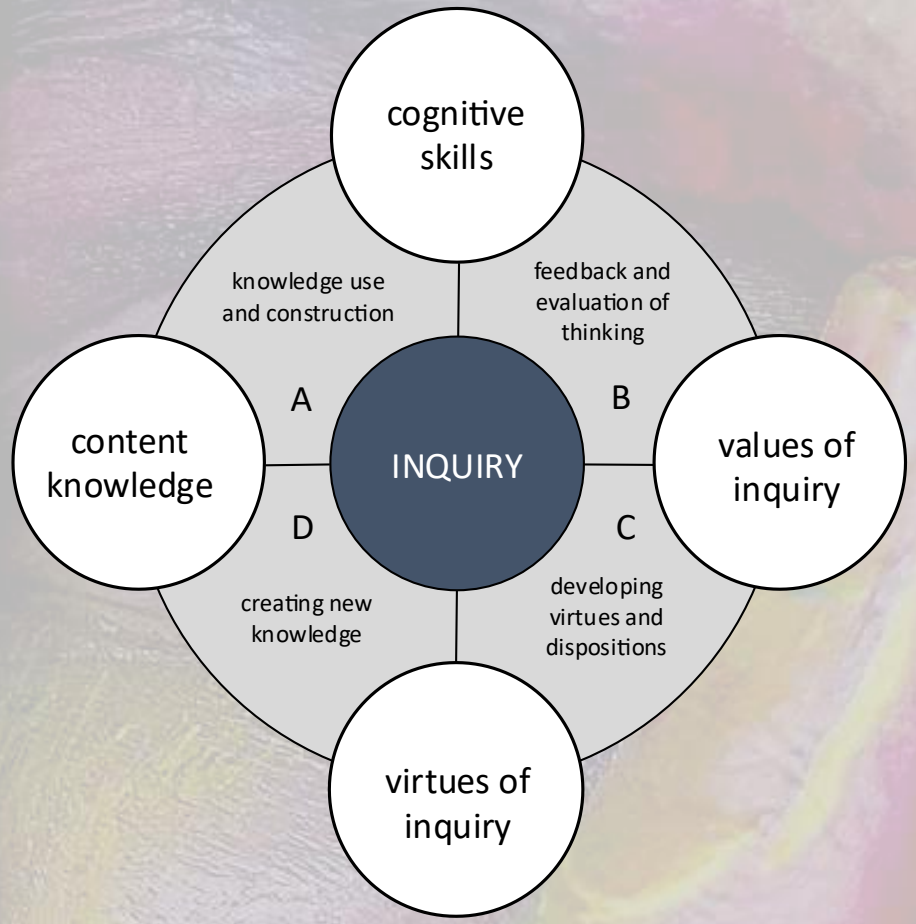
Cognitive skills: things we do with knowledge (analyse, justify, evaluate, explain, etc.)

Values of inquiry: things we value in good inquiry/thinking (clarity, accuracy, precision, relevance, significance, breadth, depth, coherence, etc.)

Virtues of inquiry: things we value in effective inquirers/knowledge makers (resilience, open-minded, curious, persistent, humility, etc.)

Inquiry: the opportunity to use and develop cognitive skills and inquiry values and virtues

UQ Critical Thinking Project Thinking Schools Network (TSN)



- Over 400 Schools, Universities and other institutions
- Over 5000 Educators
- Pacific Partnership: ULCA and Pepperdine universities, California; Simon Fraser University, British Columbia
- Australia, Singapore, South Africa, Belgium, USA, Canada
- Strong research output

Did the dingo go around the goanna?

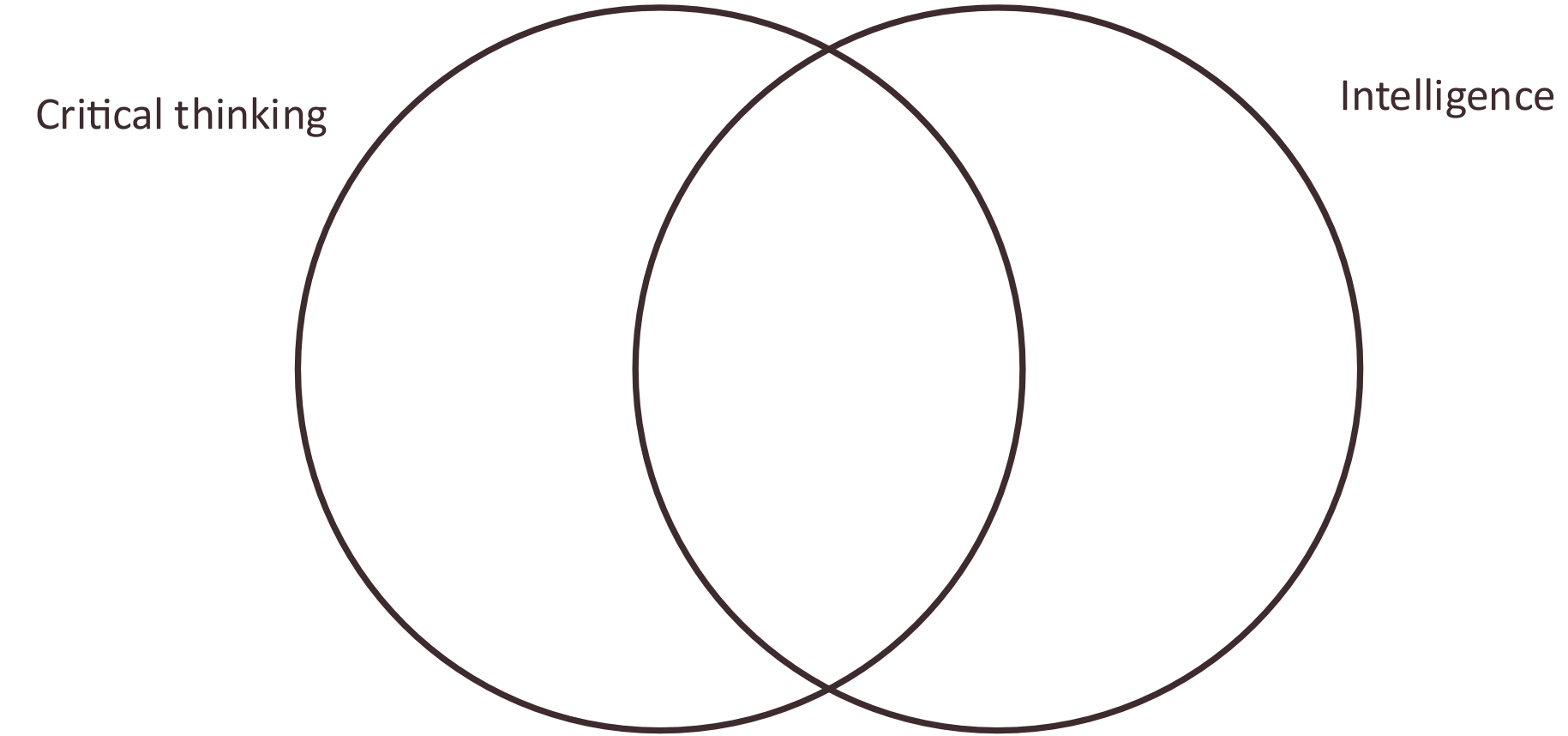


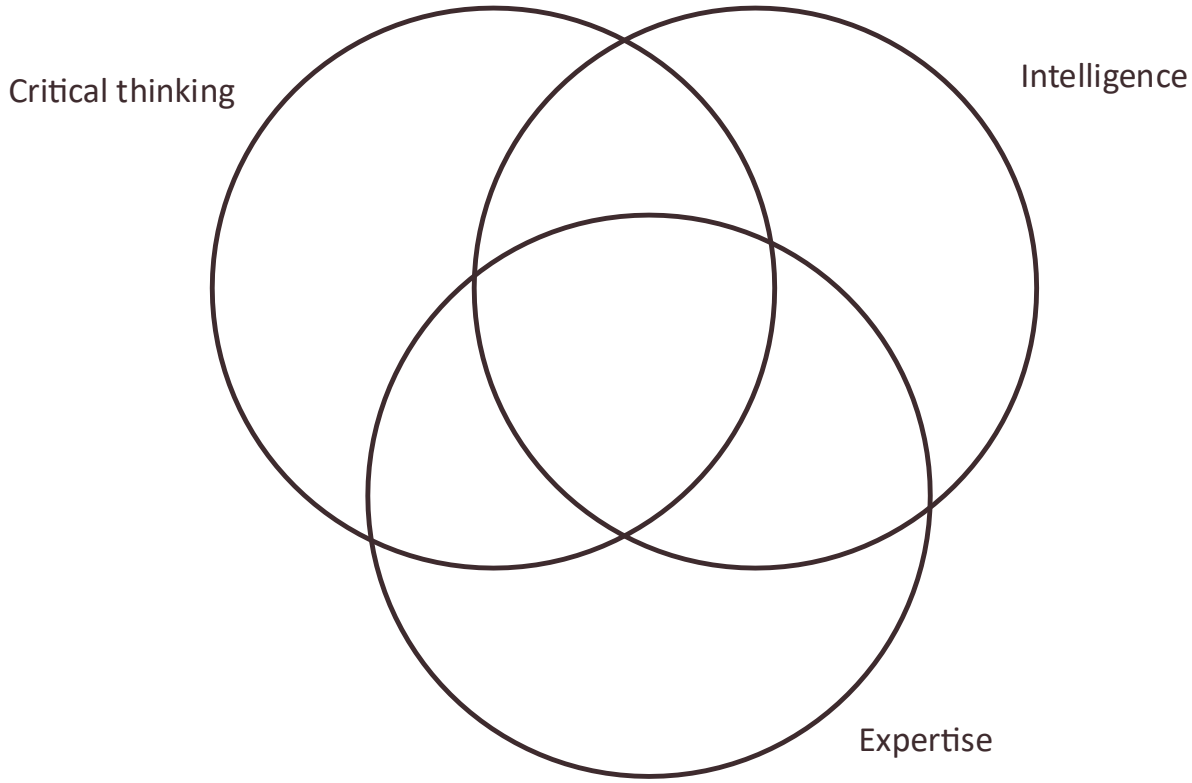


What critical thinking is.

Peter Ellerton

University of Queensland Critical Thinking Project


Critical thinking
Intelligence


Critical thinking
Intelligence
Expertise

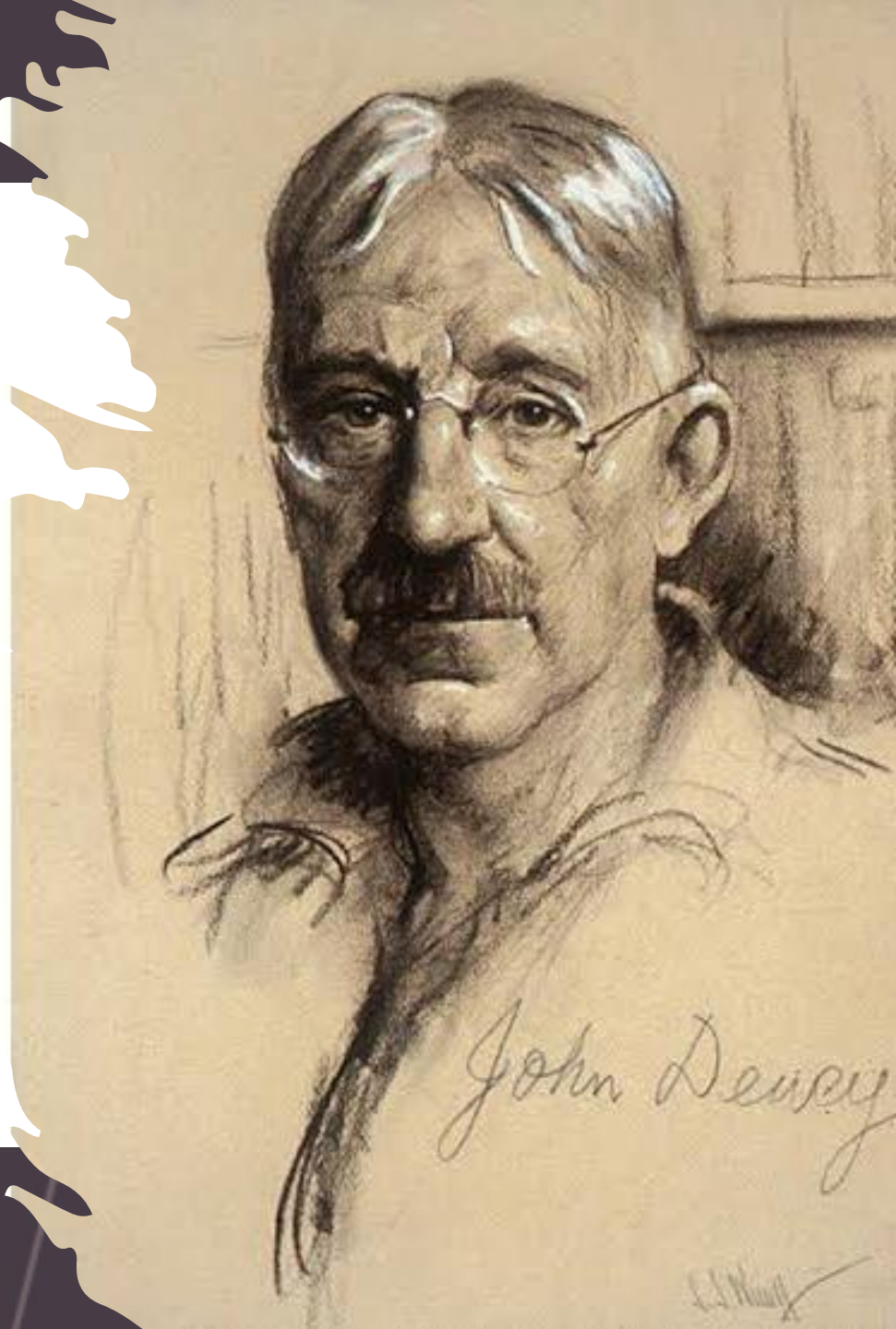


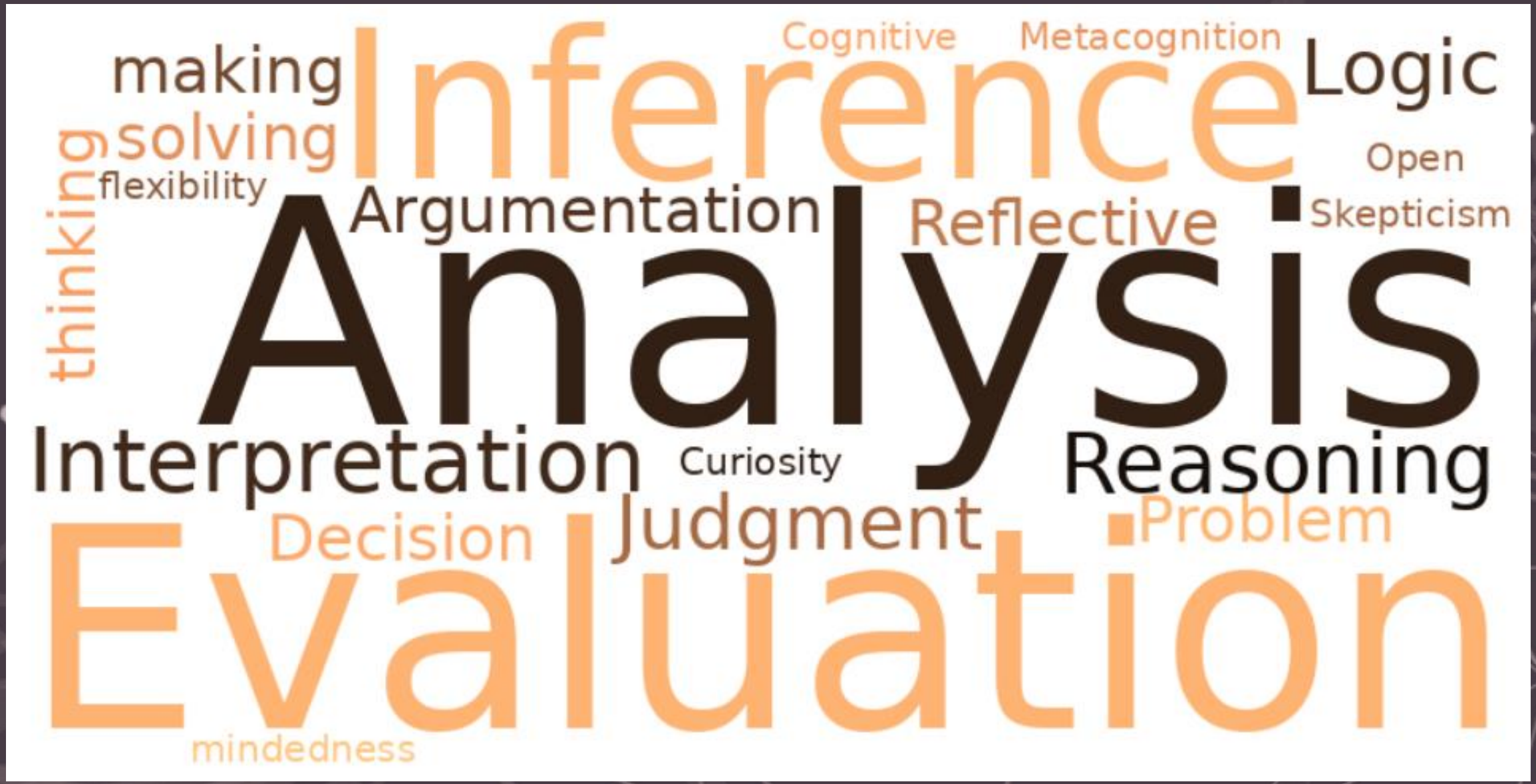
Every paper dedicated to understanding or developing critical thinking seems doomed to the Sisyphean task of defining it.

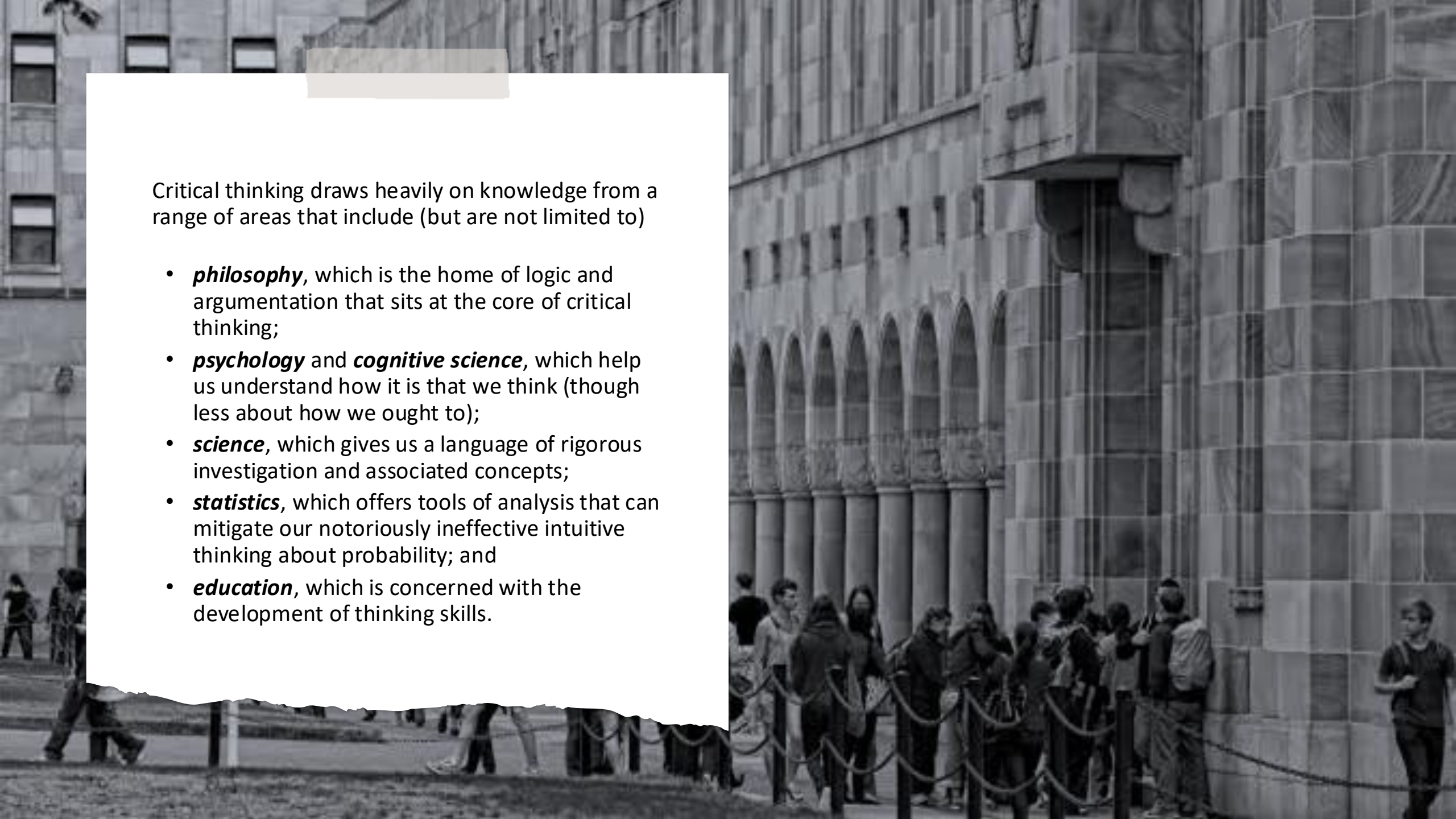
Modern conceptions of critical thinking

Dewey's works, especially How We Think (1910), significantly influenced educational theory and practice and paved the way for the emergence of "critical thinking" as a pedagogical goal.

While Dewey rarely used the phrase outright, he laid the foundation through his concept of "reflective thinking": the *disciplined process of active, persistent, and careful consideration of any belief or supposed knowledge.*

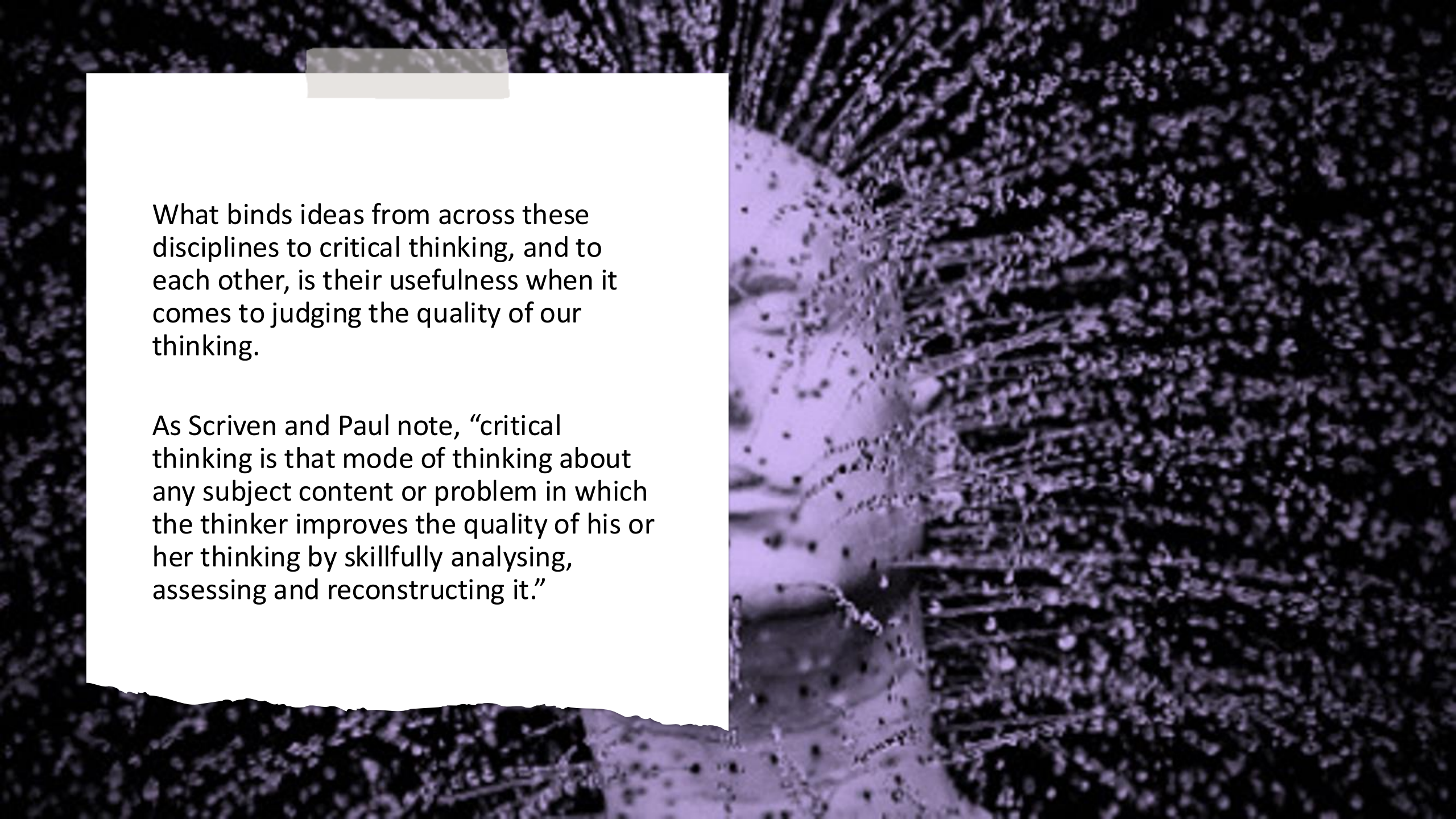



making
Cognitive
Metacognition
Logic
Inference
solving
Open
thinking
flexibility
Argumentation
Reflective
Skepticism
Analysis
Interpretation
Curiosity
Reasoning
Judgment
Problem
Decision
Evaluation
mindedness



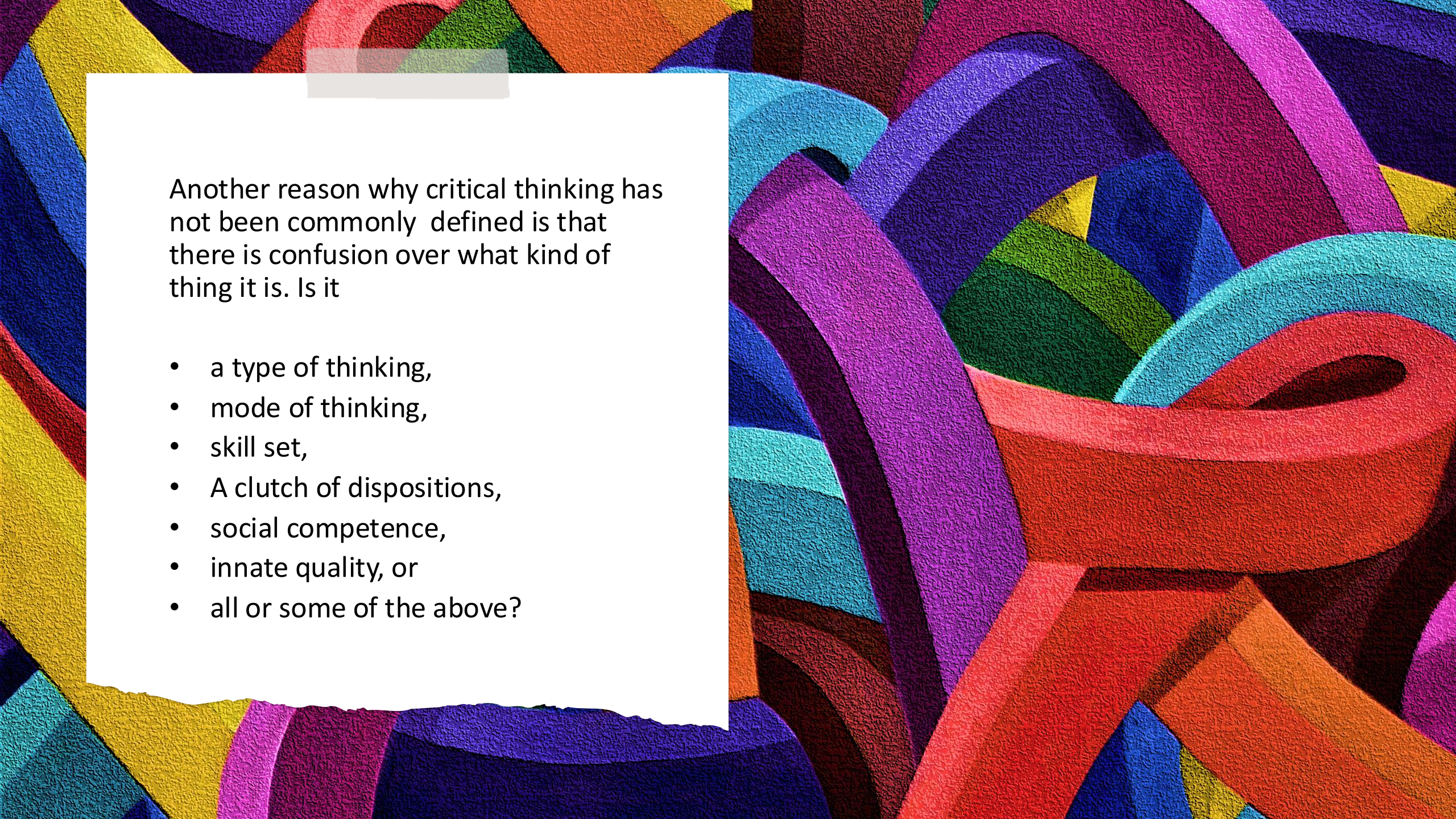
Critical thinking draws heavily on knowledge from a range of areas that include (but are not limited to)

- ***philosophy***, which is the home of logic and argumentation that sits at the core of critical thinking;
- ***psychology*** and ***cognitive science***, which help us understand how it is that we think (though less about how we ought to);
- ***science***, which gives us a language of rigorous investigation and associated concepts;
- ***statistics***, which offers tools of analysis that can mitigate our notoriously ineffective intuitive thinking about probability; and
- ***education***, which is concerned with the development of thinking skills.



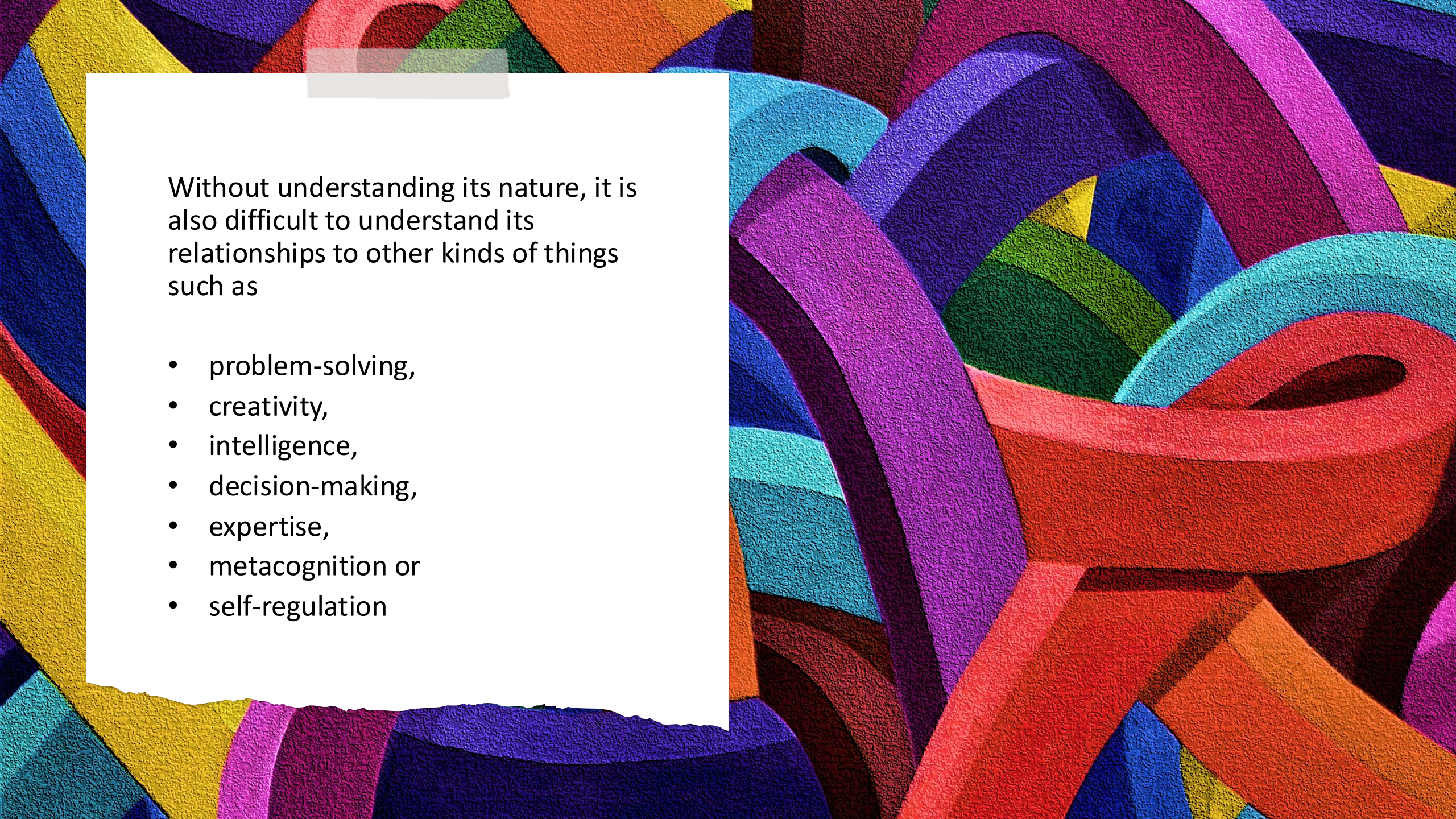
What binds ideas from across these disciplines to critical thinking, and to each other, is their usefulness when it comes to judging the quality of our thinking.

As Scriven and Paul note, “critical thinking is that mode of thinking about any subject content or problem in which the thinker improves the quality of his or her thinking by skillfully analysing, assessing and reconstructing it.”



Another reason why critical thinking has not been commonly defined is that there is confusion over what kind of thing it is. Is it

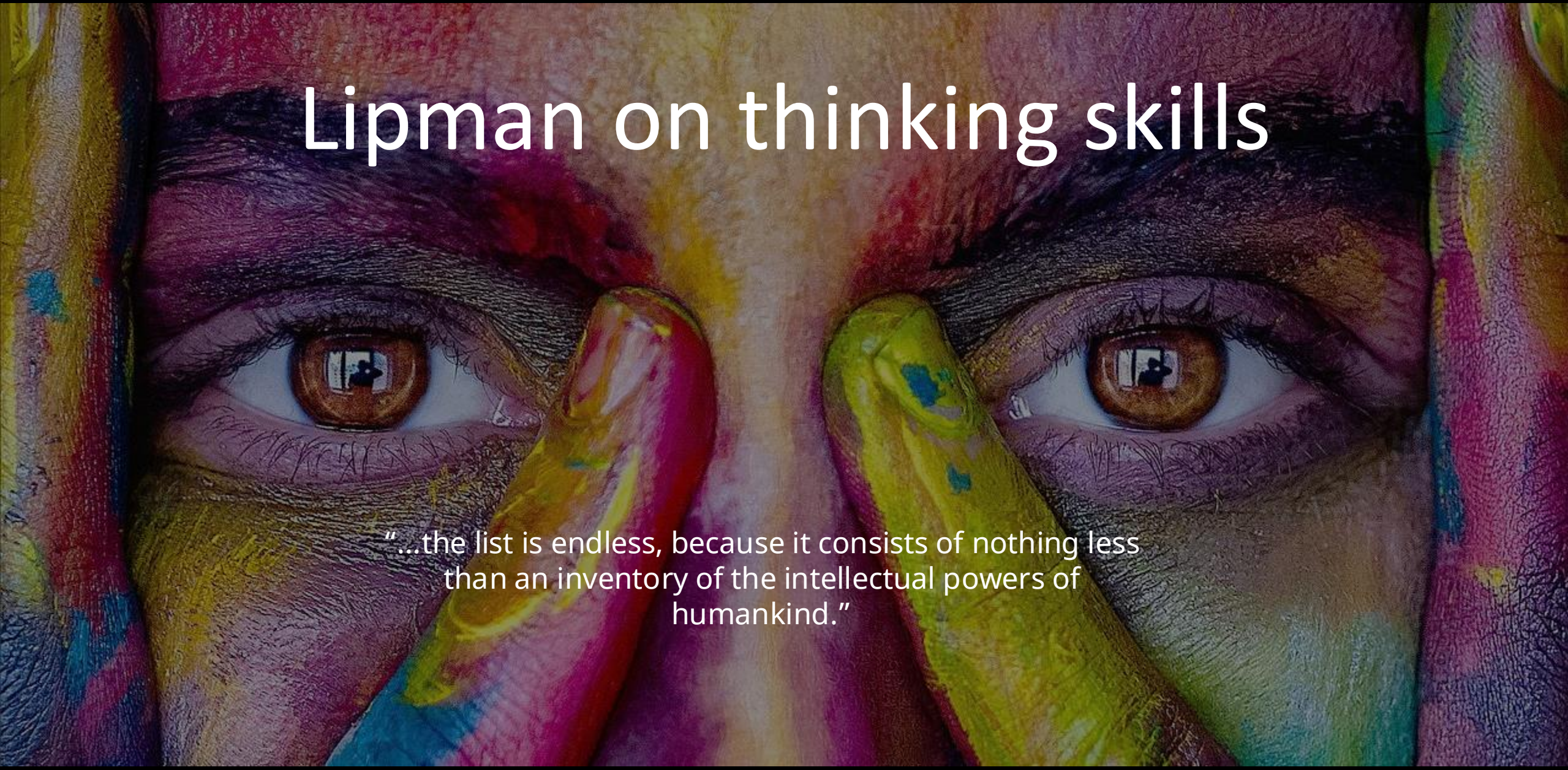
- a type of thinking,
- mode of thinking,
- skill set,
- A clutch of dispositions,
- social competence,
- innate quality, or
- all or some of the above?



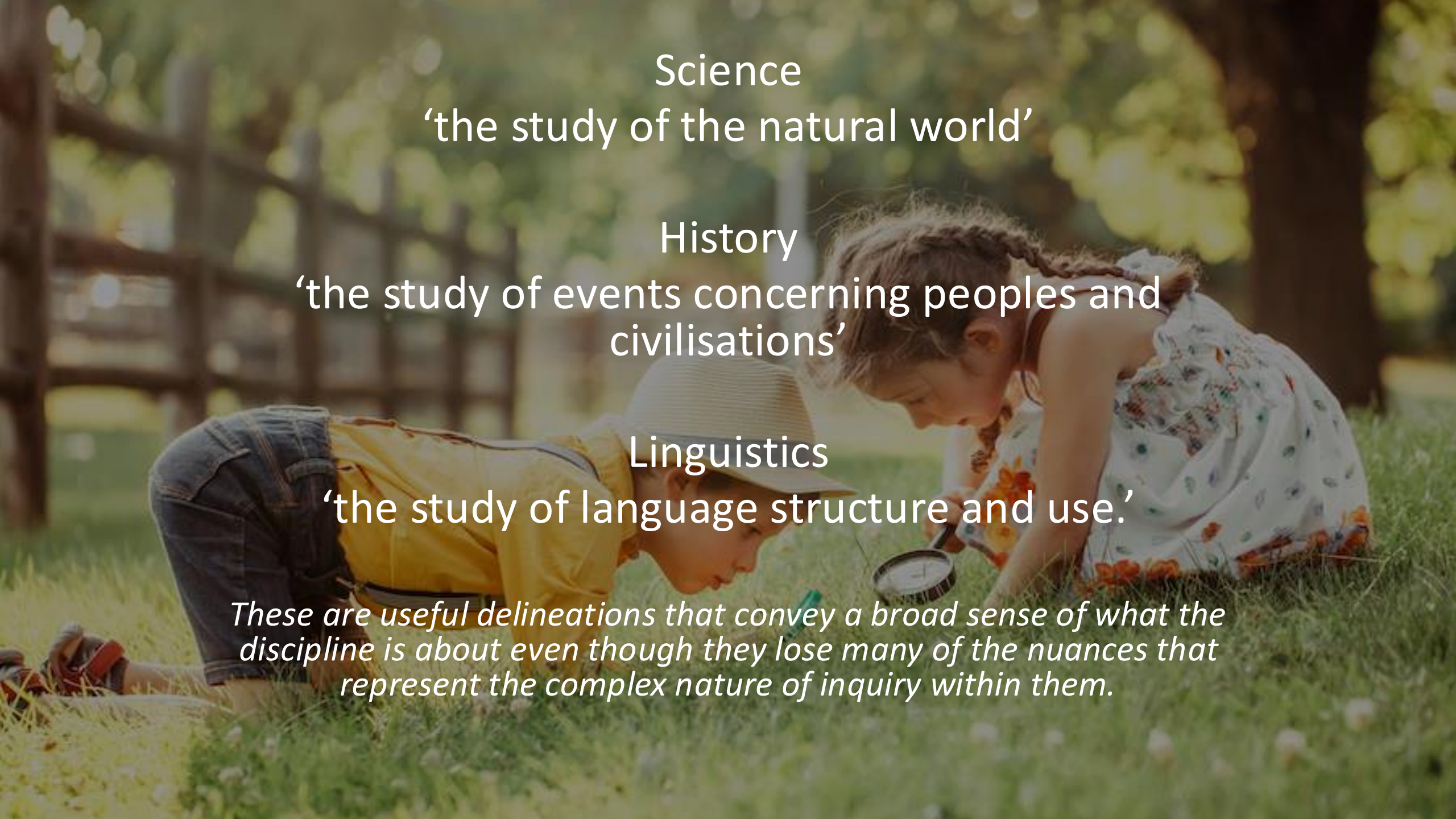
Without understanding its nature, it is also difficult to understand its relationships to other kinds of things such as

- problem-solving,
- creativity,
- intelligence,
- decision-making,
- expertise,
- metacognition or
- self-regulation

Lipman on thinking skills



"...the list is endless, because it consists of nothing less than an inventory of the intellectual powers of humankind."



Science

‘the study of the natural world’

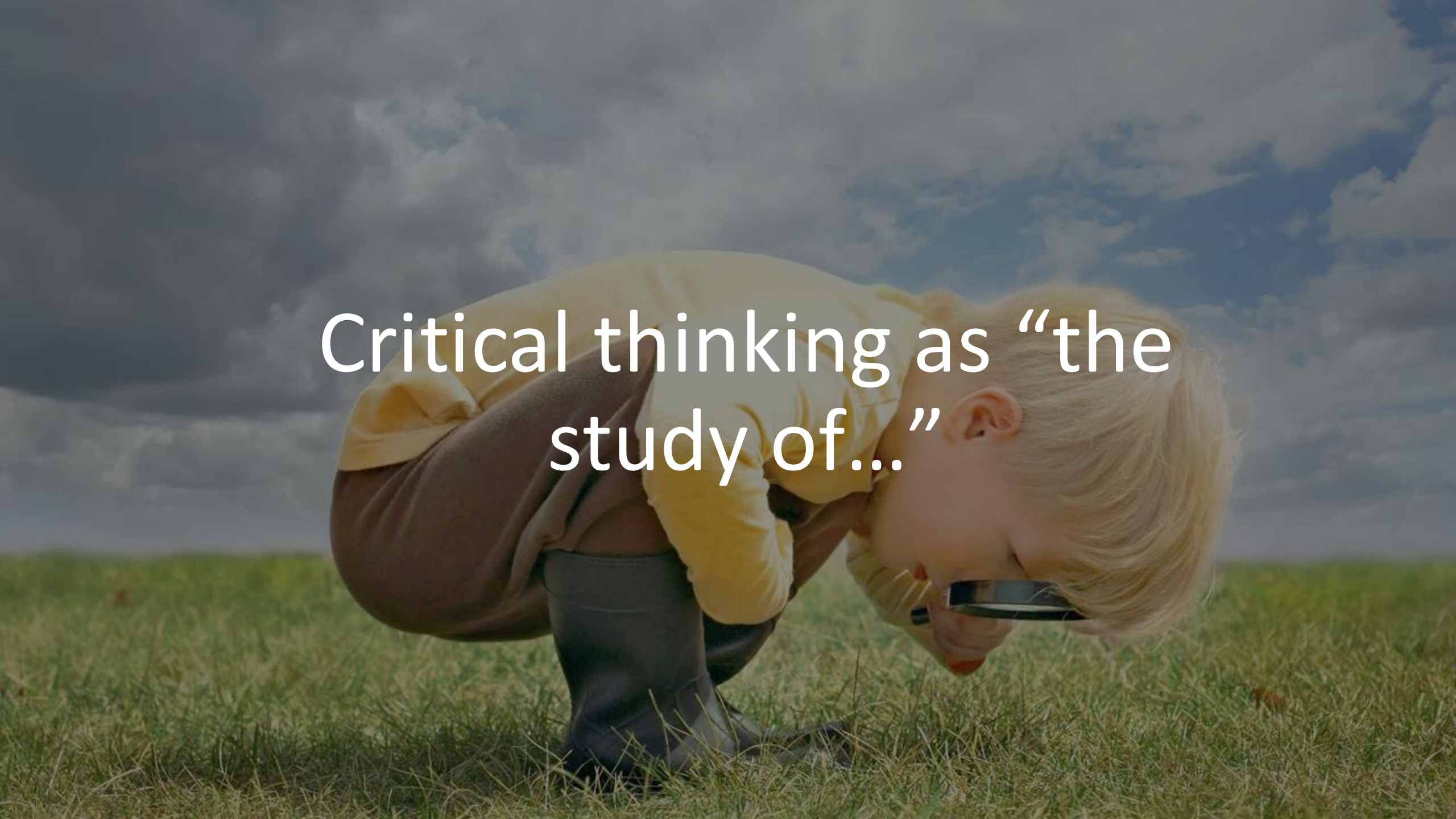
History

‘the study of events concerning peoples and civilisations’

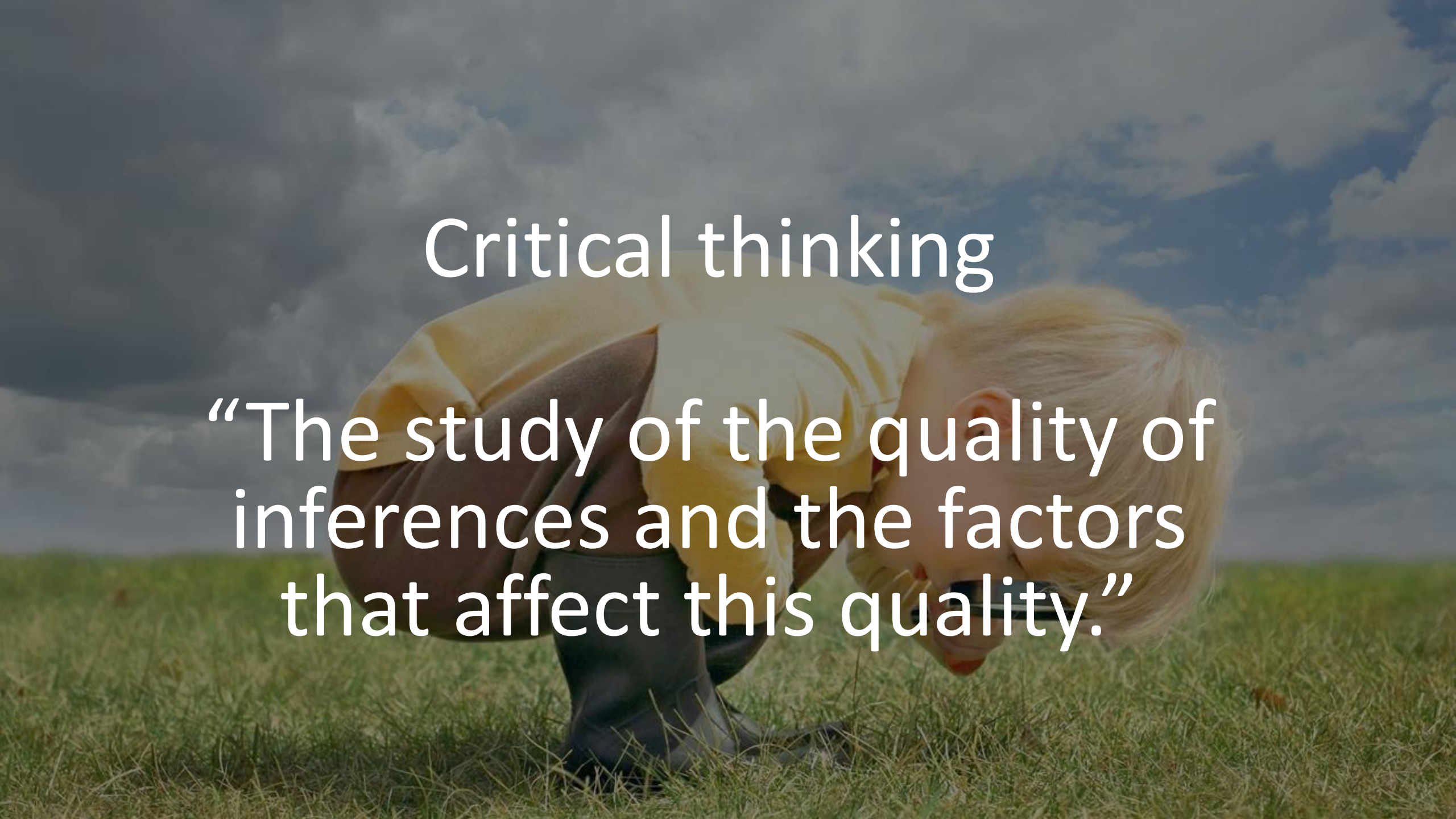
Linguistics

‘the study of language structure and use.’

These are useful delineations that convey a broad sense of what the discipline is about even though they lose many of the nuances that represent the complex nature of inquiry within them.

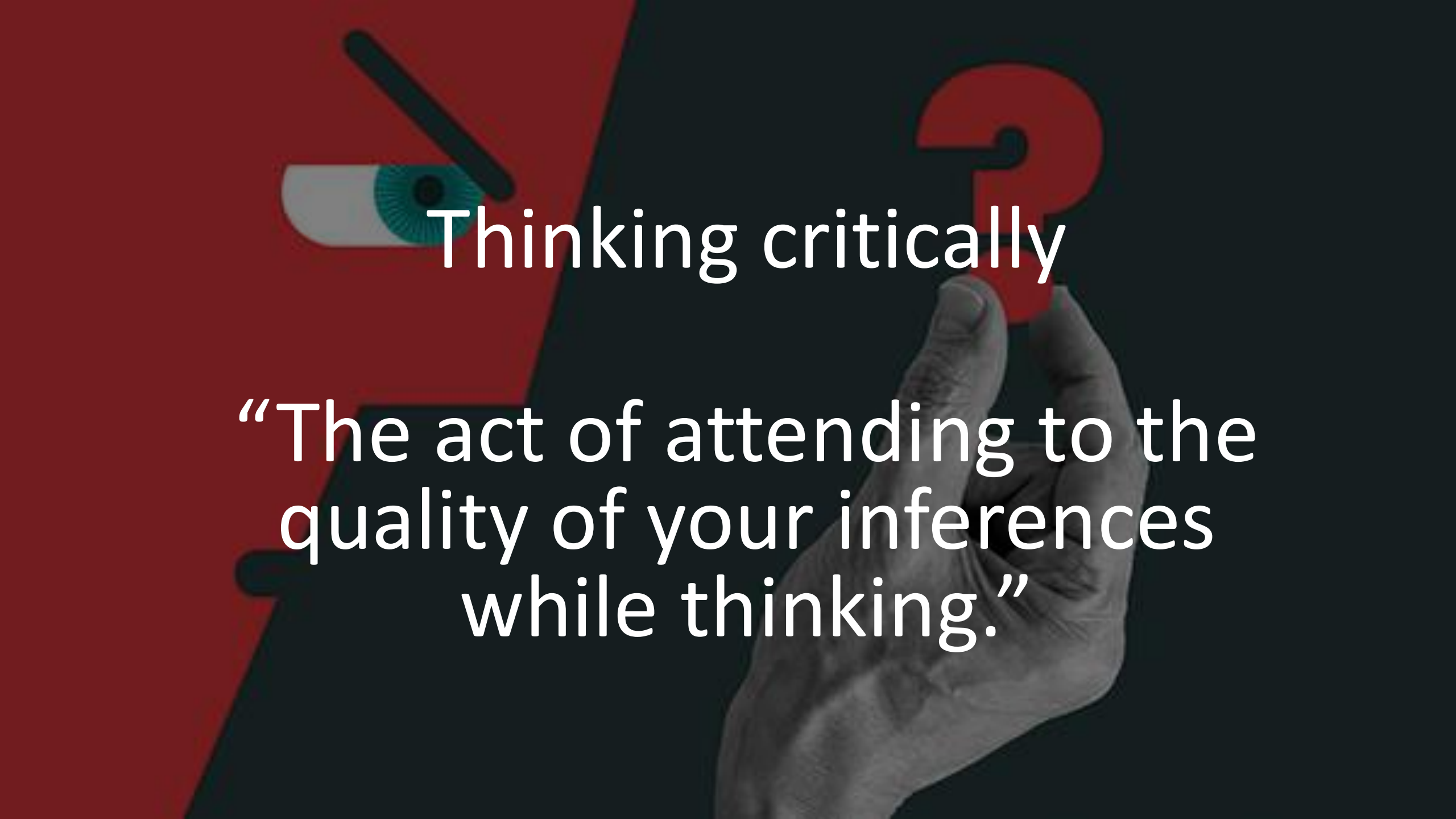

Critical thinking as “the study of…”


Thinking critically as “the act of…”



Critical thinking

"The study of the quality of inferences and the factors that affect this quality."



Thinking critically

"The act of attending to the quality of your inferences while thinking."



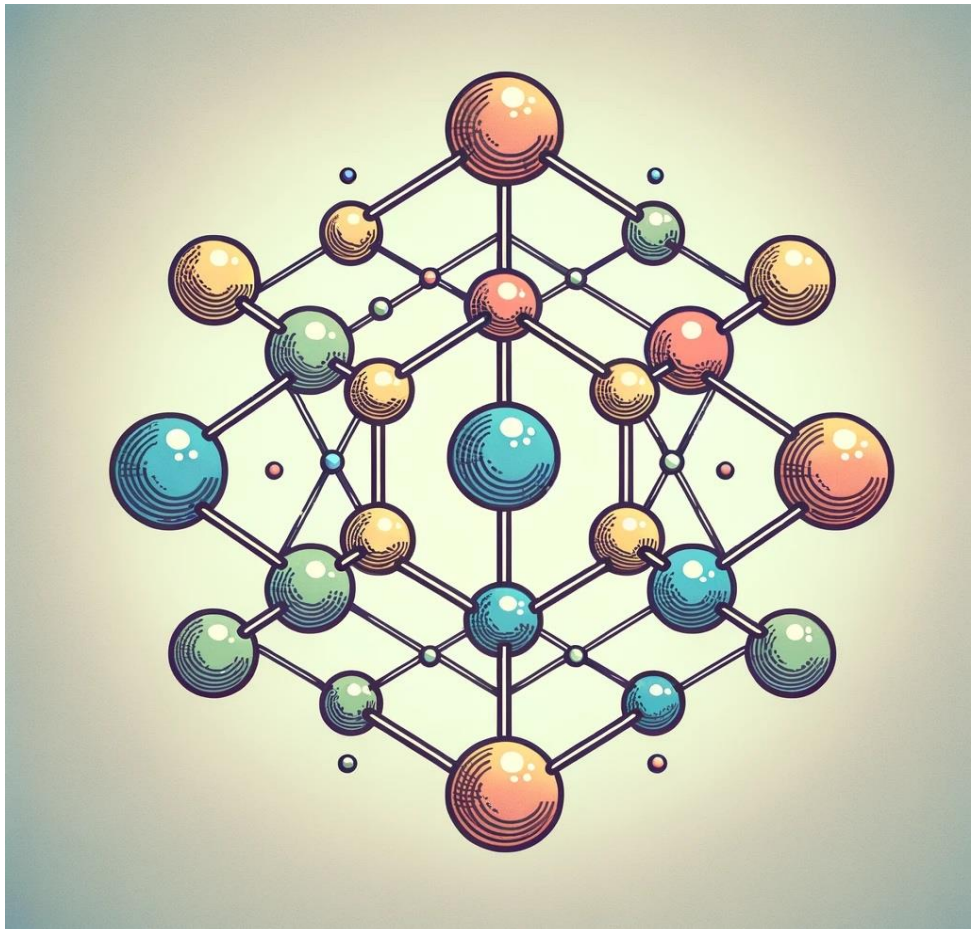
Thinking scientifically

“Thinking with attention to the knowledge, norms and methodologies of science”

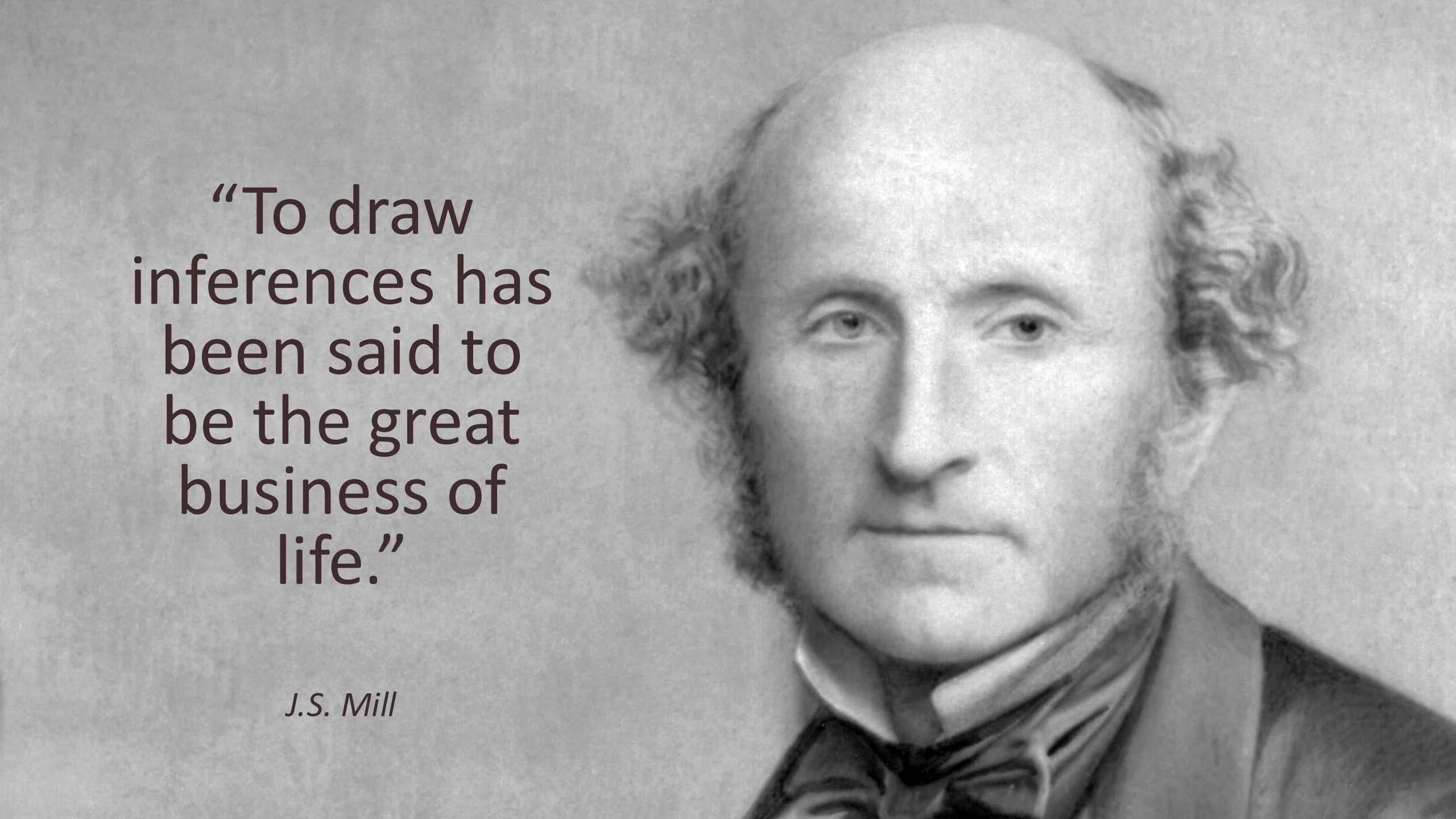
Thinking critically

“Thinking with attention to the knowledge, norms and methodologies of critical thinking”


“I’m gonna have to science the shit out of this.”
Matt Damon, The Martian

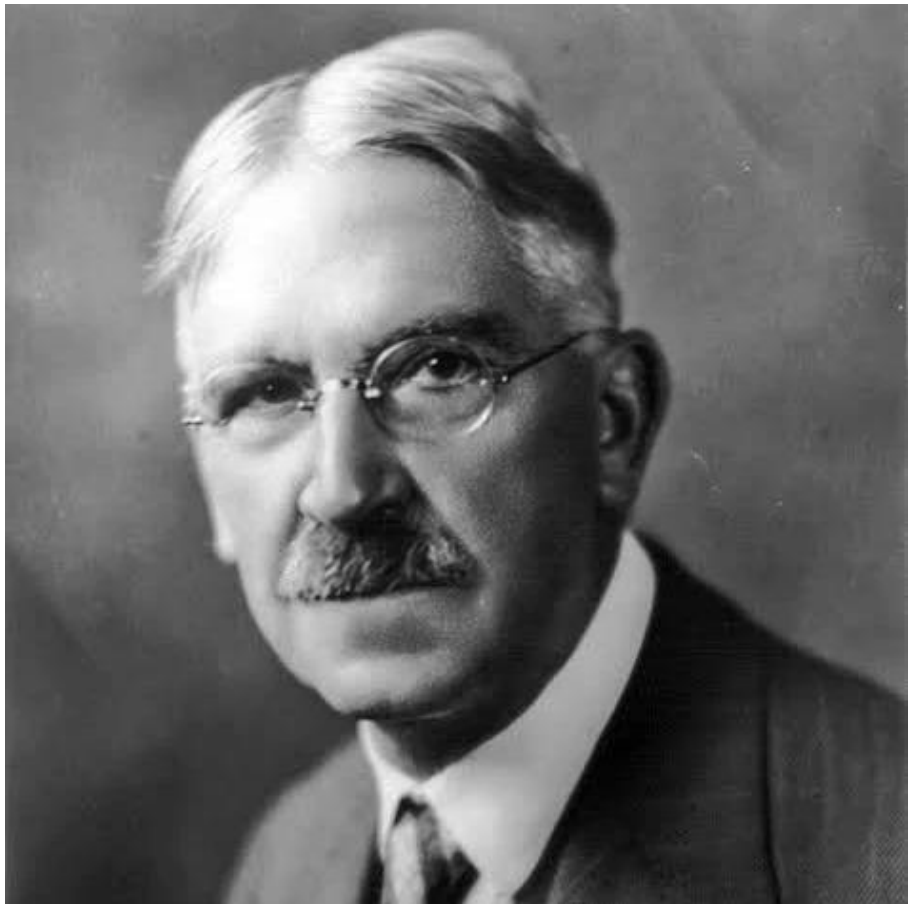


Inferences are the units of our cognition, atomic to reasoning. They are the individual, often indivisible, constituents of reasoning that serve to connect—through a chain of other inferences—facts, evidence, observations, intuitions and mental heuristics to decisions, conclusions, recommendations and judgements.


“To draw inferences has been said to be the great business of life.”
J.S. Mill

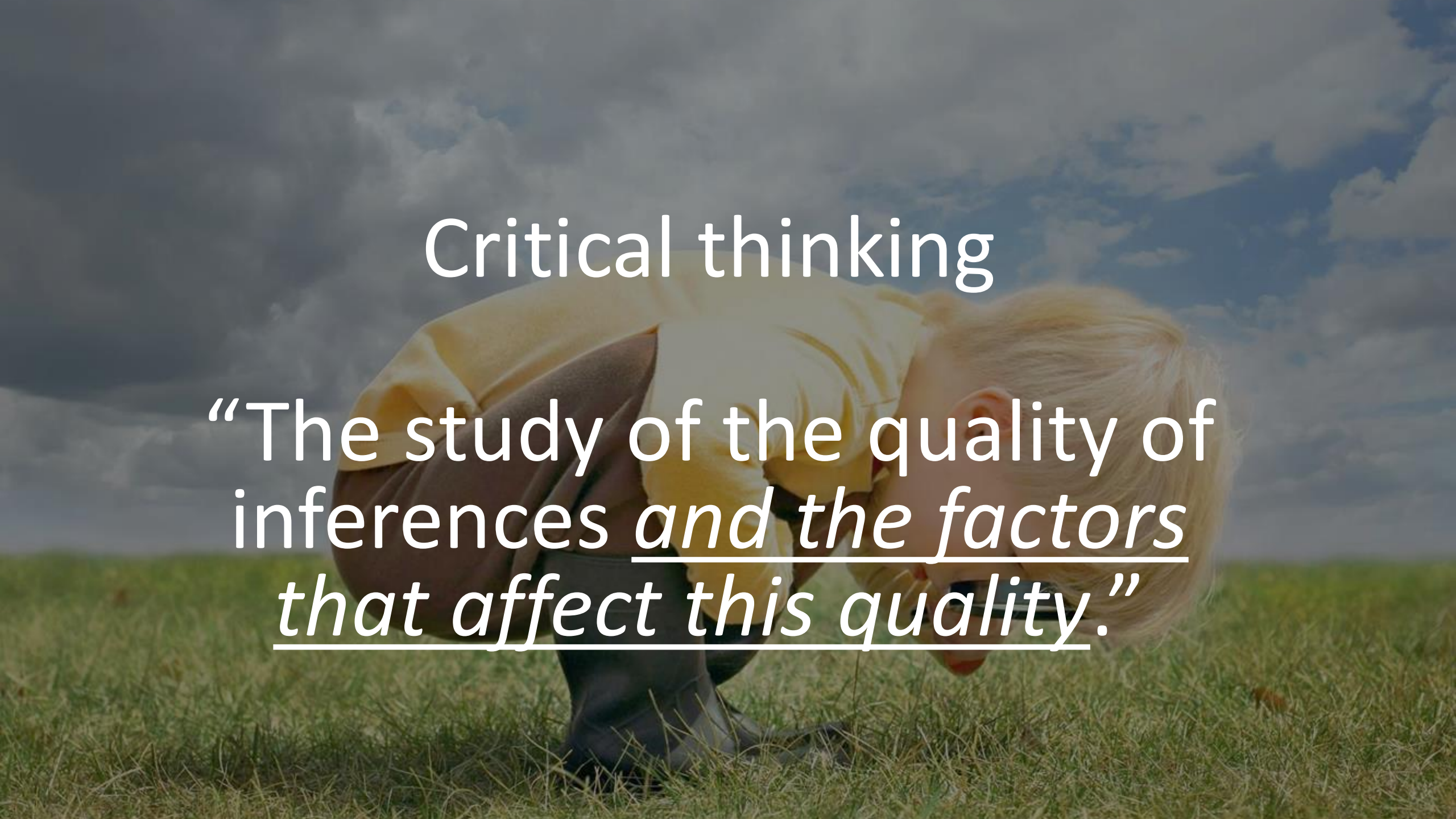
“The exercise of thought is, in the literal sense of that word, *inference*…”

Dewey



When weighing evidence to determine a proposition’s relevance and importance to a consideration, we infer as to why it should be heavily or lightly weighted or dismissed altogether. When it comes to argument construction, analysis and evaluation, it’s inferences all the way down.



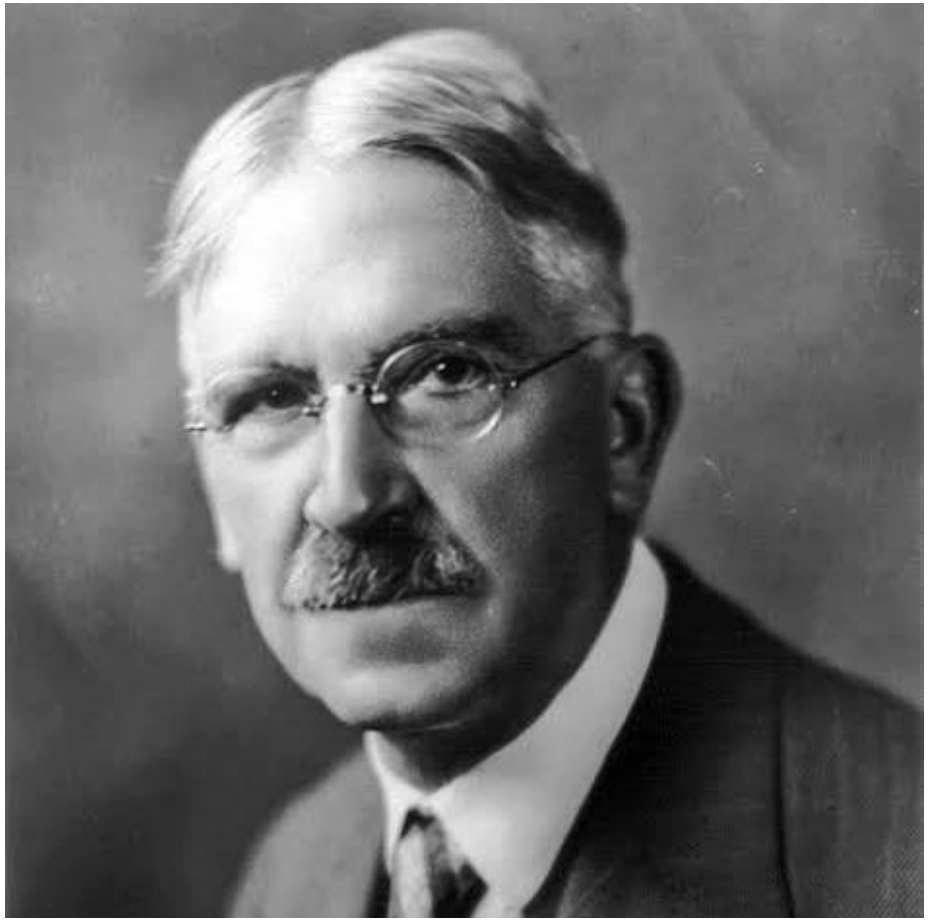


Critical thinking

"The study of the quality of inferences *and the factors that affect this quality*."

“The very inevitableness …[of the inference]… emphasizes the necessity of attention to the conditions under which it occurs…”

Dewey



Cognitive biases, logical fallacies, prior beliefs and existing world views, framing effects, subject matter knowledge, level of education (including in technical areas such as argumentation as well as discipline knowledge), general intelligence, time and resources, social forces, collaborative opportunities, emotional states, context, community priorities, existing value systems, cultural norms, past experience, self-interest, self-doubt or confidence and doubtless many other things can be at play when decisions or judgements (and all manner of inferences) are made.

“

It is this rich constellation of influencing factors that lifts framing critical thinking as the study of the quality of inferences from the game board of deduction into the lived experiences of rational agents.

”

Critical thinking as the study of the quality of inferences (noun sense)

Argumentation
Norms of reasoning
Methodologies
Factors affecting the quality of inferences

Thinking critically as the act of thinking with attention to the quality of inferences (verb sense)

Use of CT knowledge
Metacognitive
Evaluative
Practical

Pedagogical Imperative #1

Focus on student thinking

Inquiry is the means of production of knowledge



Three key questions in the classroom

1. How do you know students are *thinking* in your classroom?
2. How do you *plan* for that thinking to occur with the same *precision* and *intentionality* that you use for planning content?
3. How do you give students feedback on the *quality* of their thinking?


Explicit focus on
content knowledge
Explicit focus on
student thinking

The idea that deep and lasting learning is a product of thinking provides a powerful case for the teaching of thinking. Indeed, we venture that the true promise of the teaching of thinking will not be realized until learning to think and thinking to learn merge seamlessly.

Ritchhart & Perkins



Ron Ritchhart · Following 2d

Author- Researcher- Teacher- Speaker

I think we need to stop referring to the explicit instruction folk's position as the "science of learning" position. There is a lot of science around motivation, engagement, curiosity, deeper learning, collaborative learning, understanding, belonging, dispositions, etc. They just choose to ignore most of it to focus on a very narrow set of often short-term outcomes.



brain sciences

MDPI

Review

Beyond Cognitive Load Theory: Why Learning Needs More than Memory Management

Andrew Sortwell [1,2,3,*], Evgenia Gkintoni [4,5], Jesús Díaz-García [6,7], Peter Ellerton [8], Ricardo Ferraz [3] and Gregory Hine [9]



Wed, 21 Jan at 8:52 am

The science is really clear on cognitive load theory



Yes, it is.



Thinking is the method of intelligent learning

John Dewey

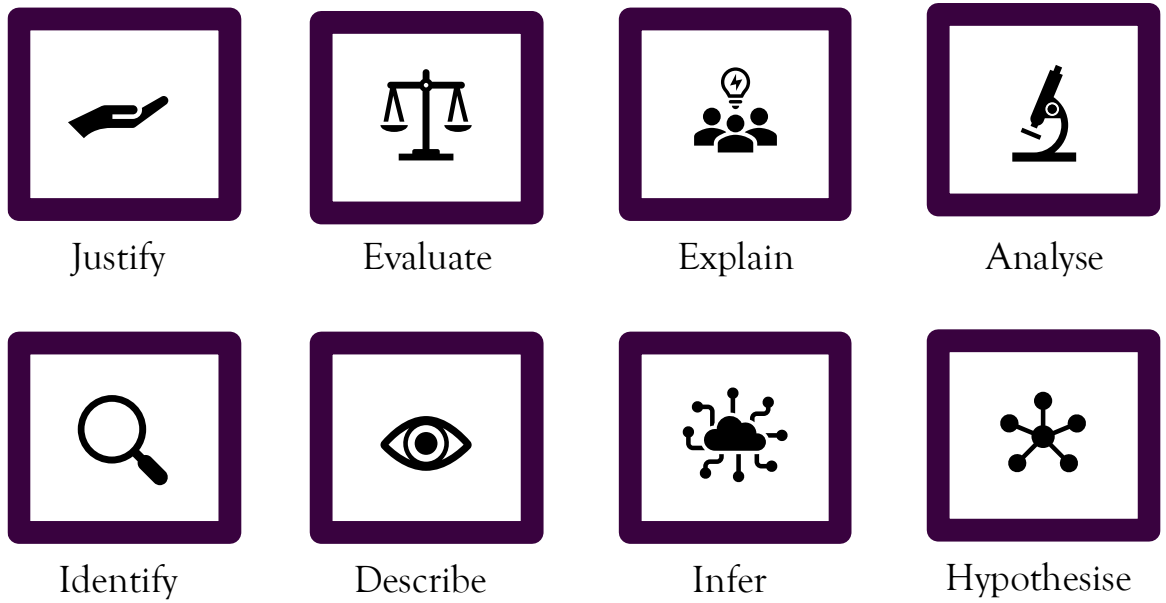


Connecting thinking and learning



Rethinking cognitive skills

What do you want your students to do when they….



What do you expect students to *do* when they analyse?

ANALYSE
JUSTIFY
EVALUATE
EXPLAIN

What do you expect students to *do* when they justify?

ANALYSE
JUSTIFY
EVALUATE
EXPLAIN

What do you expect students to *do* when they evaluate?

ANALYSE
JUSTIFY
EVALUATE
EXPLAIN

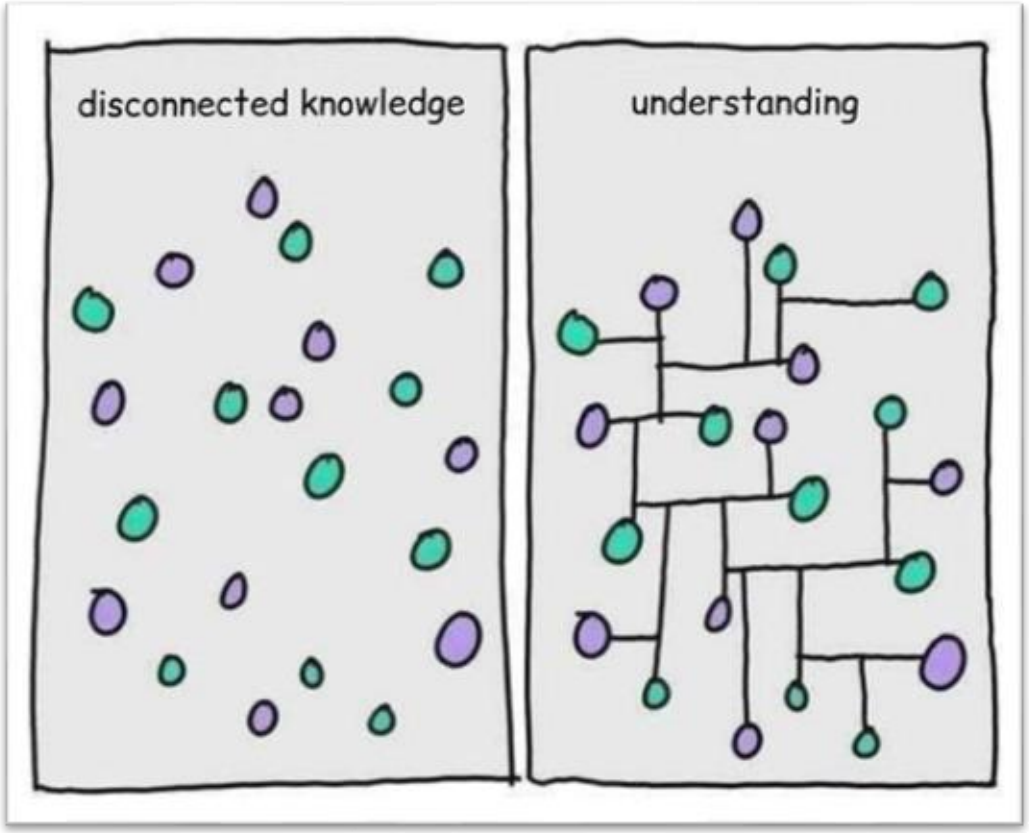
What do you expect students to *do* when they explain?

ANALYSE
JUSTIFY
EVALUATE
EXPLAIN

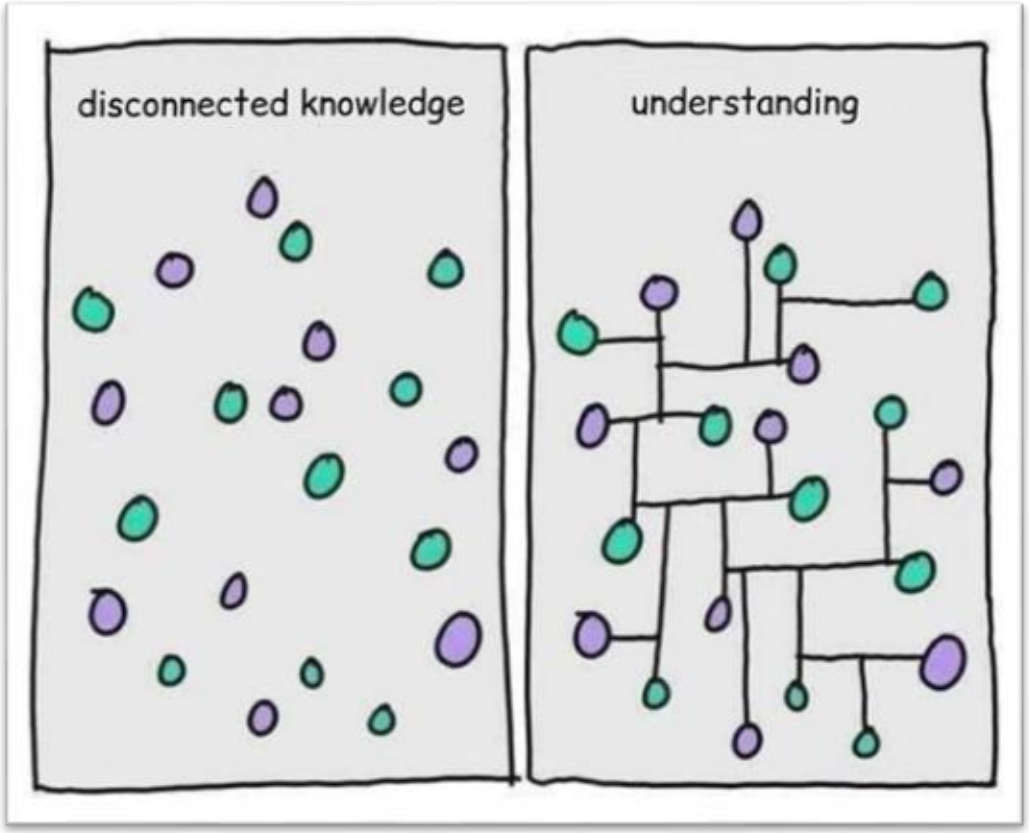
~~What do you expect students to do when they explain?~~

What is the difference between ‘explain’ and ‘describe’?

ANALYSE
JUSTIFY
EVALUATE
EXPLAIN



ANALYSE
JUSTIFY
EVALUATE
EXPLAIN



ANALYSE
JUSTIFY
EVALUATE
EXPLAIN

Things that are cognitive skills

ANALYSE
JUSTIFY
EVALUATE
EXPLAIN



Things that are not cognitive skills

SNORING
UNDERSTANDING
BANANAS

Analyse

to break down information and reveal aspects that are not immediately obvious

The process of analysing

Before analysing
determine the reason for analysis

Identify
essential parts, elements or features

Find
meanings or relationships, patterns, similarities and differences

Determine
the logic and reasonableness



After analysing
review the analysis to ensure the reason has been met

Sentence starters

- The elements/features demonstrate …
- There is/is not a relationship between …
- Through the use of … the author implies that ...
- Through this analysis it was shown that …

Verb explanation created March 18, 2025, with Claude Sonnet.

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Describe

to provide an account of a characteristic, feature or event

The process of describing

Before describing
gather evidence in preparation for giving an account

Identify
the facts, events, patterns or processes

Put in **order**
the facts, events, patterns or processes

Give an **account** of:
- characteristics
- features
- steps
- sequence of the situation, event, pattern or process

After describing
check the description can be understood by the audience



Sentence starters

- The key features/characteristics of … include …
- The distinct features of … are …
- The pattern identified is …
- The … has certain characteristics, including …

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Explain

to make something clear by revealing a cause, reason, context or relationship

The process of explaining

Before explaining
identify the topic, idea or concept

Determine
the facts, parts, processes or events involved

Make connections
between these facts, parts, processes or events for the audience

Write
an explanation

After explaining
check the explanation enhances audience understanding



Sentence starters

- This happened because …
- A closer examination of … leads to the conclusion that …
- The connections that can be made are …
- To make this clear …

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Evaluate

to make a judgment about the value, quality or significance of something

The process of evaluating

Before evaluating
determine the purpose and criteria for this evaluation

Examine
ideas, works, solutions or methods



Determine
the value or significance of the ideas, works, solutions or methods

Make a **judgment**
using the strengths limitations and implications based on criteria

After evaluating
review the evaluation to ensure the criteria has been applied and the reason for this evaluation has been met

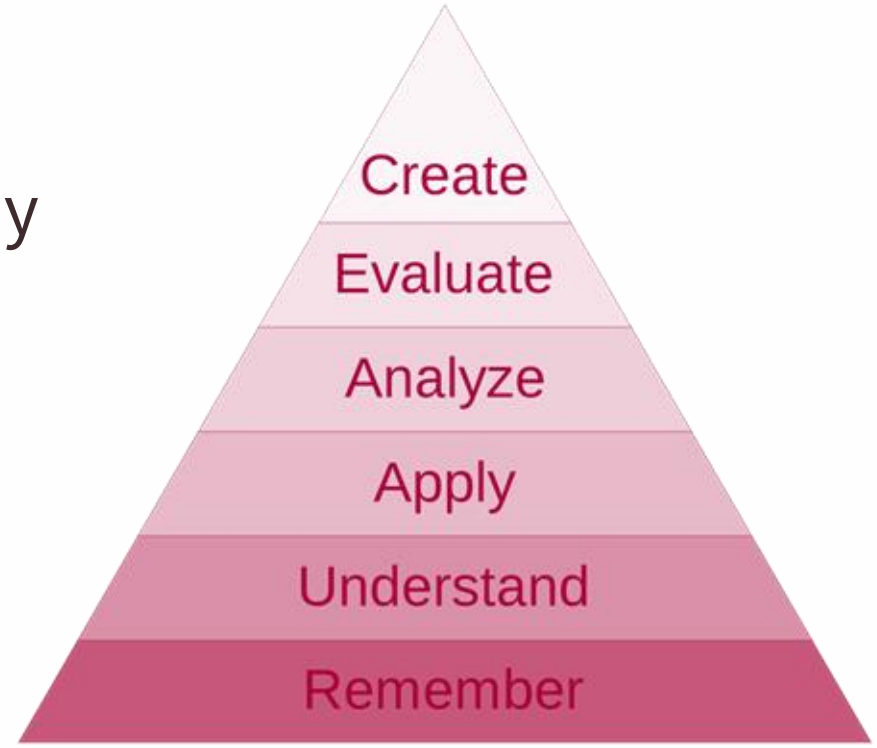
Sentence starters

- The strengths/limitations of … are …
- Based on criteria … the …
- Supporting this judgment is …
- The evidence suggests/shows …

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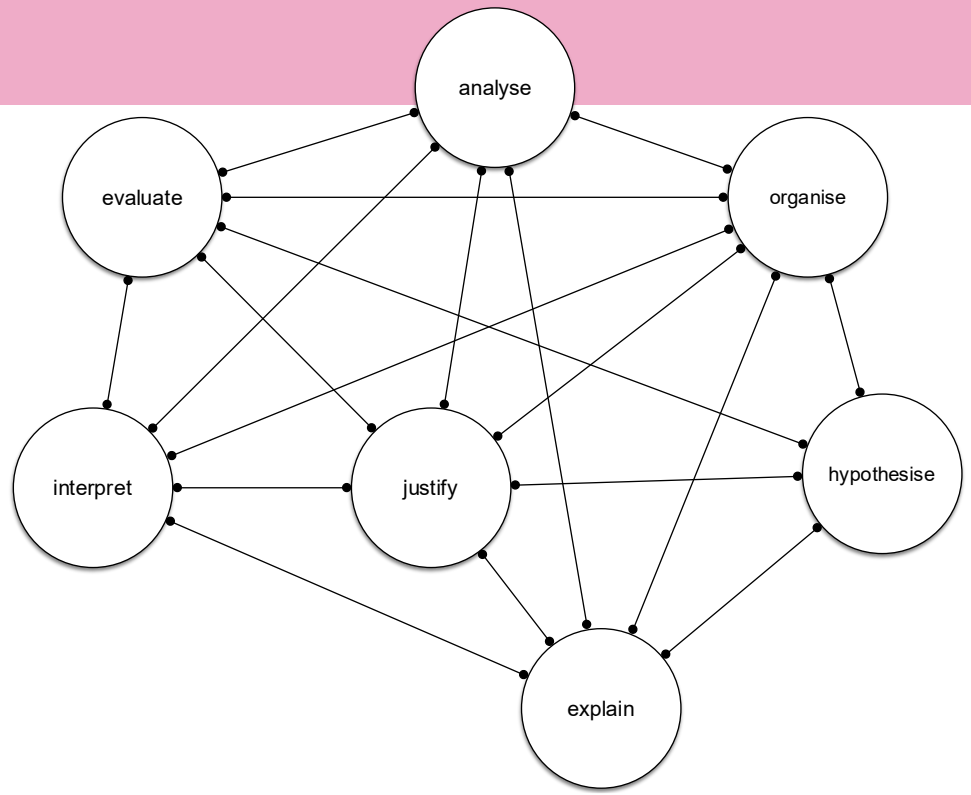
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Beyond Bloom’s taxonomy

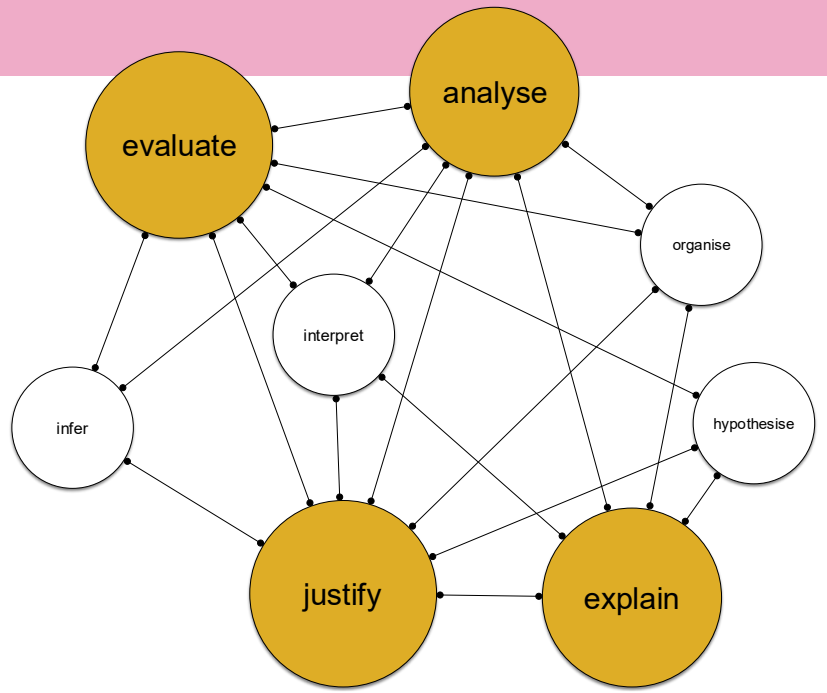


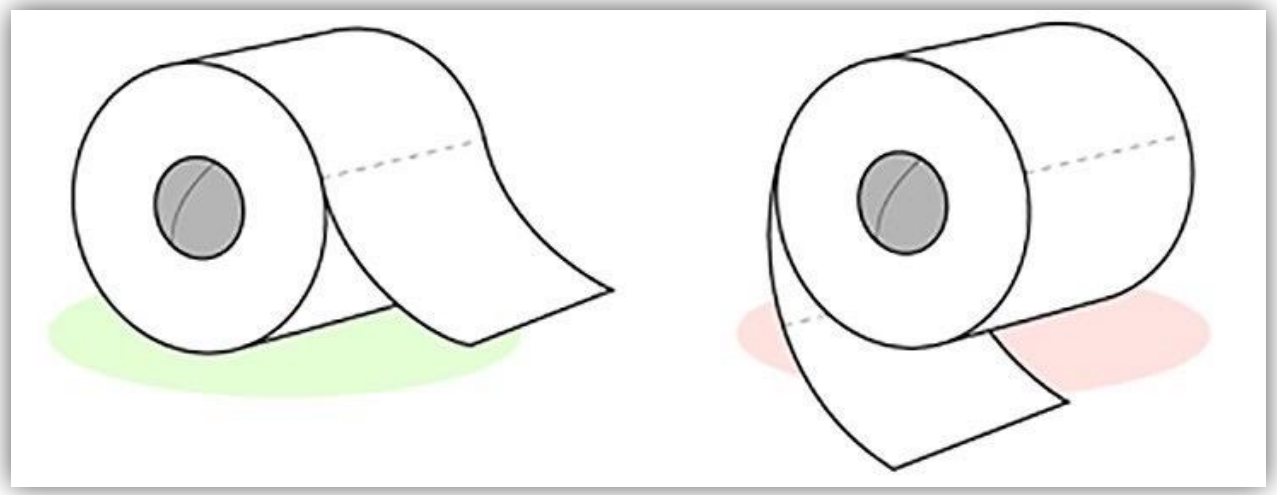
The problems with Bloom's Taxonomy were indirectly acknowledged by its authors. This is evidenced in their discussion of analysis: "It is probably more defensible educationally to consider analysis as an aid to fuller comprehension (a lower-class level) or as a prelude to an evaluation of the material" . The authors also acknowledged problems with the taxonomy's structure in their discussion of evaluation: "Although evaluation is placed last in the cognitive domain because it is regarded as requiring to some extent all the other categories of behavior, it is not necessarily the last step in thinking or problem solving. It is quite possible that the evaluation process will in some cases be the prelude to the acquisition of new knowledge, a new attempt at comprehension or application, or a new analysis and synthesis" (p.185). In summary, the hierarchical structure of Bloom's Taxonomy simply did not hold together well from logical or empirical perspectives. (Marzano, 2006, pp.8–9)

The Cognitive Web Model



The Golden Tetrad of Cognitive Skills



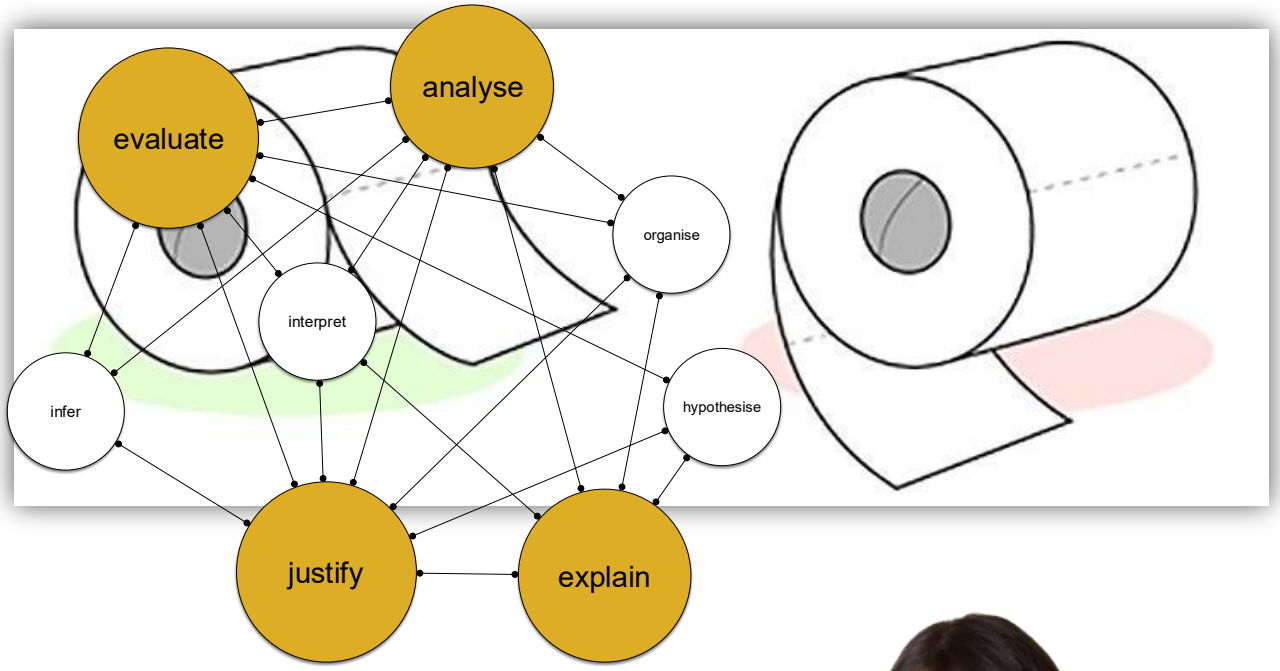


the
Golden
Tetrad

discuss…

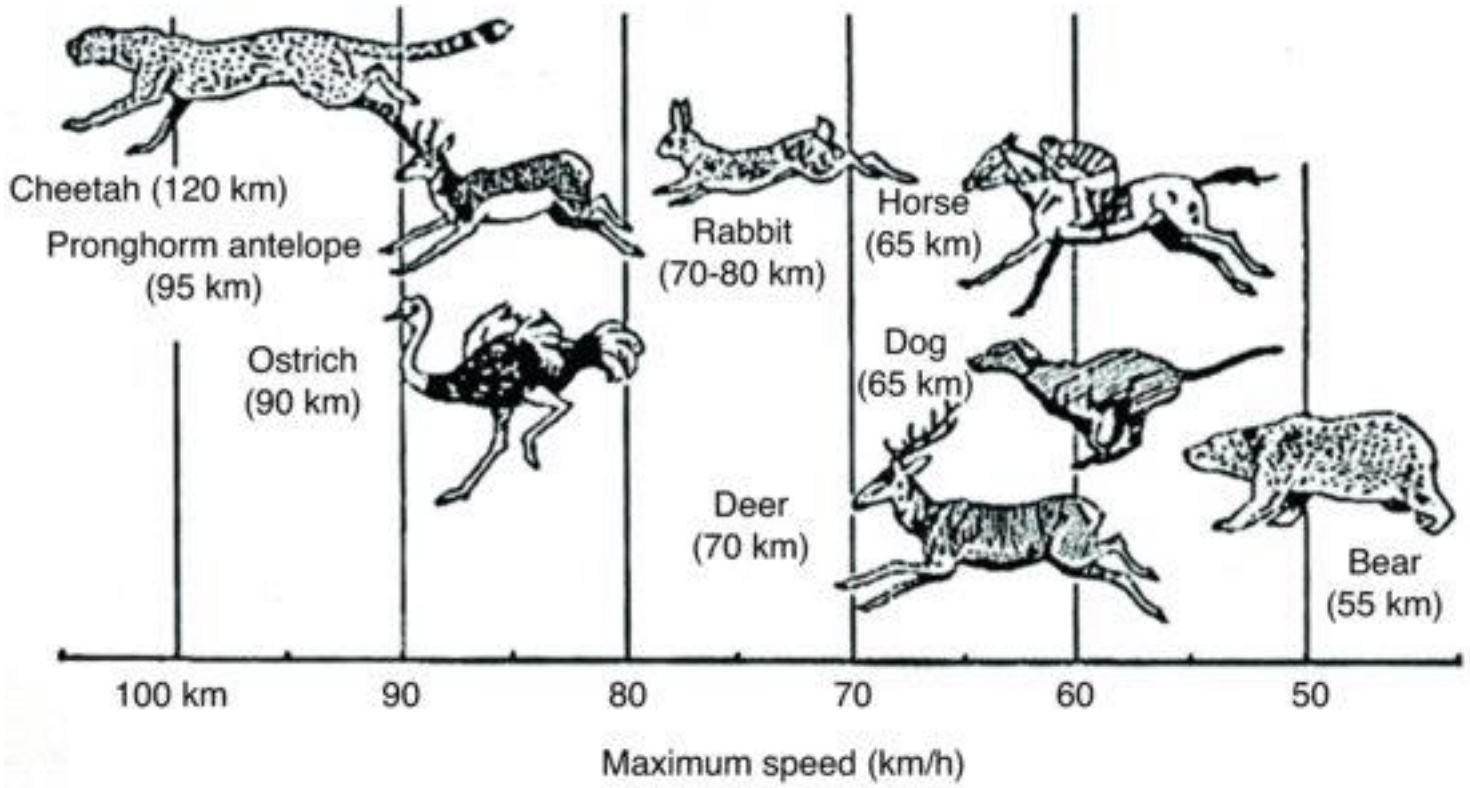


the Golden Tetrad

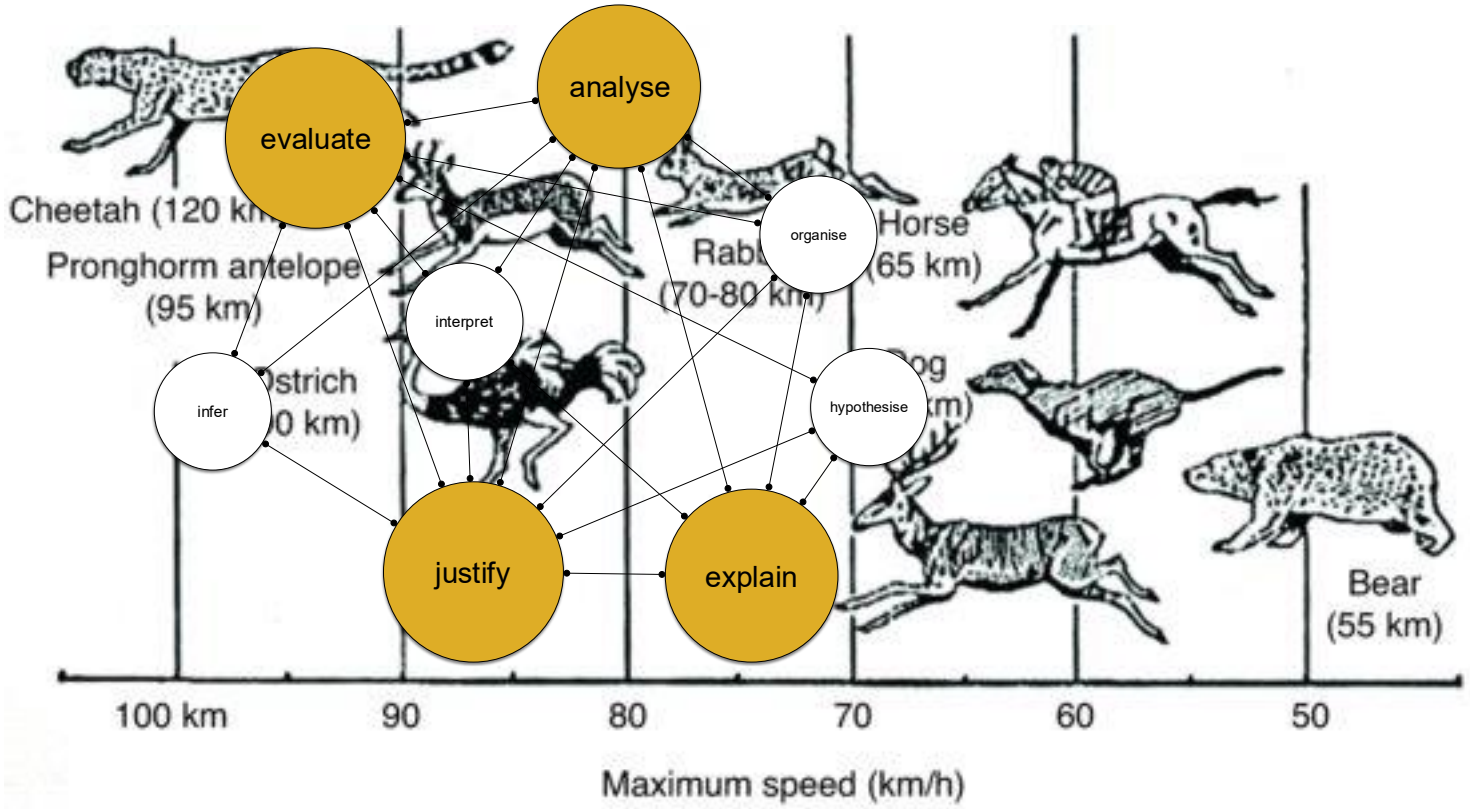


discuss...





the Golden Tetrad



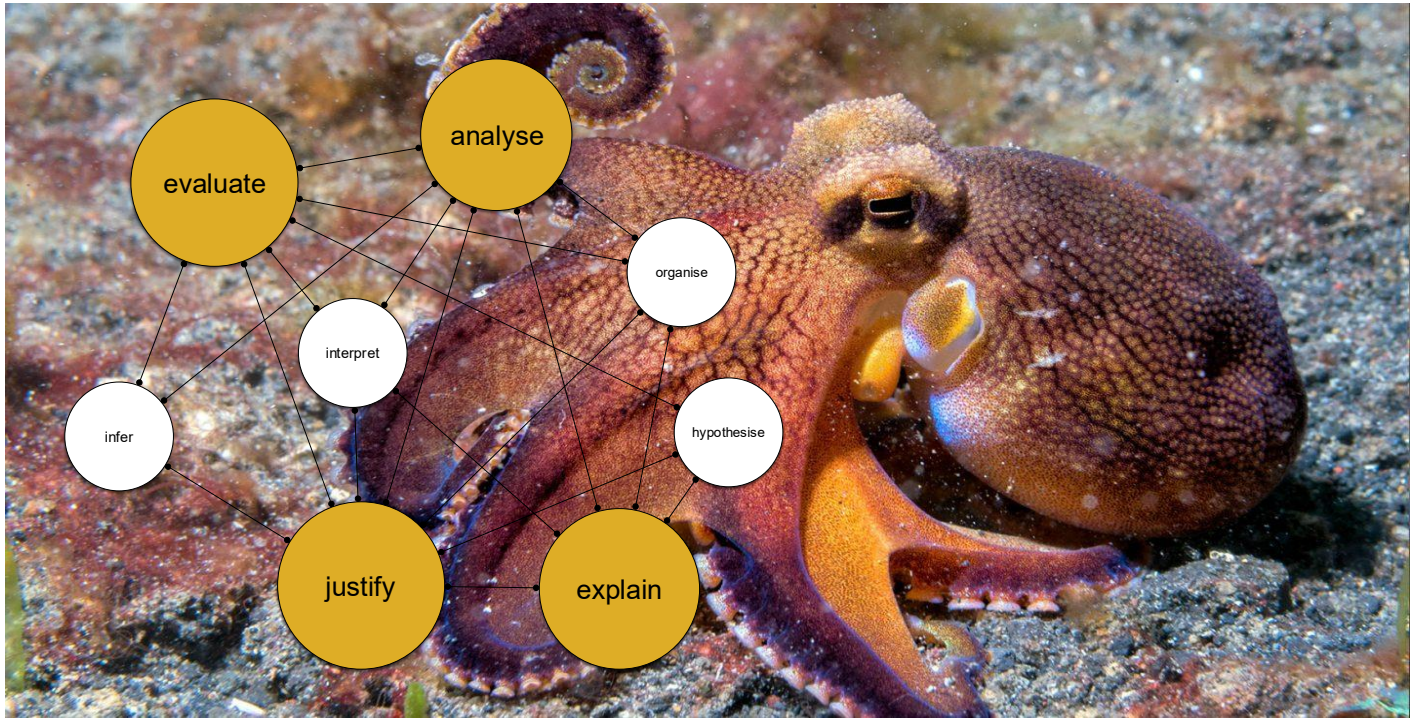
the Golden Tetrad

the Golden Tetrad



Are octopuses intelligent?

the Golden Tetrad



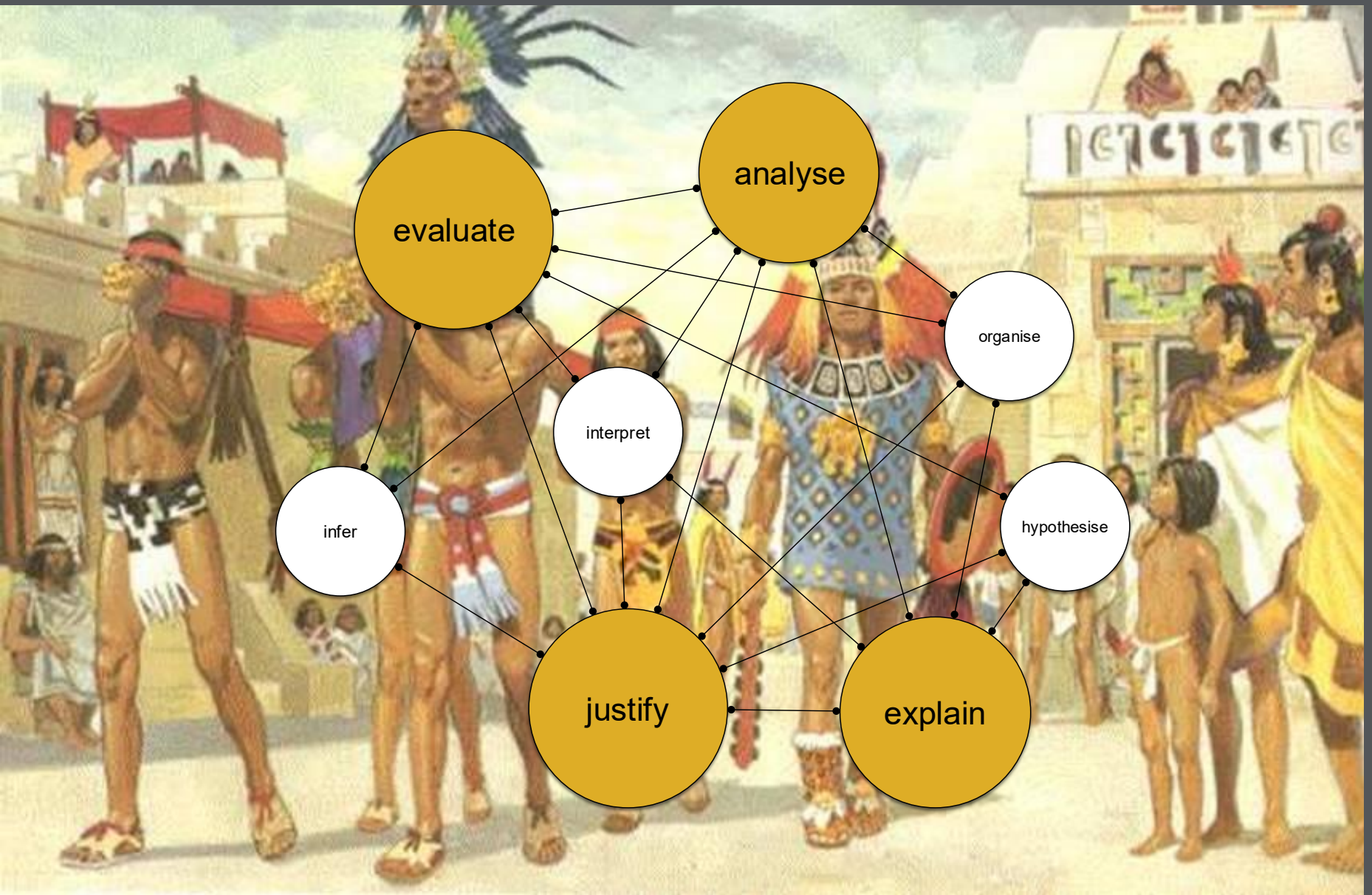
Are octopuses intelligent?

What can you infer about this civilization?



Analyse
Construct
Evaluate
Explain
Generate
Hypothesise
Identify
Infer
Interpret
Justify
Organise
Speculate
State
Synthesise

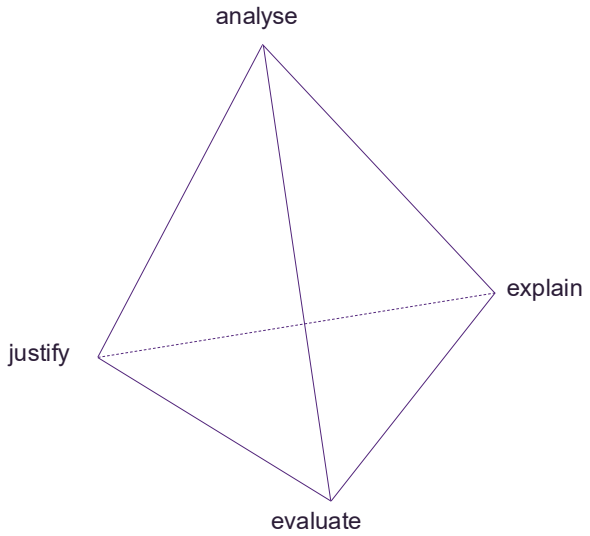
What can you infer about this civilization?

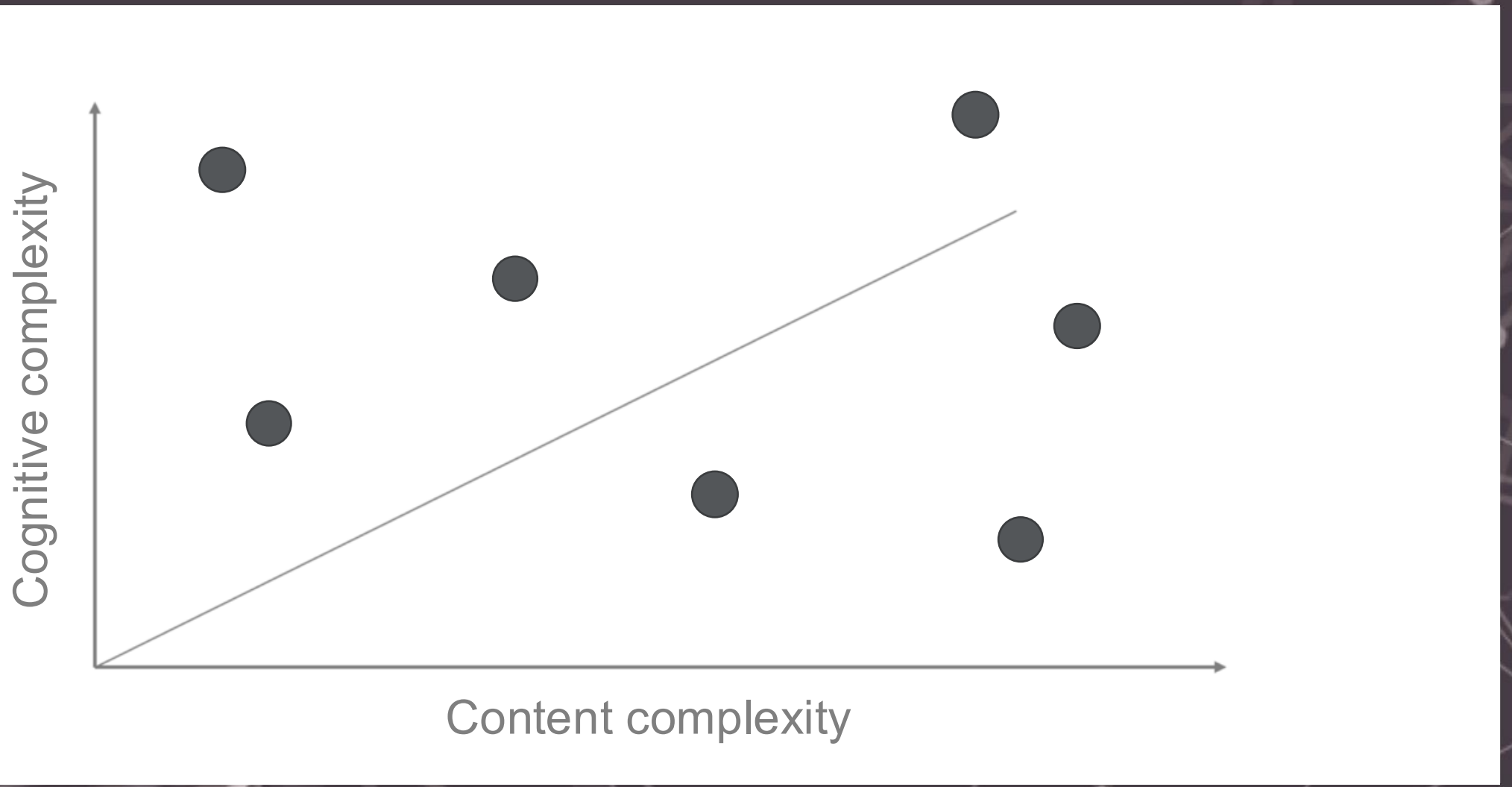


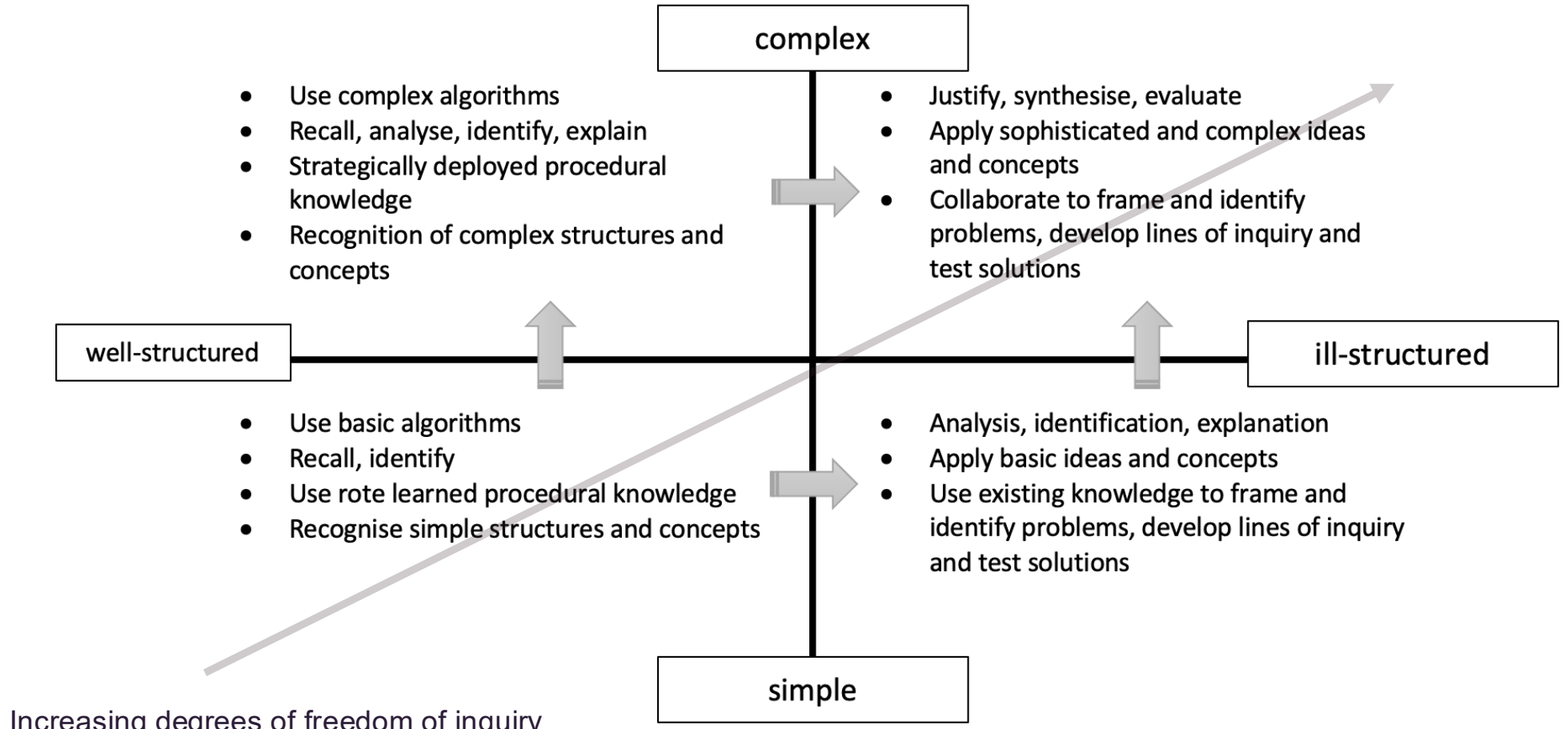
Analyse
Construct
Evaluate
Explain
Generate
Hypothesise
Identify
Infer
Interpret
Justify
Organise
Speculate
State
Synthesise

Some relationships between the cognitions

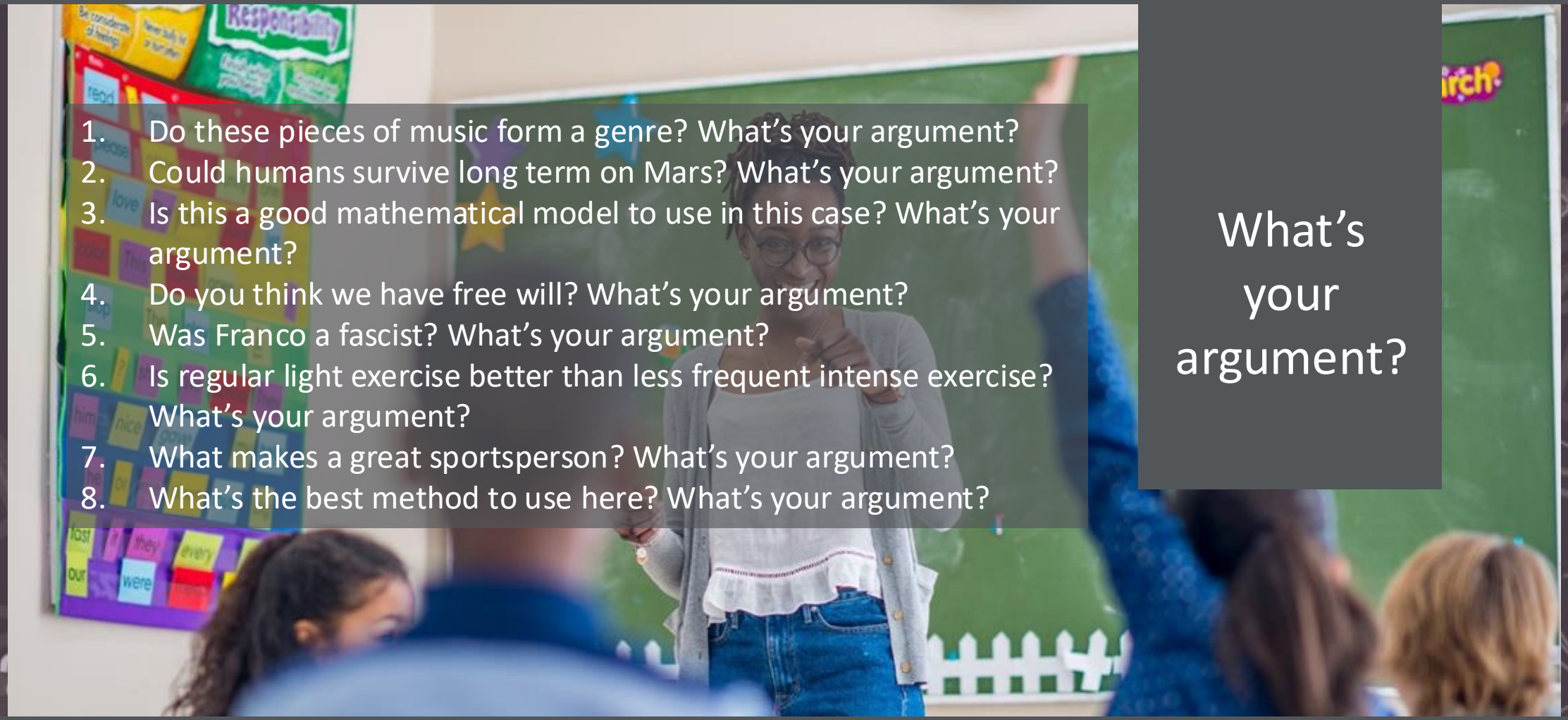
- Some relationships between the cognitions:
- The extent of understanding and quality of explanation is a function of the depth and breadth of analysis.
- The strength of a justification is often a function of the quality of analysis.
- The persuasiveness of a justification is often a function of the quality of explanation
- The criteria of evaluation are used to justify and explain decisions (and themselves require justification).




Cognitive complexity
Content complexity


complex
Use complex algorithms
Recall, analyse, identify, explain
Strategically deployed procedural knowledge
Recognition of complex structures and concepts
Justify, synthesise, evaluate
Apply sophisticated and complex ideas and concepts
Collaborate to frame and identify problems, develop lines of inquiry and test solutions
well-structured
ill-structured
Use basic algorithms
Recall, identify
Use rote learned procedural knowledge
Recognise simple structures and concepts
Analysis, identification, explanation
Apply basic ideas and concepts
Use existing knowledge to frame and identify problems, develop lines of inquiry and test solutions
simple
Increasing degrees of freedom of inquiry

Teacher questioning and the Golden Tetrad



1. Do these pieces of music form a genre? What's your argument?
2. Could humans survive long term on Mars? What's your argument?
3. Is this a good mathematical model to use in this case? What's your argument?
4. Do you think we have free will? What's your argument?
5. Was Franco a fascist? What's your argument?
6. Is regular light exercise better than less frequent intense exercise? What's your argument?
7. What makes a great sportsperson? What's your argument?
8. What's the best method to use here? What's your argument?

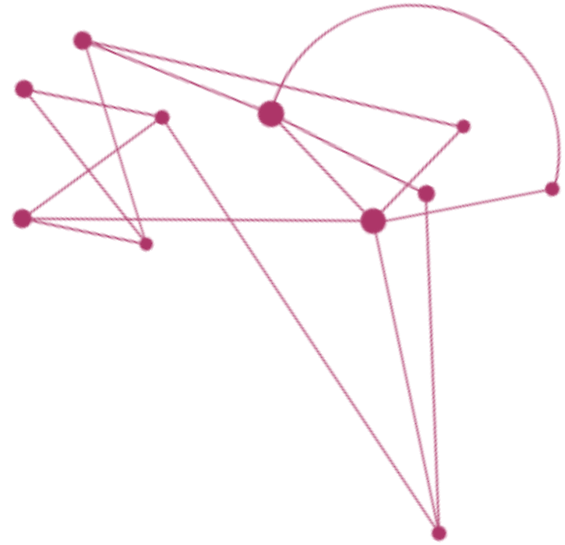
What's your argument?

Critical thinking begins with the giving and taking of reasons

Teacher questioning and the Golden Tetrad



Critical thinking begins with the giving and taking of reasons

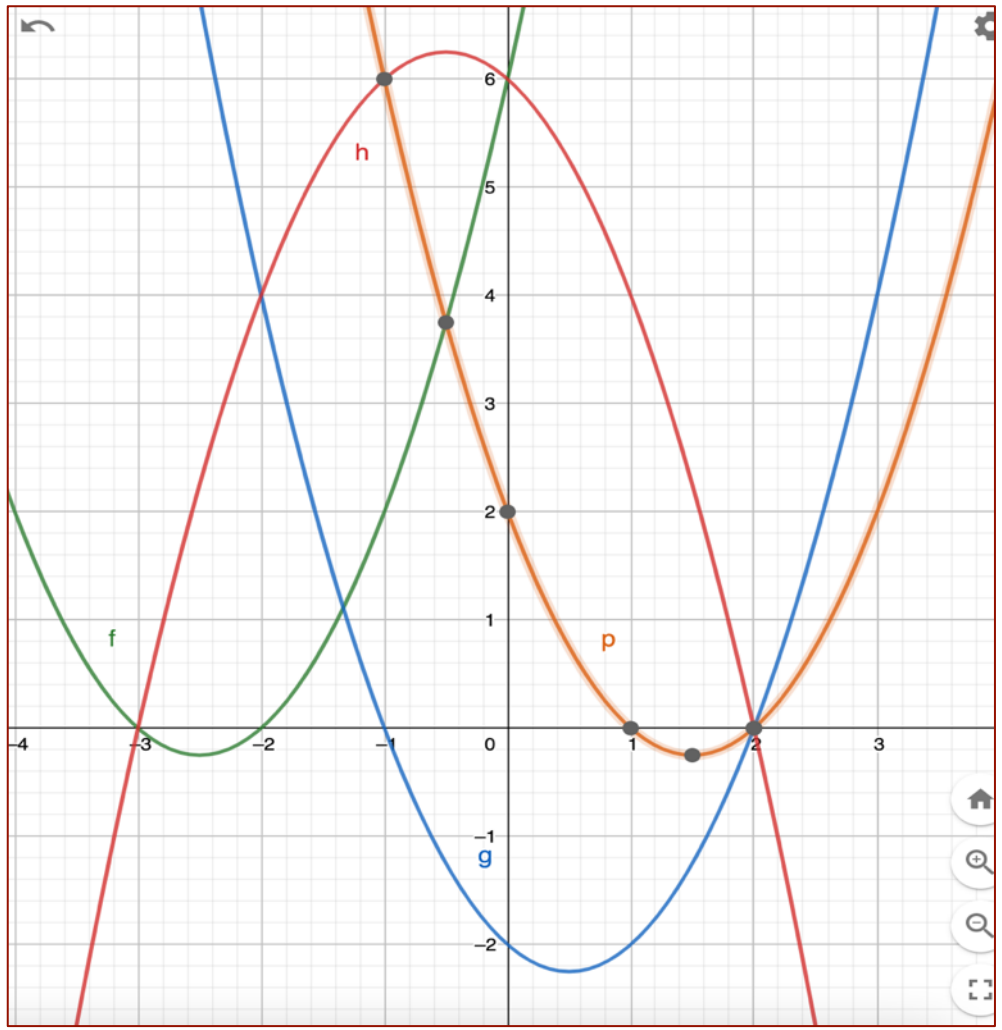


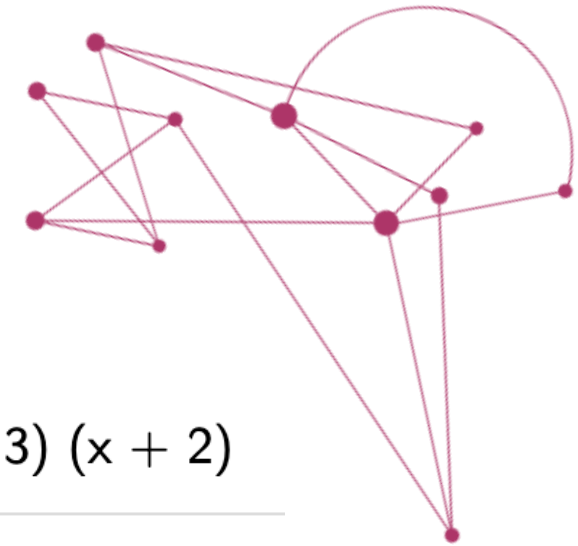
A. He dashed quickly through the forest.

B. He eavesdropped while they spoke.

C. She glared menacingly at her opponent.

D. They were seriously overwhelmed by the other side.





	f: $y = (x + 3)\,(x + 2)$
	g: $y = (x - 2)\,(x + 1)$
	h: $y = (2 - x)\,(3 + x)$
	p: $y = (1 - x)\,(2 - x)$







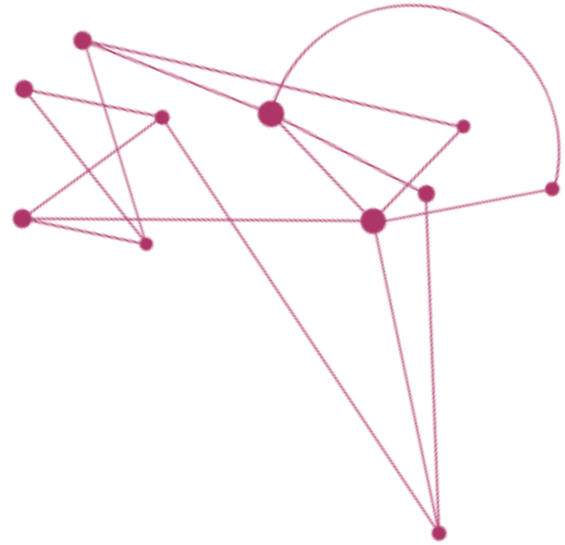


The values of inquiry

The root of the word *evaluate* is *value*. The values of inquiry represent those things we value in the act of inquiry and therefore in thinking, since thinking is inseparable from inquiry.

The values of inquiry provide criteria to evaluate the quality of our thinking.

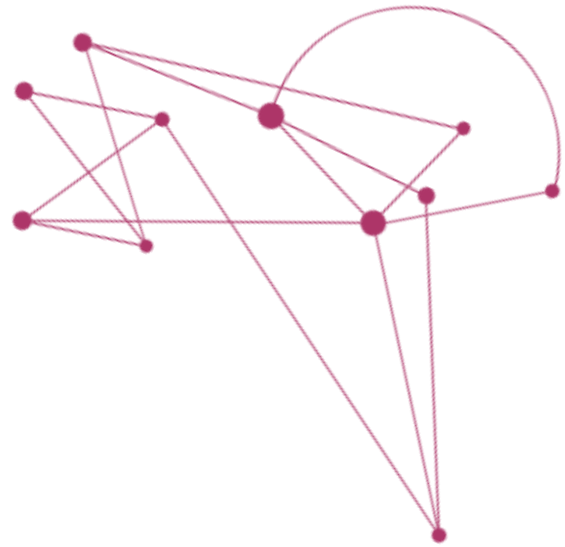
Inquiry values





The Values of Inquiry: explanations and supporting questions

Dr Peter Ellerton, the University of Queensland. https://critical-thinking.project.uq.edu.au

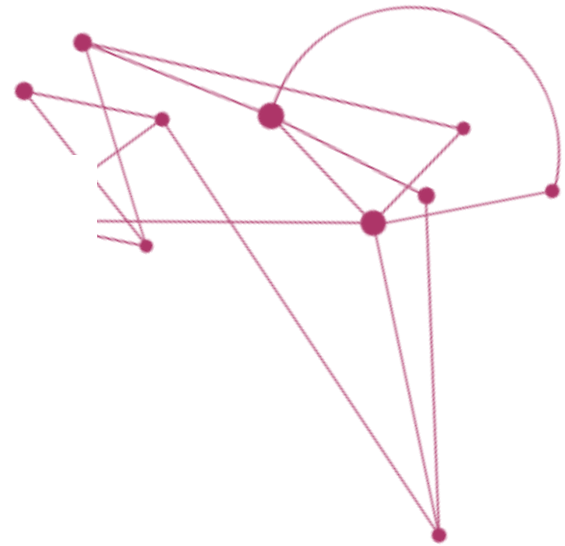


"The values of inquiry represent things that we value in the act of inquiry and hence in thinking. They provide a language for providing feedback on the quality of student thinking and so help us to ***evaluate*** thinking."

Meaning		Questions	Associated terms
Clarity	When we communicate with clarity, we ensure that our audience can understand what we mean. We are making our points as clear as possible to others.	• Are your examples useful? • Is your argument structure clear? • Are your diagrams easy to understand? • Is your paragraph structure well-developed? • Are your words well-defined and unambiguous?	Interpretation Meaning Shared understanding
Accuracy	When we communicate with accuracy, we seek to represent all information correctly and closely aligned with its original meaning.	• Is your argument sound? • Are your claims justified? • Is what you are saying true? • Have you represented ideas faithfully? • How could people check on your claim?	Truth Measurement Correctness
Precision	When we communicate with precision we are specific and intentional with our language and terminology in order to remove any potential for misunderstanding in meaning.	• Is your attention to detail sufficient? • Have you used technical terms appropriately? • Have you quantified your information where appropriate? • Are bullet points categorically distinct from each other? • Have you identified areas of vagueness or ambiguity ?	Exactitude Care
Depth	When we communicate with depth we provide detailed information and explanations to thoroughly develop our points.	• Are the complexities of the issue sufficiently described? • Are your analogies and generalisations well-justified? • Do you arguments consider premises that are themselves conclusions? • Have the problematic aspects of the issue been identified and dealt with?	Scope Perspectives Alternatives Detail
Breadth	When we communicate with breadth we aim to cover a diverse range of directly relevant content and considerations in relation to the topic. This helps us to ensure that we do not ignore any key components.	• Have you considered alternative perspectives? • Have you represented a broad range of alternative views? • Why have you preferred one perspective over another? • Have you sought out others for the purpose of testing your ideas?	Thoroughness Thoughtfulness Focus Empathy
Relevance	When we communicate with relevance we choose information that relates directly to the points we are developing. We do not incorporate any distracting or useless information that may confuse our audience.	• Have you focussed on the point at issue? • Have you selected information supporting the topic? • Is distracting or unhelpful information minimised? • Have you been able to identify why information is relevant? • Have you justified why your selection of material is relevant?	Importance Impact Discernment
Significance	When we communicate with significance we discuss the most important information that is related to the given topic. This allows us to focus on key ideas rather than distracting the audience with tangential information.	• Have you avoided superficial issues or arguments? • Have you identified and developed your core ideas? • Have you identified the most meaningful aspects? • Have you focused on substantive aspects?	Connections Understanding Application
Coherence	When we communicate with coherence we structure our arguments in a way that makes logical sense. Each point builds towards the overall intended meaning of the piece.	• Have you avoided using logical fallacies? • Have you avoided contradicting statements? • Are your ideas developed in logical manner? • Do all your premises support your conclusions? • Have you used transition phrases to identify logical progressions?	Logic Consistency Integration Argument Justification Persuasiveness

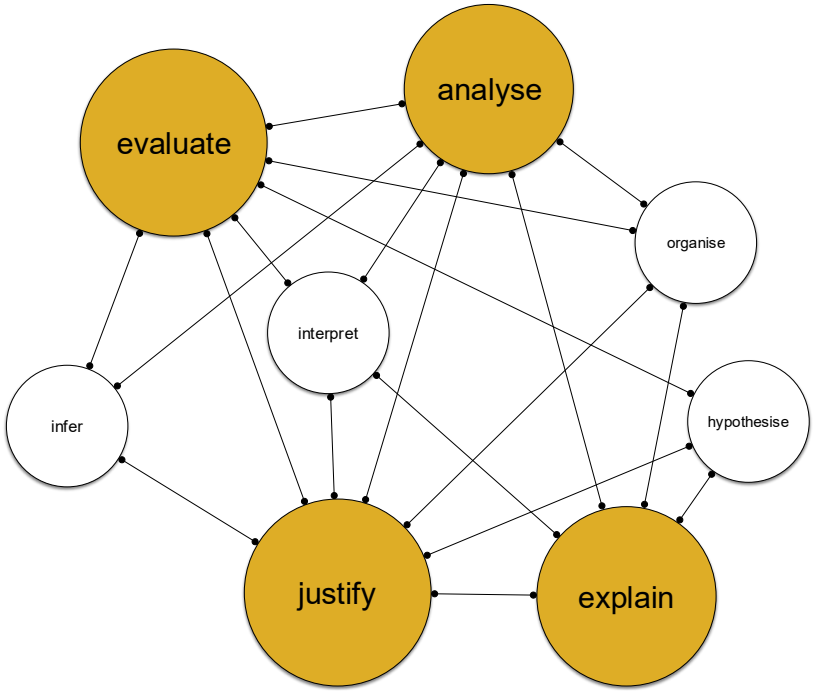
Values of inquiry modified from Intellectual Standards of Elder, L. and R. Paul (2001), Kuhn,T. SSR (1970), Lipman, M. TE (2003).

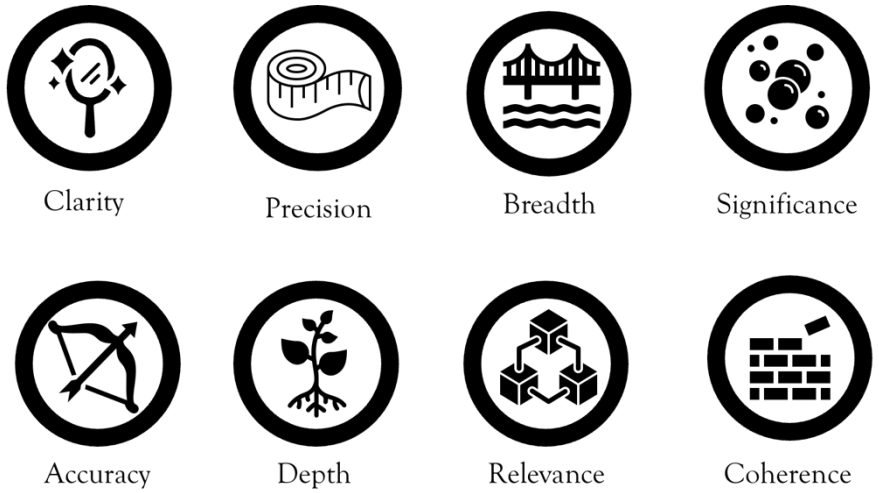
Meaning		Questions	Associated terms
 Clarity	When we communicate with clarity, we ensure that our audience can understand what we mean. We are making our points as clear as possible to others.	• Are your examples useful? • Is your argument structure clear? • Are your diagrams easy to understand? • Is your paragraph structure well-developed? • Are your words well-defined and unambiguous?	Interpretation Meaning Shared understanding Truth Measurement Correctness Exactitude Care
 Accuracy	When we communicate with accuracy, we seek to represent all information correctly and closely aligned with its original meaning.	• Is your argument sound? • Are your claims justified? • Is what you are saying true? • Have you represented ideas faithfully? • How could people check on your claim?	
 Precision	When we communicate with precision we are specific and intentional with our language and terminology in order to remove any potential for misunderstanding in meaning.	• Is your attention to detail sufficient? • Have you used technical terms appropriately? • Have you quantified your information where appropriate? • Are bullet points categorically distinct from each other? • Have you identified areas of vagueness or ambiguity ?	



Depth	When we communicate with depth we provide detailed information and explanations to thoroughly develop our points.	• Are the complexities of the issue sufficiently described? • Are your analogies and generalisations well-justified? • Do you arguments consider premises that are themselves conclusions? • Have the problematic aspects of the issue been identified and dealt with?	Scope Perspectives Alternatives Detail Thoroughness Thoughtfulness Focus Empathy
Breadth	When we communicate with breadth we aim to cover a diverse range of directly relevant content and considerations in relation to the topic. This helps us to ensure that we do not ignore any key components.	• Have you considered alternative perspectives? • Have you represented a broad range of alternative views? • Why have you preferred one perspective over another? • Have you sought out others for the purpose of testing your ideas?	
Relevance	When we communicate with relevance we choose information that relates directly to the points we are developing. We do not incorporate any distracting or useless information that may confuse our audience.	• Have you focussed on the point at issue? • Have you selected information supporting the topic? • Is distracting or unhelpful information minimised? • Have you been able to identify why information is relevant? • Have you justified why your selection of material is relevant?	Importance Impact Discernment Connections Understanding Application
Significance	When we communicate with significance we discuss the most important information that is related to the given topic. This allows us to focus on key ideas rather than distracting the audience with tangential information.	• Have you avoided superficial issues or arguments? • Have you identified and developed your core ideas? • Have you identified the most meaningful aspects? • Have you focused on substantive aspects?	

The values are most effective when used as feedback on cognition



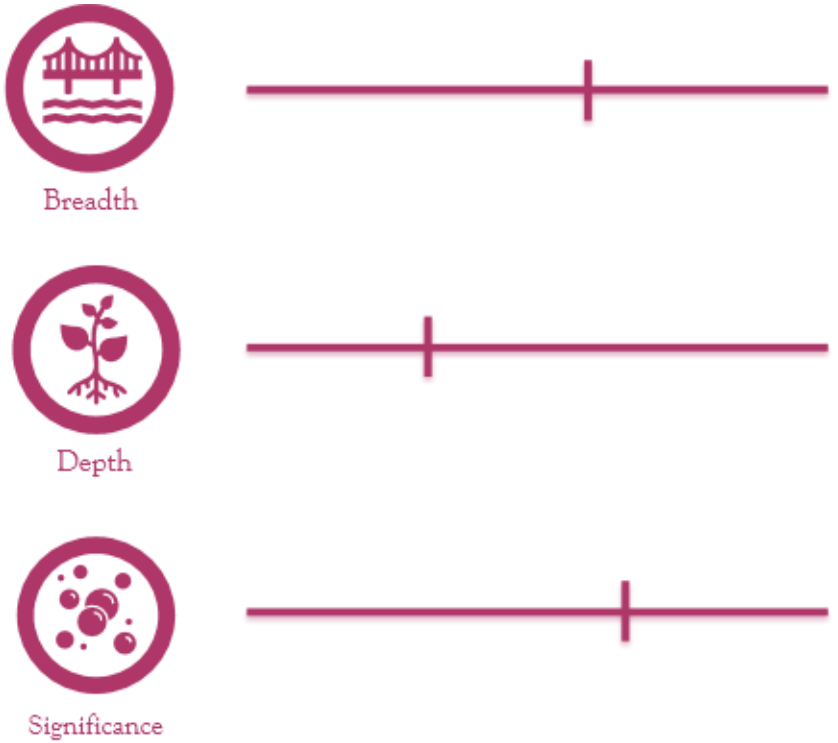


The values of Inquiry act as feedback on cognitions

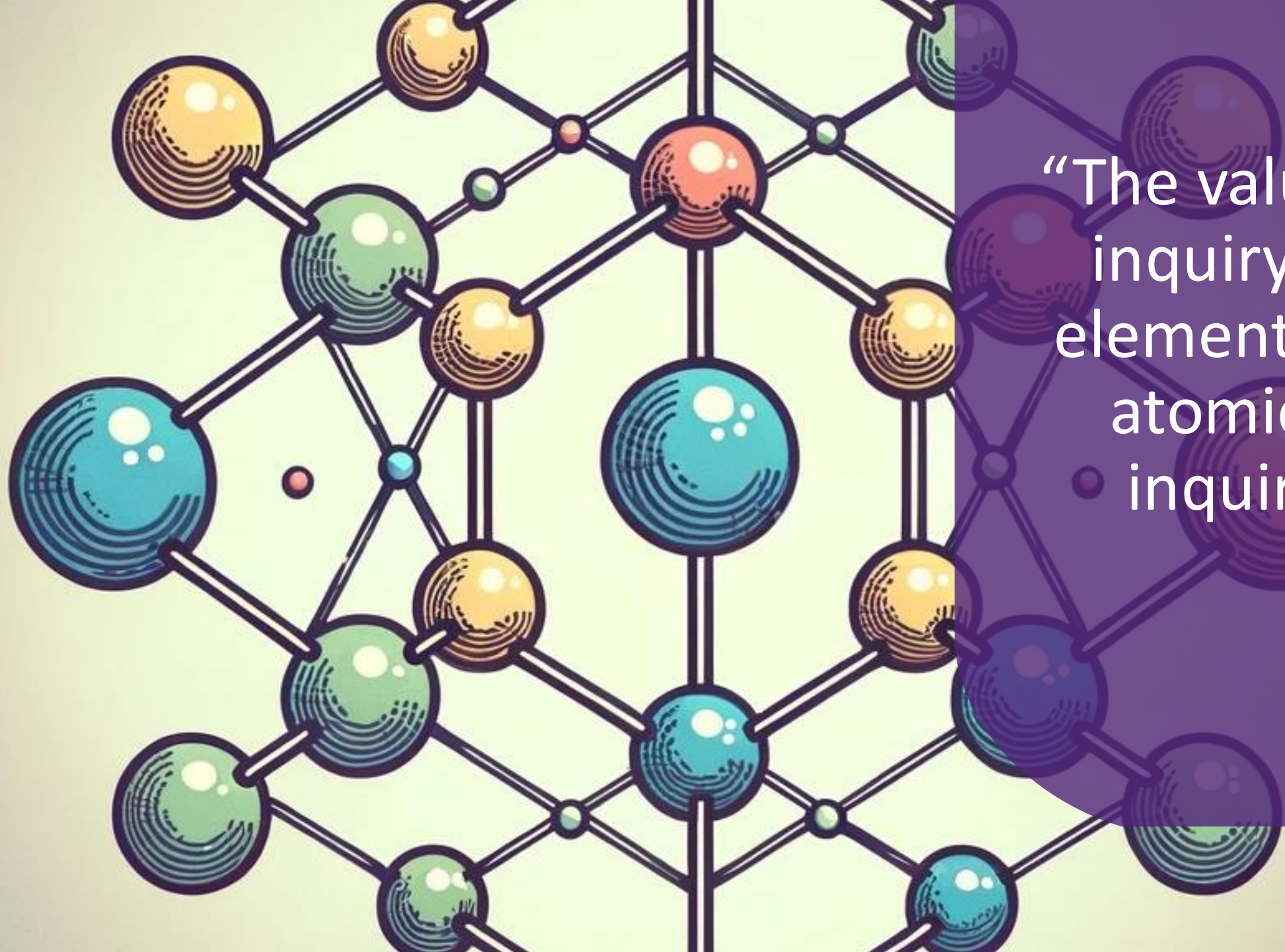




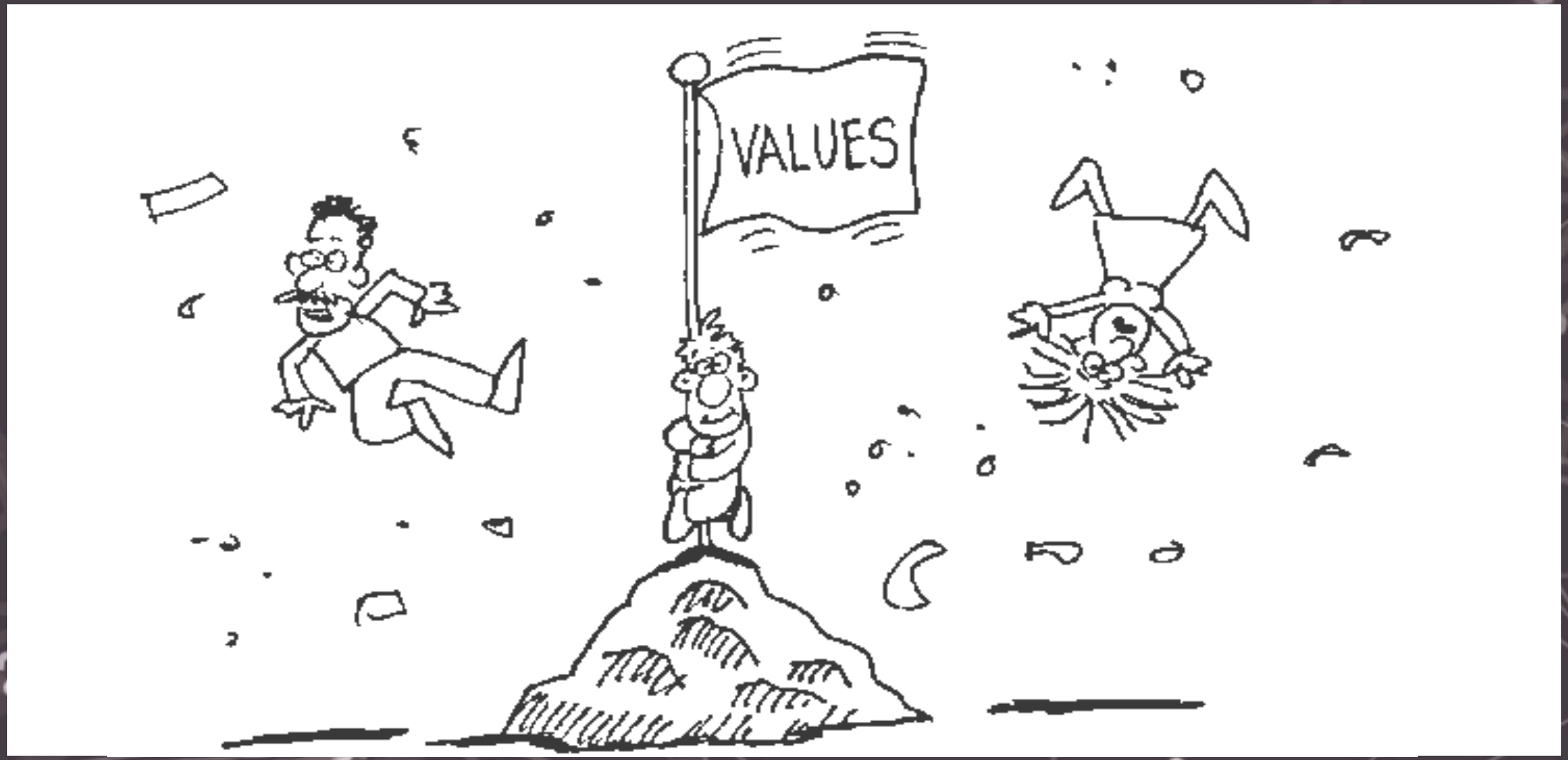
What do we *do* when we analyse?







“The values of inquiry are elemental, or atomic to inquiry.”


VALUES

Pedagogical Imperative #2

Reason collaboratively

Reasoning is a social competence as much as an individual faculty




The future is
collaborative

The assembly bonus

In a seminal paper, Michaelson, Watson and Black (1989)[1] identified what they called an *assembly bonus* in teams working collectively (p.843). They found that the performance of the group (3-8 members) eclipsed that of the most able member 97% of the time. Woolley et al. (2010)[2] suggest that a general collective intelligence factor, c, analogous to individual general intelligence, exists for groups as measured across a wide variety of tasks. Their findings indicate that this so-called c-factor does not correlate well with individual or average general intelligence and is *most strongly aligned with "average social sensitivity of group members, [and] the equality in distribution of conversational turn-taking*" (p. 686).



[1] Michaelsen, L. K., Watson, W. E., & Black, R. H. (1989). A realistic test of individual versus group consensus decision making. *Journal of Applied Psychology, 74*(5), 834–839. https://doi.org/10.1037/0021-9010.74.5.834

[2] Woolley, A. W., Chabris, C. F., Pentland, A., Hashmi, N., & Malone, T. W. (2010). Evidence for a Collective Intelligence Factor in the Performance of Human Groups. *Science*, *330*(6004), 686–688

I love the chatter, shouts and laughter that echoes through our corridors, the charged silence of classrooms filled with concentrated learning and the smiles of students and staff as they go about the business of education.

High School principal



Socially extended cognition

Extending the unit of cognition from the individual to the group



…in Vygotsky's general genetic law of cultural development: "every function in the child's cultural development appears twice: first, on the social level, and later, on the individual level; first *between* people (inter psychological), and then *inside* the child (intra psychological)" (Vygotsky, 1978; p. 57, emphasis in the original).



Wertsch (1991) provided an illustration of this law by considering the case of a young child who was assisted by his mother to remember where his toy was. He points out that it is impossible to say that either participant did the remembering, as neither the child could have effectively managed his memory resources nor the mother could have known the position of the toy. The cognitive act of remembering was carried out on the intermental plane.

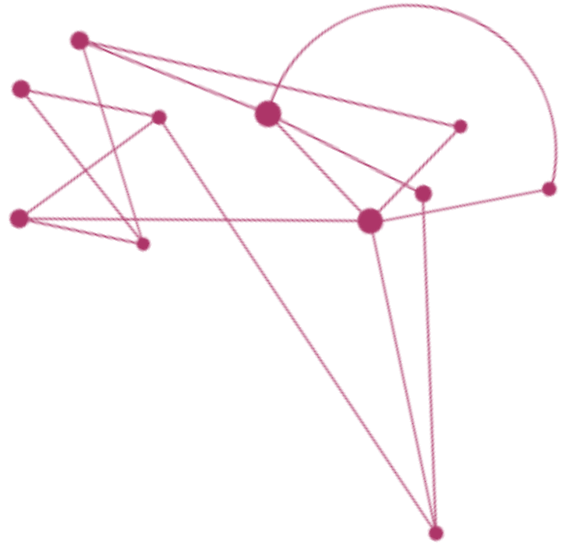


As individuals reason together, their inputs and outputs can form a system that encompasses and extends what is possible as separate agents.

In these cases, other minds act as cognitive resources that are not available to us acting in isolation. We are not always just communicating the results of our completed cognition but are engaged in a flow of ideas and exchange of partially formed thoughts to see where they may lead. The exchange is a part of the cognitive process, and the result is more than the sum of the parts.

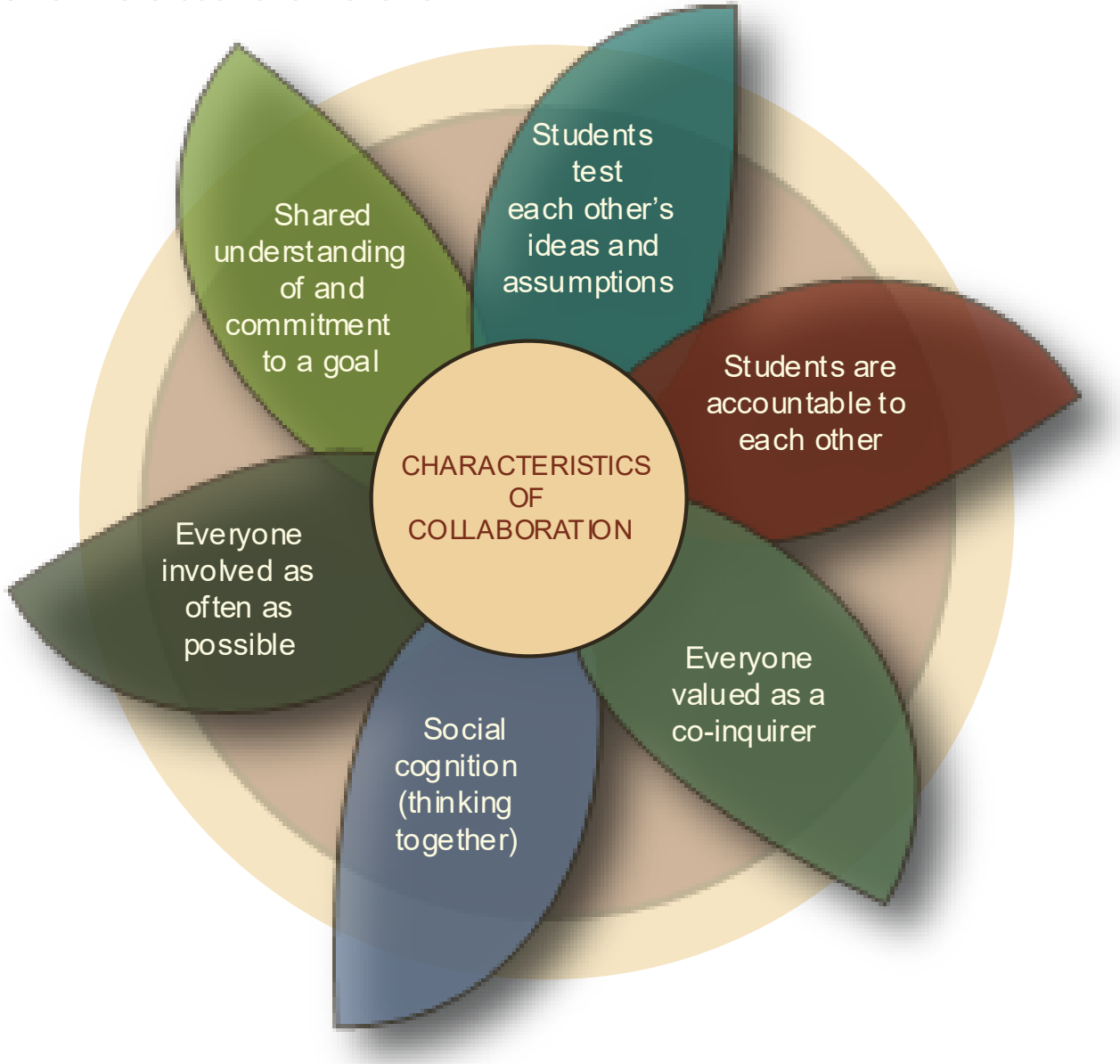
Ellerton et al., 2025

Reasons to collaborate



1. **Develop rigour in reasoning through accountability**
   Working with others provides opportunities and contexts for explanation, analysis, justification and evaluation
2. **Grow virtues that enable and enhance collaboration**
   Character traits that are indicative of good critical thinkers include humility, curiosity, honesty and open-mindedness
3. **Apply and refine the Values of Inquiry**
   Critical thinkers make their own thinking an object of study, understanding what we collectively value in good thinking
4. **Learn the norms and standards of good reasoning**
   Like a language, thinking together is about creating shared meaning using socially derived norms of reasoning
5. **Engage in social cognition (thinking together)**
   Thinking together means we are making the group, not the individual, the unit of cognition
6. **Learn social skills needed for 21C success**
   Teamwork, communication, creativity and criticality are all best developed collaboratively

Characteristics of collaboration



University of Queensland Critical Thinking Project: Collaboration Matrix

Criteria	1 - Poor	2 - Fair	3 - Good	4 - Very Good	5 - Excellent
Shared Goals and Vision	No clarity or alignment of objectives	Some alignment but objectives are not clear to all	Clear objectives but not all are aligned	Mostly aligned with clear objectives	Fully aligned with a clear and shared vision
Open Communication	Rarely communicates; many misunderstandings	Limited communication; some misunderstandings	Regular communication; occasional misunderstandings	Frequent and clear communication; few misunderstandings	Constant open and effective communication
Mutual Trust and Respect	Mistrust evident; no respect for contributions	Occasional trust issues; minimal respect	Generally trusting and respectful	High trust and respect with occasional lapses	Absolute trust; deep respect for all contributions
Active Participation	Rarely contributes; minimal involvement	Occasional contributions; limited involvement	Regular contributions but not fully engaged	Actively contributes most of the time	Fully engaged; consistently proactive
Flexibility	Resistant to change or feedback	Struggles with change; occasionally considers feedback	Adaptable but with some resistance	Often flexible and open to feedback	Always adaptable; embraces change and feedback
Diversity of Skills and Knowledge	Homogeneous skills; no diversity	Limited diversity; some overlapping skills	Balanced skill set but lacks diversity	Diverse skills with some unique expertise	Highly diverse and complementary skill sets
Joint Decision-making	Decisions made unilaterally	Some joint decisions but occasional exclusion	Joint decisions made regularly	Mostly inclusive decision-making	Always inclusive and collective decision-making
Shared Accountability	Blames others; avoids responsibility	Sometimes accepts responsibility; occasional blame	Generally shares responsibility but with lapses	Often accountable with minimal blame	Fully accountable; no blame culture
Conflict Resolution	Avoids conflicts; unresolved issues	Some conflicts addressed but not effectively	Regularly addresses conflicts; some unresolved	Effectively resolves most conflicts	Always addresses and resolves conflicts constructively
Feedback Loops	Rarely seeks or gives feedback	Occasionally seeks or gives feedback	Regular feedback but not always acted upon	Frequent feedback with most being actionable	Continuous feedback and always acts upon it
Shared Leadership	One dominant leader; no role changes	Occasional shared roles; limited leadership diversity	Shared leadership but with clear dominant figures	Often shared leadership with rotating roles	Fully shared leadership; roles adapt as needed
Synergy	Individual efforts; no combined value	Some joint efforts but limited synergy	Clear synergy but with some isolated efforts	High synergy with occasional individual efforts	Full synergy; combined effort exceeds individual contributions
Transparent Processes	Processes unclear and confusing	Some processes in place but lack clarity	Clear processes but not always followed	Mostly clear and often followed processes	Fully transparent and always followed processes

Dr Peter Ellerton, UQ Critical Thinking Project

Assessing for thinking

Designing tasks with attention to cognitions and values



Why did the Roman Empire fall?

What sort of response could you expect from students?

Cognitive instructions (options)

1. **State** three contributing factors/causes for the fall of the Roman empire.
2. **Describe** the causes of the fall of the Roman empire.
3. **State** three causes for the fall of the Roman empire and **explain** how each cause contributed to the empire's collapse.
4. **Evaluate** the *accuracy* of the following statement: Germanic tribes are responsible for the fall of the Roman Empire. **Justify** your stance using *relevant* historical information.

Sample questions — Pharmacy

Identify and research a Health Promotion or Disease Prevention program that was run or is running in Australia during 2020 and/or 2021 and outline:

a) whether it is a health promotion or disease prevention program, whether it is a primary, secondary or tertiary program and the group towards whom the program is aimed.
b) the aim of the program and why it is necessary.
c) what is it about the program's promotional material (including but not limited to slogans, jingles, colours etc.) that meant that, in your opinion, it is a successful or unsuccessful campaign?

Sample questions — Pharmacy

Identify and research a Health Promotion or Disease Prevention program that was run or is running in Australia during 2020 and/or 2021 and ~~outline~~:

a) Identify **w**hether it is a health promotion or disease prevention program, whether it is a primary, secondary or tertiary program and the group towards whom the program is aimed.
b) State **t**he aim of the program and explain why it is necessary.
c) Identify what is it about the program's promotional material (including but not limited to slogans, jingles, colours etc.) that meant that, in your opinion, it is a successful or unsuccessful campaign? Explain their effectiveness (or lack of it) in terms of potential phycological factors at play.

Sample questions — Pharmacy

An in-patient in your ward has been told that he has liver disease and that he needs to give up alcohol. He tells you, he does not intend to do so as '*the best part of the week is going to the pub'.*

a) ~~Outline~~ Generate five questions that you would pose to this specific patient considering motivational interviewing techniques and avoiding victim blaming.
b) Discuss each question in turn, ~~describing~~ explaining why you chose to phrase it the way you did.
c) Explain why victim blaming can have negative effects on patient health outcomes.
d) ~~Compare~~ **Evaluate*** the effectiveness of motivational interviewing ~~with victim blaming~~ as a means of ensuring the best health outcomes for this patient. ~~(Discuss the reasons why)~~

*this would also require a justification of the means of evaluation

Sample questions — Pharmacy

Good: Barriers to effective communication can be either personal or environmental. Which **ONE** of the following statements contains two examples of personal barriers to communication?

1. (a) External noise and psychological aspects
2. (b) Historical aspects and social aspects
3. (c) External noise and internal noise
4. (d) The history with the message sender and the setting of the communication
5. (e) The physical layout of the pharmacy and cultural aspects

Better: Consider the scenario below.

A patient is clearly uncomfortable during an information giving session as they are picking up a prescription related to the treatment of anxiety. The pharmacy is very busy and while speaking with the patient you notice them constantly monitoring their environment, making you uncertain that they are processing what is being said to them.

In this scenario,

(a) environmental barriers are more significant than psychological barriers to effective communication
(b) psychological barriers are more significant than environmental barriers to effective communication
(c) environmental and psychological barriers to effective communication are connected

Even better: Barriers to effective communication can be either personal or environmental. Outline a patient communication scenario in which

(a) environmental barriers are more significant than psychological barriers
(b) psychological barriers are more significant than environmental barriers
(c) environmental and psychological barriers are inseparable

In each case explain your reasoning.

Challenge: Improve the task below by breaking it down into a series of cognitive instructions for students.

Task: *Who is Australia's greatest sportsperson?*

+ *Task: Who is Australia's greatest sportsperson?*

1. *Select a range of sporting activities to consider.*
2. *Analyse these sporting contexts and identify what we as a country value in sports and sports people.*
3. *Use these values to construct criteria of evaluation for selecting candidates. Justify your criteria based on your value choices.*
4. *Generate a list of candidates and apply your criteria to the candidates.*
5. *Rank your candidates against the criteria and explain why the person you have chosen deserves the award.*

+ *Task: Who is Australia's greatest sportsperson?*
+ Groups must construct and defend a reasoned judgement by:

1. *Analysing the Australian sporting context*
2. *Identifying and explaining what Australians value in sport and sportsmanship*
3. *Developing and justifying criteria for evaluating "greatness"*
4. *Evaluating a range of candidates against those criteria*
5. *Justifying a final, defensible conclusion*

+ *There is no single "correct" answer. What matters is the quality of inquiry and reasoning.*

+ ANALYSE — A standard

- The response presents a clear, precise, and accurate analysis of the Australian sporting context.
- It demonstrates depth by identifying and interrogating underlying assumptions about sporting “greatness” (e.g. achievement, character, influence, fairness).
- The analysis shows breadth by considering multiple sporting codes, eras, and perspectives, while maintaining strong relevance to the central question.
- It prioritises significant features of Australian sport and sportsmanship rather than peripheral detail and integrates these into a coherent and purposeful structure that clearly supports later evaluative work.

+ EXPLAIN — A standard

- The response provides a clear, coherent, and precise explanation of what Australians value in sport and sportsmanship, and why these values matter in the Australian context.
- It demonstrates depth by addressing tensions and complexities (e.g. winning versus fairness, individual excellence versus team contribution).
- Explanations are accurate, well-sequenced, and supported by relevant examples.
- The explanation foregrounds the most significant values and shows how they meaningfully inform judgements about sporting greatness.

+ JUSTIFY (Criteria construction) — A standard

- The response develops explicit, well-defined evaluation criteria that are clearly grounded in the identified values of sport and sportsmanship.
- Each criterion is coherently and convincingly justified, with reasons that are relevant, accurate, and precisely expressed.
- The justification demonstrates depth by acknowledging trade-offs between criteria and explaining how tensions are managed.
- It shows breadth by considering plausible alternative criteria and defending the final selection as the most significant for answering the inquiry question.

+ EVALUATE — A standard

- The response applies the justified criteria systematically, consistently, and fairly to a range of credible candidates.
- Evaluation demonstrates depth by weighing strengths, limitations, and trade-offs rather than listing achievements.
- It shows breadth through comparison across different sports, contexts, or eras, while maintaining strong relevance to the criteria.
- Judgements are coherent, evidence-informed, and focused on significant differences between candidates rather than superficial features.

Dr Peter Ellerton, University of Queensland Critical Thinking Project

THE UNIVERSITY OF QUEENSLAND AUSTRALIA
UQ Critical Thinking Project

Assessment design in the language of student cognition

Cognitive instructions make the cognitive demands of the task explicit.

E.g. The question "How does the system react when….?" can be understood as "Describe how the system reacts when…" or "Explain why the system reacts when…" Both are consistent with the question and hence the question is ambiguous to the student.

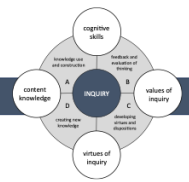
Precision of language provides clarity of purpose.

Step 1: Identify necessary content

Step 2: Determine cognitive intent of questions (what you would like students to do)

Assert	Examine	Solve	Construct	Argue
Step 3: Select appropriate cognitive verbs				
State List Describe Outline Suggest Recall	Analyse Calculate Compare Contrast Define Determine Distinguish Document Explain Explore Identify Interpret Investigate Measure Recall Reflect Recognise Show	A cognitive instruction may lead with a verb but also imply the use of a range of others.	Annotate Apply / use Design Classify / categorise Conjecture Demonstrate Derive Discuss Estimate Exemplify Hypothesise Predict Present Summarise Synthesise	Analogise Deduce Evaluate Explain Induce Infer Generalise Justify Prove Rationalise
Step 4: Construct assessment using cognitive instructions where possible				
• State the conditions under which… • Describe the process of… • List 4 characteristics of effective… • Suggest 2 alternative approaches.	• Calculate the value of… • Determine the optimum pathway… • Identify the most significant… • Analyse the graph and determine… • Reflect on your thinking and identify… • Explain why the graph is non-linear…	While questions are useful in many ways, they can also be ambiguous in terms of cognitive demands.	• Apply your understanding of… • Demonstrate the process of… • Derive the equation for… • Discuss the options for… • Predict the outcome of… • Synthesis the following information and explain how…	• Deduce from the data… • Evaluate the recommendations and decide… • Explain why this approach is the best considering… • Infer from the information provided… • Justify your approach or recommendation…

The range of questions above can collectively relate to a single stimulus, such as a diagram, case study, scenario, problem or piece of text, ensuring that a range of cognitive processes are targeted in the assessment design.



Designing assessment with a focus on cognitive verbs provides

- Clarity of cognitive demands the task is making on students
- Alignment with learning objects and critical thinking outcomes
- A means of determining the cognitive variety within the task

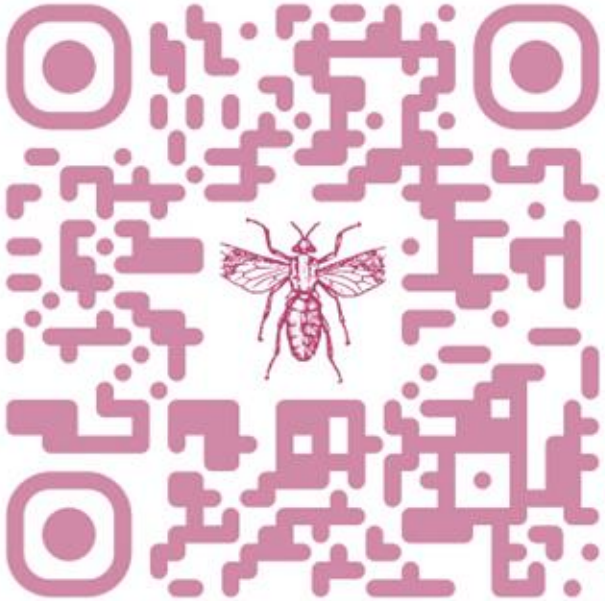
E: peter.ellerton@uq.edu.au

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Other resources

The Education Contrarian



Kialo.com
Reasons.io