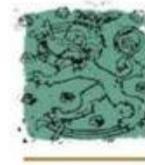




# Critical Thinking Skills Program Efficacy

20 – 21 October 2025



Ministry of  
Education  
and Culture



# Acknowledgments

- **Ministry of Education and Culture**
- **KAPPAS2 Team**
- **CAE Team**

## **Participating Institutions**

- Arcada University of Applied Sciences
- Haaga-Helia University of Applied Sciences
- Häme University of Applied Sciences
- Jamk University of Applied Sciences
- Kajaani University of Applied Sciences
- Lapland University of Applied Sciences
- Lappeenranta-Lahti University of Technology
- Metropolia University of Applied Sciences
- Novia University of Applied Sciences
- Police University College
- Savonia University of Applied Sciences
- Tampere University of Applied Sciences
- Turku University of Applied Sciences
- University of Eastern Finland
- University of Helsinki
- University of Lapland
- University of Vaasa
- Vaasa University of Applied Sciences

# About CAE

Formerly part of the RAND Corporation, CAE is a research-driven nonprofit with 20+ years of experience evaluating and improving higher order skills internationally.

CAE leverages innovative assessment and instructional models and best practices for the development of assessment and instructional materials, insights, and psychometrics.



ITESO, Universidad Jesuita de Guadalajara



# | Theory of Action

CAE believes, based on over 20 years of measuring and evaluating critical-thinking, problem-solving, and written-communication skills, that an opportunity exists to **intentionally address** students' insufficient proficiency in these skills.

By improving their skills, students will be **better equipped** to navigate complex challenges, make informed decisions, and contribute meaningfully to their fields.

They will have the **opportunity to participate** in the high-wage, high-growth careers requiring these skills while also ensuring they are **future-ready** for the dynamic environment they will live in.

These skills must be intentionally taught, deliberately practiced, and directly measured for students to **reap the benefits** of these skills.



# The Importance of Critical Thinking Skills

# Critical Thinking Skills Are Essential

## In everyday life:

- Buying a product - compare features, prices, and brands before making a purchase
- Planning a trip - research destinations, transportation, accommodations, and activities
- Resolving a conflict - consider different perspectives, identify the root cause, and find a compromise

## At school or work:

- Choosing your major - weigh your interests and strengths, research potential career paths, and consider the long-term implications of your choices
- Investing in a new technology - assess the costs and benefits of the technology, compare it to other options, and make a decision that aligns with your company's goals



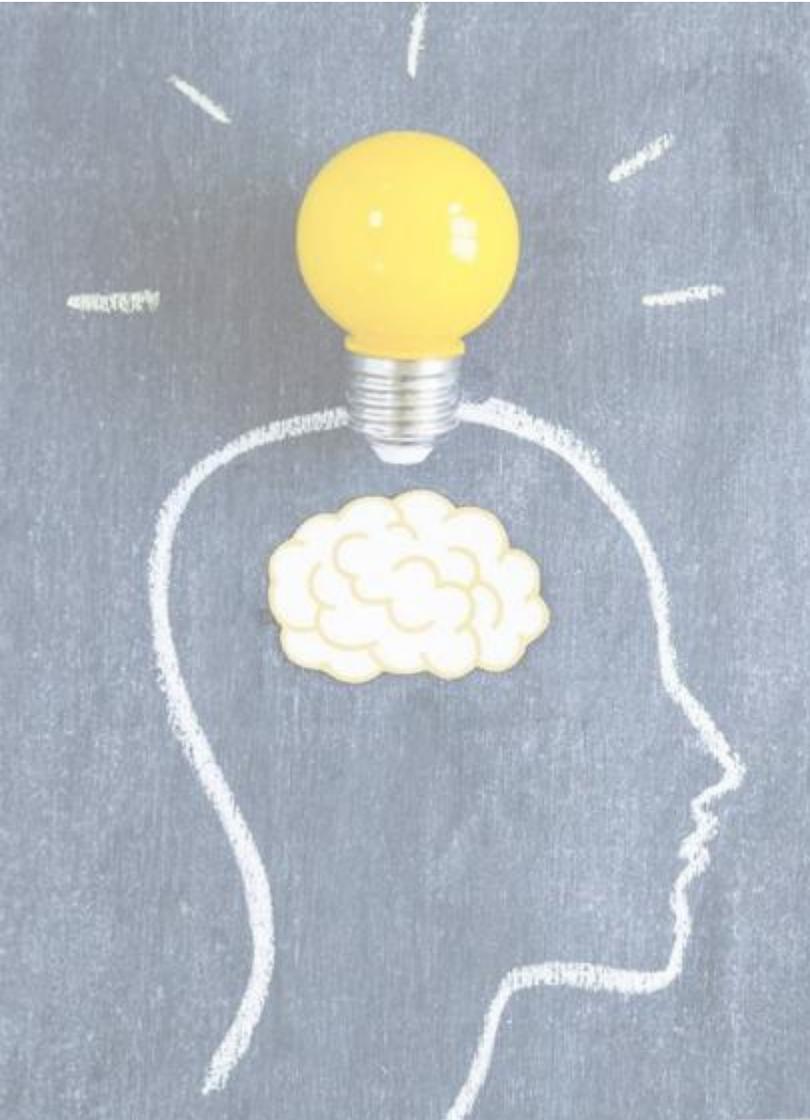
# Critical Thinking Skills Are Essential

## Dealing with novel situations:

- A doctor encounters a patient with a set of symptoms they've never seen before.
- A project manager's carefully laid plan is disrupted by a sudden change in client requirements.
- A technician is troubleshooting a complex system that's suddenly malfunctioning.
- A researcher uncovers data that contradicts their initial hypothesis and could have negative implications.



# Critical Thinking Skills for Future Success



- **Making Informed Decisions:** analyze complex data, weigh various options, assess potential risks and benefits, and make decisions based on objective evidence rather than personal biases, emotions, or political expediency
- **Identifying the Root Causes:** look beyond superficial symptoms, ask probing "why" questions, and employ systematic approaches like root cause analysis to uncover the fundamental issues contributing to a problem
- **Evaluating Evidence and Information:** scrutinize sources, identify biases, evaluate the credibility of information, and distinguish between solid evidence and "noise"
- **Avoiding Logical Fallacies and Biases:** fosters self-awareness of these tendencies and provides tools to recognize and avoid them, leading to more rational and objective policy formulations.
- **Innovate and Adapt:** promotes a mindset of inquiry and reflection, anticipate changes, generate innovative solutions, and adapt existing policies to new realities
- **Promote Accountability and Transparency:** better explain reasoning and justify actions and decision

# Employers Want These Skills

**Critical thinking** (79% of employers), **problem solving** (74%), and **written communication** (77%) have consistently been ranked by employers as the **most important skills** over time.

Yet employers find that most students are **not prepared** in critical thinking (only 49% prepared), problem solving (50%), and written communication (54%).

Finley, A. P. (2023). *The career-ready graduate: What employers say about the difference college makes*. American Association of Colleges and Universities.



# Students Value These Skills

**Q2: How valuable do you think critical thinking and problem-solving skills are for a business career?**



**Q5: How much do you think employers value critical thinking and problem-solving skills?**



% Valuable and Highly Valuable



Zahner, D., Dawber, T., & Cortellini, O. (2023, April). *Measuring and improving higher education students' critical-thinking and written-communication skills* [Paper presentation]. 2023 American Educational Research Association Annual Meeting, Chicago, IL, United States.

# These Skills Lead to Positive Future Outcomes

Higher education students who have **higher proficiency** in critical thinking, problem solving, and written communication skills are more likely to have positive future outcomes:

- **Higher cumulative GPAs** at the end of their senior year (Zahner et al., 2012)
- **Positive post-university outcomes** as measured by employment, salary, and graduate school enrollment as well as employer ratings (Zahner et al., 2022)

Zahner, D., Ramsaran, L. M., & Steedle, J. T. (2012). *Comparing alternatives in the prediction of college success* [Paper presentation]. 2012 American Educational Research Association Annual Meeting, Vancouver, Canada.

Zahner, D., James, J., & Lehrfeld, J. (2022). Predictive validity of CLA+. In D. Van Damme & D. Zahner (Eds.), *Can higher education students think critically?* (Chapter 7). OECD Publishing.



# These Skills Lead to Positive Future Outcomes



Controlling for both education and major occupational group, in-demand competencies like **communication** (+20%) and **problem solving and complex thinking** (+19%) are associated **with higher earnings** in jobs where they are used most intensively.

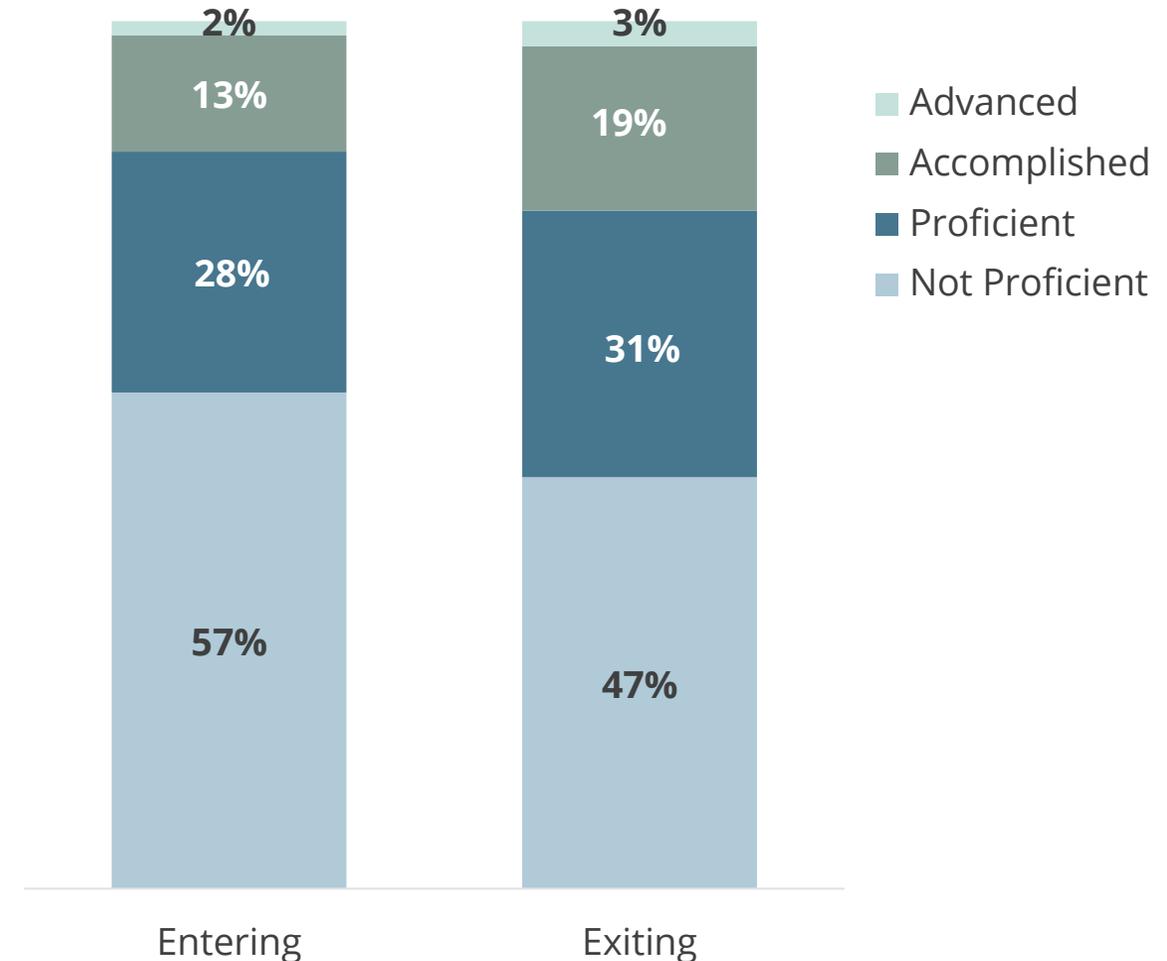
Carnevale, A. P., Fasules, M. L., & Peltier Campbell, K. (2020). *Workplace basic: The competencies employers want*. Georgetown University Center on Education and the Workforce Report.

Carnevale, A. P., & Smith, N. (2013). Workplace basics: The skills employees need and employers want. *Human Resource Development International*, 16(5), 491-501.

# Most Students Do Not Have Proficiency in Critical Thinking Skills

**57%** of students **entering** higher education internationally are **not proficient** in critical thinking, problem solving, and written communication.

**47%** of **exiting** students are **STILL below proficiency** in these skills.



# International Comparative Study

## Research Questions:

- In what way are the overall gains in generic skills between the entering and exiting students different between Finland and the United States?
- Are there background variables that can explain the possible difference in gain between the two countries?

## Results:

- Exiting students significantly outperformed entering students
- Learning gains were greater for the American students, despite entering Finnish students having a higher average score
- Controlling for effort/engagement and demographic variables (gender, primary home language, parental level of education) did not explain the observed differences in learning gains.

## Comments:

- American students have four years of higher education
- Finnish primary and secondary schools may better prepare students for higher education, so the opportunity for growth is larger for American students.
- Higher education institutions can do more to improve these skills.



Average CLA+ scores

$n_{FIN\_ENT} = 1467$ ;  $n_{FIN\_EXT} = 829$ ;

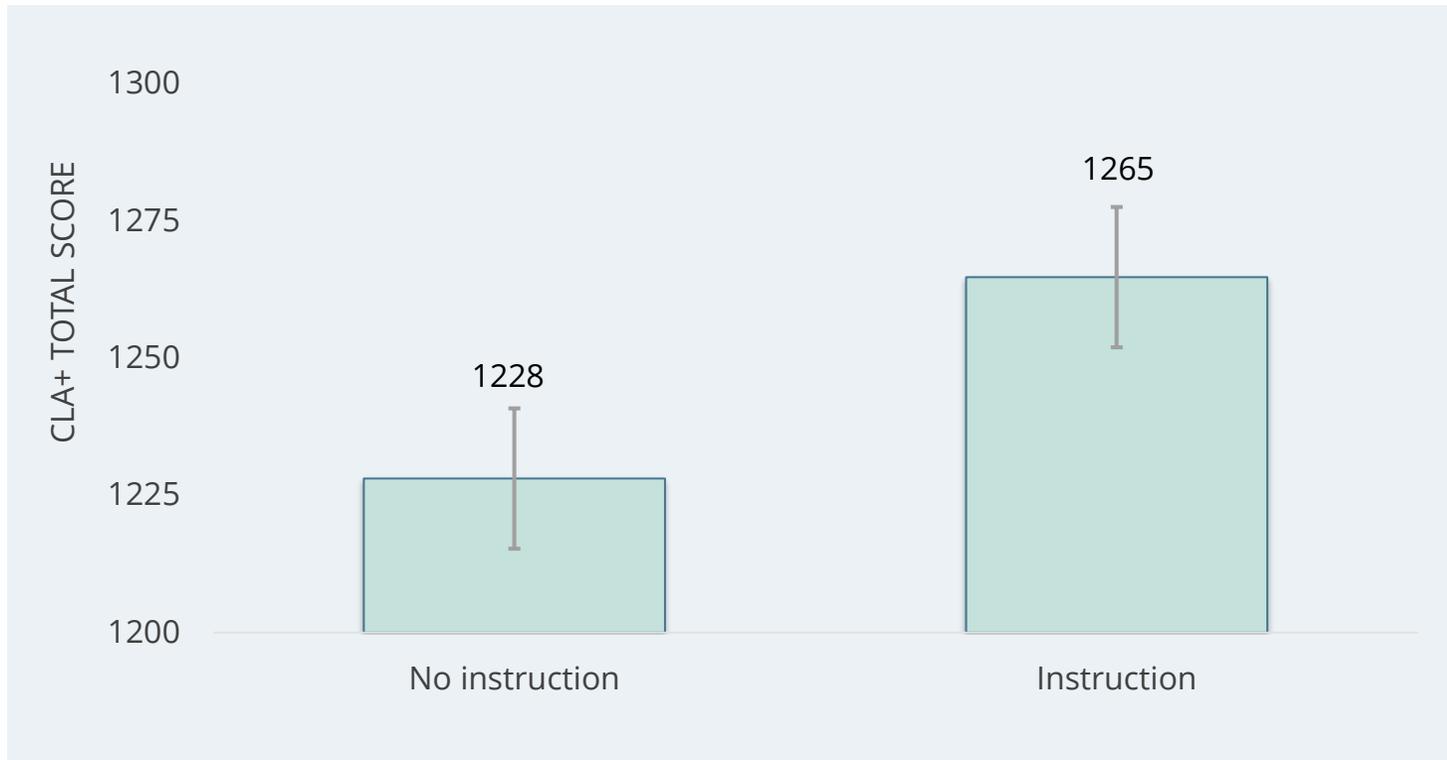
$n_{USA\_ENT} = 28,428$ ;  $n_{USA\_EXT} = 21,550$

Zahner, D., Hyytinen, H., Nissinen, K., Silvennoinen, K., & Ursin, J. (2025). Investigating Learning Gains of Generic Skills among Finnish and American Higher Education Students. *Journal of Applied Research in Higher Education*. <https://doi.org/10.1108/JARHE-05-2025-0420>.



# Critical Thinking Skills Program Efficacy

# Intentional Instruction and Deliberate Practice is Effective



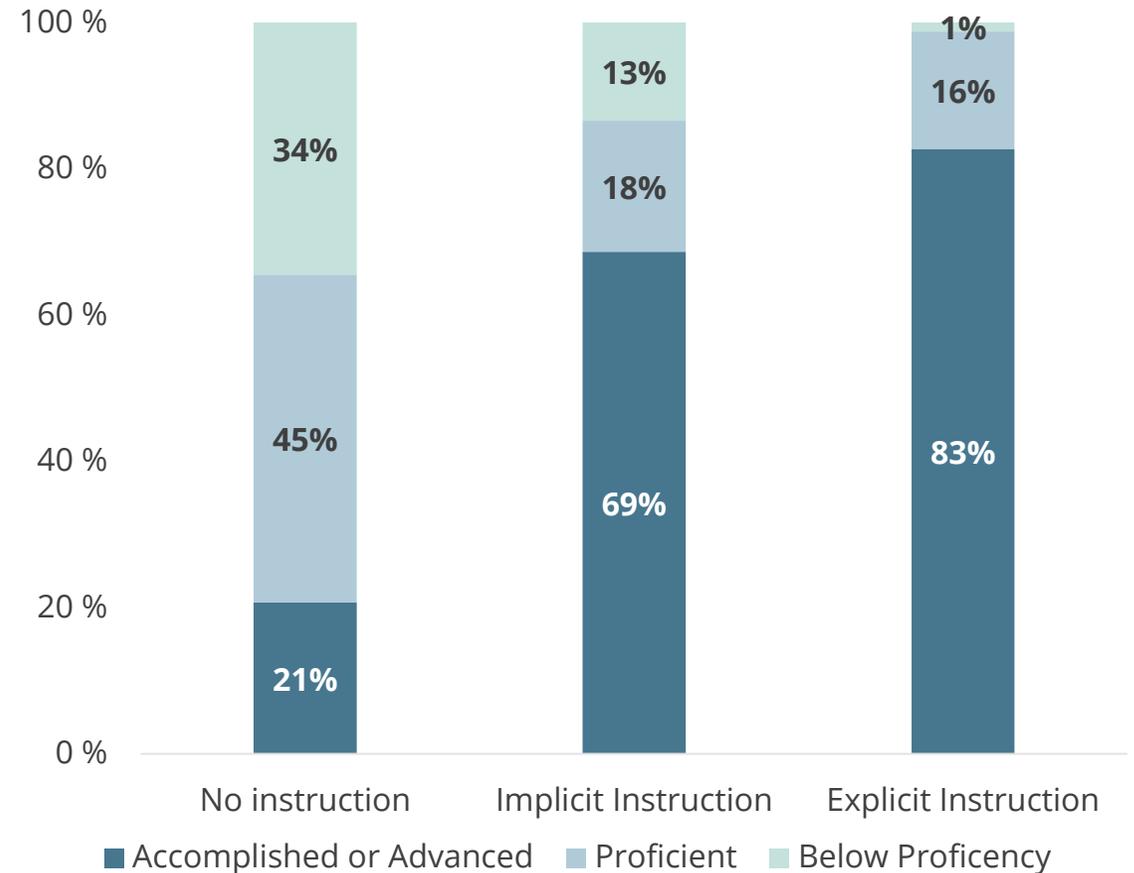
4th-year students who had classroom instruction on critical thinking **performed statistically significantly higher** on the CLA+ total score ( $t(df = 87) = 1.74; p = .042, d = .37$ ).

Students' self-reported effort and engagement did not differ significantly by instruction group, indicating that motivation can potentially be removed as a factor in the observed group differences.

Zahner, D., Dawber, T., & Cortellini, O. (2023, April). *Measuring and improving higher education students' critical-thinking and written-communication skills* [Paper presentation]. 2023 American Educational Research Association Annual Meeting, Chicago, IL, United States.

# Intentional Instruction and Deliberate Practice is Effective

- Analyses of CLA+ scores for a cohort of higher education students<sup>1</sup>, showed that by **increasing the level of curricular instruction, students statistically significantly increase in their CLA+ Total Score.**
- Proportionally more students** were in **the top two Mastery levels** as their curricular instruction increased with **fewer Below Proficiency.**



<sup>1</sup> Efficacy study of CAE's Seven Steps for Effective Critical Thinking of 179 students in a one-year Masters program.

**No instruction:** Students received **neither implicit nor explicit instruction** on Critical Thinking.

**Implicit Instruction:** Faculty were trained on CAE's Seven Steps for Effective Critical Thinking and incorporated the concepts into their teaching **but did not explicitly teach** the Seven Steps.

**Explicit Instruction:** Faculty were trained on CAE's Seven Steps for Effective Critical Thinking and **explicitly taught the steps** using CAE provided student and instructor materials.

# Instruction and Practice Changes Students' Views

- A **higher percentage of students** in the Year 2 cohort reported **greater value from the expanded program** and a **higher ranking of their critical thinking skills** when compared to peers.\*
- They placed a higher value on their **instructor** and the **university** for helping to develop these skills.

Question	Year 2 Cohort vs. Year 1 Cohort**
How valuable did you find the <b>instruction</b> you received?	+21%
How valuable did you find your <b>report</b> ?	+21%
How valuable did you find the <b>assessment</b> ?	+24%
How much do you think <b>your professor values</b> developing your critical thinking and problem-solving skills?	+10%
How much do you think the <b>university values</b> developing your critical thinking and problem-solving skills?	+10%

\*CAE Critical Thinking Skills Program for entering undergraduate students at a leading business school, survey results

\*\*Change in percentage of students who answered a 4 (very) or 5 (extremely) to the survey question.

# | Faculty Feedback



**Business**

"I gained valuable insights into the strengths and challenges of integrating critical-thinking instruction into my course. Critical thinking has relevance far beyond classroom activities."



**Polytechnic**

"I taught the first lesson in the module this morning and I'm not sure it could have gone better. The kinds of discussions I was hearing in class had me grinning from ear to ear. These are the best problem statements I've seen at the start of the semester ever."

# | Faculty Feedback



**Biology**

"I have introduced the students to the steps of critical thinking. I mentioned how important it was to practice these steps. I was pleased to hear students that same class clearly using the steps when they described their discussion around a complex topic."



**Public  
Policy**

"The experience was very positive and engaging for both students and myself. It was really rewarding to see the students start to actively incorporate the notion of critical thinking and its characteristics."



# “Colleges must intentionally teach critical-thinking skills.”

Shannon Deer, Associate Dean for Undergraduate Programs & Kyle Gammenthaler, Lecturer  
Texas A&M’s Mays Business School | November 16, 2023



“As the workplace becomes increasingly automated, our leadership team at Texas A&M University Mays Business School has come to understand that Mays students had better be imbued with more than rote knowledge and technical business skills. They must become good thinkers. More to the point, they **must become critical thinkers.**”

“As higher education leaders, it’s incumbent on all of us to make today’s college students much more than ordinary. **If we teach them to think critically, they’ll have a better chance to be extraordinary.**”

“Reacting to what employers increasingly say they are seeking in new hires, and with the understanding that we previously **hadn’t been intentional enough about teaching and measuring critical thinking.**”

“This framework is now so **ingrained in our thinking**, it impacts every major decision we make as a college.”

“To prepare students for post-graduate success, **critical thinking skills must be woven into all aspects of instruction.**”

“A student’s first semester is a great time to begin ingraining critical thinking as a daily habit. Giving them tools to think more deeply about their choices—from the appropriateness of their major to where they want to eat dinner on any given night—**will help them for the rest of their lives.**”

“More and more companies are moving away from testing technical skills, the business fundamentals,” said Mihir Cherukumilli, a Mays peer leader and teaching assistant who has interviewed at several companies. “No one’s going to put a balance sheet in front of you anymore, but a case interview that requires you to **demonstrate critical thinking** is becoming very common.”





# Critical Thinking in the AI Age

# Critical Thinking in the AI Age

Artificial Intelligence (AI) has profoundly transformed industries and everyday life, highlighting the importance of critical thinking skills.

While AI can process vast amounts of data and perform complex calculations, it **fundamentally lacks human judgment, nuanced understanding, and the ability to question its own assumptions or detect biases.**



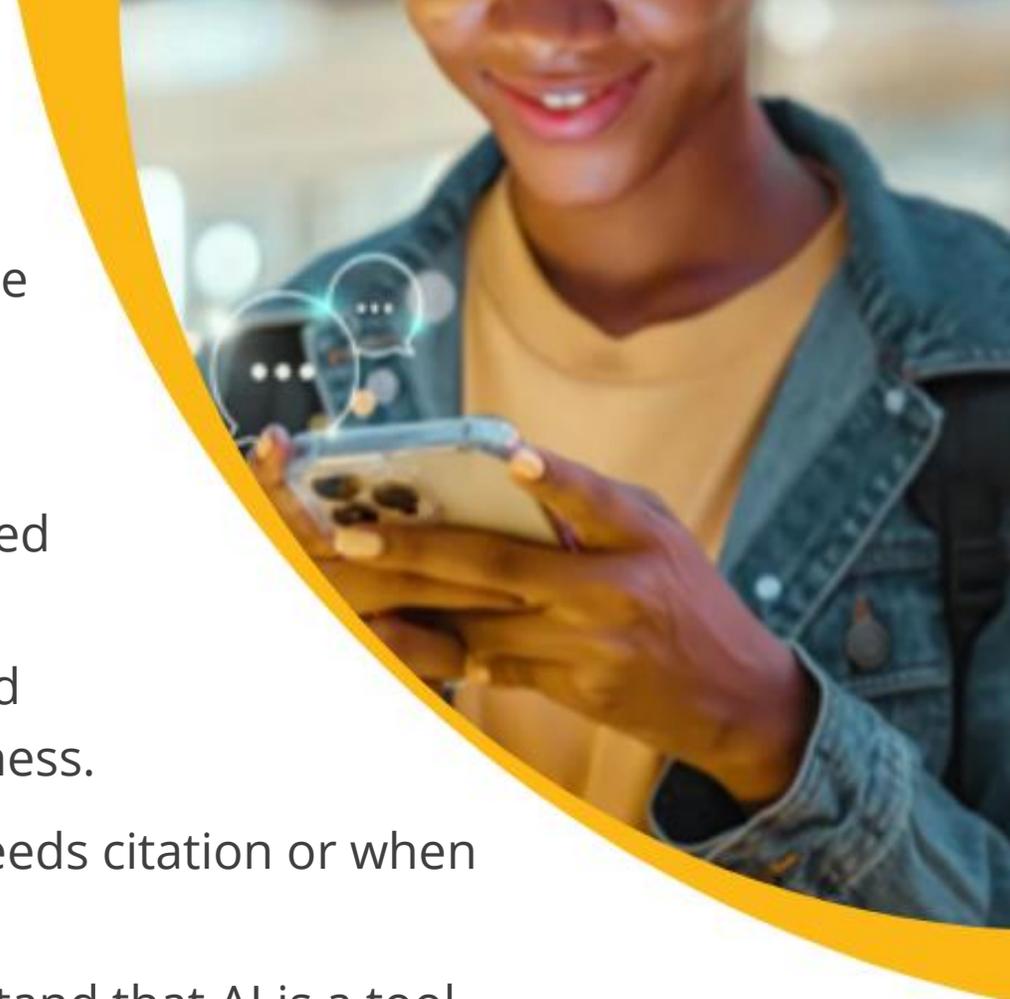
## **Critical thinking is indispensable for:**

- Evaluating AI Output
- Effective AI Interaction (Prompt Engineering)
- Problem-Solving Beyond Automation
- Avoiding Cognitive Offloading and "Digital Amnesia"
- Persuasive Writing
- Ethical Considerations and Responsible AI Development

# Evaluating AI Output

Generative AI can produce convincing but inaccurate or biased information ("hallucinations"). Critical thinking allows users to:

- **Fact-check and verify:** Cross-check against trusted sources; avoid assuming AI is authoritative.
- **Assess logical coherence:** Scrutinize AI-generated output for logical consistency and factual correctness.
- **Validate attribution:** Recognize when content needs citation or when training data may include copyrighted work.
- **Understand limitations:** Critical thinkers understand that AI is a tool with specific capabilities and limitations.



# Effective AI Interaction (Prompt Engineering)

To get the most out of AI, users need to formulate clear, precise, and well-thought-out prompts. This requires critical thinking to:

- **Define the problem:** Clearly articulate the question or task for the AI.
- **Chain-of-thought prompting:** Divide large tasks into smaller, manageable parts for AI.
- **Iterate and refine:** Refine prompts iteratively to guide tone, complexity, or focus.



# Problem-Solving Beyond Automation



While AI can automate routine tasks, ultimately, decision-making, ethical considerations, and strategic planning fall to humans who can:

- **Synthesize information:** Integrate AI-generated data with other knowledge and context.
- **Navigate ambiguity and uncertainty:** Make decisions in situations where there isn't a clear-cut answer.
- **Avoid replacement:** Recognize when decisions should not be fully delegated to AI—particularly in high-stakes, ethical, or ambiguous contexts.
- **Apply systematic thinking:** Understanding how AI tools integrate into broader workflows or organizational systems and connect to institutional goals and frameworks.

# Avoiding Cognitive Offloading and "Digital Amnesia"

Studies have shown a negative correlation between frequent AI tool usage and critical thinking abilities due to "cognitive offloading" – essentially, transferring mental effort to external aids.



# Impact on Persuasive Writing

In a world saturated with AI-generated text, only content that carries authentic human insight, emotion, and creativity will truly resonate and hold greater value. This will increasingly lie in the author's ability to:

- **Craft compelling narratives:** Stories and emotional appeals are powerful, persuasive tools that AI struggles to create with genuine impact..
- **Understand and connect with the audience on a deeper level:** AI can analyze demographics, but true empathy and understanding of human psychology for persuasion remain human strengths.
- **Inject unique insights and original thought:** Persuasion often relies on novel arguments or perspectives that only a human can conceive.



# Ethical Considerations & Responsible AI Development

Critical thinking is essential for addressing the ethical implications of AI. Professionals in various fields need to think critically about:

- **Accountability:** Who is responsible when an AI makes a mistake or causes harm?
- **Human oversight:** How can human judgment and intervention be maintained in AI-driven processes?
- **Representation:** Who and what is being included — *or excluded* — in AI outputs?
- **Misleading Elements:** Is there emotional manipulation through tone, style, or selective framing?
- **Manipulation:** Are there visual, auditory, or textual elements that may distort reality (e.g., deepfakes, exaggerated claims, or synthetic voices)?



# Critical Thinking in the AI Age

The importance of critical thinking is growing!

- **Historical Continuity:** Every major technological leap — calculators, networks — reshaped work, yet humans remained essential as **critical thinkers, problem solvers, and ethical decision-makers**.
- **Skill Demand Shift:** McKinsey finds AI is reducing demand for routine cognitive work while driving a **19% increase** in roles requiring advanced critical thinking, creativity, and complex decision-making by 2030.
- **Human-AI Collaboration:** Deloitte urges organizations to “invest in cultivating uniquely human skills — judgment, creativity, ethical reasoning” — as apprenticeships in these skills diminish.
- **Forward-Looking Mindset:** AI is best deployed in “**collaborative intelligence**” frameworks — augmenting, not replacing, human insight.



CAE



# A Solution

# Professional Development, Instruction, Performance Task, Instructional Materials, Performance-Based Skills Assessment, Reports and Insights

## Professional Development

## Performance Task Instructional Materials

## Performance-Based Skills Assessment

## Reports and Insights

**Day 1 Agenda**

Time	Topic
8:00 – 8:30	Welcome and Introductions
8:30 – 10:30	Importance of Critical Thinking Skills
10:30 – 11:00	Crucial Thinking in the AI Age
11:00 – 11:45	Break
11:45 – 12:30	Measuring Critical Thinking Skills: CLA+ Online Thinking Skills Program
12:45 – 1:30	Wrap-up Day 1



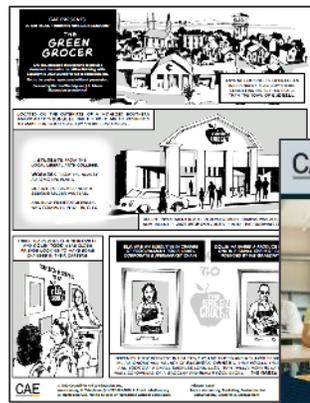
**Day 2 Agenda**

Time	Topic
9:00 – 9:15	Recap from Day 1
9:15 – 11:00	The 7-Step for Effective Critical Thinking
11:00 – 11:15	Break
11:15 – 12:00	Introduction to Module Framework
12:00 – 12:45	Classroom Module Uses
12:45 – 1:00	Wrap-up Day 2



**Day 3 Agenda**

Time	Topic
9:00 – 9:15	Recap of Day 2
9:15 – 10:00	Share Module Framework (small group)
10:00 – 1:00	Share Module Framework (15-min work group)
1:30 – 1:45	Break
1:45 – 2:15	Program implementation
2:15 – 2:45	Reflections and Feedback
2:45 – 2:50	Wrap-up Day 3

**CAE**

Instructor Guide  
CRITICAL THINKING SKILLS



**CAE**

Critical Thinking Skills  
Resources Overview



**Critical Thinking Skills Framework**



**CAE**

**CLA+**  
Sample Assessment  
HIGHER EDUCATION



	1	2	3	4	5	6
<b>Analysis and Problem Solving</b>	Identify the main purpose of the text and the author's point of view.	Identify the main purpose of the text and the author's point of view.	Identify the main purpose of the text and the author's point of view.	Identify the main purpose of the text and the author's point of view.	Identify the main purpose of the text and the author's point of view.	Identify the main purpose of the text and the author's point of view.
<b>Writing</b>	Write a clear and concise response to the prompt.	Write a clear and concise response to the prompt.	Write a clear and concise response to the prompt.	Write a clear and concise response to the prompt.	Write a clear and concise response to the prompt.	Write a clear and concise response to the prompt.
<b>Writing Process</b>	Plan, write, and revise a response to the prompt.	Plan, write, and revise a response to the prompt.	Plan, write, and revise a response to the prompt.	Plan, write, and revise a response to the prompt.	Plan, write, and revise a response to the prompt.	Plan, write, and revise a response to the prompt.
<b>Writing Style</b>	Use appropriate language and tone for the audience and purpose.	Use appropriate language and tone for the audience and purpose.	Use appropriate language and tone for the audience and purpose.	Use appropriate language and tone for the audience and purpose.	Use appropriate language and tone for the audience and purpose.	Use appropriate language and tone for the audience and purpose.

**CAE Assessment Results STUDENT REPORT**

**OVERVIEW**

This report provides an analysis of your performance on the Performance-Based Skills Assessment (PBSA) and the CLA+ Higher Education Sample Assessment. These are among the key skills and competencies that are essential for success in higher education and the workforce.

The assessment will help you understand your current level of skills and areas in which you can improve — increasing your academic and career success.

**Total Score: 1,221**  
This is the sum of your scores on the CLA+ Higher Education Sample Assessment and the PBSA. Your score is 1,221 out of a possible 1,500.

**Mastery Level: Accomplished**  
This indicates you have demonstrated a high level of proficiency in the skills and competencies assessed.

**U.S. Percentile Ranking: 78**  
This is the percentage of students who scored below your score. Your score is in the 78th percentile, which is above the national average.

**Institution Percentile Ranking: 85**  
This is the percentage of students who scored below your score at your institution. Your score is in the 85th percentile, which is above the institutional average.



# Higher Education Case Study

## Background:

- Employers shared that recent graduates had great technical skills but were **not sufficiently proficient** in higher-order skills.

## Goal:

- Increase students' academic success and workforce readiness** by improving their ability to think critically, problem solve and effectively communicate.

## Results:

- Positive feedback** from students, faculty, and employers
- Elite employers** recruiting on campus
- Fully integrated** into all core courses as part of a curriculum redesign

1. Provide **Professional Development** to help faculty incorporate instructional materials into their courses and utilize the assessment results.

2. **Measure** students through an authentic performance-based assessment to create a baseline and identify areas of strengths and opportunities for improvement through individual student reports.

6. **Re-assess** students at the end of the semester to measure individual learning gains and program efficacy.



5. Create opportunities for deliberate practice through **Critical Thinking Performance Tasks**, aligned with the curriculum and provided throughout the student's academic journey.

3. **Review** results to determine specific areas for class-wide improvement and to identify individual students who may need additional support.

4. Deliver the **Seven Steps for Effective Critical Thinking instruction**, providing a framework to help students develop and apply these skills, integrated into the curriculum.

# Seven Steps for Effective Critical Thinking

1. Organize the information.
2. Define the key issue.
3. Analyze the information.
4. Construct your argument.
5. Critique your argument.
6. Communicate your conclusions.
7. Engage in self-reflection.

## The Social War

(91 – 88 B.C.)

Asculum, Central Italy. Autumn 91 B.C.: The death of the Tribune Marcus Livius Drusus has caused long-simmering tensions between Romans and Italians to reach a boiling point. Worried that the Italians are preparing a widespread revolt, the Senate sends the praetorian proconsul Q. Servilius and his legate Fonteius to assess the situation and reassert Roman authority.

A crowd has gathered as Servilius prepares to address the townspeople.

Drusus was a friend of the Italians! They murdered him!

Land and citizenship for the Italians!

Listen to the words of the **Praetor!**

People of Asculum- Allies of the Roman people! Recall the fate of your ancestors, who faced the full might of the Romans! I urge you **NOT** to follow their example!

Then pass the reforms of **Drusus!**

We'll send you back to **Rome** in pieces!

Disrespectful Italians! Crucify them and line the **Via Salaria** with their crosses!

# Sample Performance Task Introduction

Thank you!

**For more information:  
Council for Aid to Education (CAE)  
[www.cae.org](http://www.cae.org)**