

What's Thinking Got To Do With It? The Challenge of Evaluating and Testing Critical Thinking in Potential Intelligence Analysts

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ABSTRACT

This paper examines the need for critical thinking skills in intelligence analysts (IA) in the twenty-first century, with the proliferation of false and misleading information, including the weaponization of information and Big Data. Additionally, it reviews concerns about the critical thinking capabilities of millennial and Gen Z IAs against the performance standards of IC Directives (ICDs) 203 and 610. The debate of how to teach and assess critical thinking skills is also considered. The methodology of evaluating critical thinking tests and the results of a critical thinking test administered to IAs is explored against the backdrop of whether testing is valid when hiring analysts.

Keywords: critical thinking, intelligence analysis, analyst, information operations

¿Qué tiene que ver el pensamiento con eso? El desafío de evaluar y probar el pensamiento crítico en analistas de inteligencia potencial

RESUMEN

Este documento examina la necesidad de habilidades de pensamiento crítico para los analistas de inteligencia en el siglo XXI con la proliferación de información falsa y engañosa para incluir el armamento de la información y Big Data. Además, revisa la preocupación sobre las capacidades de pensamiento crítico del Analista de Inteligencia Millennial y Gen Z contra los estándares de rendimiento de ICD 203 y 610. También se considera el debate sobre cómo enseñar y evaluar las habilidades de pensamiento crítico. La metodología de evaluación de las pruebas de pensamiento crítico y los resultados de una prueba de pensamiento crítico administrada a los analistas de inteligencia se explora en el contexto de si las pruebas son válidas para la contratación de analistas.

Palabras clave: pensamiento crítico, análisis de inteligencia, analista, operaciones de información

思维有什么关系？评价和测试潜在情报分析师的批判性思维一事遭遇的挑战

摘要

鉴于错误信息和误导性信息的扩散，进而对信息和大数据进行武器化，本文检验了21世纪情报分析师所需的批判性思维技能。此外，本文审视了有关千禧一代和Z世代情报分析师在情报界指令203和指令610标准方面的批判性思维能力的关切。还考量了有关如何教授和评价批判性思维技能的辩论。在（批判性思维能力）测试是否适用于分析师招聘这一背景下，探究了有关评价该测试和一项由情报分析师完成的测试结果的方法论。

关键词：批判性思维，情报分析，分析师，信息操作

Introduction

Many people would rather die than think—in fact, they do.

—Bertrand Russell, Nobel Laureate

90 percent of analysts don't know the difference between what they know and what they believe.

—Professor Jan Goldman, Intelligence and Security Studies,
The Citadel

Critical thinking is a paramount skill for humans overall, and essential for intelligence analysts (IA) in the twenty-first century, with the proliferation of false, misleading, and ambiguous information. The current information arena is also rife with malicious content spread by news sources, state and non-state actors, and trolls. What is very concerning is state actors,

like Russia, who leverage information as a form of psychological warfare. One of the few resources against weaponized information is critical thinking. Critical thinking forces us outside of our own psychology to confront biases, dissonance, and logical fallacies.

Additionally, the twenty-first century global information age is ex-

posing us to more people and ideas and to colossal amounts of open-source resources with more data to sift through, synthesize, and evaluate. While technological advances are being made to data-mine these large datasets, data analytics is reliant on the human capability to decode, evaluate, and make inferences so that priorities can be set and decisions and recommendations can be made. Humans think critically; machines process and sift.

Yet, employers in the intelligence community (IC) have been concerned about the critical thinking capabilities of millennial and Gen Z IAs, which have been compounded by intelligence challenges. The IC has had many issues with both training and framework that began to be voiced in the 1990s by intelligence experts and were followed by a series of intelligence reforms after 9/11. The initial solution was the Intelligence Reform and Terrorism Prevention Act of 2004, which created the Director of National Intelligence (DNI). This act also had the goals of information sharing and created analytic standards, including the IC directives (ICDs) 203 and 610, which forced a critical evaluation of the foundational skills needed for IAs and set a benchmark for performance standards in the IC.

Both directives spell out the hard and soft skills needed for twenty-first century IAs. ICD 203 outlines the core principles, assessment criteria, and deliverables for providing analytic rigor and personal integrity to analytic practice. ICD 610 captures the core competencies needed for GS-15 civil-

ian employees. These groundbreaking directives come at a time when experts and agencies have stated that post-9/11 US analytical capabilities and human and technical procedures need to be repaired and replaced to respond to twenty-first-century threats, including the weaponization of information. Meanwhile, the IC and the education community have been debating how critical thinking and the foundation of social science methodology should be taught in bridging the gap from student or active duty military to government analyst.

While ICDs 610 and 203 provide benchmarks, this leaves employers in the IC struggling to find ways to hire IAs with core competencies that meet these standards and to train their current workforce. Employers have to fill in the gaps in the educational experience that many of their employees received in secondary and academic environments. Additionally, the generalist vs. the specialist debate of how critical thinking skills are learned further dilute a clear and pragmatic approach to addressing the challenge of fostering critical thinking.

One approach for employers is testing a potential employee's critical thinking skill base as part of the hiring process; however, identifying appropriate critical thinking measurements can be daunting and expensive. Also, one option is to address the current employees' lack of skillset with tutorials, but before tutorials can be designed, current employees must be tested for their skill levels.

The methodology of evaluating tests and the administration of a critical thinking test will be examined in this article; one of the striking results found in a critical thinking test administered by this author illustrates the IC's concerns. A critical thinking test professionally designed for defense and military employees was given to a random sampling of twenty junior and senior IAs with disparate levels of experience and education, from high school to Master's degrees, and varying levels of military experience. In the domain of precise knowledge, 56 percent of IAs could not anticipate outcomes or see logical consequences (Marangione 2019). Due to the cost of the test, it was administered to a small sample of IAs, but it may explain why the IC is concerned. While addressing this skill gap is doable, it requires an understanding of twenty-first-century challenges, why this critical thinking skillset is perceived as lacking, what constitutes the critical thinking skillset, and the benefits and drawbacks of critical thinking tests as evaluators of employees.

The Weaponization of Information and Intellectual Awareness

Perhaps now, more than ever, it is imperative to address and foster critical thinking because we are living in a world that challenges the truth on many levels. There has never been such a precedent for the ongoing, systematic efforts to deny the truth and sow seeds of suspicion through the purposeful spreading of disinformation.

Additionally, with everyone able to author and publish their truth, conspiracy theories, fake science, and hate have found a market. Manipulative actors use new digital tools to take advantage of humans' inbred preference and craving for answers that reinforce their echo chambers. Alarmingly, a Pew Research Study predicted a future information landscape in which fake information would crowd out reliable information. Some respondents in the Pew study even foresaw a world in which widespread information scams and mass manipulation would cause broad swathes of the public to simply give up on being informed participants in civic life (Anderson 2017). This is especially important when it is well known that deliberate misinformation is being spread by Russia and is powerful enough to begin to weaken the foundations of democracy. As detailed in press accounts and the US Department of Justice's February 2018 indictment of sixteen Russian organizations and persons, scores of full-time employees faked news articles, social media posts, and comments on mainstream websites with the intention of influencing US public opinion. During the run-up to the 2016 US election, Russian social media bots reportedly helped drive mainstream media coverage of false stories and even influenced American stock prices (Golson 2018).

The IC's Perspective

The IC is vested in its IAs' critical thinking skills, even though this skill base has been questioned

and challenged with greater frequency internally in the IC and externally by the President, federal agencies, and academics over the last twenty years, especially as national academic scores have declined. To combat this, on June 21, 2007, the DNI signed and implemented ICD 203, Analytic Standards, regulating and providing baseline competencies for the production and evaluation of intelligence analysis and analytical products, mandating critical thinking standards in the IC. This occurred after the IC was called to task in the *Weapons of Mass Destruction (WMD) Commission Report*. The report stated, “Perhaps most troubling, we found an Intelligence Community in which analysts had a difficult time stating their assumptions upfront, explicitly explaining their logic, and, in the end, identifying unambiguously for policymakers what they do not know. In sum, we found that many of the most basic processes and functions for producing accurate and reliable intelligence are broken and underutilized” (Pigg 2009).

These accusations have continued to haunt the IC. Since his election, President Trump has also questioned their reliability and aptitude, tweeting in April 2019, “They are wrong! Perhaps intelligence should go back to school!” (Trump 2019). This was in response to DNI Dan Coats and other senior intelligence leaders contradicting President Trump’s assertions on Iran, North Korea, and ISIS. At a news conference on Abu Bakr al Baghdadi’s death in October 2019, President Trump commented, “I’ve dealt with some people that aren’t very intelligent having to do with in-

tel” (Baker 2019). While the President’s apprehensions are part of his straightforward style, the IC has reasons to be concerned.

In a study by the National Defense Intelligence College on critical thinking and IAs, David Moore examined repeated intelligence failures, including Pearl Harbor, the Cuban Missile Crises, the invasion of Kuwait, and WMD. He states, “While hindsight is an imperfect mirror for reviewing the past, one conclusion to be drawn from a review of the evidence is that critical thinking could have minimized many of the ensuing crises” (Moore 2007). “For example, the Senate noted in its review of the failure [of WMD] that [rather] than thinking imaginatively and considering seemingly unlikely and unpopular possibilities, the IC, instead found itself wedded to a set of assumptions about Iraq, focusing on intelligence reporting that appeared to confirm those assumptions” (Moore 2007). In his article, Moore also mentions a graduate of the National Security Administration’s critical thinking and structured analysis class, who attended an IC seminar on counterintelligence that included representatives from all branches of the IC, including Central Intelligence Agency (CIA) and Federal Bureau of Investigation case officers. During the class, the instructor used a case study for students to use to decide how best to analyze and investigate data to find a mole. Differing opinions surfaced, but a common thread appeared among the case officers: follow your *gut* feeling and collect evidence to support that assumption (Moore 2007). From a critical

thinking perspective, this is alarming; critical thinking is not just about putting information together, finding a pattern, then choosing an answer, it is about reducing bias, considering all options available, and presenting options to a decision-maker. Additionally, critical thinking is about paying attention to what and how conclusions are derived and being able to replicate those conclusions through sound methodologies.

Besides the IC, employers and academia are also concerned about the critical thinking skill level that they see in potential hires, employees, and students. Although critical thinking skills are what employers desire and find most essential, the average employer thinks recent graduates are only “somewhat proficient” in critical thinking skills. This means that, while employers think critical thinking skills are 99.2 percent essential, only 55.8 percent of graduates are proficient (Campbell 2019). Critical thinking specialist Randy Kasten believes that critical thinking “is one skill separating innovators from followers” (Crockett 2012). This is supported by other studies that have found critical thinking is not just about thinking clearly or rationally, but also about thinking independently. According to Lee Crockett, author of *Literacy is Not Enough*, “Critical thinking about something means formulating your own opinions and drawing conclusions. This happens regardless of outside influence. It’s about the discipline of analysis and seeing connections between ideas” (Crockett 2012). Student and IAs are both under a steady barrage of in-

formation and it important they learn how to evaluate what they see and hear every day. They must be able to identify false ideas and look beyond superficial appearances. These skills are paramount in the age of Big Data and fake news. Yet, this skillset, identified as critical and lacking with employees, can be a challenge to foster in millennials and Gen Zs and may not be developed in secondary and college-level education.

The Generation Gap

There is growing evidence that millennials and Gen Zs may have a gap in critical thinking skills; some researchers see one of the causes of this gap as the information age. The reality for most of these workers has been digital media, online transparency, and the internet (the iPhone was launched in 2007 and Facebook was founded in 2004), which encourage the skimming and scanning of info bites. Along with the proliferation of data, how and what is taught has influenced this skill gap. According to Jan Goldman, Professor of Intelligence Studies at The Citadel, who also has over thirty years working in the IC as an advisor, writer, editor, and IA, “We [educational institutions] are no longer teaching critical thinking. It has gone out the window!” (Goldman 2019). Additionally, the habits that differentiate millennials’ and Gen Z’s working style are inextricably tied to a desire for quick, accessible answers, rather than a drive to think through problems, which is paramount for critical thinking (Botnick 2017). The choice or inability to evaluate and synthesize

information may put millennials and Gen Zs at the lower end of Bloom's taxonomy. Simply defined, critical or analytic thinking means being able to use the higher end of Bloom's Digital Taxonomy or higher-order thinking skills (HOTS), as illustrated in Figure 1. For readers interested in more research

about millennials' and Gen Z's critical thinking skills, I refer them to my articles, *Teaching the Millennial Intelligence Analyst*, published in the Global Security and Intelligence Studies Journal in January 2017, and the December 2016 SIGNAL magazine article *Mind the Millennial Training Gap*.

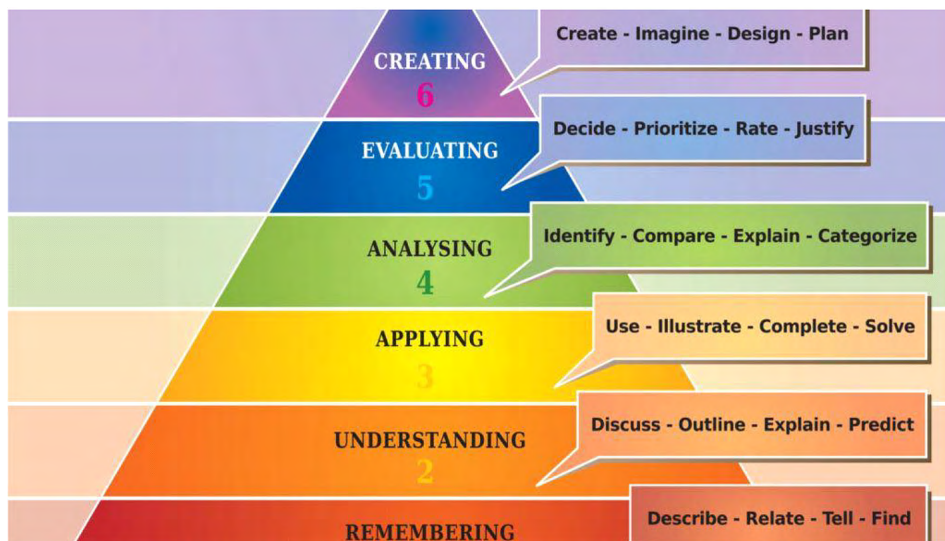


Figure 1: The scaffolding and development of cognition (thinkingmaps.com).

What Is Critical Thinking and Can It Be Taught?

According to Professor William Growley of Georgetown University, critical thinking is “An open-minded but focused inquiry that seeks out relevant evidence to help analyze a question or hypothesis” (Manville 2017). IAs, in particular, have to be able to ask tough questions based on evidence and analysis, to consider and reconsider their cognitive assumptions and biases, and to scaffold what they know from a historic backdrop for fore-

casting. Additionally, critical thinking goes hand-in-hand with creative thinking and both need to be leveraged for problem solving. For example, one IA explains, “An IA must possess an inquisitive nature. Puzzle solving is another excellent quality found in IAs. Whether you choose crosswords, sudoku, pattern analysis, word search, jigsaw or any type of other puzzles, an IA must grow their mind in order to understand the problem sets that they will work” (Doe 2019.) Professor Jan Goldman concurs. “The best analysts read science fiction” (Goldman 2019).

Cognition can also be developed and enhanced with the structured problem-solving model like solution frequency, which proposes to foster a

scaffolded platform for teaching the fundamentals of problem-solving, as shown in Figure 2.

SOLUTION FLUENCY
Define the problem, because you need to know exactly what you're doing before you start.
Discover a solution, because planning prevents wasted effort.
Dream up a process, one that is suitable and efficient.
Design the process in an accurate and detailed action plan.
Deliver by putting the plan into action by both producing and publishing the solution.
Debrief and foster ownership by evaluating the problem solving process.

Figure 2: Steps of solution frequency (Marangione 2019).

Along with solution fluency, many propose that there are additional analytical fluencies that students most possess and master. Educating students using traditional literacy standards is no longer enough. If students are to thrive in their academic and twenty-first-century careers, then independent and creative thinking holds the highest currency. This includes solution fluency, information fluency, creativity fluency, collaboration fluency, and analytic fluency. Students must master these fluencies to succeed in a culture of technology-driven automation and abundance and with access to global labor markets. Figure 3 presents an additional production framework of solution fluency for the needs of the twenty-first century.

The Academic Challenge

Ideally, before students become employees, their education should have prepared them to be inquirers,

knowledgeable thinkers, and communicators, and to be balanced and reflective—all qualities that encompass critical or analytical thinking. This baseline is often reflected in a college or college department's mission statement and values, which by their very nature, can be a bit vague and obtuse. For example, the James Madison University (JMU) Intelligence Analysis program states, "Students learn innovative ways to structure their thinking to solve complex real-world problems when there is both time pressure and a lack of reliable information. The program highlights the continually evolving nature of intelligence analysis, with an emphasis on employing new academic research into analytic methods" (Intelligence 2019). How students will develop and be assessed in the areas of problem-solving, creative and analytic thinking, collaboration and communication, ethics, action, and accountability are determined



	Scientific Method	Writing Process	Media Production	Design Thinking
define	Aim	Prewriting	Preproduction	Define
discover	Background / Introduction	Prewriting	Preproduction	Research
dream	Hypothesis	Prewriting	Preproduction	Ideation
design	Equipment / Method	Draft	Preproduction	Prototype / Choose
deliver (produce)	Experiment	Revision / Editing	Production	Implement
deliver (publish)	Results	Publish	Post Production	Implement
debrief	Conclusion	Review	Review	Learn

Figure 3: Production framework of solution fluency (Crockett 2012).

by each individual professor. Yet, critical thinking is not entirely dependent on the skill base developed in college, but ideally should be developed throughout secondary education. Interestingly, the College Board revamped the SATs, which are taken when students are between sixteen and seventeen years of age, to better assess a high school student's critical thinking (Willingham 2008). In secondary education, due to the reliance on standardized testing (e.g., SATs and the required Standards of Learning (SOL) tests), which hinges on multiple-choice questions, schools do not develop lesson plans around building critical thinking skillsets, but on being able to recall facts, which is a low-level process.

Additionally, it has been proposed that the process of thinking is intertwined with domain knowledge. Anything experienced is automatically interpreted from what a student (or employee) already knows about similar subjects. Familiarity with a problem's

deep structure and the knowledge that one should look for a deep structure is inherent in critical thinkers. When a student or employee is very familiar with a problem's deep structure, knowledge about how to solve it transfers well. That familiarity can come from long-term, repeated experience with one problem, or from various manifestations of one type of problem (i.e., many problems that have different surface structures, but the same deep structure). After repeated exposure to either or both, the student or analyst simply perceives the deep structure as part of the problem description. However, it takes a good deal of practice with a problem type before a person knows it well enough to immediately recognize its deep structure (Willingham 2007).

Many classes at the university level adopt meta-cognitive critical thinking paradigms to coursework where a problem's deeper structure is explored. For example, critical thinking can be embedded into scaffolded as-

signments that build on students' skills, knowledge acquisition, and synthesis of information, usually assessed through written research papers, lab reports, and mathematical problem sets. Inherent within writing a research paper are various levels of reasoning that, according to Bloom's taxonomy, promotes higher-order thinking skills and more critical thought in the form of synthesis-level thinking and builds on the prior skill levels in a hierarchical fashion (Wallmann and Hoover 2012). Professor Wallman of Western Kentucky University states, "Arguably, an important component of critical thinking skills is the ability to critically examine and understand published research ... requiring students to critique published research is one way of addressing the goal of teaching students to critically evaluate ..." (Wallmann and Hoover 2012). Research papers inherently require students to evaluate, process, sift, and synthesize information into a conclusion. At their very essence, research papers are problem-based learning activities that sharpen critical thinking skills. However, some college classes utilize multiple-choice tests. It should be noted that multiple choice tests do have their place in assessment as they can be graded objectively without bias and allow for inclusion of a broad range of topics on a single exam, thereby testing the breadth of a student's knowledge. Yet, they should be used with other measurements, and questions have to be developed that allow students to think rather than simply recall facts.

Strides have been made by the American Association of Colleges and

Universities (ACCU) to develop guidelines and rubrics for college-level assignments to measure areas in critical thinking, but these guidelines and rubrics are not required mandates for college professors. For example, in the paper *California Teacher Preparation for Instruction In Critical Thinking Instruction*, the authors found 89 percent of college faculty claimed critical thinking as a primary objective of instruction, yet only 19 percent could define the term and only 9 percent were using it in teaching methods on a daily basis (Paul 2007). Interestingly, in *Critical Thinking and Intelligence Analysis*, David Moore (2007) states, "In informal conversations with recent hires at NSA ... fewer than half of these individuals have been exposed to critical thinking skills in college."

The study that has become most emblematic of higher education's failure to teach critical-thinking skills to college students is Richard Arum and Josipa Roksa's *Academically Adrift*. The researchers found that college students make little gain in critical-thinking skills, as measured by students' scores on the Collegiate Learning Assessment (Arum and Roksa 2011). Therefore, it is not surprising that the math skills of college-bound graduates in the United States have slid to their lowest point in fourteen years. For example, an indicator that students were ready to succeed in first-year college algebra fell to its lowest level since 2004, a decline of 46 percent. English proficiency or readiness also dropped to 60 percent for test-takers, from 64 percent in 2015—the lowest level since testing began. In

reading, 46 percent of students were ready to move to the next level of learning, while in science, the metric stood at 36 percent (Crises at the Core 2005).

These scores are supported by many in the teaching field and by literacy experts. Professor Goldman (2019) states, “We don’t teach students how to think. The average student has not improved their reading skills since the fifth grade and that is the skill set they come to college with.” This is echoed in the seminal book, *How To Read a Book*, by Mortimer Adler, who defines elementary, inspectional, analytical, and synoptical levels of reading. Many argue students’ post-high school reading is at the elementary and inspectional level of reading, when at the college level, synoptical reading is expected and assumed to be mastered by college-level students. Synoptical reading requires an individual to perform deep structure analysis by reading and/or analyzing numerous sources, analyzing those sources in relation to one another and to a subject around which they all revolve. Then the individual draws conclusions from the evaluation and analysis—the baseline job description for any IA (Adler, 1972)

In addition to synoptical reading levels, many in the intelligence field feel that being able to communicate orally and in writing goes hand-in-hand with critical thinking and is of equal importance. Defense Contractor and IA Mark Sanders (2019) states,

The ability to speak and present information well goes beyond writing. An IA must be

able to distill huge amounts of data coherently and be able to discern what is critical. For example, I have briefed Chairman JCS [Joint Chief Secretary], Deputy Secretary of Defense, the National Security Council, Under Secretaries, and Ambassadors and every time I had much less time than originally scheduled. In addition to briefing people quickly, I have had to craft one-page decision papers [from larger papers] distilling very detailed technical information to senior leaders – this is an art. The analyst needs to not only impart the knowledge but if interacting with a senior, needs to ensure that what is required, a decision, a policy, an action, is apparent to that individual. I’ve seen lengthy briefings end badly when I had to ask, “So what do you want me to do?”

The analyst needs to be able to cope with stressful situations, large data sets, conflicting information and maintain focus.

Complementing Mark Sanders is IA and Technical Reports Editor Mark Ashley (2019), who states, “While critical thinking is of utmost importance, it is right next to writing and production. The IC suffers greatly from a *drastic* shortage of strong writers. It is an epidemic. I have seen firsthand how careless articulation and misplaced punctuation can disrupt an entire intelligence message.”

The Generalist and Specifists Debate

Further complicating critical thinking is how to develop this skill base; contemporary arguments in critical thinking swing between two camps: generalists and specifists. A key question in the debate is whether thinking skills can exist independently from discipline-specific content in a meaningful way so that the transfer of critical thinking skills is possible. On one side are the generalists who believe “critical thinking can be distilled down to a finite set of constitutive skills, ones that can be learned in a systematic way and have applicability across all academic disciplines” (Willingham 2007).

On the opposing side are specifists who argue that “critical thinking ... is always contextual and intimately tied to the particular subject matter with which one is concerned” (Willingham 2007). The generalist position is the philosophical basis for the stand-

alone, generic thinking skills course, in which students supposedly learn skills that transfer across subjects and domains. But Daniel Willingham (2007) points out that such courses “primarily improve students” thinking with the sort of problems they practiced in the program, “not with other types of problems.” This suggests that it is extremely difficult, if not impossible, to separate thinking skills from the content. In other words, critical thinking is only possible after one acquires a significant amount of domain-specific knowledge, and even then, it is no guarantee.

Instead of a debate between these two camps, what might be seen as the best of both worlds is the infusion approach, which suggests that the generalist and specifist approaches can be married, as seen in Figure 4. The generalist perspective provides for a foundation in reasoning and the specifist perspective applies this sound reasoning to specific content.

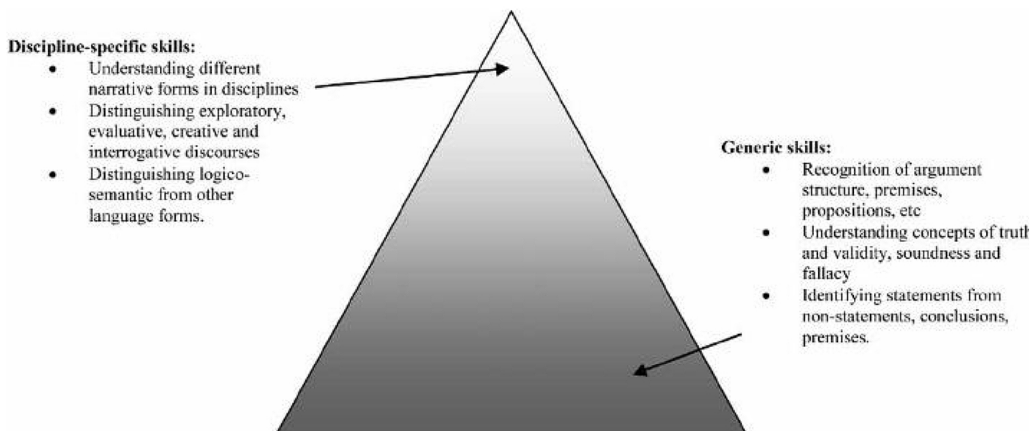


Figure 4. Combining generalist and specifist perspectives (Davis 2013).

Teaching Critical Thinking and the Skill Gap

The challenge then becomes how can critical thinking be taught effectively? In the article, *Critical Thinking: Why is it So Hard To Teach?*, the author points out that critical thinking is not even a skill. Willingham (2007) states, "... teaching [people] to think critically probably lies in a small part in showing them new ways of thinking and enabling them to deploy the right type of thinking at the right time." The author also states that there are metacognitive strategies that once learned can make critical thinking more likely and that domain knowledge and practice are paramount to aptitude, which is supported by the infusion approach of the generalist and specifist perspectives.

Students who take classes in intelligence analysis or complete programs of study, degrees, or certificates in this area are exposed to analytical methodologies and generalist frameworks for structured problem solving and improving critical thinking skillsets. These metacognition strategies, or thinking about thinking, assist students in developing a critical thinking skillset that enables understanding and control of the cognitive processes like not settling on the first conclusion, avoiding biases, ignoring countervailing evidence, overconfidence, etc. Additionally, most intelligence analysis classes teach and stress methodologies, but there are strengths and weaknesses to utilizing methodologies.

Methodology has an advantage because it can be replicated; this is important especially in viewing the IC as a profession that relies on a scientific model. Historically, in the IC, e.g., the Office of Strategic Service (OAS) in 1947, academics performing intelligence analysis were trained in and familiar with rigorous critical thinking. In the 1960s, the employment pool opened up in the IC and with this change, there had to be a codification of thinking. According to Jan Goldman, methodology did not get introduced until Sherman Kent, commonly known as the father of intelligence analysis, along with Richard Heur's analysis of competing hypotheses for observed data. "He [Kent] codified analytic methodologies because IAs' thinking had to be replicated and professional" (Goldman 2019).

In addition to replication, ap-
positive to utilizing methodologies, an analyst has to be able to differentiate and sometimes utilize numerous methodologies. One analyst stated, "I do not limit myself to one methodology but use: competing hypothesis, qualitative, quantitative, mixed-method, what-if scenarios, scenario trees, weighted ranking, probability trees, pros cons and fixes, casual flow and diagraming. Different problem sets require different analytics or a mix of methodologies" (Doe 2019). Mark Sanders (2019) states, "I really like red team approaches where an analyst can think contrarian views. What I look for in an analyst is someone who does not mirror image a viewpoint." On the other hand, some feel that methodologies are dangerous if that is all that is relied upon. Using

methodologies might not correlate to critical thinking because theory has to relate to practice and different methodologies might provide divergent answers to the same problem set.

Complicating the issue is that many new hires in intelligence analysis do not come into the community with a four-year university intelligence degree or exposure to metacognition strategies or analytical methodologies. In a survey of thirty-two new hires for IA positions at a defense contractor, undergraduate degree programs were predominantly in criminal justice, cybersecurity, history, and homeland security. Other degrees included international relations, political science, government, and politics (Wynn 2019). Additionally, many of the IA positions do not require a Bachelor's degree, though it can count towards experience in qualifying for a position level (junior, mid-level, or senior). For a senior position, most positions require specialized training like intelligence courses and ten-plus years' experience. An undergraduate degree could count for up to four years of required experience. Most defense contractors will substitute two years' experience for a Bachelor's degree, and another two years for a Master's degree (Wynn 2019).

Many intelligence positions are staffed by former military analysts who may have a variety of military experience. They may not have taken the Department of Defense military intelligence training classes, and many of those classes might not include analytic methodologies. While the Defense Intelligence Agency (DIA) offers a variety

of training venues and training partnerships with other government agencies like the Joint Military Attaché School, Joint Military Intelligence Training Center programs and the National Intelligence University, there might be a variance in how critical thinking is defined, measured, or assessed from instructor to instructor.

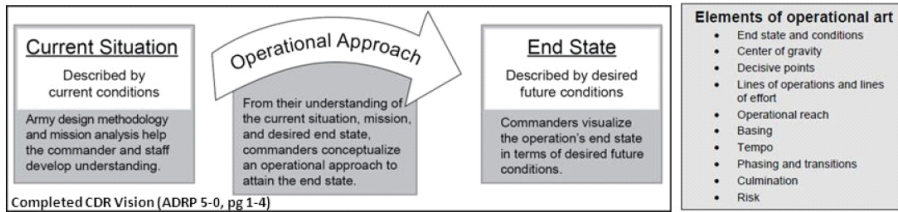
Furthermore, military operational and strategic methodologies, which are dependent on branch and job position, have different targeted outcomes and may require different tools and critical thinking skillsets, as shown in Figures 5 and 6. This disparate approach to how critical thinking is taught, assimilated, and applied does not entail that students in military analysis or employees possess a variety of degrees or education levels lacking in critical thinking skills, but it does point to the challenge for employers to determine the level of critical thinking a new employee from any academic background brings to the job.

Testing IAs for Critical Thinking: A Silver Bullet?

How can employers specifically evaluate the critical thinking skills of potential IAs with such far-ranging backgrounds? One tool in the hiring toolbox may be testing for it. According to the *Harvard Business Review*, there is already a precedent in the industry. "Recent research shows that about 76% of organizations with more than 100 employees rely on assessment tools such as aptitude and personality tests for external hiring. That figure is

Operational Approach

- **Current Definition:** Operational Approach – (DOD) A description of broad actions that the force must take to transform current conditions into those desired at end state. See ADRP 3-0 and ADRP 5-0. (ADRP 1-02, pg 1-27)



- Through operational art, commanders translate their operational approach into a concept of operations and ultimately into tactical tasks. (ADRP 3-0, pg 4-1)
- In applying operational art, commanders and their staffs use a set of intellectual tools to help them communicate a common vision of the operational environment as well as visualizing and describing the operational approach. Collectively, this set of tools is known as the elements of operational art. These tools help commanders understand, visualize, and describe combinations of combat power and help them formulate their intent and guidance. (ADRP 5-0, pg 2-4)

Figure 5: Operational Approach

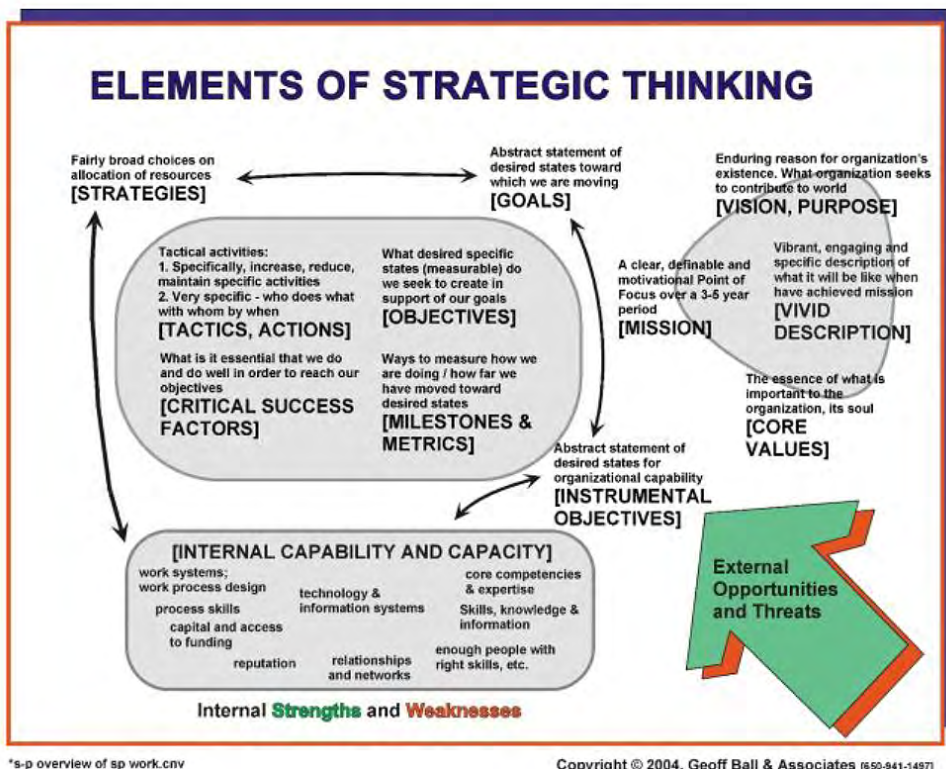


Figure 6: Strategic approach (Geoff Ball and Associates 2004).

expected to climb to 88% over the next few years” (Chamorro-Premuzic 2015). There are numerous online critical thinking tests available from no cost to over \$75.00 per test that claim to provide critical thinking assessment. Additionally, some companies provide profile reports that compile the results into specific categories of recognizing assumptions, evaluating arguments, and drawing conclusions. Most tests purport to determine a person’s ability to reason through an argument logically and make an objective decision. Some tests claim to measure a person’s ability to assess a situation, recognize assumptions, create a hypothesis, and evaluate arguments. Additionally, some tests assert to be able to test a person’s ability to distinguish between strong and weak arguments. For example, if an argument is strong it must be directly related to the question and if it is weak it confuses correlation with causation. Deduction questions have test-takers draw conclusions based on the information given in a case study. Interpretive questions ask test-takers to regard the information presented and determine if a conclusion is true and logically follows the information presented. Inferences can also be measured to determine how well a test-taker can draw conclusions from the observed facts.

Evaluating available critical thinking tests, determining if the tests actually measure critical thinking and then deciding if the tests encapsulate the IA skillset is a formative task. Three reviewers, which included this author, an educator, and a college Coordinator of Assessment and Transfer Degrees,

reviewed ICDs 610 and 210, studied critical thinking definitions, investigated academic assessments of how critical thinking is taught at the secondary and college level, and finalized a spreadsheet with a list of eleven possible tests out of twenty tests reviewed that seemed to best measure critical thinking skills in concordance with IDCs 610 and 203. Reviewers then evaluated those tests based on cost and content. Using these criteria, reviewers determined that three tests were the best options for final evaluation.

From mid-February through mid-March 2019, three critical thinking tests were taken by the author, the educator, and the coordinator of assessment; each reviewer evaluated the strengths and weaknesses of the test based on the goals of ICDs 610 and 203 for IA competencies. See Appendix A for a detailed review of these three tests’ strengths and weaknesses (Marangione and Long 2019).

All evaluators agreed that the tests provide a measurement of competency on a basic level. They measure if a person is low, moderate, or high in applying critical thinking for analysis and decision-making. Subscale interpretations test whether a person can read between the lines, and explore and measure the awareness of some cognitive biases. Additionally, test results provided whether a person can assimilate and evaluate information into conclusions, take into account alternate points of view, and evaluate arguments based on the strength of evidence. Figure 7 provides an illustration of the reviewer’s final assessment.

CRITICAL THINKING TEST ASSESSMENTS

TEST A Time Frame: 30-60 minutes. Cost: \$28.00 per person & \$37 per profile development (20 tests = \$1,300).	TEST B Cost: E-testing System Orientation - \$190.00; 20 Defense Skills at \$75.00 each = \$1,690.00	TEST C Time Frame: 20-45 minutes. Test System Hardware: \$116.88, Test System Software: \$532.91, Postage/Packing: \$146.10 = \$795.89
Measures ability to draw conclusions. Reflective component allows participants to provide assessment and feedback.	Two-part test measures critical thinking and personality traits corresponding to participants' critical thinking ability.	Tests critical thinking in an easy to understand way. Judgments applied to everyday scenarios.
Purports to measure confirmation biases and emotional thinking.	The two tests give a solid overview of skills and ability.	Purports to measure critical thinking skills involved when confronted with a general scenario.
Test questions generic to critical thinking; no defense scenarios.	Test questions are specific with many defense/military scenarios that use critiquing and justifying decisions in scenarios.	Test questions generic to critical thinking; no scenarios specific to defense.
Provides a general overview of the candidate: moderate, strong, or weak critical thinking skills.	Provides overall numerical score for critical thinking and a descriptive interpretation.	Provides an overall numerical score of critical thinking.
Provides subscale interpretation for recognizing assumptions, evaluation of arguments, and drawing conclusions in a non-numerical, detail-rich report.	Provides subscale interpretation for ambiguous contexts, precise contexts, problem analysis, quantitative contexts, and evaluation of alternatives with a detail-rich report.	Does not provide subscale interpretation of verbal reasoning, argument analysis, skills in thinking as hypothesis testing, using likelihood and uncertainty, decision-making, and problem solving.
Medium length test with non-military scenarios.	Test is longer in duration with in-depth scenarios; second part evaluates how the tester approaches different scenarios.	Short test length with non-military scenarios.

Figure 7: Critical thinking test assessments (Marangione 2019).

The DIA also administered Test A to a sample of its employees. The concerns that the DIA had regarding the test was how effective the test was in measuring metacognition—thinking about thinking—or measuring whether a potential analyst is capable and aware of the processes used to plan, monitor, and assess one’s understanding (Moore 2007). Test A and B, as determined by

the evaluators, did not measure metacognition. Test C had questions that required test-takers to consider their biases, assumptions, and evaluations, but in multiple-choice test format, which was the format for all three tests. The drawback of multiple-choice is that they do not provide qualitative data. Even so, it was determined that Test B was the most effective in measuring critical thinking and included real-world scenarios that applied directly to defense professionals.

Critical Thinking Test B Findings

Test B was administered to a random sampling of twenty junior and senior IAs employed by a defense contractor and working at numerous military locations. Interestingly, in this cohort, individuals who had training in analytic methodologies had low scores on the critical thinking test. In fact, only three IAs out of twenty stated that they used analytical methodologies on the job. Out of those three, one had low scores and two had moderate scores (Marangione and Long 2019). Also concerning is the testing results measuring precise contexts; 53 percent of the cohort of IAs did not manifest this skill, as illustrated in Figure 8.

Because of the cost factor, the test was only administered to a small sample. It is understandable that conclusions cannot be drawn from such small a sample; however, the results appear to support the conclusions drawn by the IC. It should be cautioned that

critical thinking skill tests might not predict job-related performance and this is an area for further study. Critical thinking tests are a tool, but only one tool in the toolbox for measuring an employee's critical thinking aptitude or at least their skill level when hired. Some researchers have also postulated that general intelligence ability, as measured by critical thinking tests, does not predict an individual's critical analytic thinking skills. Instead, it found that "critical thinking predicts task performance above and beyond the ability of general intelligence" (Eslon 2018). Also, according to Statistics and Research Methods Professor Hilary Campbell, assessment tests are inherently and seriously flawed, and their results cannot be evaluated in a silo. For example, she feels that assessment tests may just measure a person's ability to take tests (Campbell 2019). Critical thinking tests suggest the importance of measuring and testing critical thinking skills when making evidence-based decisions while hiring, but they are not the only means and certainly should not be used exclusively. Their results suggest the potential benefits of measuring critical thinking skills in the hiring process and testing before and after analytical training to gauge the effectiveness of training.

The Way Forward

Significant research shows that metacognition can be a skill that is developed over time and must be fostered by employers by encouraging and welcoming strategies to employ critical thinking in the workplace. This

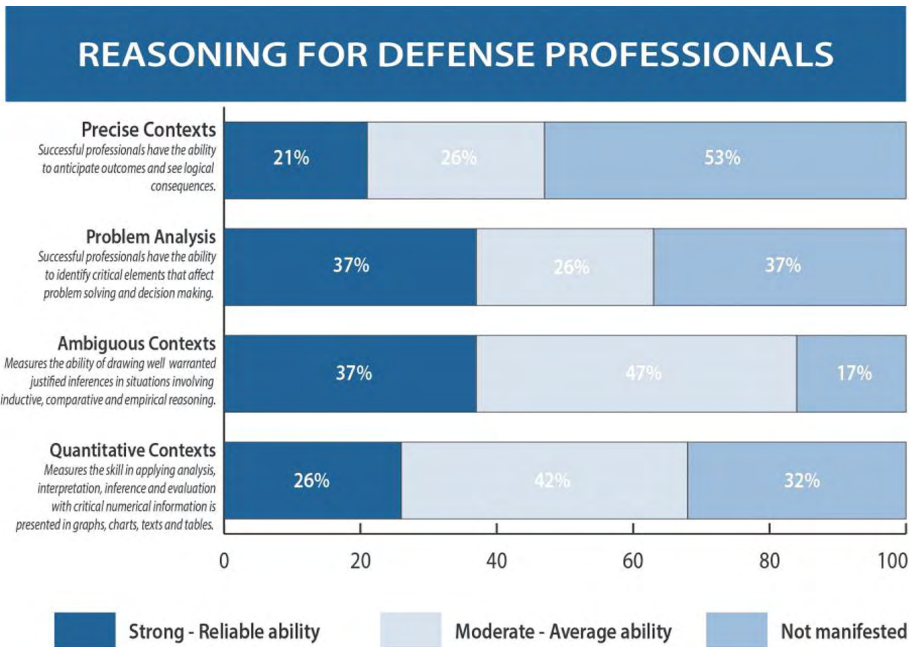


Figure 8: Reasoning for defense professionals (Marangione 2019).

FOSTERING THE METACOGNITION SKILL SET

Provide a workplace environment that supports creative thinking. *Have an environment that encourages and supports out of the box thinking-new ideas and innovations.*

Analysts must challenge and question their assumptions, decisions and evaluations; they also must be pressed to be skeptical and critique a coworker's perspectives. *This fosters self-awareness and metacognition.*

Onboarding process must immediately stress a culture of analysts using creative and critical techniques as a shared problem-solving tool.

Leadership must model these behaviors.

Provide incentives for completing skill-building classes.

Workplace layout that encourages collaboration. *Steve Jobs laid out the bathrooms in Pixar so that engineers and artists would bump into each other (Donfro 2015).*

Build a long-term talent pipeline by partnering with schools through apprenticeships, internships, and continuing education programs.

Figure 9: Fostering the metacognition skill set (Marangione 2019).

SITUATIONAL INTERVIEW QUESTIONS:

Provide a scenario: How would employee break it down or analyze it with evaluation tools? *The focus should be on their thinking process.*

Describe a problem to the candidate with information that is missing. What information should be sought before making a decision? *Ideally, each new question brings a new set of questions and considerations.*

Have the candidate describe a problem they faced in a previous job. *Awareness should be on candidate's rationale and cognitive process.*

Ask candidate to explain if and when they ever questioned the status quo, implemented new policies and procedures, and evaluated their own or a co-workers' cognitive biases.

Figure 10: Situational interview questions (Marangione 2019).

can be fostered through Socratic communication in the workplace and may be best developed in a workplace environment that supports and rewards effective and seasoned analysts, values and encourages continued training, and promotes mentorships and interactions with senior and junior IAs. This is further clarified in Figure 9.

There are numerous steps that an employer can take in assessing new hires; resumes and previous job performance are indicators of skill base and training. Along with critical thinking tests, employers can use situational interview questions to tease out a potential employer's critical thinking skillset, as characterized in Figure 10.

When an employee is on the job, the workplace environment is critical to building the metacognition skillset that many researchers argue is developed through context, mentorship, longevity, and practice. Additional training can be useful for employees; however, as one Chief Executive Officer of a defense company stated, "Buy-in [from employees] can be a challenge. Many

analysts feel it is another thing to do in their already busy days. They resent it and do not value the training" (Anonymous 2019). This can be remedied by an onboarding process that clearly spells out the company's training goals, rewards professional development, and offers incentives for programs of studies, classes, and completing tutorials.

For employers, their worries are not just a modern dilemma. Pre-hire assessments have been around at least since the Han dynasty in the third century. Chinese imperial leaders used them to gauge knowledge, intellect, and moral integrity when selecting civil servants. Modern personality and intelligence tests were introduced in the United States and Europe during World War I to aid in military selection. After World War II, companies started adopting them to screen applicants. Today, employers like assessments because they greatly reduce the time and cost of recruiting and hiring. Tests also aid in preventing interviewers from accepting or rejecting candidates based on conscious or unconscious biases. Because

tests can be given remotely and scored electronically, they can widen the pool of candidates. Most importantly, valid tests can help companies' measure three critical elements of success on the job: competence, work ethic, and emotional intelligence. Although employers still look for evidence of those qualities in résumés, reference checks, and interviews, they need a fuller picture to make smart hires.

Partnering and encouraging academic institutions to trail-blaze new measures for fostering critical thinking in the twenty-first century age of Big Data, fake news, and the weaponization of information is also paramount. The University of Washington is at the forefront of making a systematic and organized effort to strengthen critical thinking skillsets at their university, disseminating lesson plans and educational material for free on their website. Their Office of the Provost states, "... it is crucial that we educate our students on how to think critically, access and analyze data, and, above all, question the answers. If our students are going to become leaders, scientists, public officials, writers, businesspeople, teachers—even informed voters—they need these skills But now, the need is more important than ever as our devices flash yet another outrageous headline every day" (Baldasty 2018).

The CIA concurs and calls for all twenty-first century citizens to be exposed to tradecraft structured analytical techniques, which can help individuals challenge the mental models which humans can use to sift through

abundant information and be aware of the fallacies that humans are prey to. "Schools and academia should consider ways such rigorous [Intelligence] analysis could be brought into curriculums. Ideally, just like every student learns the scientific method in STEM classes, every civics student should learn intelligence analysis techniques" (Golson 2018). The CIA further suggest that there should be an online initiative or a "Master Class taught by former IAs with the goal to encourage Americans to be 'self-conscious about their reasoning process.'" As critical thinking trailblazer, CIA analyst and educator Richards Heuer writes, "[Individuals] should think about how they make judgments and reach conclusions, not just [think] about the judgments and conclusions themselves" (Golson 2018).

Along with the weaponization of information, what has been called the Fourth Industrial Revolution is changing and shaping the students, employees, and the IAs of tomorrow. Many forecasters have predicted that talent and ability will represent a critical factor in the workforce. Talent assessment, recruitment, and employee training and engagement will have to be revisited because an employer will need to find talented IAs whose skills stack up against the high-paced needs of the IC. Complex problem solving, all aspects of critical thinking, creativity judgment, decision-making, and the ability to be cognitively flexible will be paramount. The twenty-first century is taking us to the threshold of a more dynamic and sophisticated digital information age, where technology's impact extends

across domains—cultural, social, business, politics, economics, engineering, medicine, and the IC. It has also taken us to a dangerous threshold, where fake news and the weaponization of information has a growing foothold. Critical thinking will be the foundation of a human's ability to thrive and survive. For employers in the IC, being able to evaluate a potential employee's cognitive ability will be acute, because the IC's most valuable asset is still its analysts, whose skills and values, it can be argued, might be far greater than

any other work of technology and relevant fields combined. The security and defense of the United States, the decisions of policymakers, and our relationship with other countries are all dependent on their assessments and evaluations. An IA's skill base must be excellent, critical thinking must continue to be addressed, and some type of baseline testing of potential IAs may be needed. At the very least, testing opens the door for dialogue of skill base and the ways to improve and address critical thinking.

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APPENDIX: CRITICAL THINKING TEST ASSESSMENTS

Test A: Taken February 2019

This test measures the ability to recognize arguments, including assumptions. It purports to measure confirmation biases and emotional thinking. It also measures the ability to draw conclusions. Time frame: 30 minutes.

Strengths:

- Test questions had simple scenarios
- Cost \$28.00 per person & \$37 per profile development (20 tests = \$1,300)
- Easy to follow instructions
- Detail-rich report that included:
 - o Evaluation based on norm group: candidate is measured against candidates in their level (managers are measured against managers)
 - o Provides a general overview of the candidate: moderate, strong, or weak skill base overall
 - o Provides subscale interpretation for recognizing assumptions, evaluating arguments and drawing conclusions (about 3-4 lines of quantitative results)
 - o Provides a number of answers that the candidate got correct
 - o Gives a percentile for each subscale (skill area) to see where the employee needs further training
- For an additional charge of \$37.00, company provides more qualitative data assessment, an appraisal of where the candidate can develop skills in target areas, and a reflective component that allows the candidate to provide their own assessment and feedback
- Quick score results
- Test time: 30-45 minutes, depending on the test-taker

Weaknesses:

- Test questions were sometimes poorly worded.
- Test scenarios vague and general

- Does not measure cognitive biases
- Took **numerous** phone calls and emails to coordinate with a representative for the company—even for simple questions. I would not categorize them as being proactive at all.
- The DIA feels that this test “confuses measuring skills with abilities.” Skill: the ability to apply knowledge to specific and practical situations and ability, which is inherent. Skills, ability, and knowledge all must be interwoven in a good IA.
- The scenarios seemed to be generic and juvenile
- There are only three subscales: recognize assumptions, evaluate arguments, and draw conclusions.

Test B: Taken February 2019

This is a two-part test that measures critical thinking and personality traits that correspond to critical thinking ability. Time frame: 30 minutes

Strengths:

- The two tests give a solid overview of both skills AND ability
- Test questions were specific, contained many military scenarios, and were well worded
- Variety of testing questions include numerical scenarios and reasoning
- Representative is proactive, eager to help and eager to learn; companies need to better choose appropriate testing cohort
- Specific tests based on company profile; i.e., defense professionals
- One test measures critical thinking in ambiguous contexts, precise contexts, problem analysis, quantitative contexts, and evaluating alternatives
- Attempts to assess both skills and abilities
- Ability to mix and match from two different genres, i.e. defense and science and engineering mindset.
- Offers six skill areas: ambiguous contexts, precise contexts, problem analysis, contexts, evaluation alternative, and overall

- Detailed analysis of strengths and weaknesses in each skill area
- Approximate test time: 1-1/2 hours depending on the test-taker

Weaknesses:

- Cost is higher than other tests: E-testing System Orientation - \$190.00; 20 SE Prof Mindset & Defense Skills at \$75.00 each = \$1,690.00
- Does not provide any suggestions for follow-up to improve skills
- Does not provide any space for candidate
- Self-reflection
- Does not test for cognitive biases

Test C: Taken March 2019

This is a 20-question test that uses scenarios and asks you to pick assumptions, facts, conclusions or validity scale answers.

Strengths:

- Easy to understand scenarios-simple and straightforward
- Quick (20-minute time frame)
- Test System Hardware - \$116.88, Test System Software - \$532.91, - \$146.10 = \$795.89

Weaknesses

- Cost in Euros—price fluctuates
- Scenario questions are repetitive
- Questions do not seem to allow for higher-order thinking
- Too basic to be comprehensive
- Repetitive
- Interview questions to be completed by Syntelligent through an interview with the employee. We must decide what we want to hear; they provide examples of questions.

- Takes up to two days to receive the scores
- Does not provide an actual score for each of the areas: verbal reasoning, analysis, skills in thinking as hypothesis testing, using and uncertainty, and decision-making and problem-solving skills

Recommendations: This is the best market value critical thinking test currently available to test a potential job candidate's critical thinking ability base, but it is flawed and weak in assessment.