# ADVANCED ANALYTIC COGNITION: THINKING DISPOSITIONS

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14. ABSTRACT

The objective of the Advanced Analysis Cognition project is to improve human performance in intelligence analysis by synthesizing the results of research in several aspects of human cognition to understand what contributes to effective cognitive performance. This report on *thinking dispositions* explores the value and feasibility of evaluating a candidate's thinking dispositions as one component of intelligence analyst selection and the feasibility of training individuals in order to strengthen their positive thinking dispositions. I conducted a literature search and found over 300 documents that explored thinking dispositions in many different fields. Based on these findings, I believe it is practical and valuable to assess a potential intelligence analyst's thinking dispositions as one component of analyst selection. In addition, currently employed intelligence analysts can improve their positive thinking dispositions through targeted performance improvement events.

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**Notes for the Reader**

In order to communicate the quality and content of the documents found and to accurately portray the authors' different perspectives, this document contains many passages extracted from their original publications. These passages may contain references, footnotes, table and figure numbering, formatting, and errors that are part of the original document, not this report. I used the passages as they were, with no additional editing. I suggest that you refer to the References section to obtain the source document if you would like to see the extract in its original context.

Since some of the excerpts included in this report are lengthy in order to illustrate the context and the voice of the author, I highlighted the main points of the excerpts in blue.

## 1.0 SUMMARY

Everyone agrees that intelligence analysis is an intensely cognitive process and that the quality of an analyst's cognition determines the quality of his or her analysis. However, less is understood about what elements combine to make productive, effective cognition. The objective of the Advanced Analysis Cognition project is to improve human performance during the analysis/synthesis process by analyzing the results of research in several aspects of human cognition to understand what contributes to effective cognitive performance.

This report on *thinking dispositions* is the second in a series of reports on different aspects of analytic cognition. My primary research questions were:

> What is the value and feasibility of evaluating a candidate's thinking dispositions as one component of intelligence analyst selection? What is the feasibility of training individuals in order to strengthen their positive thinking dispositions?

I found:

- Scholars in multiple disciplines share a common understanding of thinking dispositions. Considerable overlap exists among the specific thinking dispositions identified in the published research.

- Thinking dispositions do have an impact on cognitive performance. Individuals with similar Intelligence Quotients (IQs) perform differently on cognitive tasks depending on the strength of their dispositions toward different aspects of cognitive effort.

- An individual's thinking disposition strength can be measured.

- A strong overlap exists between thinking dispositions found for this report and what scholars in the intelligence community have identified as characteristics of effective intelligence analysts.

- Individuals can strengthen their positive thinking dispositions with focused effort.

Based on these findings, I believe it is practical and valuable to assess a potential intelligence analyst's thinking dispositions as one component of analyst selection. In addition, currently employed intelligence analysts can improve their positive thinking dispositions through targeted performance improvement events.

## 2.0    INTRODUCTION

Everyone agrees that intelligence analysis is an intensely cognitive process and that the quality of an analyst's cognition determines the quality of his or her analysis. However, less is understood about what elements combine to make productive, effective cognition.

Richards Heuer noted this challenge in *Psychology of Intelligence Analysis*:

> Of the diverse problems that impede accurate intelligence analysis, those inherent in human mental processes are surely among the most important and most difficult to deal with. Intelligence analysis is fundamentally a mental process, but understanding this process is hindered by the lack of conscious awareness of the workings of our own minds.[1]

The objective of the Advanced Analysis Cognition project is to improve human performance during the analysis/synthesis process. To accomplish this we have analyzed the results of research in several areas of human cognition in order to understand what contributes to effective cognitive performance. We hope to increase conscious awareness about the workings of our minds. This report on *thinking dispositions* is the second in a series of reports on different aspects of analytic cognition.

*Thinking dispositions* are a theoretical construct intended to describe one aspect of cognition. They describe a person's *inclination* or *motivation* to make an effort to use one's mental skills to address tasks requiring thinking.

The *Framework for Analytic Cognition (FAC): A Guide for Doing All-Source Intelligence Analysis* noted the contribution that thinking dispositions make to effective cognition:

> While there are many unknowns about how people think and various terms are used, the preceding discussion indicates the following factors are important.

- Knowledge
- Thinking dispositions
- Cognitive skills
- Motivation and engagement
- Epistemological beliefs[2]

*Advanced Analysis Cognition: Critical Thinking* also highlighted the importance of thinking dispositions to effective thought:

> The ability to employ critical thinking skills is still not sufficient to ensure that an individual will bring a critical approach to thinking. A thinker must be willing to make the extra effort to think critically. The thinker must have the *disposition* to think critically.[3]

The earliest scholars interested in improving thinking highlighted the importance of attitude. For example, John Dewey noted that a thinker needs more than skills in *How We Think*.

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[1] Heuer, R.J.J. *Psychology of Intelligence Analysis,* Center for the Study of Intelligence, Washington, D.C., 1999, p. 1.

[2] Kampman, C.M., Mangio, C.A., Parry, T.L. & Wilkinson, B.J. *Framework for Analytic Cognition (FAC): A Guide for Doing all-Source Intelligence Analysis,* in press.

[3] Marsh, M. *Advanced Analytic Cognition: Critical Thinking*, in press.

Knowledge of the methods alone will not suffice; there must be the desire, the will, to employ them. This desire is an affair of personal disposition. But on the other hand the disposition alone will not suffice. There must also be understanding of the forms and techniques that are the channels through which these attitudes operate to the best advantage.[4]

Edward Glaser described the importance of thinking dispositions in his 1938 experiment regarding teaching critical thinking:

The development of ability to think critically, it should be noted, is not limited to cultivation of better methods for finding and testing evidence and meanings, and arriving at well-founded conclusions. Knowledge of the methods of logical inquiry is important. Even more important for the everyday practice of democracy, however, are the *attitudes* involved in critical thinking. Persons who have acquired a disposition to *want* evidence for beliefs, and who have acquired an attitude of reasonableness have also acquired something of a way of life which makes for more considerate and humane relationships among men.[5]

Our understanding of the contribution of thinking dispositions toward effective thinking led us to explore further what has been researched about thinking dispositions. We hoped to determine if improving positive thinking dispositions could benefit the intelligence analysis process.

## 2.1    Purpose

My primary research questions are:

What is the value and feasibility of evaluating a candidate's thinking dispositions as one component of intelligence analyst selection? What is the feasibility of training individuals in order to strengthen their positive thinking dispositions?

To answer this question, I explored the following topics:

- What are thinking dispositions?
  - How are they described? Do different professional disciplines have different perspectives on thinking dispositions?
  - How are they related to various descriptions of thinking such as critical thinking, reflective thinking, or rational thinking?
  - Are related concepts that describe the affective or motivational aspects of human cognition present in their literature?
  - How have thinking dispositions been understood over time?
- How do thinking dispositions affect cognitive performance?
  - How do individuals use their thinking dispositions while performing cognitive tasks?
  - Does the use and influence of thinking dispositions vary depending on the nature of the cognitive task?

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[4] Dewey, J. *How We Think: A Restatement of the Relation of Reflective Thinking to the Educative Process,* 2nd ed., Regnery, Chicago, IL, 1933, p. 30.
[5] Glaser, E.M. *An Experiment in the Development of Critical Thinking,* AMS Press Inc., New York, NY, 1941, p. 6.

- Can thinking dispositions be assessed? Do reliable and valid assessment methods exist? What evidence exists that supports the value of thinking disposition assessments?

- How do thinking dispositions relate to the characteristics, attributes, and traits of intelligence analysts?

- How are an individual's thinking dispositions established or subsequently changed?
  - What factors influence the development of various thinking dispositions?
  - Can thinking dispositions be improved with training and education or other factors such as life experience or maturity? What evidence exists for this improvement?

## 3.0 METHODS, ASSUMPTIONS, AND PROCEDURES

This project builds upon work completed to support the *Framework for Analytic Cognition*[6] development and the *Advanced Analysis Cognition: Critical Thinking* research.[7] As a result, the initial documents searched were those collected for these two projects.[8]

### 3.1 Information Acquisition

The steps I used to identify potentially relevant documents were:

1. Search all documents in our document collection for the term *thinking dispositions*.
2. Search our collection for documents describing analyst attributes or characteristics.
3. For those documents identified as containing thinking disposition or analyst attribute information, search the individual document to identify what was said.
4. Review reference lists in these documents to identify additional documents to review and evaluate.
5. Use Google search to identify additional documents, articles, and resources. Search terms included: *thinking dispositions*, *cognitive styles*, other synonyms for thinking dispositions found in the documents, author names, article and document names found in references within documents, and tools or resources mentioned in documents.
6. Follow interesting leads to relevant journals, web sites, new documents, new authors, and new tools.

Using these steps, I reviewed a total of 301 documents that appeared to be potentially relevant to the research topics. Research and reflection about thinking dispositions encompasses multiple fields of study, with the majority of documents from the fields of philosophy, psychology, and education. The documents addressed thinking disposition concepts and theories, as well as information on assessments, training, guidelines, application, and the results of experiments. The collection includes documents from the best known theorists in thinking dispositions (such as Facione, Tishman, Perkins, Stanovich, and Cacioppo) as well as from scholars who were interested in a specific application of or experiment into thinking dispositions.

### 3.2 This Report

This report evaluates and summarizes the results of the research, with an emphasis on how *thinking dispositions* might be used in selecting intelligence analysts and developing their professional performance.

I selected publications for inclusion in the report to illustrate the range of perspectives present in the literature of thinking dispositions. I also selected documents that highlight areas of convergence that address the primary purpose of the report and that are most beneficial for intelligence analysis.

The remainder of the report is organized as follows:

4.0 Results and discussion

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[6] Kampman et al., in press.
[7] Marsh, in press.
[8] This document collection currently includes over 5000 references in a variety of fields including intelligence analysis, cognitive psychology, philosophy, training and education, and more.

## 4.0      RESULTS AND DISCUSSION

### 4.1 What Are Thinking Dispositions?

In this section of the report I explore the following concepts surrounding thinking dispositions:

- How do scholars define thinking dispositions?  Do different professional disciplines have perspectives on thinking dispositions?  Are different thinking dispositions required for different types of thinking such as critical thinking reflective thinking, or rational thinking?

- What are some examples of thinking dispositions?

- Are there related concepts describing affective or motivational aspects of cognition?

- How have thinking dispositions been understood over time?

The goal of this section of the report is to determine if sufficient consistency exists in the understanding of thinking dispositions that it enables us to use the concept for selecting and developing intelligence analysts.

### 4.1.1.      Scholarly Definitions of Thinking Dispositions

Thinking dispositions are a theoretical construct intended to describe one aspect of cognition – the *inclination* or *motivation* to make an effort to use one's mental skills to address tasks requiring thinking.  Although scholars in the fields of education, philosophy and psychology conducted most of the thinking dispositions research, researchers in other fields have also investigated the topic. I found that the conceptualization of thinking dispositions is relatively consistent between scholars and across fields.  I have included three examples below to illustrate these similarities.

Educators Tishman, Perkins, and Jay have written extensively about thinking dispositions and the importance of attending to thinking dispositions when teaching.  They defined thinking dispositions for *good thinking* as:

> Yet what sets good thinkers apart is not simply superior cognitive ability or particular skills; rather, it is their abiding tendencies to explore, inquire, seek clarity, take intellectual risks, and think critically and imaginatively.  These tendencies can be called "thinking dispositions."[9]

Tishman, Perkins and Jay expanded on their concept of thinking dispositions by adding the idea of *sensitivity* as part of thinking dispositions in addition to inclination.  While their third component, *ability*, crosses over into the skills area, the distinction between sensitivity and inclination is an important one.  Someone who is willing to put effort into thinking but does not recognize when this effort is appropriate may still not engage cognitively when needed.

> Specifically, a disposition in our sense is a psychological element with three components: inclination, sensitivity, and ability.  The three components contribute as follows: Inclination refers to the person's felt tendency toward behavior X.  For example, a person with an inclination to open-minded thinking will feel a leaning toward open-minded thinking when he or she discerns the need.  Sensitivity, in contrast, refers to the person's alertness to X occasions.  For example, a person sensitive to the need for open-minded thinking will notice occasions where narrow thinking and prejudice and bias are likely

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[9] Tishman, S., Jay, E. & Perkins, D.N. "Teaching Thinking Dispositions: From Transmission to Enculturation," *Theory into Practice,* Vol. 32, No. 3, 1993, pp. 147-148.

and open-mindedness called for.  Finally, ability, of course, refers to the actual ability to follow through with X behavior.  A person with the ability to be open-minded knows how to go about it: resisting the impulse to decide quickly, listening to evidence for rival points of view, and so on.[10]

Psychologist Deanna Kuhn defined the dispositions needed to support *critical thinking* as:

> Critical thinking is more than the successful use of a particular skill in an appropriate context.  It is also an attitude or disposition to recognize when a skill is needed and the willingness to apply it.  Sears and Parsons (1991) called these dispositions the ethic of a critical thinker.[11]

Philosopher Harvey Siegel described the dispositions supporting *critical thinking* as providing someone with a critical spirit.

> In order to be a critical thinker, a person must have, in addition to what has been said thus far, certain attitudes, dispositions, habits of mind, and character traits, which together may be labeled the "critical attitude" or "critical spirit."  Most generally, a critical thinker must not only be *able* to assess reasons properly, in accordance with the reason assessment component, she must be *disposed* to do so as well; that is, a critical thinker must have a well-developed disposition to engage in reason assessment.  A critical thinker must have a *willingness* to conform judgment and action to principle, not simply an ability to so conform.[12]

Although the vast majority of scholars whose work I reviewed for this study believe that thinking dispositions are essential components of effective cognition, I did find one contrary view. Michael Fisher and Alec Scriven noted:

> Now this distinction between critical thinking and the critical thinker may seem fairly obvious, but it's a distinction that has been treated carelessly by several writers who too quickly argue that one can't do critical thinking if one doesn't have the critical thinker's characteristically active approach.  Some have even argued that you can't be said to be doing critical thinking unless you have a reliable disposition that will always incline you to do it.  Here, we're saying that one can often do critical thinking without reaching the higher levels of activity (sub-levels 3B and 3C), and do it just as well as the characteristically active critical thinker would do it.[13]

A common understanding of the definition of thinking dispositions is clear from the research: thinking dispositions represent an individual's inclination toward thinking.  Positive or productive thinking dispositions describe the tendency to notice when effortful thinking is required and the inclination to make the effort when thinking is required.  Less productive dispositions might lead an individual toward ineffective approaches to thinking tasks. As Tishman, Perkins, and Jay noted:

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[10] Perkins, D.N., Jay, E. & Tishman, S. "Beyond Abilities: A Dispositional Theory of Thinking," *The Merrill-Palmer Quarterly,* Vol. 39, No. 1, 1993,  p. 4.

[11] Halpern, D.F. "Teaching Critical Thinking for Transfer Across Domains," *American Psychologist,* Vol. 53, No. 4, 1998, p. 152.

[12] Siegel, H. *Educating Reason: Rationality, Critical Thinking, and Education,* Routledge, New York, NY, 1988, p. 39.

[13] Fisher, A. & Scriven, M. *Critical Thinking: Its Definition and Assessment,* Edgepress, Point Reyes, CA, p. 46.

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They can be good or bad, productive or counterproductive. For example, you might have the disposition to make careful plans in appropriate situations. That's good. But sometimes you might have the disposition to plunge ahead blindly, without taking the time to plan or think ahead. That's bad.[14]

Someone who has strong positive thinking dispositions and weak negative thinking dispositions is more likely to be an effective thinker. The converse is also true: someone who has weak positive thinking dispositions or strong negative thinking dispositions is less likely to be an effective thinker. Section 4.3 of this report addresses how we can assess the relative strength or weakness of an individual's thinking dispositions.

With a clear understanding of the concept of thinking dispositions, let us evaluate some of the specific thinking dispositions identified by scholars and practitioners.

### 4.1.2. Examples of Thinking Dispositions

Because thinking dispositions are a theoretical construct, moving from an agreement about what thinking dispositions are conceptually to specific examples of useful thinking dispositions represents a minor challenge. Each scholar had a slightly different perspective on which thinking dispositions are most crucial for good thinking. For example, some scholars focused on positive thinking dispositions such as open-mindedness while others focused on thinking dispositions that inhibit effective thinking such as dogmatism.

Even when the concepts expressed by these examples of specific thinking dispositions are similar, the language used to describe the thinking disposition varied. For example, Ennis' disposition to *seek reasons,* Tishman et al. and Zechmeister & Johnson's disposition to be *intellectually curious,* Stanovich's disposition to have a *tendency to collect information,* and Facione's disposition of *truthseeking* all appear to describe the same inclination toward gathering information before coming to a decision or conclusion.

I found two fundamentally different approaches to identifying specific thinking dispositions:

1. Scholars who addressed the question of <u>what makes an effective thinker</u>. These scholars tended to define a list of multiple dispositions in support of some conception of thinking such as good thinking, critical thinking, or rational thinking.
2. Scholars who addressed the question of <u>what causes individual differences in cognitive effort and effectiveness</u>. These scholars tended to focus on exploring a single disposition and measuring its impact on cognition.

***Dispositions that Characterize an Effective Thinker***: The lists of examples included in this report have been developed by scholars in different fields and in support of different types of thinking. Despite different terminology, strong similarities do exist between the lists. For example, the majority of lists addressed the disposition of being open-minded in some way. These lists also recognize that the inclination to avoid biases and to hold decisions or conclusions until appropriate information or evidence is available is an important contributor to all forms of effective thinking. Another very commonly-identified disposition is the inclination to search for relevant information.

I found documents defining and describing thinking dispositions to support a wide variety of kinds of thinking. Despite the different types of thinking the dispositions support, I found no

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[14] Tishman, S., Jay, E. & Perkins, D.N. "Teaching Thinking Dispositions: From Transmission to Enculturation," *Theory into Practice,* Vol. 32, No. 3, 1993, p. 148.

significant difference between dispositions in support of the different effective thinking types, including:

- Good thinking
- Intelligent thinking
- Rational thinking
- Reflective thinking
- Constructive thinking
- Critical thinking

Table 1 consists of six lists of dispositions describing some kind of effective thinking.[15] The authors featured in Table 1 and their backgrounds include:

- Robert Ennis is a philosopher and educator who has studied critical thinking extensively. His list of dispositions was published in his article, "A Taxonomy of Critical Thinking Dispositions and Abilities."

- Educators Tishman, Perkins, and Jay included their list of dispositions supporting good thinking in multiple articles.

- Psychologists Zechmeister and Johnson included a description of critical thinking dispositions in their textbook called *Critical Thinking: a Functional Approach*.

- Psychologist Keith Stanovich has written extensively on the impact that thinking dispositions have on reasoning ability. He summarized dispositions that lead to rational thinking in *What Intelligence Tests Miss: the Psychology of Rational Thought*.

- The organization that is known today as the Foundation for Critical Thinking was established in 1980 as the Center for Critical Thinking. The Center is now part of the Critical Thinking Community[16] consisting of the Foundation for Critical Thinking, the Center for Critical Thinking, the National Council for Excellence in Critical Thinking, and the International Center for the Assessment of Higher Order Thinking. The Foundation published a booklet entitled *Critical Thinking Competency Standards* which included a list of dispositions.

- Philosopher Peter Facione led an effort for the American Philosophical Association (APA) to develop a consistent understanding of critical thinking. This effort resulted in what has been called the consensus definition of critical thinking. It also provided a list of characteristics describing the disposition of effective critical thinkers. Facione later developed the California Critical Thinking Dispositions Inventory (CCTDI) to assess an individual's disposition to think critically based on the results of the APA study. In the course of the development of the CCTDI, the long list of characteristics was collapsed into a shorter list of broad categories of dispositions.

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[15] Appendix A contains all thinking dispositions found in the research for this report.
[16] www.criticalthinking.org

**Table 1: Comparison of Thinking Dispositions by Different Scholars for Different Types of Thinking**

| **Critical Thinking Dispositions Defined by Ennis** [17] | **Good Thinking Dispositions Defined by Tishman, Jay, and Perkins** [18] | **Critical Thinking Dispositions Defined by Zechmeister & Johnson** [19] |
|---|---|---|
| 1. Seek a clear statement of the thesis or question | 1. *The disposition to be broad and adventurous*: the tendency to be open-minded, to explore alternative views; an alertness to narrow thinking; the ability to generate multiple options. | 1. *Intellectual curiosity*: seeking answers to various kinds of questions and problems. |
| 2. Seek reasons | | 2. *Objectivity*: using objective factors when one makes decisions and avoiding being influenced by emotional or subjective factors. |
| 3. Try to be well informed | | |
| 4. Use and mention credible sources | 2. *The disposition toward sustained intellectual curiosity*: the tendency to wonder, probe, find problems; a zest for inquiry; an alertness for anomalies; the ability to observe closely and formulate questions. | 3. *Open-mindedness*: being willing to consider a wide variety of beliefs. |
| 5. Take into account the total situation | | |
| 6. Try to remain relevant to the main point | | 4. *Flexibility*: exhibiting a willingness to change one's beliefs or methods of inquiry. |
| 7. Keep in mind the original and/or basic concern | | |
| 8. Look for alternatives | 3. *The disposition to clarify and seek understanding*: a desire to understand clearly, to seek connections and explanations; an alertness to unclarity and need for focus; an ability to build conceptualizations. | 5. *Intellectual skepticism*: not accepting a conclusion as being true until adequate evidence is provided. |
| 9. Be open-minded | | |
|   a) Consider seriously other points of view than one's own (dialogical thinking) | | |
|   b) Reason from premises with which one disagrees—without letting the disagreement interfere with one's reasoning (suppositional thinking) | 4. *The disposition to be planful and strategic*: the drive to set goals, make and execute plans, envision outcomes; alertness to lack of direction; the ability to formulate goals and plans. | 6. *Intellectual honesty*: accepting statements as true even when they don't agree with one's own position. |
|   c) Withhold judgment when the evidence and reasons are insufficient | | 7. *Being systematic*: following a line of reasoning consistently to a conclusion. |
| 10. Take a position (and change a position) when the evidence and reasons are sufficient to do so | 5. *The disposition to be intellectually careful*: the urge for precision, organization, thoroughness; an alertness to possible error or inaccuracy; the ability to process information precisely. | 8. *Persistence*: being persistent in seeking to resolve disputes. |
| 11. Seek as much precision as the subject permits | | 9. *Decisiveness*: reaching a conclusion when the evidence warrants it. |
| 12. Deal in an orderly manner with the parts of a complex whole | | |
| 13. Use one's critical thinking abilities | 6. *The disposition to seek and evaluate reasons*: the tendency to question the given, to demand | 10. *Respect for other viewpoints*: willingness to admit that you are wrong and that others may be |
| 14. Be sensitive to the feelings, level of | | |

[17] Ennis, R.H. "A Taxonomy of Critical Thinking Dispositions and Abilities," in *Teaching Thinking Skills: Theory and Practice*, eds. J.B. Baron & R.J. Sternberg, Freeman, New York, NY, 1987, p. 12.
[18] Tishman, S., Jay, E. & Perkins, D.N. "Teaching Thinking Dispositions: From Transmission to Enculturation," *Theory into Practice,* Vol. 32, No. 3, 1993, p. 148.
[19] Zechmeister, E.B. & Johnson, J.E. *Critical Thinking: A Functional Approach,* Brooks/Cole Publishing Co., Pacific Grove, CA, 1992, pp. 6-7.

| | | |
|---|---|---|
| knowledge, and degree of sophistication of others | justification; an alertness to the need for evidence; the ability to weigh and assess reasons.<br><br>7. *The disposition to be metacognitive*: the tendency to be aware of and monitor the flow of one's own thinking; alertness to complex thinking situations; the ability to exercise control of mental processes and be reflective. | right. |
| **Rational Thinking Dispositions defined by Stanovich** [20]<br>the tendency to collect information before making up one's mind,<br><br>the tendency to seek various points of view before coming to a conclusion,<br><br>the disposition to think extensively about a problem before responding,<br><br>the tendency to calibrate the degree or strength of one's opinion to the degree of evidence available,<br><br>the tendency to think about future consequences before taking action,<br><br>the tendency to explicitly weigh pluses and minuses of situations before making a decision, and<br><br>the tendency to seek nuance and avoid absolutism. | **Critical Thinking Dispositions defined by the Foundation for Critical Thinking** [21]<br>The competencies focusing on the intellectual traits, virtues or dispositions:<br>Fairmindedness - seek to treat all viewpoints with equality<br>Intellectual Humility - distinguish what they know from what they don't know<br>Intellectual Courage - willing to challenge popular beliefs<br>Intellectual Empathy - to sympathetically enter into points of view that differ from their own<br>Intellectual Integrity - hold themselves to the same standards they expect others to meet<br>Intellectual Perseverance - work through complexities and frustration without giving up<br>Confidence in Reason - recognize that good reasoning is the key to living a rational life, and to creating a more fair and just world<br>Intellectual Autonomy - take responsibility for their own thinking, beliefs, and value | **Critical thinking Dispositions defined by Facione** [22]<br>Truth-seeking is the habit of always desiring the best possible understanding of any given situation; it is following reasons and evidence wherever they may lead, even if they lead one to question cherished beliefs.<br>Open-mindedness is the tendency to allow others to voice views with which one may not agree.<br>Analyticity is the tendency to be alert to what happens next.<br>Systematicity is the tendency or habit of striving to approach problems in a disciplined, orderly, and systematic way.<br>Critical thinking self-confidence is the tendency to trust the use of reason and reflective thinking to solve problems.<br>Inquisitiveness is intellectual curiosity.<br>Cognitive maturity (maturity of judgment) is the tendency to see problems as complex, rather than black and white. |

[20] Stanovich, K.E. *What Intelligence Tests Miss: The Psychology of Rational Thought,* Yale University Press, New Haven, CT, 2009, pp. 31-32.
[21] Paul, R. & Elder, L. *A Guide for Educators to Critical Thinking Competency Standards,* Foundation for Critical Thinking, Dillon Beach, CA, 2006, pp. 26-32.
[22] Facione, P.A. & Facione, N.C. *California Critical Thinking Disposition Inventory (CCTDI) Test Manual,* California Academic Press, Millbrae, CA, 2010, pp. 9-10.

Table 2 includes sample dispositions developed for specific industries and organizations as part of their investigation of critical thinking. Again, similarities exist between these and the scholarly lists of thinking dispositions as shown in Table 1.

- Ed Krupat with the Center for Evaluation Medical Education Grand Rounds conducted a survey of practicing Medical Doctor (MD) faculty at five medical schools. Ten percent of the responses described critical thinking in dispositional terms.

- Sharon Staib reported on a study in the nursing profession that was modeled on Facione's project for the APA. This consensus definition for critical thinking in nursing also addressed thinking dispositions.

- The planning group on critical thinking at Frostburg State University developed an operational definition of critical thinking to enable the university to teach critical thinking and to assess the ability of students to think critically. Their definition included thinking dispositions.

**Table 2:  Comparison of Thinking Dispositions for Specific Industries and Organizations**

| **Critical Thinking Dispositions for Physicians Summarized by Krupat**[23] | **Critical Thinking Dispositions for Nurses Reported by Staib**[24] | **Critical Thinking Dispositions Defined by Frostburg State University**[25] |
|---|---|---|
| • …careful attention to what you know, vigilance for what you do not, and the courage to question both of the above categories.<br><br>• …thinking about an topic, issue, or challenge in a way that sets aside my immediate 'gut' response, so that I can be open and reflective to other possible ways of viewing the challenge…<br><br>• …thinking deeply, keenly, flexibly, openly, reflectively, with an awareness of self and others, with attention to what is known and unknown, and with humility. | Critical thinkers in nursing exhibit these habits of the mind:<br><br>• confidence,<br>• contextual perspective,<br>• creativity,<br>• flexibility,<br>• inquisitiveness,<br>• intellectual integrity,<br>• intuition,<br>• open-mindedness,<br>• perseverance, and<br>• reflection | A student who has developed critical thinking dispositions will show the inclination to<br><br>• approach questions with an open-minded and curious attitude, be informed by multiple relevant perspectives, and be willing to examine questions in a fair-minded way;<br>• apply critical thinking skills to thinking about issues in a major field of study, general education courses, and everyday lives;<br>• reflect on how best to answer questions, solve problems, and make decisions in academic and everyday settings. |

[23] Krupat, E. *Critical Thinking in Medical Education: Assessing What We Mean and What We Know [Powerpoint Presentation],* 2008, p. 14.

[24] Staib, S. "Teaching and Measuring Critical Thinking," *Journal of Nursing Education,* Vol. 42, No. 11, 2003, p. 499.

[25] Bensley, A., Doyle, R., Lyon, L. & Robinson, S. *Basic Proficiencies in Critical Thinking*, Frostburg State University, Frostburg, MD, 2006, p.3.

***Dispositions that Explain Individual Differences in Cognition***:  Scholars who explored individual differences in cognition tended to focus on a single disposition at a time rather than a list of thinking dispositions.  Their work generally described the disposition, researched the impact of the disposition on an individual's ability to think effectively, and developed assessments for the disposition.  I found the following dispositions to be the most frequently referenced in the literature:

- Need for cognition (NFC) – The disposition to engage in and enjoy effortful cognitive activities.[26]

- Need for cognitive closure – The disposition to try for cognitive closure on a topic, sometimes resulting in premature closure before a topic has been thoroughly investigated. [27]

- Actively open-minded thinking – The disposition to seek information, including information that disconfirms a belief; the willingness to change a belief in the face of contradictory evidence; an avoidance of bias.[28]

- Ambiguity tolerance/intolerance – High tolerance for ambiguity is the disposition to seek out ambiguity, enjoy ambiguity, and excel in the performance of ambiguous tasks.[29]

- Dogmatism – The disposition to hold a relatively closed cognitive organization of beliefs which provides a framework for patterns of intolerance toward others.[30] Dogmatism has also been described as close minded and inflexible.[31]

- Rigidity/rigid thinking – The disposition to resist changing beliefs or habits.[32]

***Making Sense of the Many Thinking Disposition Examples***:  Of all the thinking disposition lists shown in Tables 1 and 2 and the individual dispositions described in the previous section, which list or individual disposition is the correct one for any cognitive activity?  We do not have a definitive answer for this question. Two factors should be considered:

1. An organization should determine which specific individual thinking dispositions are most beneficial to the types of cognitive work needed by that organization. Which items appear to be most important to the organization's cognitive work? What terminology associated with the thinking disposition is understood by members of the organization?

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[26] Cacioppo, J.T., Petty, R.E., Feinstein, J.A. & Jarvis, W.B.G. "Dispositional Differences in Cognitive Motivation: The Life and Times of Individuals Varying in Need for Cognition," *Psychological Bulletin,* Vol. 119, No. 2, 1996, p. 197.

[27] Kruglanski, A.W. & Webster, D.M. "Motivated Closing of the Mind: "Seizing" and "Freezing"," *Psychological Review,* Vol. 103, No. 2, 1996, p. 264.

[28] Stanovich, K.E. & West, R.F. "Reasoning Independently of Prior Belief and Individual Differences in Actively Open-Minded Thinking," *Journal of Educational Psychology,* Vol. 89, No. 2, 1997, p. 346.

[29] MacDonald, A.P. "Revised Scale for Ambiguity Tolerance: Reliability and Validity," *Psychological Reports,* Vol. 26, No. 3, 1970, p. 791.

[30] Rokeach, M., McGovney, W.C. & Denny, M.R. "A Distinction between Dogmatic and Rigid Thinking," *Journal of Abnormal and Social Psychology,* Vol. 51, No. 1, 1955, p. 87.

[31] Shearman, S.M. & Levine, T.R. "Dogmatism Updated: A Scale Revision and Validation," *Communication Quarterly,* Vol. 54, No. 3, 2006, p. 275.

[32] Rokeach, M., McGovney, W.C. & Denny, M.R. "Dogmatic Thinking Versus Rigid Thinking: An Experimental Distinction," in *The Open and Closed Mind*, ed. M. Rokeach, Basic Books, New York, NY, 1960, p. 183.

2.  Can the organization assess an individual's dispositional strength for any list or individual thinking disposition?  Only some of the specific thinking dispositions have assessments designed to determine an individual's strength of inclination.  Section 4.3 contains information on the different assessments available for thinking dispositions.

This list of thinking dispositions, synthesized from the many thinking dispositions found during my research, appears to be of benefit to intelligence analysis:

- Enjoyment of cognitive effort (NFC), disposition to think deeply)
- Intellectual curiosity - seek information, inclination to look for evidence (truth-seeking, inquisitive)
- Open-mindedness (actively open-minded thinking, fair-mindedness; not dogmatic)
- Intellectual honesty (respect for other viewpoints, intellectual integrity)
- Tolerance for ambiguity - inclination to wait for appropriate evidence before making judgments
- Focus on evidence – reach conclusions only after sufficient evidence is found
- Persistent (intellectual perseverance)
- Systematic (makes plans and is strategic, metacognitive)

### 4.1.3.  Related Concepts Describing Affective or Motivational Aspects of Cognition

Psychologists are interested in the topic of *individual differences* in personality and in cognition.  Because thinking dispositions are one contributor to individual differences, they are sometimes grouped with or connected to other contributors to individual differences.

Scholars in different fields use a number of different terms to describe the non-skills attributes of thinking.  In my research I found the following terms used to describe some aspect of individual differences regarding approaches to thinking:

- Cognitive style/thinking style/intellectual style
- Habits of mind
- Intellectual character

A large number of scholars have considered cognitive, thinking, or intellectual styles to be similar to thinking dispositions.  These approaches to thinking are of interest not only to scholars focused on improving thinking, but also to scholars interested in teaching and learning.  Many have connected cognitive styles with learning styles.

Krouter described cognitive style as:

> Cognitive style refers to the manner in which individuals acquire and process information.  Hansen (1995) argued that "Cognitive style measures do not indicate the content of the information but simply how the brain perceives and processes the information."[33]

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[33] Kroutter, P. & Witkin, H.A. *Field-Dependence Vs. Field-Independence Theory,* 2008, p. 2.

I found a variety of models of thinking/cognitive styles during my research. These models include:

- Mental self government[34]
- Meyers Briggs Types[35]
- Herrmann Brain Dominance.[36]
- Field dependence-independence[37]

After reviewing the literature I concluded that cognitive styles differ from thinking dispositions. Cognitive styles focus on *how* someone approaches thinking; thinking dispositions focus on *whether* someone willingly engages in thinking. Although thinking styles may provide valuable insight into effective analysis,[38] they are a separate theoretical construct from thinking dispositions and are of no further interest to this study.

Rather than cognitive styles or thinking dispositions, some scholars wrote about thinking habits, specifically *habits of the mind*. Arthur Costa clearly linked habits of the mind with thinking dispositions:

> A "Habit of Mind" means having a disposition toward behaving intelligently when confronted with problems, the answers to which are not immediately known. When humans experience dichotomies, are confused by dilemmas, or come face to face with uncertainties--our most effective actions require drawing forth certain patterns of intellectual behavior. When we draw upon these intellectual resources, the results that are produced through are more powerful, of higher quality and greater significance than if we fail to employ those patterns of intellectual behaviors.[39]

Costa identified 16 habits of the mind that enable someone to behave intelligently:

1. Persisting
2. Managing Impulsivity
3. Listening To Others—With Understanding and Empathy
4. Thinking Flexibly
5. Thinking About our Thinking (Metacognition)
6. Striving For Accuracy and Precision
7. Questioning and Posing Problems
8. Applying Past Knowledge to New Situations
9. Thinking and Communicating with Clarity and Precision
10. Gathering Data through All Senses

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[34] Sternberg, R.J. "Mental Self-Government: A Theory of Intellectual Styles and their Development," *Human Development,* Vol. 31, No. 4, 1988, p. 197.

[35] Krizan, L. *Intelligence Essentials for Everyone,* Joint Military Intelligence College, Washington, D.C., 1999, p. 58.

[36] Leonard, D. & Straus, S. "Putting Your Company's Whole Brain to Work," *Harvard Business Review,* Vol. 75, No. 4, 1997, p. 115.

[37] Kroutter & Witkin, p. 2.

[38] The Intelligence Community has investigated the link between intelligence analysis and some of these styles.

[39] Costa, A.L. & Kallick, B. *Describing 16 Habits of Mind,* The Institute for Habits of Mind, [undated], p. 1.

11.      Creating, Imagining, and Innovating

12.      Responding with Wonderment and Awe

13.      Taking Responsible Risks.

14.      Finding Humor

15.      Thinking Interdependetly

16.      Learning Continuously[40]

This specific list of habits of the mind does overlap with the thinking dispositions identified in Tables 1 and 2, but also includes items such as finding humor that do not necessarily relate to critical, rational, and good thinking dispositions.

James McTighe also described thinking habits that are very similar to our list of thinking dispositions.

> Effective problem solvers, in contrast, view problems as challenges and are persistent in seeking solutions.  If a particular strategy is unsuccessful, they take a different approach. Other attitudes and habits of effective thinking are well known: open-mindedness, flexibility, ability to defer immediate judgment, attention to detail.[41]

Ron Ritchart described the importance of *intellectual character* in his book of the same name. His theory of intellectual character is founded upon thinking dispositions.  Ritchart has worked closely with Perkins, Tishart, and Jay who developed the list of dispositions that lead to *good thinking* found in Table 1.  Ritchart defined intellectual character as:

> As an overarching construct, the notion of intellectual character can be understood only in terms of the thinking dispositions that give it shape and meaning.[42]

While all of the concepts related to thinking dispositions discussed in this section are interesting, I have concluded that they do not appear to contribute to answering the questions posed by this study.  My research confirmed that the term thinking dispositions is widely understood and therefore is a sufficient conceptual framework for describing an individual's sensitivity and inclination to engage cognitively.

### 4.1.4.     How Have Thinking Dispositions Been Understood Historically?

The term *thinking disposition* has been in use for a very long time.  Surprisingly, the term's meaning has remained relatively consistent. Google enables you to find books from specific time periods that contain a specified term.  Using this feature I found books from the 1800s that included *thinking disposition*.  Indeed, one book contained a translation from Homer's *Iliad* which used the term thinking disposition similarly to its usage in this report.

> As between lions and men there are no faithful covenants,—
>
> Nor have wolves and lambs a same-thinking disposition,
>
> But perpetually are plotting evil to each other;[43]

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[40]Costa & Kallick, pp. 2-12

[41] McTighe, J.J. "Teaching for Thinking, of Thinking, and about Thinking," in *Thinking Skills Instruction: Concepts and Techniques*, eds. M. Heiman & J. Slomianko, National Education Association, Washington, D.C., 1987, p. 30.

[42] Ritchhart, R. *Intellectual Character: What It Is, Why It Matters, and How to Get It,* Jossey-Bass, San Francisco, CA, 2002, p. 19.

Dewey was the most frequently-referenced author when scholars highlighted the historical usage of the term *thinking disposition*. This quote from the 1933 version of *How We Think* was cited frequently:

> Knowledge of the methods alone will not suffice; there must be the desire, the will, to employ them. This desire is an affair of personal disposition.[44]

In 1941 Edward Glaser believed thinking dispositions were sufficiently important that he included them as part of his definition of critical thinking:

> The ability to think critically, as conceived in this volume, involves three things: (1) an attitude of being disposed to consider in a thoughtful way the problems and subjects that come within the range of one's experiences, (2) knowledge of the methods of logical inquiry and reasoning, and (3) some skill in applying those methods.[45]

A common understanding of the term *thinking disposition* continues to the present time. Kelly Ku provided this explanation in 2009:

> The disposition to think critically includes the motivation of a person (i.e., a matter of choosing to engage in effortful thinking or not) and it accounts for how critical thinking is triggered, "good timing - attempting the right kind of thinking at the right moment" (Perkins & Ritchhart, 2004, p. 352). In other words, what makes a good thinker is now a question that "must be answered as much in terms of people's attitudes, motivations, commitments, and habits of mind as in terms of their cognitive abilities" (Perkins & Ritchhart, 2004, p. 352).[46]

All of the research I conducted appears to support the impression that a consistent understanding of thinking dispositions has existed for a remarkably long period of time. This consistency lends credibility to the possibility of using thinking dispositions as part of the selection and development activities of intelligence analysts.

### 4.1.5. Summary: What Are Thinking Dispositions?

Thinking dispositions represent an individual's inclination toward thinking . An individual's strength in positive or productive thinking dispositions identify *whether someone is likely to notice when effortful thinking is required and the degree of inclination to make the effort when thinking is required*. This is a stable understanding of the concept of thinking dispositions over time, across academic disciplines, and for different types of thinking.

Those thinking dispositions that seem to be applicable to intelligence analysts might include:

- Enjoyment of cognitive effort
- Intellectual curiosity
- Open-mindedness

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[43] Wilson, J. *Essays Critical and Imaginative Volume IV: Homer and His Translators*, William Blackwood and Sons, Edinburgh and London, 1857.

[44] Dewey, J. *How We Think: A Restatement of the Relation of Reflective Thinking to the Educative Process,* 2nd ed., Regnery, Chicago, IL, 1933, p. 30.

[45] Glaser, E.M. *An Experiment in the Development of Critical Thinking,* AMS Press Inc., New York, NY, 1941, pp. 5-6.

[46] Ku, K.Y.L. "Assessing Students' Critical Thinking Performance: Urging for Measurements using Multi-Response Format," *Thinking Skills and Creativity,* Vol. 4, No. 1, 2009, p. 71.

- Intellectual honesty
- Tolerance of ambiguity
- Focus on evidence
- Persistent
- Systematic

With a clear understanding of what thinking dispositions are and the kinds of thinking dispositions that might be useful for intelligence analysis, we turn our attention to *why* they are important. What impact do thinking dispositions have on cognitive performance and results?

**4.2     Thinking Dispositions and Cognitive Performance**

This section of the report addresses the impact of thinking dispositions. We'll explore:

- How do thinking dispositions affect cognitive performance?
  - How do individuals use their thinking dispositions while performing cognitive tasks?
  - Does the use and influence of thinking dispositions vary depending on the nature of the cognitive task?

A number of scholars have conducted experiments to understand the impact that thinking dispositions have on cognitive performance. Their research has demonstrated that thinking dispositions do have a significant impact on cognitive performance.

In the previous section, we noted the different approaches scholars took to defining thinking dispositions. These different approaches continued in the studies and experiments reported in this section. We'll explore the impact of thinking dispositions on cognitive performance from two perspectives:

1. Scholars who addressed the question of what makes an effective thinker by evaluating the impact thinking dispositions in general have on cognitive performance.
2. Scholars who addressed the question of what causes individual differences in cognitive effort and effectiveness by evaluating the impact of one or a few specific thinking dispositions.

As part of the explanation of different studies and experiments, I mention assessments researchers used to evaluate the strength of an individual's thinking dispositions. The assessments are explained more fully in Section 4.3 of this report.

**4.2.1.     General Experiments into the Impact of Thinking Dispositions on Cognitive Performance**

Arthur Whimbey described results of research conducted by Benjamin Bloom and Lois Broder in 1950. Although Bloom and Broder used the terms *behavior* and *habit* rather than disposition, it is clear that the report was describing the difference between individuals with strong, positive thinking dispositions and individuals with weak or negative thinking dispositions. Bloom and Broder were describing differences in such thinking dispositions as enjoyment of cognitive effort, intellectual curiosity, and being systematic and persistent in intellectual efforts.

First, they asked students with both high and low scores on aptitude tests to think aloud while solving academic reasoning problems. They found that the problem-solving behavior of low-aptitude college students was characteristically different from that of high-aptitude students.

The cognitive profile of low-aptitude college students had two prominent features. First, there was one-shot thinking, rather than extended, sequential construction of understanding. Second, there was a willingness to allow gaps of knowledge to exist, an attitude of indifference towards achieving an accurate and complete comprehension of situations and relations. These students were mentally careless and superficial in solving problems. They often rushed through instructions or even skipped them, and selected a

wrong answer on the basis of a feeling or a guess. They were almost completely passive in their thinking, taking little time to consider a question or break it down into its component parts.

High-aptitude students, by contrast, made an active attack on problems. When a question was initially unclear, they employed a lengthy sequential analysis in arriving at an answer. They began with what they understood of the problem, drew on other information, and carefully proceeded through a series of steps that brought them to a conclusion.

Having isolated the habitual thinking deficiencies of low-aptitude students, Bloom and Broder undertook to develop a remedial training program.[47]

Philosopher Stephen Norris conducted a series of experiments to determine whether performance on *critical thinking skills tests* were an accurate reflection of critical thinking abilities. He theorized that performance on these tests might be constrained by weak thinking dispositions. To test this theory he created modified versions of the tests to simulate stronger thinking dispositions.

The modifications were not designed to teach critical thinking, that is, to provide examinees critical thinking abilities they did not have. The guidelines and hints suggested to examinees what they might do, but did not instruct them in how to do it. Thus, if they did not have the appropriate abilities, the guidelines and hints would be of no value. However, if they did have the abilities, but not the dispositions to use them, then the guidelines and hints could serve in the place of dispositions, as surrogate dispositions, and if effective would lead to improved performance.[48]

He found mixed results. Participants showed no difference in outcome on some of the multiple choice or short answer skills tests when disposition-oriented hints were provided. However, on some of the tests, the dispositional hints did cause significant improvement.

Second, performance levels on some critical thinking tests underestimate examinees' critical thinking abilities in an area because examinees' disposition to think critically falls short of their ability to do so. Both the Ennis-Weir and the multiple-choice version of the Observations test showed positive gains for the hints version over the original and guidelines versions.[49]

Educators Perkins and Ritchart also explored the impact of thinking dispositions in general on cognitive effort. For example, in one experiment they found:

In later research, the interviewer pushed subjects to elaborate their arguments on both sides further. When it appeared that a subject had no more to say, the interviewer then asked the subject point blank to identify weaknesses in his or her argument and to elaborate the other side of the case. Subjects could do so readily. Most dramatically, when directly prompted, subjects increased points mentioned on the other side of the case

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[47] "Conversation with Arthur Whimbey," in *Thinking Skills Instruction: Concepts and Techniques*, eds. M. Heiman & J. Slomianko, National Education Association, Washington, D.C., 1987, pp. 161-162.

[48] Norris, S.P. "The Meaning of Critical Thinking Test Performance: The Effects of Abilities and Dispositions on Scores," in *Critical Thinking: Current Research, Theory and Practice*, ed. D.J. Fasko, Hampton Press, Cresskill, NJ, 2003, p. 321.

[49] Norris, p. 325.

by an average of 700% (Perkins et al., 1991). The data showed that subjects generally did not, but easily could, examine the other side of the case with care. It implicated an important role for dispositions in thinking: People in trend were capable of, but not generally disposed to, critique their own arguments or examine the other side of the case.[50]

The authors also explored the specific contribution made by each component in their three-part understanding of thinking dispositions: sensitivity, inclination, and ability

The most important finding, confirmed over and over again in our work, showed that dispositional considerations more than abilities limited thinking. Sensitivity was by far the greatest bottleneck, followed by inclinations.[51]

Psychologists Dweck and Leggett conducted a series of experiments to understand the impact of disposition and situation on cognitive performance. In the experiments summarized in their 1988 article entitled "A Social-Cognitive Approach to Motivation and Personality" they specifically investigated the behavior of students who have different goals in a learning situation. After assessing the students' performance, the investigators then provided guidance to override the students' goals in order to create situational changes. They found:

First, our research has clearly shown that both situational variables and dispositional variables play important roles in producing behavior. We have experimentally induced goals and behavior patterns by manipulating situational variables (Dweck, Davidson, Nelson, & Enna, 1978; Elliott & Dweck, 1988), but we have also predicted goal choice and behavior patterns by measuring existing dispositional variables (e.g., implicit theories: Bandura & Dweck, 1985;Leggett, 1985). A view that integrates these findings is one in which dispositions are seen as individual difference variables that determine the a priori probability of adopting a particular goal and displaying a particular behavior pattern, and situational factors are seen as potentially altering these probabilities.[52]

Several different scholars attempted to find correlations between results on the CCTDI and academic performance but were unable to find a direct correlation. For example, shortly after he completed development of the CCTDI, Peter Facione investigated its usefulness in several different studies.

The purpose of the current research is to explore conceptually the disposition toward critical thinking, and to report preliminary empirical explorations concerning whether college students, display that disposition.[53]

Facione's findings include:

The sample described in Table 1 includes only entering freshmen who had not yet experienced college level instruction. Only 13% of these 567 new college students were

[50] Perkins, D. & Ritchhart, R. "When is Good Thinking?" in *Motivation, Emotion, and Cognition: Integrative Perspectives on Intellectual Functioning and Development*, eds. D.Y. Dai & R.J. Sternberg, L. Erlbaum Associates, Mahwah, NJ, 2004, pp. 361-362.

[51] Perkins & Ritchhart, p. 363.

[52] Dweck, C.S. & Leggett, E.L. "Social-Cognitive Approach to Motivation and Personality," *Psychological Review,* Vol. 95, No. 2, 1988, p. 269.

[53] Facione, P.A., Sanchez, C.A. & Facione, N.C. *Are College Students Disposed to Think?*, California Academic Press, Millbrae, CA, 1994, p. 3.

positive on all seven CT dispositional scales of the CCTDI. The other 87% were disposed against at least one of the seven aspects of the overall disposition toward CT.[54]

A comparison of graduate students and undergraduates at an institution did show stronger thinking dispositions for graduates, but the study could not identify the cause:

> The profile of the graduate students is stronger in each dimension, which may reflect genuine growth or which may be an artifact of selection to graduate school.[55]

In a study of nursing students from over 50 different nursing programs, Peter and Noreen Facione attempted to understand the relationship between critical thinking and nursing. Research questions included:

> This was a real world investigation of a process in action, not a planned quasi-experiment. The principal investigator and on-site investigators often talked at length about the kinds of data that would be needed to answer complex questions like "What is the relationship between critical thinking skills and dispositions and the development of expertise in nursing practice?" or "What kinds of data would be most informative of a particular learning outcome?"[56]

Unfortunately, the data from this study varied from institution to institution, making it difficult to draw any useful conclusions. The researchers were not able to collect data upon entry as well as upon exit from the programs to compare the results nor were they able to make connections to academic performance.

> The analyses of correlations between CT dispositions and academic achievement measures were surprisingly mixed. As expected there were no significant relationships between CCTDI scales and Scholastic Aptitude Test (SAT) math scores, not even in the case of systematicity, where we might have expected some modest degree of relationship. But we did see a relationship between several of the dispositional scores and both the SAT verbal and the American College Test (ACT). The sample for which these values were available is quite small. We prefer to simply report these results and to defer interpretation of them at this time. If they are replicated in other samples, it would then be important to try to determine what is being measured by the SAT verbal and the ACT that could be related to the CCTDI scales.

> Our desire to examine CT dispositions in relation to Grade Point Average (GPA) variables was all but impossible.[57]

Finally, the investigators reported an inability to answer the question of connection between thinking dispositions and nursing expertise.

> We were similarly unable to examine the relationship between scores on the CCTDI scales and a successful passage on the National Council Licensure Examination

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[54] Facione et al. p. 10.
[55] Facione et al. p. 10.
[56] Facione, N.C. & Facione, P.A. *Critical Thinking Assessment in Nursing Education Programs: An Aggregate Data Analysis,* California Academic Press, Millbrae, CA, 1997, pp. 5-6.
[57] Facione & Facione, p. 73.

(NCLEX) examination due to too few individuals for whom NCLEX scores were contributed to the aggregate data set.[58]

Walsh and Seldomridge experienced similar challenges in a 2006 review of critical thinking in nursing education. As a result of their research they recognized the need to have a better understanding of what was to be measured and, perhaps, a different approach to measuring it.

> Although demonstrating modest gains in critical thinking dispositions by some cohorts, data collected from 1997 to 2002 showed no consistency of pattern. While some cohorts saw gains, subsequent cohorts saw losses, and several years had essentially no change. Throughout this period, the usual academic indicators (e.g., SAT/ACT data, cumulative grade point average, science grades) remained the same. The data on critical thinking skills were likewise inconclusive and difficult to explain. This raised concerns about both the definition of critical thinking and the utility of using standardized instruments to measure critical thinking.[59]

### 4.2.2.    Experiments That Study the Impact of Specific Thinking Dispositions

The researchers discussed in this section of the report are psychologists interested in understanding the causes of or contributors to individual differences in cognitive processing. The experiments they conducted tended to be much more focused with clearer investigational goals. As a consequence, the results appeared to be more useful.

IQ is generally accepted as one primary cause of individual cognitive differences. Individuals with higher IQs have the capacity to think better or more effectively than individuals with lower IQs. However, researchers have found that this does not explain all individual differences in thinking ability. Stanovich described the challenge this way:

> Intelligence tests are thus radically incomplete as measures of cognitive functioning. Because of their vast influence, IQ tests have both explicitly and implicitly defined, for the layperson and psychologist alike, what cognitive attributes to value. These are important abilities, to be sure, but the tests leave out huge domains of cognitive functioning.[60]

As a reminder, I found the following dispositions to be the most frequently referenced in the literature. I'll discuss the impact of each of these thinking dispositions individually.

- Dogmatism
- Rigidity/rigid thinking
- Need for cognition
- Need for cognitive closure
- Actively open-minded thinking
- Ambiguity tolerance/intolerance

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[58] Facione & Facione, p. 73.
[59] Walsh, C.M. & Seldomridge, L.A. "Critical Thinking: Back to Square Two," *Journal of Nursing Education,* Vol. 45, No. 6, 2006, pp. 212-213.
[60] Stanovich, K.E. *What Intelligence Tests Miss: The Psychology of Rational Thought,* Yale University Press, New Haven, CT, 2009, p. xi.

***Dogmatism and Rigid Thinking:*** The earliest experimental results that I found came from a 1955 experiment conducted by psychologists Rokeach et al. concerning dogmatism and rigid thinking. Rokeach defined dogmatism as a closed system of beliefs and rigidity as the way a person addresses a specific task or problem. The experiment consisted of providing a challenging problem to the research subjects that required them to overcome both individual beliefs and systems of beliefs. Subjects completed the thinking disposition tools known as the Dogmatism Scale and the Rigidity Scale.

Rokeach described the experiment this way:

> We will attempt to demonstrate experimentally this aspect of dogmatism - and how it is distinguished from rigidity - by presenting subjects *(Ss)* with a cognitive task which, if it is to be solved, involves the successful completion of two discrete stages of the problemsolving process: *(a)* the overcoming of several sets (or beliefs, or expectancies) and *(b)* the integration of new sets - after the older ones have been overcome - into the problem solution.[61]

The findings demonstrated that individuals with different scores on the Rigidity Scale and Dogmatism Scale did perform differently in the task. Those with a higher degree of dogmatism had greater difficulty integrating multiple new concepts into the solution. Those with a higher degree of rigidity had greater difficulty integrating single new concepts.

1. The construct of dogmatism, and its operational definition by means of the scale designed to measure it, can now with some empirical validity be said to deal with cognitive *systems* of expectancies, and the extent to which such systems are organized in an open or closed manner. This is evidenced by the differential responses of the High and Low Dogmatic Groups to a cognitive task especially designed to bring out this distinguishing property of the construct of dogmatism. While high and low scorers in dogmatism, as has been seen, are not found to differ significantly from each other in ease of overcoming single sets, they do appear to differ from each other in ease of integrating several sets into a new cognitive system. The greater difficulty manifested by the High Dogmatic Group in integrating newly arrived at sets into a new system can be seen as a function of the stronger operation of systems of older sets organized into relatively more closed systems.

2. The findings lend further empirical support to the theoretical distinction drawn between the constructs of dogmatism and rigidity. As has been shown, high and low scorers on rigidity are differentiated on measures involving the overcoming of single sets but not on measures involving the integration of such sets.

3. Finally, the findings suggest that individual differences in personality organization play an important role in problem-solving behavior. This is indicated by the fact that differential responses to the Denny Doodlebug Problem can be systematically related to differential responses to the two personality scales employed in this study.[62]

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[61] Rokeach, M., McGovney, W.C. & Denny, M.R. "A Distinction between Dogmatic and Rigid Thinking," *Journal of Abnormal and Social Psychology,* Vol. 51, No. 1, 1955, p. 87.
[62] Rokeach et al. p.92.

A 2006 report on dogmatism included descriptions of the impact of dogmatism in every day reasoning. For example:

> More recently, Palmer and Klain (1985) reported that the individuals high in dogmatism attempt to avoid information that is inconsistent with their belief systems, and they react to inconsistent information by minimizing or ignoring it. Leone (1989) reported that as the opportunity for thoughts increases, dogmatic people are more likely to polarize their attitudes, and hold more attitude-consistent beliefs and fewer attitude-inconsistent beliefs. Davies (1993) investigated the effect of dogmatism on the persistence of beliefs when facing discredited evidence. Davies (1998) also investigated the effect, of dogmatism on belief formation and reported that high dogmatics produced more consistent reason generation than inconsistent reasons compared to low dogmatics.[63]

*NFC:* Psychologist John Cacioppo et al. have investigated the impact of the thinking disposition known as the NFC since the 1980s. In a report summarizing the results of multiple studies using their NFC Scale (a thinking disposition assessment tool) they reported a number of interesting impacts:

> Another key set of distinctions between individuals high and low in N is that the former enjoy effortful reasoning and problem solving more and are less stressed by cognitively effortful problems, complex life circumstances, or cognitively demanding tasks.[64]

> A meta-analytic comparison of the overall difference in recall between participants high and low in need for cognition across all of these studies demonstrated that, in general, individuals high in need for cognition recall more of the information to which they are exposed than individuals low in need for cognition $(d = .355, p < .001$; see Table 3).[65]

> In sum, research manipulating the quality of the arguments in a persuasive message strongly indicates that individuals high in need for cognition are more likely to exert the cognitive effort necessary to process the substantive merits of the information to which they are exposed than are individuals low in need for cognition.[66]

> Several tests have been reported of the hypothesis that individuals high in need for cognition are more likely to generate issue- or task-relevant thoughts than individuals low in need for cognition.[67]

A recent experiment by Savia Coutinho investigated the impact that NFC has on intellectual performance. This study also compared NFC with metacognition. Coutinho described metacognition this way:

> Metacognition refers to one's ability to know and regulate cognitive processes (Schraw & Moshman, 1995). Flavell (1979) conceptualized metacognition as "knowledge and

Shearman, S.M. & Levine, T.R. "Dogmatism Updated: A Scale Revision and Validation," *Communication Quarterly,* Vol. 54, No. 3, 2006, p. 276.

[64] Cacioppo, J.T., Petty, R.E., Feinstein, J.A. & Jarvis, W.B.G. "Dispositional Differences in Cognitive Motivation: The Life and Times of Individuals Varying in Need for Cognition," *Psychological Bulletin,* Vol. 119, No. 2, 1996, p. 215.

[65] Cacioppo et al. p. 229.

[66] Cacioppo et al. pp. 229-230.

[67] Cacioppo et al. p. 231.

cognition about cognitive phenomena." Simply stated, metacognition is thinking about your thinking.[68]

The results of the experiment confirmed the value of NFC:

> This study examined the relationship between the need for cognition and metacognition and how these variables relate to intellectual task performance. Students completed items from the GRE analytical subtest and this was used as a measure of intellectual task performance. Only the need for cognition was a significant predictor of performance. Students who had a strong desire to understand and solve complex problems tended to respond accurately to these problems. Metacognition did not appear to benefit students in performance terms as students with good metacognition did not score significantly better than students with poor metacognition.[69]

Petty et al. summarized several decades of research into the NFC in 2009 and described the impact of the thinking disposition this way:

> At the most basic level, NC affects the amount of thought that goes into a decision. Thus those high in NC tend to think more about available options prior to making a decision (Levin, Huneke, & Jasper, 2000) and are more likely to search for additional information before coming to a judgmental conclusion (Yang & Lee, 1998).[70]

Petty et al. also noted that individuals high in NFC are not immune to bias in their thinking.

> Across a variety of studies, those low in NC tend to show greater amounts of bias when this bias is created by a reliance on mental shortcuts. Alternatively, when the bias is created through effortful thought, individuals high in NC tend to be more strongly affected. When a bias can come about through either route, individuals both low and high in NC can show the effect, but it will be produced by different mechanisms.[71]

*NFC Closure*: The need for cognitive closure appears to be a situation-dependent thinking disposition. Psychologists Webster and Kruglanski reported on a number of factors that have an impact on the NFC closure:

> Thus, Kruglanski and Freund (1983) found that elevating the need for closure through time pressure increased subjects' tendency to succumb to primacy effects in impression formation, render stereotypically driven judgments, and anchor judgments on initial estimates, all presumed to represent various effects of the need for closure on the judgmental process. Similar time pressure effects were obtained in research by Freund, Kruglanski, and Schpitzajzen (1985), Heaton and Kruglanski (1991), Jamieson and Zanna (1989), and Sanbomatsu and Fazio (1990).

> Webster (1993) manipulated the need for closure through varying the perceived attractiveness of an attitude-attribution task (Jones & Harris, 1967). When the task was perceived as unattractive (rendering extensive processing of relevant information costly),

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[68] Coutinho, S.A. "The Relationship between the Need for Cognition, Metacognition and Intellectual Task Performance," *Educational Research and Reviews,* Vol. 1, No. 5, 2006, p. 162.
[69] Coutinho p. 164.
[70] Petty, R.E., Brinol, P., Loersch, C. & McCaslin, M.J. "The Need for Cognition," in *Handbook of Individual Differences in Social Behavior*, eds. M.R. Leary & R.H. Hoyle, Guilford Press, New York, NY, 2009, p. 322.
[71] Petty et al. p. 323.

subjects were more likely to exhibit the "correspondence bias" than when the task was perceived as moderately attractive.  Furthermore, when the task was perceived as highly attractive (reducing the perceived costs of information processing), the tendency to exhibit the correspondence bias was all but eliminated.[72]

Webster and Kruglanski summarized the findings from multiple experiments:

> In the realm of social cognition, for example, the need for closure was found to affect, among others, persons' tendency to (a) use stereotypes or render judgments in a category-based versus attribute-based fashion (Fiske & Neuberg, 1990; Jamieson & Zanna, 1989; Kruglanski & Freund, 1983, Study 2), (b) exhibit construct-accessibility effects in interpreting ambiguous information (E. P. Thompson, Roman, Moskowitz, Chaiken, & Bargh, 1993), (c) exhibit correspondence bias in person perception (Webster, 1993), and (d) conduct social comparisons with similar versus dissimilar others (Kruglanski & Mayseless, 1987).  In the realm of social interactions, the need for closure was found to affect (a) persons' readiness to be persuaded by their partners (Kruglanski et al., 1993) and (b) group members' tendency to react with rejection to opinion deviates (Kruglanski & Webster, 1991).[73]

***Actively Open-Minded (AOT) Thinking:***  Psychologist Keith Stanovich and colleagues have conducted experiments into the impact of thinking dispositions on cognitive performance for many years. The experiments have repeatedly demonstrated that when individuals with similar intelligence levels (IQ) are faced with the same problem, those who have thinking dispositions that lead to stronger cognitive effort perform better.  An early experiment conducted by Stanovich and West in 1997 focused on the impact of open-mindedness.  They assessed individual biases on different arguments as a separate step in the experiment.  The researchers then asked participants to provide SAT scores and complete a vocabulary test to identify relative IQ.  Finally, participants were asked to complete an assessment developed by the researchers called the Thinking Dispositions Questionnaire to assess various dispositional characteristics. Stanovich and West combined several of the individual dispositional characteristics into one composite outcome score they called the AOT score:

> Because several of the scales displayed moderate intercorrelations (see Appendix B), a composite actively open-minded thinking (AOT) score was formed by summing the scores on the Flexible Thinking, Openness-Ideas, and Openness-Values scales and subtracting the sum of the Absolutism, Dogmatism, and Categorical Thinking scales. Thus, high scores on the AOT composite indicate openness to belief change and cognitive flexibility, whereas low scores indicate cognitive rigidity and resistance to belief change.[74]

Their results demonstrated that thinking dispositions accounted for differences in cognitive performance independent of the SAT, their measure of intelligence in this experiment[75]:

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[72] Webster, D.M. & Kruglanski, A.W. "Individual Differences in Need for Cognitive Closure," *Journal of Personality and Social Psychology,* Vol. 67, No. 6, 1994, pp. 1049-1050.

[73] Webster & Kruglanski, p. 1061.

[74] Stanovich, K.E. & West, R.F. "Reasoning Independently of Prior Belief and Individual Differences in Actively Open-Minded Thinking," *Journal of Educational Psychology,* Vol. 89, No. 2, 1997, p. 347.

[75] Stanovich and West used a tool called the argument evaluation test, referred to as the AET in this quote, to measure the research subjects' critical thinking abilities.

The criterion variable in the series of hierarchical regression analyses presented in Table 2 was the beta weight for argument quality on the AET. Entered first into the regression equation was the SAT total score which, not surprisingly, given the results displayed in Table 1, accounted for a significant proportion of variance.[4] However, listed next are alternative second steps in the hierarchical analysis. As the table indicates, the AOT composite score accounted for significant variance in performance on the AET even after SAT scores were entered into the equation—as did scores on the superstitious thinking, outcome bias (a measure of decontextualization), and counterfactual thinking (a measure of perspective switching) measures. Thus, the linkage between thinking dispositions and performance on the AET illustrated in Table 1 is not entirely due to covariance with cognitive ability. Various measures of thinking dispositions are predictors, independent of SAT scores.[76]

Stanovich and his colleagues have continued experiments into the impact of thinking dispositions on cognitive performance to the present time. He summarized years of experiments in his 2010 book entitled *What Intelligence Tests Miss: the Psychology of Rational Thought*.

In my own laboratory, we have developed an argument evaluation task in which we derive an index of the degree to which argument evaluation is associated with argument quality independent of prior belief.[16] Intelligence did in fact correlate with the ability to avoid belief bias in our task. Nonetheless, we have consistently found that, *even after statistically controlling for intelligence,* individual differences on our index of argument-driven processing can be predicted by a variety of thinking dispositions, including: measures of dogmatism and absolutism; categorical thinking; flexible thinking; belief identification; counterfactual thinking; superstitious thinking; and actively open-minded thinking.[77]

***Ambiguity Tolerance (AT)/Intolerance***: In 1995 Furnham and Ribchester summarized five decades of research into ambiguity tolerance in individuals and organizations. They noted:

Ambiguity tolerance (AT) refers to the way an individual (or group) perceives and processes information about ambiguous situations or stimuli when confronted by an array of unfamiliar, complex, or incongruent clues. AT is a variable that is often conceived on an unidimensional scale. The person with low tolerance of ambiguity experiences stress, reacts prematurely, and avoids ambiguous stimuli. At the other extreme of the scale, however, a person with high tolerance for ambiguity perceives ambiguous situations/stimuli as desirable, challenging, and interesting and neither denies nor distorts their complexity of incongruity.[78]

The authors noted that some evidence exists that using ambiguity tolerance during personnel selection is valuable:

The application of an AT concept or use of any of the measures in management selection, training, or education is surprisingly limited. Where good research has been done with representative samples and robust and realistic dependent measures, AT has proven to be

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[76] Stanovich & West, p. 349.
[77] Stanovich, K.E. *What Intelligence Tests Miss: The Psychology of Rational Thought,* Yale University Press, New Haven, CT, 2009, p. 34.
[78] Furnham, A. & Ribchester, T. "Tolerance of Ambiguity: A Review of the Concept, its Measurement and Applications," *Current Psychology,* Vol. 14, No. 3, 1995, p. 179.

a highly predictive individual difference variable. Clearly, individuals with low AT appear to be more sensitive to stress, more risk averse, and more sensitive to particular kinds of feedback.[79]

### 4.2.3.   Summary:  Thinking Dispositions and Cognitive Performance

It is clear that thinking dispositions are a trigger for cognitive activity.  When an individual is *disposed* to think, he or she makes the effort to engage cognitively.  The specific thinking dispositions possessed by the individual and the relative strength of these individual dispositions influence the degree to which an individual makes an effort to:

- Engage cognitively at all
- Override personal beliefs and biases to ensure an open-minded approach to the task
- Thoroughly investigate a situation in order to find relevant information and to look at all sides of an issue
- Avoid premature closure of the thinking task and to tolerate the lack of a clear answer (ambiguity) while investigation continues
- Reach a conclusion only after finding sufficient evidence to support the conclusion

If we can determine how to assess an analyst's thinking dispositions, evaluating thinking dispositions could be a valuable part of selecting intelligence analysts.  In the next section we'll explore the assessment tools that might be used during intelligence analysis selection.

### 4.3      Assessing Thinking Dispositions

This section of the report addresses the question of how to determine the relative strength of an individual's thinking dispositions.  We'll explore the following questions:

- Can thinking dispositions be assessed?
- Do reliable and valid assessment methods exist?
- What evidence exists that supports the value of thinking disposition assessments?

I found that the following assessments do make some reference to thinking dispositions:

- CCTDI
- AOT Scale
- Thinking Dispositions Questionnaire
- NFC Scale
- NFC Closure Scale
- Dogmatism Scale
- Rigidity Scale/Flexibility Scale
- Tolerance of Ambiguity
- Cognitive Reflection Test

Of these assessments, only the CCTDI is commercially available.  The remaining assessments were developed by individual researchers for use in specific experiments.  Some of the

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[79] Furnham & Ribchester, p. 193 .

researchers included the actual assessment in their reports; other assessments were only described. Since these assessments were developed primarily for use in experiments, many of the assessments evolved over time. Additionally, for some thinking dispositions, different researchers developed their own assessments so that one thinking disposition might be assessed in multiple ways. Therefore it was sometimes difficult to find a definitive version of an assessment.

In this section of the report I provide:

- A brief description of each assessment

- Sample questions when samples were available

- Evaluations of the assessment in order to provide a non-biased view of the assessment usefulness. Note that I was not always able to find independent evaluations for all assessments.

### 4.3.1. CCTDI

Peter Facione of Insight Assessments was the primary developer of the CCTDI. As the only commercially available thinking dispositions assessment, far more has been written about this assessment than any other assessment. Because it is a commercial product, Facione has made every effort to demonstrate its reliability, validity, and usefulness.[80] Additionally, the CCTDI is a broad assessment whose goal is to provide a holistic evaluation of all of the dispositions believed to be needed by an effective critical thinker.

The CCTDI grew out of the APA study that created the consensus definition of critical thinking. As one component of their work, the participants defined the characteristics of the ideal critical thinker:

> The ideal critical thinker is habitually inquisitive, well-informed, trustful of reason, open-minded, flexible, fair-minded in evaluation, honest in facing personal biases, prudent in making judgments, willing to reconsider, clear about issues, orderly in complex matters, diligent in seeking relevant information, reasonable in the selection of criteria, focused in inquiry, and persistent in seeking results which are as precise as the subject and the circumstances of inquiry ' permit.[81]

Facione explained why this was a good starting point for developing critical thinking assessments:

> The process of developing a good educational assessment tool of any kind begins with the construct, or idea, that one seeks to measure. The construct-validity of the instrument depends on how well that idea has been articulated and how well the tool captures that idea. The Delphi Report provided a wonderful opportunity for tool development, since it

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[80] See Facione, P.A. & Facione, N.C. *California Critical Thinking Disposition Inventory (CCTDI) Test Manual,* California Academic Press, Millbrae, CA, 2010.

[81] Facione, P.A. *Critical Thinking: A Statement of Expert Consensus for Purposes of Educational Assessment and Instruction. Research Findings and Recommendations,* American Philosophical Association, Newark, DE, 1990, p. 3.

The CCTDI evaluates the strength of an individual's disposition toward:

**Truth-Seeking:** Truth-seeking is the habit of always desiring the best possible understanding of any given situation; it is following reasons and evidence wherever they may lead, even if they lead one to question cherished beliefs.  Truth-seekers ask hard, sometimes even frightening questions; they do not ignore relevant details; they strive not to let bias or preconception color their search for knowledge and truth.  The opposite of truth-seeking is bias which ignores good reasons and relevant evidence in order not to have to face difficult ideas.

**Open-Mindedness:** Open-mindedness is the tendency to allow others to voice views with which one may not agree.  Open-minded people act with tolerance toward the opinions of others, knowing that often we all hold beliefs which make sense only from our own perspectives.  Open-mindedness, as used here, is important for harmony in a pluralistic and complex society where people approach issues from different religious, political, social, family, cultural, and personal backgrounds.  The opposite of open-mindedness is closed-mindedness and intolerance for the ideas of others.

**Analyticity** also describable as **Foresightfulness:** Analyticity is the tendency to be alert to what happens next.  This is the habit of striving to anticipate both the good and the bad potential consequences or outcomes of situations, choices, proposals, and plans.  The opposite of analyticity is being heedless of consequences, not attending to what happens next when one makes choices or accepts ideas uncritically.

**Systematicity:** Systematicity is the tendency or habit of striving to approach problems in a disciplined, orderly, and systematic way.  The habit of being disorganized is the opposite characteristic to systematicity.  The person who is strong in systematicity may or may not actually know or use a given strategy or any particular pattern in problem solving, but they have the mental desire and tendency to approach questions and issues in such an organized way.

**Critical Thinking Self-Confidence:** The tendency to trust the use of reason and reflective thinking to solve problems is reasoning self-confidence.  This habit can apply to individuals or to groups; as can the other dispositional characteristics measured by the CCTDI.  We as a family, team, office, community, or society can have the habit of being trustful of reasoned judgment as the means of solving our problems and reaching our goals.  The opposite is the tendency to be mistrustful of reason, to consistently devalue or be hostile to the use of careful reason and reflection as a means to solving problems or discovering what to do or what to believe.

**Inquisitiveness:** Inquisitiveness is intellectual curiosity.  It is the tendency to want to know things, even if they are not immediately or obviously useful at the moment.  It is being curious and eager to acquire new knowledge and to learn the explanations for things even when the applications of that new learning are not immediately apparent.  The opposite of inquisitiveness is indifference.

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[82] Facione, P.A., Facione, N.C. & Giancarlo, C.A. "The Disposition Toward Critical Thinking: Its Character, Measurement, and Relationship to Critical Thinking Skill," *Informal Logic,* Vol. 20, No. 1, 2000, p. 12.

**Judiciousness** also called **Maturity of Judgment:** Cognitive maturity is the tendency to see problems as complex, rather than black and white. It is the habit of making a judgment in a timely way, not prematurely, and not with undue delay. It is the tendency of standing firm in one's judgment when there is reason to do so, but changing one's mind when that is the appropriate thing to do. It is prudence in making, suspending, or revising judgment. It is being aware that multiple solutions may be acceptable while appreciating the need to reach closure in certain circumstances even in the absence of complete knowledge. The opposite, cognitive immaturity, is characterized by being imprudent, black and-white thinking, failing to come to closure in a timely way, stubbornly refusing to change one's mind when reasons and evidence would indicate one is mistaken, or foolishly revising one's opinions willy-nilly without substantial reason for doing so.[83]

Since the CCTDI is a commercial product, Insight Assessments protects the contents and has not published a complete list of the questions it contains. However, Facione did include some sample questions in a 1995 article:

Truthseeking

"Everyone always argues from their own self-interest, including me."

"If there are four reasons in favor and one against, I'll go with the four."[84]

Openmindedness:

"It's important to me to understand what other people think about things."

"It concerns me that I might have biases of which I am not aware."[85]

Analyticity

"If bothers me when people rely on weak arguments to defend good ideas."

"People need reasons if they are going to disagree with another's opinion."[86]

Systematicity

"I always focus on the question before I attempt to answer it."[87]

CT Self-Confidence:

"Tests that require thinking, not just memorization, are better for me."

"I take pride in my ability to understand the opinions of others."[88]

Inquisitiveness

"No matter what the topic, I am eager to know more about it,"

"Learn everything you can, you never know when it could come in handy."[89]

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[83] Facione, P.A. & Facione, N.C. *California Critical Thinking Disposition Inventory (CCTDI) Test Manual,* California Academic Press, Millbrae, CA, 2010, pp. 9-10.
[84] Facione, P.A., Sanchez, C. & Facione, N.C. "The Disposition Toward Critical Thinking," *The Journal of General Education,* Vol. 44, No. 1, 1995, p. 8.
[85] Facione et al., pp. 6-7.
[86] Facione et al., p. 8.
[87] Facione et al., p. 7.
[88] Facione et al., p. 9.

Maturity of Judgment:

> "The best argument for an idea is how you feel about it at the moment."

> "Things are as they appear to be."[90]

***What Others Have Written About the CCTDI***:  The Buros Institute of Mental Measurement provides an evaluation of every commercially-available cognitively-oriented assessment. Buros provides one or two separate evaluations for each assessment selected for review.  Two reviewers of the CCTDI expressed several concerns, which are included below.

Carolyn M. Callahan, Professor, Curry School of Education, University of Virginia, wrote:

> The manual is clearly written and the instructions for administration and scoring of the test are easily followed.  Further, the process of translating the point totals into standard scores is easily executed.  However, the interpretation of the resulting standard scores is questionable.  These scores are labeled T-scores in footnotes which describe their derivation, yet they are not derived from z-scores or normative groups.  If the scores are presented as T-scores, there is a danger of misinterpretation of the scores as representative of standing in some normative group.  Further, the authors have presented "cut off scores" based on a theoretical rationale for a positive or negative disposition for critical thinking, but present no empirical evidence that individuals scoring above or below those cutoff scores will be better or worse critical thinkers.  No normative data are provided in the manual and data comparing the percentage of undergraduate and graduate students scoring above and below the cut scores are highly questionable given the small number of post-baccalaureate cases (34).[91]

Salvador Hector Ochoa, Assistant Professor of Educational Psychology at Texas A&M University wrote:

> The content validity of the test is based on claims the items are derived from the consensus of 46 theoreticians regarding the dispositional dimension of critical thinking.  An original set of 150 statements was reduced to 75 based on the psychometric performance of the items on a pilot version of the instrument.  Although the subscales are described in depth, little information is provided on how the characteristics list was translated into the statements on the instrument itself or how these were reviewed for accurate reflection of the characteristic.[92]

A number of studies have also suggested that there are four primary thinking dispositions rather than the seven reported by Facione.  For example, Walsh et al. found only four thinking dispositions through a principal component analysis process similar to Facione's:

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[89] Facione et al., p. 6.

[90] Facione et al., p. 9.

[91]Callahan, C.M. "Test Review of the California Critical Thinking Dispositions Inventory," in *The Twelfth Mental Measurements Yearbook*, eds. J.C. Conoley & J.C. Impara, Retrieved from the Buros Institute's *Test Reviews Online* website: http://www.unl.edu/buros, 1995.

[92] Ochoa, S.H. "Test Review of the California Critical Thinking Dispositions Inventory," in *The Twelfth Mental Measurements Yearbook*, eds. J.C. Conoley & J.C. Impara, Retrieved from the Buros Institute's *Test Reviews Online* website: http://www.unl.edu/buros, 1995.

- Intellectual prowess
- Objectivity
- Systemacity
- Receptivity[93]

### 4.3.2. AOT Scale

The AOT Scale was developed by Keith Stanovich and Richard West to support their experiments on the impact thinking dispositions have on cognitive performance. As noted in the previous section of this report, Stanovich and West combined several subscales to create the overall AOT Scale.

Stanovich and West have modified the assessment over time. These sample questions came from the 2003 version of the AOT Scale:

1. Even though freedom of speech for all groups is a worthwhile goal, it is unfortunately necessary to restrict the freedom of certain political groups.
2. What beliefs you hold have more to do with your own personal character than the experiences that may have given rise to them.
3. I tend to classify people as either for me or against me.
4. A person should always consider new possibilities.
5. There are two kinds of people in this world: those who are for the truth and those who are against the truth.
6. Changing your mind is a sign of weakness.[94]

***What Others Have Written About the AOT Scale:*** Marsh and Pastor of James Madison University provided this evaluation of the AOT Scale:

> The purpose of the current study was to examine the emergent factor structure of Stanovich and West's (2007) AOT scale in an effort to determine whether scores on the AOT accurately represent actively open-minded thinking as conceptualized by Stanovich and West (1997, 2007). Stanovich and West (2007) suggest calculating an AOT scale total score by summing participant responses across item statements originally developed to address six facets of the actively open-minded thinking construct, including, dogmatic thinking, categorical thinking, flexible thinking, openness to values, belief identification, and counterfactual thinking. The suggested calculation of an AOT total score implies that Stanovich and West believe the scale to be unidimensional. However, this does not appear to be the case based upon the findings of the current study. AOT items did not load on the six subscales originally developed by Stanovich and West (2007) nor were they unidimensional; instead, a 4-factor solution emerged.
>
> EFA results not only indicated that calculation of an AOT total score is inappropriate, but that the current version of the Stanovich and West (2007) AOT scale needs to be revised and conceptualization of the actively open-minded thinking construct revisited. Examination of

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[93] Walsh, C.M., Seldomridge, L.A. & Badros, K.K. "California Critical Thinking Disposition Inventory: Further Factor Analytic Examination," *Perceptual & Motor Skills,* Vol. 104, No. 1, 2007, p. 148.
[94] Sá, W., Kelley, C., Ho, C., Stanovich, K.E. & West, R.F. *Composite Actively Open-Minded Thinking Scale -- 11/6/03,* 2003, pp. 1-2.

the AOT inter-item correlation matrix revealed that inter-item correlations were quite low, indicating that the 41 items currently on the AOT scale may be measuring distinct, or seemingly unrelated concepts. Given the low inter-item correlations, it is not surprising that although the EFA resulted in an interpretable 4-factor solution, there were a series of problematic items identified in need of substantial revision or removal (e.g., items that failed to load across factor solutions, items that failed to load on any of the emergent four factors). In addition, the emergent factors failed to adequately represent theorized aspects of actively open-minded thinking (e.g., factor 3 which did not appear to represent a theorized aspect of actively open-minded thinking, factor 4 which only consisted of two items). Moreover, estimates regarding the percentage of variance accounted for in AOT scores by each of the four factors, item communalities, and total variance accounted for in AOT scores by all four factors further support the distinct nature of AOT item statements.[95]

### 4.3.3. Thinking Dispositions Questionnaire

Stanovich and West report that they created an assessment they called the Thinking Dispositions Questionnaire. This assessment incorporates multiple assessments addressing individual characteristics into one composite assessment. Components of the Thinking Dispositions Questionnaire include:

- Flexible Thinking
- Openness-Ideas
- Openness-Values
- Absolutism
- Dogmatism
- Categorical Thinking
- Superstitious Thinking
- Counterfactual Thinking
- Outcome Bias
- Social Desirability Response Bias[96]

This assessment appears to have significant overlap with the AOT Scale. In fact, when I asked Dr. Stanovich for a copy of the Thinking Dispositions Questionnaire, he sent a copy of the AOT Scale.

***What Others Have Written About the Thinking Dispositions Questionnaire***: I found no independent assessments of the Thinking Dispositions Questionnaire.

### 4.3.4. NFC Scale

John Cacioppo and Richard Petty developed the NFC Scale and reported how they developed the scale in a 1982 article entitled "The Need for Cognition." The article abstract provided a useful summary of their work:

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[95] Marsh, K.R. & Pastor, D.A. "Stanovich and West's (2007) Actively Open-Minded Thinking Scale: An Examination of Factor Structure," *Annual Meeting of the Association for Psychological Science,* Washington D.C., May 26-29, 2011, pp. 11-12.

[96] Stanovich, K.E. & West, R.F. "Reasoning Independently of Prior Belief and Individual Differences in Actively Open-Minded Thinking," *Journal of Educational Psychology,* Vol. 89, No. 2, 1997, pp. 346-347.

Four studies are reported in which a scale to assess the need for cognition (i.e., the tendency for an individual to engage in and enjoy thinking) was developed and validated. In Study 1 a pool of items was administered to groups known to differ in need for cognition. Members of a university faculty served as subjects in the high-need-for-cognition group, whereas assembly line workers served as subjects in the low-need-for-cognition group. The criteria of ambiguity, irrelevance, and internal consistency were used to select the items for subsequent studies. A factor analysis was performed on the selected items and yielded one major factor. In study 2 the scale was administered to a more homogeneous population (400 undergraduates) to validate the factor structure obtained in Study 1 and to determine whether the scale tapped a construct distinct from test anxiety and cognitive style. The factor structure was replicated in Study 2, responses to the need for cognition scale were predictably and weakly related to cognitive style, and responses were unrelated to test anxiety. In Study 3, 104 subjects completed need for cognition, social desirability, and dogmatism scales and indicated what their American College Test scores were. Results indicated that need for cognition was related weakly and negatively to being close minded, unrelated to social desirability, and positively correlated with general intelligence. Study 4 replicated the major findings of Study 3 and furnished evidence of the predictive validity of the Need for Cognition Scale: Attitudes toward simple and complex versions of a cognitive task appeared indistinguishable until the subjects' need- for 'cognition was considered. The theoretical utility of the construct and measure of need for cognition are discussed.[97]

The scale initially contained 34 questions. Cacioppo and Petty later condensed it to 18 questions. Sample questions include:

1. I would prefer complex to simple problems.
2. 1 like to have the responsibility of handling a situation that requires a lot of thinking.
3. Thinking is not my idea of fun.
4. I would rather do something that requires little thought than something that is sure to challenge my thinking abilities.
5. I try to anticipate and avoid situations where there is likely chance I will have to think in depth about something.
6. I find satisfaction in deliberating hard and for long hours.[98]

***What Others Have Written About the NFC Scale***:  Ann Bost of Wabash University provided a brief evaluation of the NFC Scale:

> Based on previous research, the Need for Cognition Scale appears to be a valid and reliable measure of individuals' tendencies to pursue and enjoy the process of thinking—that is, of their "need for cognition" (Cacioppo & Petty, 1982; Cacioppo, Petty, Feinstein, & Jarvis, 1996; Cacioppo et al., 1984; Sadowski, 1993; Sadowski & Gulgoz, 1992b). Need for Cognition scores are not influenced by whether an individual is male or female,

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[97] Cacioppo, J.T. & Petty, R.E. "The Need for Cognition," *Journal of Personality and Social Psychology,* Vol. 42, No. 1, 1982, p. 116.

[98] Cacioppo, J.T., Petty, R.E. & Kao, C.F. "The Efficient Assessment of Need for Cognition," *Journal of Personality Assessment,* Vol. 48, No. 3, 1984, p. 307.

or by differences in the individual's level of test-taking anxiety or cognitive style (the particular way that an individual accumulates and merges information during the thinking process).  In general, scores on the Need for Cognition Scale also are not impacted by whether or not the individuals are trying to paint a favorable picture of themselves (Cacioppo & Petty, 1982).[99]

### 4.3.5.     Need for Cognitive Closure Scale (NFCS)

Webster and Kruglanski developed the NFCS and described its development in "Individual Differences in Need for Cognitive Closure."

> In developing the NFCS, our initial item-generation process attempted to capture a broad sense of the construct.  In accordance with the underlying theory (Kruglanski, 1989, 1990a 1990b), we reasoned that the need for closure may express itself in various ways.  Thus, we treated it as a latent variable manifest through different aspects (Carver, 1989).  In particular, we identified five major such aspects assumed to broadly represent the universe of the construct and generated diverse items correspondent with those aspects.[100]

The five major aspects of the need for cognitive closure are: preference for order and structure, discomfort with ambiguity, decisiveness, predictability and close-mindedness.  Sample questions from the NFCS that measure these characteristics include:

1.      I think that having clear rules and order at work is essential for success.
2.      I'd rather know bad news than stay in a state of uncertainty.
3.      I usually make important decisions quickly and confidently.
4.      I don't like to go into a situation without knowing what I can expect from it.
5.      I do not usually consult many different opinions before forming my own view.[101]

***What Others Have Written About the NFCS:***  Although Kruglanski and Webster included reliability and validity information in their article, I found no independent evaluations of the reliability and validity of the NFCS.

### 4.3.6.    Dogmatism Scale

Milton Rokeach developed the Dogmatism Scale and described his approach to the assessment in *The Open and Closed Mind*:

> Our assumption was that if a person strongly agrees with such statements it would indicate that he possesses one extreme of the particular characteristic being tapped, and if he strongly disagrees, that he possesses the opposite extreme. Insofar as possible, we looked for statements that express ideas familiar to the average person in his everyday life.  Some of the statements appearing in the Dogmatism Scale were inspired by spontaneous remarks we overheard being made by persons we thought intuitively to be closed-minded. Above all, each statement in the scale had to be designed to transcend specific ideological positions in order to penetrate to the formal and structural

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[99] Bost, A. The Need for Cognition Scale, Wabash College. Available: http://www.liberalarts.wabash.edu/ncs/, Viewed: July 12, 2011.
[100] Webster, D.M. & Kruglanski, A.W. "Individual Differences in Need for Cognitive Closure," *Journal of Personality and Social Psychology,* Vol. 67, No. 6, 1994, p. 1050.
[101] Webster & Kruglanski, p. 1050.

characteristics of all positions. Persons adhering dogmatically to such diverse viewpoints as capitalism and communism, Catholicism and anti-Catholicism, should all score together at one end of the continuum, and should all score in a direction opposite to others having equally diverse yet undogmatic viewpoints. Thus, it was our hope that the Dogmatism Scale could be employed as a research tool not only in the Western countries but also in the Soviet Union and in other Eastern countries.[102]

The final version of the Dogmatism Scale contained 40 questions. The following are sample questions from the assessment:

1.    Even though freedom of speech for all groups is a worthwhile goal, it is unfortunately necessary to restrict the freedom of certain political groups.

2.    While the use of force is wrong by and large, it is sometimes the only way possible to advance a noble ideal.

3.    It is only natural that a person would have a much better acquaintance with ideas he believes in than with ideas he opposes.

4.    Fundamentally, the world we live in is a pretty lonesome place.

5.    In a heated discussion I generally become so absorbed in what I am going to say that I forget to listen to what the others are saying.

6.    It's all too true that people just won't practice what they preach. [103]

A number of researchers have updated the Dogmatism Scale to shorten it, to make the questions it uses more balanced, and to make the questions more pertinent to modern audiences. For example, Troldahl and Powell developed a shorter version in 1965:

Rokeach recently introduced a theory about different styles of belief systems that people have. The theory is an outgrowth of work on the Authoritarian Personality. The theory has not been utilized much in field studies because the primary measuring instrument, the "dogmatism" scale, contains 40 items. In this article, the authors recommend shorter versions of the dogmatism scale, indicating which items should be used to maintain the reliability of the measuring instrument. The short forms were developed from data collected in two field studies.[104]

The interest in developing a useful Dogmatism Scale continues to the present time. Shearman and Levine proposed a new version of the scale in 2006:

Therefore, based on the observations noted, this study attempts to update the dogmatism scale. This study aims to clarify the conceptualization of dogmatism as a closed cognitive style separate from political connotations, update the scale for practical usage

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[102] Rokeach, M. "The Measurement of Open and Closed Systems," in *The Open and Closed Mind*, ed. M. Rokeach, Basic Books, New York, NY, 1960, p. 72.
[103] Rokeach, pp. 74-76.
[104] Troldahl, V.C. & Powell, F.A. "A Short-Form Dogmatism Scale for Use in Field Studies," *Social Forces,* Vol. 44, No. 2, 1965, p. 211.

with current language and fewer items, examine the scale as a unidimensional construct, and finally conduct validity testing for the revised scale.[105]

Shearman and Levine proposed changes to the scale to accomplish the following:

> The present intention is to make this concept of the closed vs. open nature of cognitive style clear and precise. To this end, four central characteristics of the dogmatic cognitive style are proposed: the degree of open-mindedness verses closed-mindedness, the extent that an individual believes in a single correct view, the extent to which one rejects ideas or viewpoints that are disagreement with one's own opinion, and blind respect or excessive reliance on authority.[106]

***What Others Have Said About the Dogmatism Scale:*** Without a definitive copy of the Dogmatism Scale, it was difficult to find an authoritative independent assessment. I did find a number of justifications for revising the Dogmatism Scale. For example, John Ray wrote:

> Since the publication of the California 'F' scale (Adorno et al., 1950) two major criticisms have been levelled against it as a measure of authoritarianism. 1. That it is ideology specific and slanted so as to cause conservatives automatically to obtain high scores; 2. That its all-positive wording causes acquiescence and authoritarianism to be confounded.

> The first of these criticisms was largely met by the Rokeach (1960) dogmatism scale and Rokeach (1967), claims that his scale is sufficiently free from response bias to render a balanced version unnecessary. Although this may be true to some extent, it does seem desirable to lay the doubts about "the acquiescent personality" completely to rest where-ever it is possible to do so. The voluminous literature on the one-way wording of the 'F' scale is sufficient to inspire in every user of scales the desire to preclude from the beginning a "response set" interpretation of his own results.[107]

### 4.3.7. Rigidity Scale/Flexibility Scale

Gough and Sanford developed a Rigidity Scale that Rokeach described as "widely used" in his 1960 book. The following are some of the questions included in the assessment:

1. I always put on and take off my clothes in the same order.
2. I never miss going to church.
3. I usually check more than once to be sure that I have locked a door, put out a light, or something of the sort.
4. I often find myself thinking of the same tunes or phrases for days at a time.
5. I prefer to stop and think before I act even on trifling matters.[108]

Gough later developed the California Psychological Inventory (CPI), a commercially-available personality assessment. He included the concept of rigid/non rigid thinking in the CPI and labeled the trait as Flexibility. He describes the polar endpoints of the Flexibility Scale as:

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[105] Shearman, S.M. & Levine, T.R. "Dogmatism Updated: A Scale Revision and Validation," *Communication Quarterly,* Vol. 54, No. 3, 2006, p. 379.
[106] Shearman & Levine, p. 379.
[107] Ray, J.J. "The Development and Validation of a Balanced Dogmatism Scale," *Australian Journal of Psychology,* Vol. 22, No. 3, 1970, pp. 1-2.
[108] Rokeach, M., McGovney, W.C. & Denny, M.R. "Dogmatic Thinking Versus Rigid Thinking: An Experimental Distinction," in *The Open and Closed Mind*, ed. M. Rokeach, Basic Books, New York, NY, 1960, pp. 184-185.

Low Flexibility:

> Prefers predictability and consistency, uncomfortable with ambiguity, programmed and planful, well-organized.[109]

High Flexibility:

> Likes change and variety, finds ordinary routine boring, quick-thinking and clever.[110]

Stanovich and West also developed a Flexible Thinking scale as part of their Thinking Dispositions Questionnaire:

> *Flexible Thinking Scale.* We devised the items on the Flexible Thinking scale. The design of the items was influenced by a variety of sources from the critical thinking literature (e.g., Ennis, 1987; Facione, 1992; Nickerson, 1987; Norris & Ennis, 1989; Perkins et al., 1993; Zechmeister & Johnson, 1992) but most specifically by the work of Baron (1985, 1988, 1993). Baron has emphasized that actively open-minded thinking is a multifaceted construct encompassing the cultivation of reflectiveness rather than impulsivity, the seeking and processing of information that disconfirms one's belief (as opposed to confirmation bias in evidence seeking), and the willingness to change one's beliefs in the face of contradictory evidence. There were 10 items on the Flexible Thinking scale,[111]

The following are sample questions from the Flexible Thinking scale:

1. "If I think longer about a problem I will be more likely to solve it;"
2. "Intuition is the best guide in making decisions;"
3. "People should always take into consideration evidence that goes against their beliefs"
4. "There is nothing wrong with being undecided about many issues,"[112]

***What Others Have Written About the Rigidity or Flexible Thinking Scales:*** I found no independent evaluations of the reliability and validity of the independent Rigidity or Flexible Thinking assessments.

### 4.3.8    Tolerance/Intolerance of Ambiguity Assessments

The most widely referenced ambiguity tolerance assessment was developed by Budner in 1962. The assessment is known as the Tolerance of Ambiguity Scale and consists of 16 questions. Some sample questions from this assessment include:

1. An expert who doesn't come up with a definite answer probably doesn't know too much.
2. I would like to live in a foreign country for a while.
3. There is really no such thing as a problem that can't be solved.
4. People who fit their lives to a schedule probably miss most of the joy of living.

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[109] Gough, H.G. & Bradley, P. *CPI 260 Client Feedback Report Example*, CPP, Inc., Mountain View, CA, 2003, p. 8.
[110] Gough & Bradley, p. 8.
[111] Stanovich, K.E. & West, R.F. "Reasoning Independently of Prior Belief and Individual Differences in Actively Open-Minded Thinking," *Journal of Educational Psychology,* Vol. 89, No. 2, 1997, p. 346.
[112] Stanovich & West, p. 346.

5.   A good job is one where what is to be done and how it is to be done are always clear.[113]


Assessments for tolerance of ambiguity have undergone significant revisions over time. Ryden and Rosen developed a new assessment in 1966. McDonald revised this assessment in 1970 by adding four questions to it to create what he called the AT-20. Kirton then developed a consolidated assessment from Budner's and McDonalds's work. He used only the questions from each assessment that his research had proved to be the most useful in distinguishing between tolerance and intolerance for ambiguity. Sample questions from Kirton's assessment include:

1.   There's a right way and a wrong way to do almost everything.
2.   If I were a doctor, I would prefer the uncertainties of a psychiatrist to the clear and definite work of someone like a surgeon or x-ray specialist,
3.   I don't like to work on a problem unless there is a possibility of coming out with a clear-cut and unambiguous answer.
4.   An expert who doesn't come up with a definite answer probably doesn't know too much.
5.   There is really no such thing as a problem that can't be solved.
6.   A good job is one where what is to be done and how it is to be done are always clear.
7.   What we are used to is always preferable to what is unfamiliar.[114]

***What Others Have Written About Tolerance/Intolerance of Ambiguity Assessments:***
*M*cDonald reported positive results for Budner's assessment:

> On the more positive side, the Budner Scale of Tolerance-Intolerance of Ambiguity has shown fairly good internal consistency (Budner, 1962). Reliabilities (alpha coefficients) reported for 13 of his 17 samples ranged from .39 to .62, with a mean of approximately .49.[115]

Benjamin et al. reported:

> Although Budner's (1962) scale is one of the better known and more widely used measures of tolerance for ambiguity (Furnham, 1994), reliability estimates for the measure tend to be inconsistent. When Budner tested his scale on 17 different samples, he reported alpha reliabilities ranging from .39 to .62 (with a mean alpha of .49), indicating that the measure was low in internal consistency. More recently, Sobal and DeForge (1992) reported alphas of .63 and .64 when the measure was administered to their two samples. In addition, Furnham (1994) found that Budner's scale had a lower reliability estimate (a = .59) than two other measures of tolerance for ambiguity. Furnham reported

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[113] Budner, S. "Intolerance of Ambiguity as a Personality Variable," *Journal of Personality*, Vol. 30, No. 1, p. 34.
[114] Kirton, M.J. "A Reanalysis of Two Scales of Tolerance of Ambiguity," *Journal of Personality Assessment,* Vol. 45, No. 4, 1981, p. 411.
[115] MacDonald, A.P. "Revised Scale for Ambiguity Tolerance: Reliability and Validity," *Psychological Reports,* Vol. 26, No. 3, 1970, p. 792.

an alpha of .89 for Norton's (1975) tolerance for ambiguity scale, and an alpha of .78 for Rydell and Rosen's (1966; see also MacDonald, 1970) measure of ambiguity tolerance.[116]

Furnham and Ribchester noted challenges with the concept of tolerance of ambiguity:

> Raphael, Moss, and Cross (1978) offered a very cautionary note that unless one always partials out intelligence, correlates of AT may be illusory. They pointed out that in many studies intelligence is not considered, but where it is shown to correlate significantly with AT, it is rarely covaried out. Indeed, this may be not the only moderator variable of importance in research in this area. However, this very piecemeal research has been handicapped particularly because of the way AT is measured. A variety of questionnaire and experimental methods have been used to classify subjects, and many have dubious psychometric validity. Furthermore, because until recently few concurrent validation studies were done, it was impossible to compare results from different studies (Furnham, 1994). Thus, whereas the vast majority of one-off studies have provided modest confirmatory results for their AT-theory-derived hypotheses, the field has not really progressed through these "correlated" studies.[117]

Several researchers noted overlap with other thinking dispositions. For example, McDonald noted:

> Additional validational evidence was reflected in the significant correlations between the AT-20 and the Rokeach Dogmatism Scale (Form E), the Gough-Sanford Rigidity Scale, and the F Scale.[118]

### 4.3.9. Cognitive Reflection Test (CRT)

The CRT is fundamentally different than previously reported assessments. All assessments so far have been based on self-reporting, with the possibility that subjects could respond with what they believe to be a positive answer. The CRT asks the test subject to perform a cognitive task that appears to be simple but is not. This task is designed to distinguish between people who rush to quick answers from those who are willing to reflect in order to get the right answer. This task-oriented assessment of willingness to reflect before providing an answer appears to be a valuable addition to assessments of thinking dispositions that rely on respondents' self-reporting.

The developer of the CRT, Shane Frederick, explained the theory underlying his assessment.

> Many researchers have emphasized the distinction between two types of cognitive processes: those executed quickly with little conscious deliberation and those that are slower and more reflective (Epstein, 1994; Sloman, 1996; Chaiken and Trope, 1999; Kahneman and Frederick, 2002). Stanovich and West (2000) called these "System 1" and "System 2" processes, respectively. System 1 processes occur spontaneously and do not require or consume much attention. Recognizing that the face of the person entering the classroom belongs to your math teacher involves System 1 processes - it occurs instantly and effortlessly and is unaffected by intellect, alertness, motivation or the difficulty of the

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[116] Benjamin, A.J., Riggio, R.E. & Mayes, B.T. "Reliability and Factor Structure of Budner's Tolerance for Ambiguity Scale," *Journal of Social Behavior and Personality,* Vol. 11, No. 3, 1996, p. 626.

[117] Furnham, A. & Ribchester, T. "Tolerance of Ambiguity: A Review of the Concept, its Measurement and Applications," *Current Psychology,* Vol. 14, No. 3, 1995, p. 184.

[118] MacDonald, A.P. "Revised Scale for Ambiguity Tolerance: Reliability and Validity," *Psychological Reports,* Vol. 26, No. 3, 1970, p. 797.

math problem being attempted at the time.  Conversely, finding $\sqrt{19163}$ to two decimal places without a calculator involves System 2 processes - mental operations requiring effort, motivation, concentration, and the execution of learned rules.[119]

By contrast with the square root example above, Frederick proposed simple questions that have intuitive, but wrong, answers.  He proposed that these simple questions will distinguish between individuals who are willing to make cognitive effort from those who rush to the obvious, intuitive solution.  The CRT consists of three questions:

1. A bat and a ball cost $1.10 in total. The bat costs $1.00 more than the ball. How much does the ball cost? _____ cents

2. If it takes 5 machines 5 minutes to make 5 widgets, how long would it take 100 machines to make 100 widgets? _____ minutes

3. In a lake, there is a patch of lily pads.  Every day, the patch doubles in size. If it takes 48 days for the patch to cover the entire lake, how long would it take for the patch to cover half of the lake? _____ days

Frederick compared the CRT with several other assessments including intelligence measures such as the SAT and the dispositional assessment for need for cognition.

> As expected, all measures correlate positively and significantly with one another.  The moderate correlations suggest that all five tests likely reflect common factors, but may also measure distinct characteristics, as they purport to.  I have proposed that the CRT measures "cognitive reflection"—the ability or disposition to resist reporting the response that first comes to mind.  The NFC is advanced as a measure of someone's "tendency to engage in and enjoy thinking" (Cacioppo and Petty, 1982), but relies on self-reports rather than observed behavior.[120]

Frederick did note a gender related difference in the CRT:

> It appears, instead, that these items measure something that men have more of.  That something may be mathematical ability or interest, since the CRT items have mathematical content, and men generally score higher than women on math tests (Benbow and Stanley, 1980; Halpern, 1986; Hyde, Fennema and Lamon, 1990; Hedges and Nowell, 1995).  However, men score higher than women on the CRT, even controlling for SAT math scores.  Furthermore, even if one focuses only on respondents who gave the wrong answers, men and women differ.  Women's mistakes tend to be of the intuitive variety, whereas men make a wider variety of errors.  For example, the women who miss the "widgets" problem nearly always give the erroneous intuitive answer "100," whereas a modest fraction of the men give unexpected wrong answers, such as "20" or "500" or "1."  For every CRT item (and several other similar items used in a longer variant of the test) the ratio of "intuitive" mistakes to "other" mistakes is higher for women than for men.  Thus, the data suggest that men are more likely to reflect on their answers and less inclined to go with their intuitive responses.[121]

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[119] Frederick, S. "Cognitive Reflection and Decision Making," *Journal of Economic Perspectives,* Vol. 19, No. 4, 2005, p. 26.
[120] Frederick, p. 34.
[121] Frederick, p. 37.

***What Others Have Written About the Cognitive Reflection Test***:  After years of working with self developed thinking disposition assessments, Stanovich et al. used the CRT in their studies of individual differences in reasoning in 2011.  They found it to be an even better predictor of cognitive results than the dispositional assessments they had been using:

> The CRT (Frederick, 2005) is designed to measure the tendency to override a prepotent response alternative that is incorrect and to engage in further reflection that leads to the correct response.  In this study, we showed that the CRT is a more potent predictor of performance on a wide sample of tasks from the heuristics-and-biases literature than measures of cognitive ability, thinking dispositions, and executive functioning.  Although the CRT has a substantial correlation with cognitive ability, a series of regression analyses indicated that the CRT was a unique predictor of performance on heuristics-and-biases tasks. It accounted for substantial additional variance after the other measures of individual differences had been statistically controlled.  We conjecture that this is because neither intelligence tests nor measures of executive functioning assess the tendency toward miserly processing in the way that the CRT does.  We argue that the CRT is a particularly potent measure of the tendency toward miserly processing because it is a performance measure rather than a self-report measure.[122]

### 4.3.10.  Thinking Disposition Assessments and Employee Selection

One of our primary research questions is whether it is feasible and worthwhile to use thinking dispositions as one part of intelligence analyst selection.  We have demonstrated that thinking dispositions do have an impact on cognitive results, thus illustrating the potential applicability of thinking dispositions.  Individuals with stronger positive thinking dispositions tend to have better results on tasks requiring cognitive effort.  We have also found a number of different assessments that can determine the strength of a particular thinking disposition, thus illustrating that the use of an assessment has potential feasibility.  We now turn to how to use assessments in employee selection.

CPP, Inc., provider of the CPI mentioned earlier in this report, developed a white paper on how to use assessments in selecting personnel.  They recommended the following steps in order to develop an appropriate selection assessment:

- **Conduct a job analysis** to identify the personal characteristics and professional competencies required for successful performance in a specific work setting.  The results of the job analysis help determine the actual assessment scales that are included in the selection procedures.

- **Conduct a validity study to** provide empirical support for the accuracy and job-relatedness of the assessment scales.

- **Use results of the job analysis and validity study** to create a personality profile.

- **Conduct adverse impact analyses** to ensure that cutoff scores do not discriminate against any protected demographic group or class.[123]

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[122] Topiak, M.E., West, R.F. & Stanovich, K.E. "The Cognitive Reflection Test as a Predictor of Performance on Heuristics-and-Biases Tasks," *Memory & Cognition,* Vol. 39, No. 7, 2011, p. 1275.
[123]Anderson, M.G. *Personality Assessment in Personnel Selection*, CPP Inc., Mountain View, CA, 2007, pp. 5-6.

Of the assessments reviewed in this report, only the CCTDI was promoted by its authors as useful in employee selection processes.  The CCTDI user's manual states:

> The attitudes and attributes measured by the CCTDI have been endorsed by employers around the world as the attributes desired in representatives of their companies and agencies.  Some agencies have explicit objectives aimed at building a critical thinking culture, and use scores on the CCTDI in conjunction with staff development workshops to engender group discussions about the value of critical thinking.[124]

The Canadian Intelligence Community (IC) is investigating the value of two assessments mentioned in this report: the NFC Scale and the Need for Closure Scale (NFCC), referred to as the NFCC in the following quote:

> Given the nature of these individual differences and the distinct requirements of intelligence analysis, we would expect more successful analysts to score higher than average in the NFC scale and lower in the NFCC scale. McLellan and Mandel (2010b) have begun to assess Canadian intelligence analyst trainees on these two individual differences measures, along with a measures of accuracy and coherence based on the Decision Making Competence index (de Bruin et al. 2007).  The aim of their field research is to test whether or not those individual differences predict coherence and accuracy, and to establish baseline levels for the community, as compared to the general population.  To the best of our knowledge, there have been no efforts to date to correlate these individual differences with performance measures with a sample of intelligence personnel. If proven to be reliable predictors of analysts' decision making performance, then the NFC and NFCC scales may be usefully employed in the analyst selection process. The NFC and NFCC scales may complement the TSD-PI measure recommended by Girard (2010) for the selection process of Intelligence Officers and Intelligence Operators in the Canadian Forces.[125]

An initial report of results was presented at the Annual Southern Ontario Behavioral Decision Research Conference, Toronto, Ontario, Canada in 2010.  Note that Decision Making Competence (DMC) refers to an assessment which was used to provide the outcome benchmark of cognitive performance.

Conclusion:

- Using a sample of intelligence trainees, the current study revealed the predictive value of individual differences in cognitive styles on a measure of decision making that is highly relevant to the tradecraft of intelligence analysis.

- NFC and NFCC—particularly the Closemindedness - predicted performance on framing items of the DMC.

- These findings extend prior research demonstrating the association between cognitive style on judgment and decision making (e.g., Mandel, 2005; Stanovich & West, 2000).

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[124] Facione, P.A. & Facione, N.C. *California Critical Thinking Disposition Inventory (CCTDI) Test Manual,* California Academic Press, Millbrae, CA, 2010, p. 6.

[125] Derbentseva, N., McLellan, L. & Mandel, D.R. *Issues in Intelligence Production: Summary of Interviews with Canadian Managers of Intelligence Analysts,* TR 2010-144, Defence R&D Canada, Toronto, ON, 2010, pp. 47-48.

- Findings from this study may help to inform practices for selecting intelligence analysts within the Canadian Forces, and the Canadian intelligence community more broadly.[126]

The US IC is calling for a more deliberate approach to analyst selection.  Although not specifically mentioning thinking dispositions, Kozlowski wrote about individual differences in the areas of knowledge, skills, abilities, and other characteristics (KSAO).  He appears to be confirming the need for the steps outlined by CPP, Inc.

> People differ from one another on a wide range of characteristics.  Individuals differ on demographic features (e.g., age, sex, race), abilities (e.g., cognitive, physical), and preferences (e.g., personality, values).  The focus from a human resources perspective is on differences in KSAOs (e.g., personality, interests, and values) that are linked to differences in, for example, educational attainment, vocational preferences, job performance, and career success.  At the most basic level, KSAOs are individual differences that contribute to job performance.[127]

Kozlowski further explained KSAOs:

> KSAOs can be divided into those that are stable and those that are malleable.  Stable KSAOs include factors such as cognitive ability, personality, and values that are relatively enduring across the span of adult development.  Malleable KSAOs include factors such as domain knowledge, job-specific skills, and motivational characteristics. For example, cognitive ability, which is a generalized predictor of learning and performance effectiveness and has a high genetic component, is very stable across a person's career (Lyons et al., 2009), whereas domain knowledge and job-specific skills accrue over time through experience and training.[128]

He emphasized the importance of understanding the KSAOs that are needed for the organization through a job analysis.  This is the first step of the CPP process:

> Scientific selection is a well-developed and proven methodology and set of practices that have been in general, though by no means universal, use for a century.  The essence of selection is to assess applicant KSAOs that are predictive of future job performance and then to hire the best applicants.  The development of a selection system has several key steps.  Job analysis is the bedrock of selection system development.  It is a systematic process to identify the important and critical task behaviors that comprise a job and the underlying KSAOs required for effective job performance.[129]

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[126] McLellan, L. & Mandel, D.R. "Cognitive Styles Predict Accuracy and Coherence in Intelligence Analyst's Judgments [Poster Presentation]," *Sixth Annual Southern Ontario Behavioral Decision Research Conference,* Toronto, ON, May 7, 2010, p. 2.

[127] Fingar, T. "Analysis in the U.S. Intelligence Community: Missions, Masters, and Methods," in *Intelligence Analysis: Behavioral and Social Scientific Foundations*, eds. B. Fischhoff & C. Chauvin, National Academies Press, Washington, D.C., 2011, p. 277.

[128] Fingar, p. 277.

[129] Fingar, p. 284.

### 4.3.11.   Summary

Thinking dispositions can be assessed and a variety of different assessments exist that organizations can use for employee selection.  Although not all of the assessments were proven to have outstanding reliability and validity, many were proven to be sufficiently reliable and valid that they have potential for employee selection purposes.

The many thinking disposition assessments provide a useful starting point for the intelligence community to identify the specific assessment or combination of assessments that could predict potential analytic success.  The studies reported in this section and in the previous section (demonstrating the impact of thinking dispositions on cognitive performance) provide models for studies designed to identify:

- What specific thinking dispositions provide the most useful prediction of analytic success?

- Which of these assessments are most useful in identifying individuals who have the cognitive dispositions that lead to contribute to effective analytic performance?

In the next section of the report we will address a part of the first step of the CPP, Inc. process and the process described by Kozlowski.  We'll investigate the traits and characteristics of successful analysts to see how these map to thinking dispositions.

### 4.4   Thinking Dispositions Compared to the Traits and Characteristics of Effective Intelligence Analysts

With our discussion of thinking disposition concepts and value now complete, we turn our attention to how thinking dispositions might relate to intelligence analysis.  What are the accepted traits and characteristics of intelligence analysts and how do these compare to thinking dispositions?

Although authors and organization have compiled many lists of analyst characteristics or attributes over the years, only one document in the intelligence analysis literature explicitly discusses thinking dispositions.  David Moore, in *Critical Thinking and Intelligence Analysis*, describes dispositions related to critical thinking.  Moore quoted from the list of dispositions provided by the Foundation for Critical Thinking and by Facione[130] and noted:

> Both sets closely match the characteristics of successful intelligence analysts identified by Lisa Krizan and the author in their work on intelligence analysts' core competencies. Krizan and the author observe that successful intelligence analysts are insatiably curious. Fascinated by puzzles, their high levels of self-motivation lead them to observe and read voraciously, and to take fair-minded and varied perspectives.[131]

In this section of the report, we explore how the IC describes analyst characteristics.  We then compare these descriptions with what we have learned about thinking dispositions.

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[130] See Table 1 of this report for the thinking disposition lists referenced in this paragraph.

[131] Moore, D.T. *Critical Thinking and Intelligence Analysis,* Joint Military Intelligence College, Washington, D.C., 2006, p. 16.

### 4.4.1.  Intelligence Analyst Characteristics

Many documents described the skills needed and tasks performed by intelligence analysts.  I concentrated on finding descriptions of cognitive characteristics that appeared to be similar to thinking dispositions or that were focused specifically on cognitive aspects of analysis.

Clauser and Weir described characteristics of the intelligence researcher in 1976.  These characteristics resemble our lists of thinking dispositions and include:

- Reasoning ability
- Accuracy
- Intellectual honesty
- Open-mindedness
- Skepticism
- Detachment
- Patience, diligence, perseverance
- Imagination[132]

A 1976 IC research project identified the following characteristics of the ideal intelligence analyst.  The purpose of the study was to develop an understanding of the cognitive processes that are required for intelligence analysis.  The attributes in this study have little in common with thinking dispositions.

> The attributes of the ideal analyst offered by analysts interviewed during the course of this project are summarized as follows. The ideal analyst:

- Is a technologist
- Is focused (either a specialist or generalist, not both).
- Is an information entrepreneur (as described earlier).
- Is comfortable with changing roles as apprentice, peer, trainer, or consultant.
- Can communicate (written and oral).
- Is a detective
- Is imaginative
- Is self-starting, self-organizing
- Has a profession (Intelligence analysis).
- Has related hobbies or technology interests.
- Prefers analysis to management.
- Can perform multiple, concurrent activities.
- Is self-confident.
- Has a photographic memory.[133]

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[132] Clauser, J.K. & Weir, S.M. *Intelligence Research Methodology: An Introduction to Techniques and Procedures for Conducting Research in Defense Intelligence,* HRB-Singer, State College, PA, 1976, pp. 48-60.
[133] Sullivan, M. "Internal Recruiting for an Intelligence Analyst," *SCIP.online,* Vol. 1, No. 13, 2002, pp. 5-5 – 5-6.

Fischl and Gilbert investigated whether the use of cognitive assessments might help in selecting intelligence analysts. They identified the following personal attributes that might predict analytic success:

- High level reasoning ability
- Inductive reasoning
- Intellectual flexibility
- Writing skill
- Memory
- Intellectual curiosity
- Deliberateness, carefulness
- Interpersonal skill
- Achievement motivation
- Self-discipline
- Perseverance[134]

Lisa Krizan included a portrait of intelligence analysts in *Intelligence Essentials for Everyone*. She used the cognitive styles assessment called the Myers-Briggs Type Indicator (MBTI)to describe characteristics of analysts:

> The third component of the intelligence analyst profile, personality traits, addresses the individual's preferences for behaving in certain ways under specific conditions. Adults tend to exhibit the same set of behavior preferences consistently in familiar situations. This behavior pattern may be identified as a personality type. One well-known instrument for identifying an individual's personality type is the Myers-Briggs Type Indicator (MBTI).[104] The following discussion of the intelligence analyst's personality is based upon MBTI research.[135]

> A significant percentage (21 percent) of those who choose to pursue employment in national security intelligence tend to express the following behavior preferences: orientation to the inner world of ideas rather than the outer world of things and people, tendency to gather factual information through the senses rather than inspiration, proclivity to make decisions on the basis of logic rather than emotion, and an eagerness to seek closure proactively instead of leaving possibilities open.[136]

Moore and Krizan wrote a series of articles describing analyst characteristics. The first was written in 2001,[137] the last in 2005.[138] All of their articles included the same model of competencies, as shown in Figure 1.

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[134] Fischl, M.A. & Gilbert, A.C.F. *Selection of Intelligence Analysts*, Army Research Institute for the Behavioral and Social Sciences, Alexandria, VA, 1983, p. 386.

[135] Krizan, L. *Intelligence Essentials for Everyone,* Joint Military Intelligence College, Washington, D.C., 1999, p. 58.

[136] Krizan, p. 59.

[137] Moore, D.T. & Krizan, L. "Intelligence Analysis: Does NSA Have What it Takes?" *Cryptologic Quarterly,* Vol. 20, No. 1-2, 2001, pp. 1-32.

[138] Moore, D.T., Krizan, L. & Moore, E.J. "Evaluating Intelligence: A Competency-Based Model," *International Journal of Intelligence and Counterintelligence,* Vol. 18, No. 2, 2005, pp. 204-220.
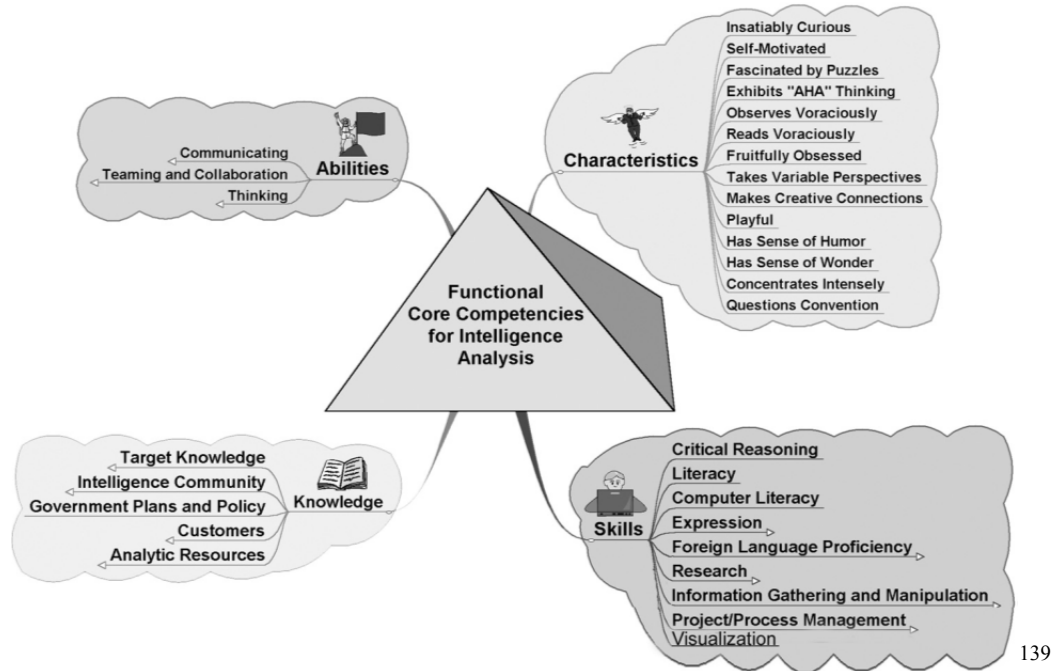
**Figure 1: Core Competencies of Intelligence Analysts**

James Simon emphasized the importance of tolerance of ambiguity in "Analysis, Analysts, and Their Role in Government and Intelligence:"

> I would argue that the greatest predictor of your success as an analyst (not success; that's a poor term, because success is something you have to define for yourself) has to do with how you deal with ambiguity.[140]

Simon described why he thought this thinking disposition was so important in analysis:

> What we're looking for are people who care a great deal about facts, but are willing to reach a conclusion without all the facts. If you wait to have all the facts before you give us an answer, then we will wait for you forever. There are never all the facts in the world of analysis. At some point, you simply must write something or tell someone something, and that brings in judgment, accuracy, and all the other things I've been talking about. You have to be tolerant enough of ambiguity to be willing to speak or write without possession of all the facts.[141]

Although open-mindedness appeared on many lists of analyst characteristics, O'Connor provided a contrary view of the disposition to be open minded:

> Intelligence analysis doesn't involve an open mind. There's no such thing as an open mind, no matter how you define it. Preconceptions are inevitable. Intelligence analysts obtain objectivity by making basic assumptions and reasoning as explicitly as possible.

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[139] Moore & Krizan, p. 206.

[140] Simon, J.M. *Analysis, Analysts, and their Role in Government and Intelligence*, Center for Information Policy Research, Harvard University, Cambridge, MA, 2003, p. 7.

[141] Simon, p. 8.

Validity is obtained by the two-fold process of self-examination (regarding the assumptions made) and making your work challengeable by other analysts (reasoning explicitly).**[142]**

Derbentseva et al. interviewed seven Canadian intelligence professionals to develop a list of skills and characteristics needed for successful analysts. Their list included:

- Ability to deal with uncertainty
- Accurate memory
- Flexibility
- Integrity and moral courage
- Self-starter
- Thirst for knowledge
- Thoroughness[143]

The authors also noted the potential value of recognizing the presence or absence of the need for cognition and the need for cognitive closure during the analyst selection process.

It is interesting to compare intelligence analyst characteristics from a business perspective with those identified by the IC. Mark Sullivan, Manager of Strategic Analysis with General Motors, provided a list of characteristics for intelligence analysts in the business community:

> But, a good intelligence analyst is more than just an analyst. He or she should also have a set of fairly unique personal attributes. Among these are:

- The ability to deal with a high level of ambiguity and lack of structure.
- The ability to be a self-starter.
- The ability to be comfortable and articulate with people in the organization who are considerably more senior then he or she is.
- The ability to get the customer to define what is really needed and why.
- The humility to understand that, as a support person, an intelligence analyst is not an advocate.
- The personal fortitude to push an intelligence finding so that it gets the attention it deserves by senior managers -- even if this means crossing the formal hierarchy of the company.[144]

### 4.4.2.    Comparing Analyst Characteristics with Thinking Dispositions

Table 3 provides a comparison of intelligence analyst characteristics with thinking dispositions. Considerable commonality exists between the two categories.

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[142] O'Connor, T. *Intelligence Analysis. Lecture Notes.* 2004, p. 3.

[143] Derbentseva, N., McLellan, L. & Mandel, D.R. *Issues in Intelligence Production: Summary of Interviews with Canadian Managers of Intelligence Analysts,* TR 2010-144, Defence R&D Canada, Toronto, ON, 2010, pp. 43-44.

[144] Sullivan, M. "Internal Recruiting for an Intelligence Analyst," *SCIP.online,* Vol. 1, No. 13, 2002, p. 2.

**Table 3: Comparison of Analyst Characteristics and Thinking Dispositions**

| Source | Analyst Characteristic | Related Thinking Disposition |
|---|---|---|
| Clauser & Weir | Intellectual honesty<br>Open-mindedness<br>Skepticism<br>Patience, diligence, perseverance | Intellectual honesty<br>Open-mindedness<br>Intellectual skepticism, focus on evidence<br>Persistent |
| Fischl & Gilbert | Intellectual flexibility<br>Intellectual curiosity<br>Deliberateness, carefulness<br>Self-discipline<br>Perseverance | Flexibility, flexible thinking<br>Intellectual curiosity<br>Systematic, intellectually careful<br>Intellectual discipline<br>Persistent |
| Moore & Krizan | Insatiably curious<br>Self Motivated<br>Fascinated by puzzles<br>Observes voraciously<br>Reads voraciously<br>Fruitfully obsessed<br>Takes variable perspectives<br>Concentrates intensely<br><br>Questions conventions | Intellectual curiosity<br>Intellectual discipline<br>Need for cognition<br>Intellectually curious<br>Intellectually curious<br>Truthseeking<br>Intellectual empathy, fairmindedness<br>Think extensively about a problem before responding, Intellectually careful<br>Intellectual autonomy, truth-seeking |
| Simon | Tolerance of ambiguity | Tolerance of ambiguity |
| Derbentseva | Ability to deal with uncertainty<br>Flexibility<br>Integrity and moral courage<br><br>Self-starter<br>Thirst for knowledge<br>Thoroughness<br>Need for cognition<br>Need for cognitive closure | Tolerance of ambiguity<br>Flexibility, flexible thinking<br>Intellectual integrity, truth-seeking, Intellectual honesty<br>Intellectual discipline<br>Intellectual curiosity<br>Systematic, intellectually careful<br>Need for cognition<br>Need for cognitive closure |
| Sullivan | The ability to deal with a high level of ambiguity and lack of structure.<br>The ability to be a self-starter. | Tolerance of ambiguity<br><br>Intellectual discipline |

### 4.4.3.   Summary

Our list of thinking dispositions does not address all of the competencies needed for analysis. Analysts also require specific skills, abilities, and knowledge. However, where scholars described disposition-like attributes of intelligence analysts, significant overlap exists between intelligence analyst attributes and thinking dispositions. It is clear that the thinking dispositions we have identified have been recognized as important contributors to analytic success.

Now that we've explored how thinking dispositions can be potentially valuable contributors to effective analysis, we investigate whether we can strengthen the thinking dispositions of analysts.

## 4.5    Developing and Improving Thinking Dispositions

Recognizing how important strong, positive thinking dispositions are to effective thinking, we now investigate the question of how to strengthen the disposition to think effectively.  We address this objective:

- How is an individual's thinking disposition initially established or subsequently changed?
    - What factors influence the development of various thinking dispositions?
    - Can thinking dispositions be improved with training and education or other factors such as life experience or maturity? What evidence exists for this improvement?

Many scholars identified the culture in which an individual lives as an important contributor to developing thinking dispositions.  For example, a family or society that discourages questioning and investigation causes the individual living in that environment to avoid those behaviors. Perkins, Jay, and Tishman described the impact of the cultural environment this way:

> Emphasis on the dispositional side of thinking implies that development involves more than just the growth of cognitive abilities.  The idiom of traditional developmental psychology, with its focus on the individual's cognitive capacities, concentrates on internally-propelled change.  The growth of dispositions, however, cannot be explained by looking at the individual as a self-contained system.  Because dispositions are grounded in belief systems, values, and attitudes as much as in cognitive structures, we need a culturally based account of their development.  An alternative tradition in developmental psychology, emanating from the work of Vygotsky, acknowledges the role of social and cultural influence on development.  Vygotsky (1978) argues that thinking is a social activity, initially shared between people but gradually internalized in the individual.  Cultural artifacts (language in particular) are experienced through interaction, re-enacted by the individual, and eventually internalized.  In a similar vein, Brown, Collins, and Duguid (1989) call learning a matter of *enculturation*: by observing and living within a particular culture people gradually start to adopt the behavior and belief systems of the culture.[145]

They go on to say:

> At the interpersonal level, children may develop thinking dispositions through social interaction with more experienced members of society (Vygotsky, 1978).  For example, a child whose family members model acceptance of different viewpoints may encourage the development of the disposition to be broad and adventurous.[146]

Although thinking dispositions are attitudinal, the majority of scholars who wrote about thinking dispositions described them as something that could be taught and developed, similar to teaching

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[145] Perkins, D.N., Jay, E. & Tishman, S. "Beyond Abilities: A Dispositional Theory of Thinking," *The Merrill-Palmer Quarterly,* Vol. 39, No. 1, 1993, pp. 16-17.
[146] Perkins et al., p. 17.

and developing skills. However, because thinking dispositions refer to inclinations that are habitual and ingrained, a simple introduction to the concepts of thinking dispositions is unlikely to result in the needed attitudinal or behavior change.

I found two approaches to teaching thinking dispositions:

- Creating a culture in the classroom and in work or life that supports and strengthens positive thinking dispositions in general. The cultural approach emphasizes two aspects: establishing an expectation that positive thinking dispositions will be demonstrated and enabling ongoing opportunities to reinforce the dispositions and make them habitual.
- Explicitly teaching thinking dispositions – developing a curriculum focused specifically on strengthening and practicing one or more dispositional attitudes that support effective thinking.

### 4.5.1.  Creating a Thinking Culture

The importance of the thinking culture was recognized as early as 1901. Nathan Schaeffer described the importance of the teacher in his book *Thinking and Learning to Think*:

> Right here the teacher who is an artist finds the opportunity for the display of his highest skill. It is his privilege to direct the flights and the perchings of the youthful mind. He can shape the thoughts and their sequence. He can cause the intellect to move from the reason to its consequence, or in the reverse direction if that be more natural or more appropriate. He can guide the thought from cause to effect, from the whole to the parts, from the general to the particular, from the end to the means, from the design to its execution; or a movement the other way is possible in each of these categories. While thus choosing the direction which thought shall take, he can select the objects upon which it shall tarry. This directing influence he will often exert when he is not aware of it. His own habits of mind will be reflected in the mental life of his pupils. There was profound philosophy in the reply of a gifted author who, when asked by his daughter what she should study, said, "I am more concerned about the teachers under whom you study than about the branches of study which you may select." Habits of thought depend far more upon the teacher than upon the text-book, upon the quality of the instruction than upon its general content.[147]

John Dewey also emphasized the importance of the teacher in creating a culture for thinking:

> The Training of Thought Is Indirect
>
> For these reasons, the problem of method in forming habits of reflective thought is the problem of establishing conditions that will arouse and guide curiosity; of setting up the connections in things experienced that will on later occasions promote the flow of suggestions, create problems and purposes that will favor consecutiveness in the succession of ideas. These topics will be considered more at length later, but an illustration or two drawn from failure to secure proper conditions will indicate more clearly what is meant. Children are hushed up when they ask questions; their exploring and investigating activities are inconvenient and hence they are treated like nuisances; pupils are taught to memorize things so that merely one-track verbal associations are set

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[147] Schaeffer, N.C. *Thinking and Learning to Think,* L. B. Lippincott Co., Philadelphia PA, 1901, p. 219.

up instead of varied and flexible connections with things themselves; no plans and projects are provided that compel the student to look ahead and foresee and in the execution of which the accomplishment of one thing sets up new questions and suggests new undertakings.  The teacher may devise special exercises intended to train thinking directly, but when these wrong conditions exist, special exercises are doomed to be futile.  The training of thought can be attained only by regulating the causes that evoke and guide it.[148]

Peter Facione emphasized the importance of culture:

Conversations with many around the world seeking to develop or evaluate programs to nurture positive habits of mind lead us to urge that *modeling and cultivating a healthy culture of learning and inquiry* may be as important, or more important, than any instructional content.[149]

Barry Beyer provided a four-part model for creating a classroom culture that strengthens positive thinking dispositions:

Teachers can use at least four techniques to foster development of attitudes associated with thinking:

*1. Model behaviors that demonstrate the desired dispositions*.

Teachers, in their teaching, should suspend judgments until they have as much relevant information as possible and should make deliberate, explicit efforts to secure such information.  They should deliberately seek out a variety of points of view on an issue or topic.  They should articulate a number of alternatives in decision-making situations before considering any and making choices.  They should give their reasoning for their assertions and decisions. In so doing, teachers should explain to their students why they are doing these things, and they need to be sure that students recognize this demonstrating of important aspects of thinking.

*2. Insist on student behavior that reflects the dispositions sought.*

Teachers should require students to exhibit behaviors demonstrate thinking, just as they do.  Students should be required to give reasons for their claims and decisions and to ask others to do the same, to generate alternatives before making choices, to seek out and explore a variety of points of view, to withhold judgment, and so on.  Practice of such behaviors, even if at the insistence of a teacher, can, in time, lead to internalization of the values implicit in these behaviors.

*3. Engage students in repeated activities that require use of these disposition-based behaviors.*

Learning activities must consistently and continuously require students to exhibit behaviors related to effective thinking.  One or two cases, instances, or opportunities to do so over the course of a semester or year are not sufficient even to begin to develop such dispositions.  Teachers must design and carry out activities in which students repeatedly seek out and discuss a variety of points of view, collect additional data,

[148] Dewey, J. *How We Think: A Restatement of the Relation of Reflective Thinking to the Educative Process,* 2nd ed., Regnery, Chicago, IL, 1933, pp. 56-57.
[149] Facione, P.A., Facione, N.C. & Giancarlo, C.A.F. *Professional Judgment and the Disposition Toward Critical Thinking*, California Academic Press, Millbrae, CA, 1997, p. 7.

suspend judgment, and choose from a number of alternatives.  These and related behaviors must be practiced in appropriate places over and over again across many grade levels and in many subjects.

### 4. Reinforce behaviors that demonstrate the appropriate dispositions.

Behaviors illustrative of effective thinking can be reinforced by explaining and demonstrating their value as well as by offering praise, grades, and other reinforcements for them.  Teachers need to take care in so doing, however, to ensure that their reinforcements clearly relate to the behavior, not to the students(s) exhibiting it.  Few, if any, students can be or even may wish to be like another individual, but all can exhibit a valued behavior.[150]

Tishman, Jay, and Perkins made an explicit call for creating a culture that nurtures and strengthens positive thinking dispositions in "Teaching Thinking Dispositions:  From Transmission to Enculturation."  The authors describe traditional teaching methods:

Much of conventional instruction reflects a tacit conception of the teaching-learning process that might be termed the transmission model.  The essence of this model is easily stated:  The teacher's role is to prepare and transmit information to learners.  The learners' role is to receive, store, and act on this information. [151]

The authors note the impact this traditional approach has on thinking dispositions:

One reason to turn to an enculturation model is that some sort of culture in the classroom always exists:  We are enculturating whether we recognize it or not, so we may as well take heed and enculture what we want.  For example, inevitably, the transmission model enculturates certain sorts of inclinations and sensitivities.  Consider a rather rigid version of the model where students' role is to sit quietly and receive the information they need for the test.  In such an environment, an inclination to be passive with respect to knowledge tends to develop.  Students do not become disposed to seek and evaluate information on their own; rather, they learn to count on the environment to automatically feed them information.[152]

They propose a model to explicitly teach for strong, positive thinking dispositions through enculturation:

In any sustained cultural context, be it a third grade classroom, a family setting, or the culture of the workplace, it is useful to think of enculturation as occurring in three mutually reinforcing ways: through cultural exemplars, cultural interactions, and direct instruction in cultural knowledge and activities.  These three aspects of enculturation-exemplars, interaction, and instruction-suggest three straightforward guidelines for organizing teaching:  For each thinking disposition one aims to enculturate, one wants to (a) provide exemplars of the disposition; (b) encourage and orchestrate student-student and teacher-student interactions involving the disposition, and (c) directly teach the disposition.[153]

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[150] Beyer, B.K. *Practical Strategies for the Teaching of Thinking,* Allyn and Bacon, Boston, MA, 1987, pp. 211-213.
[151] Tishman, S., Jay, E. & Perkins, D.N. "Teaching Thinking Dispositions: From Transmission to Enculturation," *Theory into Practice,* Vol. 32, No. 3, 1993, p. 149.
[152] Tishman et al., p. 150.
[153] Tishman et al., p. 150.

Tishman et al. investigated the use of explicit thinking routines in the classroom as tools for building the culture of thinking they recommend. The authors found that thinking routines could instill the sensitivity to notice when thinking is needed and the inclination to think when needed. These thinking routines appear to provide a bridge between the cultural model of teaching thinking dispositions and the explicit model of teaching thinking dispositions. The authors described how they came to develop thinking routines:

> Consequently, an overarching question guiding our work has been: How do we influence and shape classroom culture to reflect a greater focus on thinking?
>
> This principal question led us to explore and identify some of the forces at work in shaping culture. In his ethnographic study of thoughtful classrooms, Ritchhart (Ritchhart, 2002) identified eight forces that shape classroom culture: expectations, time, modeling, routines, opportunities, relationships, physical environment, and language. From these forces, we identified routines as a potentially high-leverage practice for creating more thoughtful classrooms and nurturing students' thinking dispositions. Designing and developing thinking routines for teachers to use provided a very concrete intervention while enabling us to touch on several others of the cultural forces indirectly. Thinking routines focus on the establishment of structures that weave thinking into the fabric of the classroom and help to make the thinking of everyone in the classroom more visible and apparent (Perkins, 2004), thus, they provide models of thinking. Routines also provide a vehicle for incorporating thinking language (Lee, 1997; Tishman & Perkins, 1997) into classrooms as well as time and opportunity for students' thinking. These links to the other cultural forces made thinking routines a strong platform from which to influence classroom culture.[154]

The authors wrote about a number of different thinking routines; Figure 2 provides some examples.[155]

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[154] Ritchhart, R., Palmer, P., Church, M. & Tishman, S. "Thinking Routines: Establishing Patterns of Thinking in the Classroom," *American Educational Research Association Annual Meeting,* San Francisco, CA, April 7-11, 2006, pp. 4-5.

[155] Ritchhart et al., p. 8.

| SEE-THINK-WONDER | CLAIM-SUPPORT-QUESTION |
|---|---|
| 1. What do you see?<br>2. What do you think about that?<br>3. What does it make you wonder? | 1. Make a claim about the topic<br>2. Identify support for your claim<br>3. Ask a question related to your claim |
| CONNECT-EXTEND-CHALLENGE | LOOKING: 10 X 2 |
| 1. How are the ideas and information connected to what you already know?<br>2. What new ideas did you get that extend your thinking in new directions?<br>3. What is still challenging or confusing for you? What questions or puzzles do you now have? | 1. Look image or artifact quietly for at least 30 seconds. Let your eyes wander.<br>2. List 10 words or phrases about any aspect of it.<br>3. Repeat Steps 1 & 2: Look at the image or artifact again and try to list *10* more words or phrases to your list. |
| PERCEIVE-KNOW-CARE ABOUT | THINK-PUZZLE-EXPLORE |
| 1. What can the person or thing perceive?<br>2. What might the person or thing know about?<br>3. What might the person or thing care about? | 1. What do you think you know about this topic?<br>2. What questions or puzzles do you have?<br>3. What does the topic make you want to explore? |

**Figure 2: Sample Thinking Routines**

The authors described the use of these routines in multiple classrooms in several different countries and reported positive outcomes from incorporating the routines into the classroom. The routine referred to in the next quote is Connect-Extend-Challenge (CEC). The authors noted that Mark, the instructor, also had to learn how to use the routine effectively and how to educate the students explicitly in the use of the routine. Mark used the routine to transform not only the culture of the classroom, but the daily practices of student work.

> Mark's observation of students' spontaneous connection making indicates that students' disposition to think are being enhanced. As CEC becomes more a part of their school experience, students are learning more than just how to do an assignment or answer the teacher's questions. Mark observed significant improvement in students' ability over time, but he also noticed that his students were becoming more inclined to look for connections, to see connection making as an important and worthwhile thing to do. In addition, his comments above suggested that students were spotting opportunities for connection making on their own as well. Thus, over time students' ability, inclination, and awareness of connection making, the disposition to make connections, was being enhanced through Mark's use of CEC.[156]

The next example of cultural teaching comes from the world of art. Nancy Lampert noted that education focused on the visual arts includes specific activities that strengthen thinking dispositions supportive of critical thinking.

> For example, in studio critiques a key component of an art student's experience is discussion of the strengths, weaknesses, successes, and failures of their own work, as

---

[156] Ritchhart et al., p. 29.

well as the work of fellow students and that of artists outside the classroom.  It is notable that the very root of the word critique is the same root in the term critical thinking.  Visual art students think critically when discussing each other's work, other artists' work, and when solving the problems of how to visually depict forms and concepts.  No road maps are available to students approaching empty space which must be filled with effective visual communication, or when interpreting other artists' visual messages.  These processes include all of the elements which research has shown impact critical thinking:  independent inquiry, problem solving, interactive discussion and analysis.  Art students continually think heuristically rather than algorithmically when practicing their discipline (Amabile, 1996).[157]

Lampert compared the scores on the CCTDI for arts students and non-arts students.  She found that arts students scored higher in three of the scales of the CCTDI:  truth-seeking, open-mindedness, and critical thinking maturity.  Lampert found that non-arts majors scored higher on the subscale of systematicity.

> The findings of this study show early indications that immersion in a discipline that requires constant heuristic problem solving, inquiry, discussion and analysis may condition the mind to approach experiences with a disposition for accepting that there are many possible solutions to complex problems - in other words, such a discipline may condition the mind to think critically.[158]

Attending college might also be considered a contributor to enculturation about thinking.  Pascarella and Terenzina, as part of their longitudinal meta-analysis of the impact of college, identified the impact college has on thinking dispositions:

> In addition to critical thinking skills, a new line of inquiry in the 1990s estimated the extent to which students develop during college in the disposition to think critically.  Across the studies we uncovered, the senior advantage over first year students in critical thinking disposition was also about .50 of a standard deviation (19 percentile points).[159]

Pascarella and Terenzina also noted that the greatest gain came during the first year of college rather than spread out over all four years.  The final three years supported and sustained positive thinking dispositions rather than further strengthening them.

### 4.5.2.    Explicitly Teaching Thinking Dispositions

Several scholars wrote about experiments in explicitly teaching thinking dispositions.  The first experiment I found was conducted by Edward Glaser in 1941.  Glaser's definition of critical thinking emphasized the importance of the critical attitude:

> The ability to think critically, as conceived in this volume, involves three things: (1) an attitude of being disposed to consider in a thoughtful way the problems and subjects that

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[157] Lampert, N. "Critical Thinking Dispositions as an Outcome of Art Education," *Studies in Art Education,* Vol. 47, No. 3, 2006, p. 224.
[158] Lampert, p. 224.
[159] Pascarella, E.T. & Terenzini, P.T. *How College Affects Students: A Third Decade of Research,* Jossey-Bass, San Francisco, CA, 2005, p. 205.

come within the range of one's experiences, (2) knowledge of the methods of logical inquiry and reasoning, and (3) some skill in applying those methods.[160]

His program addressed all three aspects of his definition. Each lesson plan included Knowledge Objectives, which addressed skills and knowledge as well as Appreciation Objectives which addressed thinking dispositions. The following is a sample of the Appreciation Objectives from Unit 2, Logic and the Weight of Evidence:

> B. Appreciation Objectives
>
> 1. The recognition of the general need of evidence for what we or others believe or question; appreciation of the need for having ground for our opinions, and of asking for evidence before believing assertions from others on matters which are not well established.
>
> 2. Appreciation of the fact that in daily life we must frequently act and make judgments about matters where the evidence one way or another is far from conclusive, and that while we must often act quickly and decisively, we must hold our minds open to other evidence which may later turn up.
>
> 3. Respect for reason and truth as determined by the weight of evidence.[161]

Glaser used six different methods to evaluate the impact of the training, including one to assess student behaviors that correspond with thinking dispositions. This connects his explicit training approach with the cultural approach. Glaser expected the instructors to monitor the culture of the classroom to observe the day-to-day behaviors of the students.

> Teachers' Ratings
>
> It seemed to the author reasonable to expect that after ten weeks of special work in critical thinking, the teachers of the four experimental classes ought to have well-founded impressions concerning the relative abilities manifested by their students. Consequently, a few days after the retesting had been completed, a mimeographed sheet, which is reproduced below, was sent to the teachers of the four experimental classes.
>
> BEHAVIOR NO 1
>
> Does he select significant words and phrases in any statement that is important to him and ask that they be carefully defined? That is, does he show a sensitivity to vague or ambiguous words or phrases and ask just what is meant by them? For example, if someone calls another person a "radical" would he be inclined to ask what is meant by a radical - how can one tell a radical from a non-radical?[162]

The results of Glaser's experiment were positive, showing improvement in both skills and thinking dispositions.

> There is evidence for some students of improvement in general disposition to consider problems thoughtfully, and evidence of ability to think more critically in other classes in school, at home, in connection with personal problems, and in connection with speeches,

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[160] Glaser, E.M. *An Experiment in the Development of Critical Thinking,* AMS Press Inc., New York, NY, 1941, p. 5.
[161] Glaser, p. 99.
[162] Glaser, p. 110.

advertisements, and arguments.  The aspect of critical thinking which appears most susceptible to general improvement is the attitude of being disposed to consider in a thoughtful way the problems and subjects that come within the range of one's experience. An attitude of wanting evidence for beliefs is most subject to general transfer. Development of skill in applying the methods of logical inquiry and reasoning, however, appears to be specifically related to, and in fact limited by, the acquisition of pertinent knowledge and facts concerning the problem or subject matter toward which the thinking is to be directed.  There is no reason to believe, for instance, that the students who gained significantly in critical thinking as measured by the tests are now appreciably more competent to make critical judgments of pieces of art, music, or literature.[163]

Jennifer Reed conducted an experiment to teach critical thinking skills in a college level history class. Although her experiment focused on skills, she assessed the impact of her teaching on both skills and thinking dispositions.  Her experiment consisted of:

Four sections of U.S. History 1877 to the Present participated in this one semester study. Two sections were randomly selected to serve as the experimental group and the other two sections served as the control group.  The experimental group (n = 29) received approximately 90 minutes of explicit instruction distributed over the semester in using Paul's model for critical thinking to analyze and interpret primary source documents.  In addition, the model was integrated into a series of assigned classroom activities.  The control group (n = 23) was taught in a more traditional manner.[164]

Students did improve their critical thinking skills, but Reed found little impact on thinking dispositions:

To test students' dispositions toward critical thinking, students in both groups took the California Critical Thinking Dispositions Inventory during the first two weeks of the course and again during the last week of the course.  Results from statistical analyses of the scores on this instrument showed no significant differences between the experimental and control groups.  Further, posttest means were not significantly different from pretest means in either group (Pretest: Experimental M = 296, Control M = 297; Posttest: Experimental M = 298, Control M = 302).  It appears that taking a single history course that includes explicit instruction in Paul's model but does not emphasize intellectual traits of the critical thinker has no effect on students' dispositions toward critical thinking.[165]

Monash University in Australia has conducted a number of experiments investigating how to teach critical thinking as part of The Critical Thinking Study. In this particular experiment, the researchers investigated whether they could explicitly teach the disposition of open-mindedness. Their experiment consisted of:

AOMT [Actively Open Minded Thinking] Teaching Strategies

**1.** Students were taught about some of the empirical evidence for myside bias and the evidence that AOMT reduces bias and improves thinking.

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[163] Glaser, p. 175.
[164] Reed, J.H. *Effect of a Model for Critical Thinking on Student Achievement in Primary Source Document Analysis and Interpretation, Argumentative Reasoning, Critical Thinking Dispositions, and History Content in a Community College History Course,* Ph.D. dissertation, University of South Florida, 1998, p. xi.
[165] Reed, p. 150.

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**2.** Exercises that focus on the ability of students to find alternative explanations or counter-evidence for a given claim.

**3.** Students taught that good arguments must take into account all the relevant evidence and counter-arguments or possible objections to the reasoning or premises.

**4.** Exercises in which students must criticise arguments in support of their own position on the topic under discussion and suggest evidence or arguments against their position.

**5.** Exercises in which students are instructed not just to pick the answer, but to actively look for evidence against their choice, by carefully considering the alternatives.[166]

To determine the outcome of their experiment, the researchers administered the California Critical Thinking Skills Test (CCTST) and the Graduate Skills Assessment (both focused on thinking skills) and Stanovich and West's Thinking Dispositions Questionnaire (TDQ) to assess open-minded thinking.  All three assessments were administered before and after the training.  The researchers found:

> Results

> Students showed no significant improvement on critical thinking tests scores on either the GSA or CCTST.  Students showed a statistically significant improvement in open-minded attitudes, as measured by the TDQ.[167]

Both the Reed experiment and the Monash study provide evidence for the differentiation between thinking skills and thinking dispositions.  Teaching explicitly for thinking dispositions may not impact skills (Monash) and teaching explicitly for skills may not have an impact on thinking dispositions (Reed).

### 4.5.3.    Summary – Teaching Thinking Dispositions Effectively

It is clear that instruction and practice can strengthen positive thinking dispositions.  Both aspects of training, that is, creating a culture that expects thinking and explicitly teaching for positive thinking dispositions, appear to be valuable.  An individual must be exposed to or made aware of positive thinking dispositions and must also have sufficient opportunity for practice in order for positive thinking dispositions to become entrenched and habitual.

Once the IC identifies and confirms the thinking dispositions with the greatest positive impact, my research shows that it is possible to develop training that instills and reinforces the thinking dispositions needed for effective intelligence analysis.

I did find evidence that work, classroom, and life cultures can have an impact on thinking dispositions and that explicitly training for specific thinking dispositions can strengthen them.  However, I found no long-term follow-up that assessed whether the stronger thinking dispositions demonstrated shortly after an intervention had staying power.  Did the individuals who participated in these training programs continue to have the disposition to engage in effortful thinking?

The impact of the culture on an individual's thinking dispositions also points to the importance of the work environment on cognitive performance.  Ensuring a work environment in the IC that

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[166] The Monash Critical Thinking Study, Monash University. Available: http://arts.monash.edu.au/philosophy/research/thinking/07aomt.php, Viewed: April 12, 2010.
[167] The Monash Critical Thinking Study, Monash University. Available: http://arts.monash.edu.au/philosophy/research/thinking/07aomt.php, Viewed: April 12, 2010.

expects and emphasizes good thinking will reinforce the value of positive thinking dispositions and might ensure that positive thinking dispositions do have staying power.

**5.0    CONCLUSIONS**

**5.1    Findings**

The primary questions guiding this research were:

> What is the value and feasibility of evaluating a candidate's thinking dispositions as one component of intelligence analyst selection?  What is the feasibility of training individuals in order to strengthen their positive thinking dispositions?

Based on the results of this research, I believe it is practical and valuable to use thinking dispositions as one component of intelligence analyst selection.  The research also shows that training intelligence analysts to improve their thinking dispositions can have a positive impact on their cognitive activity.

The findings that contributed to these conclusions include:

1. What are thinking dispositions?
   a. Thinking dispositions represent an individual's inclination toward thinking.  An individual's strength in positive or productive thinking dispositions identifies *whether someone is likely to notice when effortful thinking is required and the degree of inclination to make the effort when thinking is required*.  This description is accepted across academic disciplines and has remained consistent over time.
   b. Thinking dispositions that might be useful for intelligence analysts include:

      - Enjoyment of cognitive effort
      - Intellectual curiosity
      - Open-mindedness
      - Intellectual honesty
      - Tolerant of ambiguity
      - Focus on evidence
      - Persistent
      - Systematic

2. How do thinking dispositions affect cognitive performance?
   a. It is clear that thinking dispositions are a trigger for cognitive activity. When an individual is *disposed* to think, he or she makes the effort to engage cognitively.
   b. The specific thinking dispositions possessed by an individual and the relative strength of individual thinking dispositions influence the degree to which an individual makes an effort to:

      - Engage cognitively at all
      - Override personal beliefs and biases to ensure an open-minded approach to the task
      - Thoroughly investigate a situation in order to find relevant information and to look at all sides of an issue
      - Avoid premature closure of the thinking task and exhibit the willingness to tolerate lack of a clear answer (ambiguity) while investigation continues

- Reach a conclusion only after finding sufficient evidence to support the conclusion
    c. Psychologists who have conducted experiments into cognitive performance have found that thinking dispositions can predict the outcome of cognitive performance after intellectual ability (IQ) has been considered.
3. Can thinking dispositions be assessed? Are there reliable and valid methods for assessment?
    a. Thinking dispositions can be assessed and a variety of different assessments exist.
4. How do thinking dispositions relate to the characteristics, attributes, and traits of intelligence analysts?
    a. Where scholars described disposition-like attributes of intelligence analysts, a significant overlap with thinking dispositions does exist. The thinking dispositions we have identified are recognized as important contributors to analytic success.
5. How are an individual's thinking dispositions established or subsequently changed?
    a. Thinking dispositions are believed to be developed by the environment and culture in which an individual lives. A family or school setting can foster positive or negative thinking dispositions and can strengthen or weaken thinking dispositions by what is modeled, expected, and rewarded in the culture surrounding the thinker.
    b. Positive thinking dispositions can be strengthened by instruction and practice. Both aspects of training, that is, creating a culture that expects effective thinking and explicitly teaching for positive thinking dispositions, appear to be valuable.
    c. One critical success factor appears to be ensuring sufficient practice for the positive thinking dispositions to become entrenched and habitual.
    d. A workplace culture can encourage and strengthen positive thinking dispositions by expecting cognitive behaviors and outcomes that rely on positive thinking dispositions.

## 5.2    Recommendations

In order to gain maximum benefit from the use of a thinking dispositions assessment in the selection of analysts, the IC should:

1. Conduct a comprehensive job analysis to identify the specific traits and characteristics needed by intelligence analysts. Using this job analysis, identify which specific thinking dispositions have the most positive impact on analytic performance.

   Numerous authors have described various traits and capabilities of the ideal intelligence analyst. These traits are, however, anecdotal. The IC should use the existing intelligence literature as a starting point for developing what might be considered a definitive description of the needed competencies and traits of an intelligence analyst. This description should include thinking dispositions.

2. Purchase, adapt, or develop assessments that measure the strength of an individual's thinking dispositions.

   Once an understanding of analyst competencies, dispositions, and other traits exists, develop an assessment that addresses, at a minimum, the thinking dispositions a candidate has. The many assessments found in this study provide a starting point for the IC. Although not all assessments identified in this study were found to be equally reliable and valid, they are a

source of potentially useful questions and approaches that might be included in the selection process for intelligence analysts.

3. Validate that the assessment is useful in identifying individuals with thinking dispositions that have a positive impact on intelligence analysis.

   Because of the potential impact of using a thinking dispositions assessment in intelligence analyst selection, care must be taken to ensure that the assessment tool is valid and useful for selection. Although intelligence analysis does not lend itself to quantitative evaluation such as sales quota achievement, it is possible to experimentally assess the impact of thinking dispositions on an individual's analytic results. The experiments conducted by Stanovich, for example, provide a model for how this might be done. An essential ingredient of the experiment would be a standard repertoire of intelligence problems and databases tailored to the participants' specialties. The experiment would include a solution for each problem that represents the best analysis that can be accomplished given the information in the databases. Experiment facilitators would use these solutions to evaluate each participant's analysis and would be able to compare analytic results with thinking disposition assessment results.

4. Validate that the assessment is fair and does not inappropriately exclude any individual or classes of individuals.

   Ensure that the assessment will meet the "Uniform Guidelines on Employee Selection Procedures" as defined by the Equal Employment Opportunity Commission, the Civil Service Commission, the Department of Labor, and the Department of Justice. These can be found at http://www.uniformguidelines.com/uniformguidelines.html.

5. Strengthen the thinking dispositions of intelligence analysts already at work in the intelligence community by improving intelligence analyst training programs. The goals of these improvement efforts are to ensure that the training culture fosters positive thinking dispositions and includes specific training on thinking dispositions.

6. Ensure the work environment continues the enculturation process through its efforts to expect, strengthen, and reward strong positive thinking dispositions.

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# APPENDIX A - Thinking Dispositions

This table contains lists of dispositions found during the search. **Source** indicates the original source of the definition such as the Foundation for Critical Thinking or the APA study convened by Facione.

| Dispositions | Author/Field | Type of Thinking | Date | Source |
|---|---|---|---|---|
| 1. seven characterological attributes or habits of mind... truth-seeking, open-mindedness, analyticity, systematicity, critical thinking, self confidence, inquisitive ness, and maturity of judgment | Moore IA | Critical | 2006 | Facione |
| 2. According to Richard Paul and Gerald Nosich, the characteristics of critical thinkers include thinking independently, exercising fair-mindedness, developing insight into egocentricity and sociocentricity, developing intellectual humility and suspending judgment, developing intellectual courage, developing intellectual good faith and integrity, developing intellectual perseverance, developing confidence in reason, exploring thoughts underlying feelings and feelings underlying thoughts, developing intellectual curiosity. | Moore IA | Critical | 2006 | Foundation |
| 3. inquisitiveness, systematicity, analyticity, truth-seeking, self-confidence, and maturity (note that author left off "of judgment") | Montgomery Medicine | Critical | 2003 | Facione |
| 4. "the disposition to weigh new evidence against a favored belief heavily (or lightly), the disposition to spend a great deal of time (or very little) on a problem before giving up, or the disposition to weigh heavily the opinions of others in forming one's own" <br><br> Baron (1985,1988) has called such tendencies dispositions toward actively open-minded thinking. Overall, the subscales in this thinking dispositions questionnaire measure the following dimensions: epistemological absolutism, willingness to perspective-switch, willingness to decontextualize, and the tendency to consider alternative opinions and evidence | Stanovich psychology | Rational | 2004 | Baron |
| 5. Need for cognition - a dispositional variable reflecting the tendency toward thoughtful analysis and reflective thinking | Stanovich psychology | Rational | 2004 | Cacioppi |
| 6. Overall, the subscales in this thinking dispositions measure the following dimensions: epistemological absolutism, willingness to perspective-switch, willingness to decontextualize, and the tendency to consider alternative opinions and evidence. Established subscales were included (e.g., Rokeach, 1960) as well as subscales new to the literature (such as an activity open-minded thinking scale based on Baron's 1985a, 1988, work). | Stanovich psychology | Rational | 1999 | Stanovich and various – he listed individual authors with some of the individual dispositions |
| 7. Perhaps the strongest similarities were with the two dispositional factors that Schommer (1990, 1993) | Stanovich psychology | Rational | 1999 | Schommer |

| Dispositions | Author/Field | Type of Thinking | Date | Source |
|---|---|---|---|---|
| called "belief in simple knowledge" and "belief in certain knowledge." | | | | |
| 8. Flexible Thinking Scale, Openness-Ideas, Openness-Values, Absolutism Scale, Dogmatism Scale, Categorical Thinking, (TDC Composite of the previous items), Superstitious Thinking, Counterfactual Thinking, Social Desirability Scale | Stanovich psychology | Rational | 1999 | Stanovich and various – he listed individual author with some of the individual dispositions |
| 9. Willingness to postpone closure<br>Willingness to consider alternative opinions<br>Willingness to consider contradictory evidence<br>Openness<br>Disposition toward absolutism<br>Disposition toward dogmatism<br>Disposition toward categorical thinking<br>Disposition toward counterfactual thinking<br>Disposition toward belief identification<br>Need for cognition | Stanovich psychology | Rational | 1999 | Stanovich and various – he listed individual author with some of the individual dispositions |
| 10. Reflectivity/impulsivity, need for cognition, vigilance, categorical thinking, flexible thinking, counterfactual thinking, and actively open-minded thinking | Stanovich & West Psychology | Rational | 2000 | Stanovich & West |
| 11. actively openminded thinking, absolutism, dogmatism, counterfactual thinking, and belief in the paranormal | Newstead, et al Psychology | Rational | 2004 | Stanovich & West |
| 12. Actively open minded thinking, counterfactual thinking, absolutism, dogmatism, paranormal beliefs, social desirability response<br>Together they made up what he called the thinking dispositions composite | Stanovich and West Psychology | Rational | 1998 | Stanovich |
| 13. Cognitive confidence, reflectivity, need for cognition, ideational generativity, dispositions toward confirmation bias and premature closure, etc. | Stanovich and West Psychology | Rational | 1998 | Oatley and Overton |
| 14. Flexible thinking, openness – ideas, openness – values, absolutism, dogmatism, categorical thinking, superstitious thinking, counterfactual thinking, outcome bias (indicator of disposition for decontextualization), social desirability response bias,<br>Composite actively open-minded thinking consist of summing the scores on the Flexible Thinking, Openness-Ideas, and Openness-Values scales and subtracting the sum of the Absolutism, Dogmatism, | Stanovich and West Psychology | Rational and critical | 1997 | Stanovich |

| Dispositions | Author/Field | Type of Thinking | Date | Source |
|---|---|---|---|---|
| and Categorical Thinking scales. | | | | |
| 15.   1. *The disposition to be broad and adventurous*: the tendency to be open-minded, to explore alternative views; an alertness to narrow thinking; the ability to generate multiple options. <br> 2. *The disposition toward sustained intellectual curiosity*: the tendency to wonder, probe, find problems; a zest for inquiry; an alertness for anomalies; the ability to observe closely and formulate questions. <br> 3. *The disposition to clarify and seek understanding*: a desire to understand clearly, to seek connections and explanations; an alertness to unclarity and need for focus; an ability to build conceptualizations. <br> 4. *The disposition to be planful and strategic*: the drive to set goals, make and execute plans, envision outcomes; alertness to lack of direction; the ability to formulate goals and plans. <br> 5. *The disposition to be intellectually careful*: the urge for precision, organization, thoroughness; an alertness to possible error or inaccuracy; the ability to process information precisely. <br> 6. *The disposition to seek and evaluate reasons*: the tendency to question the given, to demand juslification; an alertness to the need for evidence; the ability to weigh and assess reasons. <br> 7. *The disposition be metacognitive*: the tendency to be aware of and monitor the flow of one's own thinking; alertness to complex thinking situations; the ability to exercise control of mental processes and be reflective. | Tishman, Jay, Perkins Education | Good thinking | Summer 1993 | Tishman, Jay, Perkins |
| 16.   Introduces the concept that thinking dispositions are made of three attributes: inclination, sensitivity and abilities then identifies these dispositions: <br> 1. **The disposition to be broad and adventurous**. <br> <u>Key inclinations</u>: The tendency to be open-minded and to look beyond what is given; the impulse to probe assumptions and examine alternative points of view; the desire to tinker with boundaries and play with new ideas; the urge to speculate, generate many options, and explore multiple interpretations. <br> <u>Key sensitivities</u>: An alertness to binariness, dogmatism, sweeping generalities, narrow thinking, parochialism, and occasions when alternative perspectives are neglected. <br> <u>Key abilities</u>: The ability to identify assumptions, to look at things from other points of view, to generate and review multiple options; brainstorming; empathic thinking; flexible thinking. <br> 2. **The disposition toward sustained intellectual curiosity**. <br> <u>Key inclinations</u>: A zest for inquiry; the urge to find and pose problems; the tendency to wonder, question, probe. <br> <u>Key sensitivities</u>: An alertness to unasked questions, anomalies, hidden facets; detection of gaps in one's knowledge or understanding; noticing what is unknown or unclear. <br> <u>Key abilities</u>: The ability to observe closely, to identify and challenge assumptions, to formulate and investigate provocative questions, to focus and persist in a line of inquiry. <br> 3. **The disposition to clarify and seek understanding**. | Tishman, Jay, Perkins Education | Good thinking | Jan. 1993 | Tishman, Jay, Perkins |

| Dispositions | Author/Field | Type of Thinking | Date | Source |
|---|---|---|---|---|
| Key inclinations: A desire to apprehend things clearly; the impulse to anchor ideas to experience and seek connections to prior knowledge; an urge to sharpen conceptions and examples; a desire to grasp the essence of things.<br>Key sensitivities: Alertness to unclarity and discomfort with vagueness; alertness to superficiality; detection of occasions needing a sharper focus; a leaning toward hard questions.<br>Key abilities: The ability to ask pointed questions and to build complex conceptualizations; the ability to apply and exemplify ideas, to make analogies and comparisons, to identify and classify details.<br>4. **The disposition to be planful and strategic.**<br>Key inclinations: The urge to set goals and to make and execute plans; the tendency to approach things in a calculated and/or stepwise fashion; a desire to think ahead.<br>Key sensitivities: Alertness to aimlessness, lack of direction, lack of orientation; alertness to off-hand thinking and sprawling thinking.<br>Key abilities: The ability to formulate goals and to evaluate alternative modes of approach; the ability to make and execute plans and to forecast possible outcomes.<br>5. **The disposition to be intellectually careful**.<br>Key inclinations: The urge for precision; a hunger for mental orderliness and organization; a desire to be thorough.<br>Key sensitivities: Alertness to the possibility of error, to disorder and disorganization; awareness of the abiding potential for inaccuracy and inconsistency.<br>Key abilities: The ability to process information precisely, to recognize and apply intellectual standards, to construct order out of disarray.<br>6. **The disposition to seek and evaluate reasons**.<br>Key inclinations: A leaning toward healthy skepticism; the tendency to question the given, to probe assumptions and biases; the drive to pursue and demand justification; the urge to discover underlying grounds and sources.<br>Key sensitivities: an alertness to evidential foundations; a responsiveness to superficiality and over-generalization, a wariness of gaps in knowledge.<br>Key abilities: The ability to distinguish cause and effect, the ability to identify logical structure; the ability to reason inductively, the ability to weigh and assess reasons.<br>7. **The disposition to be metacognitive**.<br>Key inclinations: The urge to be cognitively self-aware and to monitor the flow of one's thinking; the impulse to stand back and take stock; the desire to be self-challenging.<br>Key sensitivities: Alertness to loss of control of one's thinking; detection of complex thinking situations requiring self-monitoring; recognition of the need to look back on a thinking episode.<br>Key abilities: The ability to exercise executive control of mental processes, to conceive of the mind as active and interpretive, to be self-evaluative, to reflect on prior thinking. |  |  |  |  |
| 17. Examples of some thinking dispositions that have been investigated by psychologists are: actively open- | Stanovich | Rational | 2009 | Not stated |

| Dispositions | Author/Field | Type of Thinking | Date | Source |
|---|---|---|---|---|
| minded thinking, need for cognition (the tendency to think a lot), consideration of future consequences, need for closure, superstitious thinking, and dogmatism | Psychology | | | |
| 18. the tendency to collect information before making up one's mind, the tendency to seek various points of view before coming to a conclusion, the disposition to think extensively about a problem before responding, the tendency to calibrate the degree of strength of one's opinion to the degree of evidence available, the tendency to think about future consequences before taking action, the tendency to explicitly weigh pluses and minuses of situations before making a decision, and the tendency to seek nuance and avoid absolutism | Stanovich Psychology | Rational | 2009 | Not stated |
| 19. Provides another list in the same book.  This is by way of an example of Stanovich's estimate of G. Bush's thinking dispositions: overconfident; low in typical intellectual engagement; low in openness to experience; high in belief perseverance; high in confirmation bias; high in faith in intuition; high in impulsiveness; high in one-sided thinking; low in need for cognition; low in openness to experience; does not engage in counterfactual thinking; treats beliefs as possessions (has high belief identification); is high in need for closure, and low in thought flexibility. | Stanovich Psychology | Rational | 2009 | Not stated |
| 20. Focused on two dispositions as they relate to critical thinking in heuristics and bias: need for cognition and actively openminded thinking | Stanovich, West, Toplak Psychology | Critical | undated | Not stated |
| 21. (1) truth-seeking, (2) open-mindedness, (3) analyticity, (4) systematicity, (5) self-confidence, (6) inquisitiveness, and (7) maturity. | Perkins Education | intelligence | 1995 | Facione |
| 22. (1) broad and adventurous thinking, (2) sustained intellectual curiosity, (3) clarifying and seeking understanding, (4) being planful and strategic, (5) being intellectually careful, (6) seeking and evaluating reasons, and (7) metacognitive self-management (monitoring and guiding your own thinking). | Perkins Education | intelligence | 1995 | Tishman, Jay, Perkins |
| 23. Perkins variation on the Tishman et al list: *Clear.* The disposition toward thinking that is clear, coherent, precise, specific, and well-organized. *Broad.* The disposition toward thinking that is broad, adventurous, flexible, independent. Respect for and appreciation of other perspectives through tolerance, openmindedness, and empathy. The disposition to seek and find connections. *Deep.* The disposition to understand deeply, to seek underlying unities in the form of laws, theories, frameworks and principles, to fathom the causes and other governing factors of ideas, things, and events. *Sound.* The disposition toward thinking that is accurate, thorough, fair, knowledgeable, logical, and well-supported by evidence. Concern with truth, judiciousness, relevance, and functionality, in the | Perkins Education | intelligence | 1995 | Perkins |

| Dispositions | Author/Field | Type of Thinking | Date | Source |
|---|---|---|---|---|
| sense of the functionality of a sound design. *Curious.* The disposition toward thinking that is curious, questioning, probing, inquisitive. The disposition to find out about things and to persist in inquiry. *Strategic.* The disposition toward thinking that is strategic and planful in style, and that uses stock thinking strategies, graphic organizers, and other devices to sustain effective organization. *Aware.* The disposition toward thinking that is metacognitive, aware of itself, critical of its own patterns and progress, and that edits its own practices. This includes awareness of affective dimensions of thinking—the clues feelings provide us with, how emotions stimulate or stifle a link of thought | | | | |
| 24. From Perkins<br>1. The disposition to be broad and adventurous<br>2. The disposition toward wondering, problem finding, and investigating<br>3. The disposition to build explanations and understandings<br>4. The disposition to make plans and be strategic<br>5. The disposition to be intellectually careful<br>6. The disposition to seek and evaluate reasons<br>7. The disposition to be metacognitive | Perkins Education | Good | 2004 | Tishman, Jay, Perkins |
| 25. open-mindedness, inquisitiveness, systematicity, analyticity, truth-seeking, critical thinking self-confidence, and maturity | Perkins Education | Good | 2004 | Facione |
| 26. Critical Thinkers ...<br>Are honest with themselves, acknowledging what they don't know, recognizing their limitations, and being watchful of their own errors.<br>Regard problems and controversial issues as exciting challenges.<br>Strive for understanding, keep curiosity alive, remain patient with complexity, and are ready to invest time to overcome confusion.<br>Base judgments on evidence rather than personal preferences, deferring judgment whenever evidence is insufficient. They revise judgments when new evidence reveals error.<br>Are interested in other people's ideas and so are willing to read and listen attentively, even when they tend to disagree with the other person.<br>Recognize that extreme views (whether conservative or liberal) are seldom correct, so they avoid them, practice fairmindedness, and seek a balanced view.<br>Practice restraint, controlling their feelings rather than being controlled by them, and thinking before acting. | Ruggerio Humanities | Critical | 2003 | Ruggerio |
| 27. From Wikipedia – Habits of mind | Wikipedia | Critical and | 2009 | Costa |

| Dispositions | Author/Field | Type of Thinking | Date | Source |
|---|---|---|---|---|
| 1. Persisting – Stick to it.<br>2. Thinking and communicating with clarity and precision – Be clear.<br>3. Managing impulsivity – Take your time.<br>4. Gathering data through all senses – Use your natural pathways.<br>5. Listening with understanding and empathy – Understand others.<br>6. Creating, imagining, innovating – Try a different way.<br>7. Thinking flexibly – Look at it another way.<br>8. Responding with wonderment and awe – Have fun figuring it out.<br>9. Thinking about your thinking (metacognition) – Know your knowing.<br>10. Taking responsible risks – Venture out.<br>11. Striving for accuracy and precision – Check it again.<br>12. Finding humour – Laugh a little.<br>13. Questioning and problem posing – How do you know.<br>14. Thinking interdependently – Work together.<br>15. Applying past knowledge to new situations – Use what you learn.<br>16. Remaining open to continuous learning – Learn from experiences. | | creative | | |
| 28. Sternberg's Mental Self Government <u>Thinking Style</u> profiles:<br><br>three *functions* of mental self-government are legislative, executive, and judicial<br>four *forms* of mental self-government: monarchic, hierarchic, oligarchic, and anarchic<br>Two *levels* are local and global<br>Two *scopes* are internal and external<br>Two *leanings* are liberal and conservative | Black, McCoach<br>Education<br>Psychiatry | None specified | | Sternberg |
| 29. approaches to life and living which characterize critical thinking include:<br>* inquisitiveness with regard to a wide range of issues,<br>* concern to become and remain well-informed,<br>* alertness to opportunities to use critical thinking,<br>* trust in the processes of reasoned inquiry,<br>* self-confidence in one's own abilities to reason,<br>* open-mindedness regarding divergent world views,<br>* flexibility in considering alternatives and opinions<br>* understanding of the opinions of other people,<br>* fair-mindedness in appraising reasoning,<br>* honesty in facing one's own biases, prejudices, stereotypes, or egocentric tendencies,<br>* prudence in suspending, making or altering judgments, | Facione<br>Philosophy | Critical | 2009 | APA |

| Dispositions | Author/Field | Type of Thinking | Date | Source |
|---|---|---|---|---|
| * willingness to reconsider and revise views where honest reflection suggests that change is warranted. | | | | |
| 30. Characteristics of critical thinkers:<br>  * clarity in stating the question or concern,<br>  * orderliness in working with complexity,<br>  * diligence in seeking relevant information,<br>  * reasonableness in selecting and applying criteria,<br>  * care in focusing attention on the concern at hand,<br>  * persistence though difficulties are encountered,<br>  * precision to the degree permitted by the subject and the circumstances. | Facione Philosophy | Critical | 2009 | APA |
| 31. From the expert consensus description of the ideal critical thinker<br>The ideal critical thinker is habitually inquisitive, well-informed, trustful of reason, openminded, flexible, fair-minded in evaluation, honest in facing personal biases, prudent in making judgments, willing to reconsider, clear about issues, orderly in complex matters, diligent in seeking relevant information, reasonable in the selection of criteria, focused in inquiry, and persistent in seeking results which are as precise as the subject and the circumstances of inquiry permit. | Facione Philosophy | Critical | 2009 | APA |
| 32. Facione's list of dispositions:<br>Inquisitive, systematic, judicious, truthseeking, analytical, openminded, confident in reasoning | Facione Philosophy | Critical | 2009 | Facione |
| 33. From a web site called habits of the mind:<br>The 16 Habits of Mind identified by Costa and Kallick include:<br>  Persisting<br>  Thinking and communicating with clarity and precision<br>  Managing impulsivity<br>  Gathering data through all senses<br>  Listening with understanding and empathy<br>  Creating, imagining, innovating<br>  Thinking flexibly<br>  Responding with wonderment and awe<br>  Thinking about thinking (metacognition)<br>  Taking responsible risks<br>  Striving for accuracy<br>  Finding humor<br>  Questioning and posing problems<br>  Thinking interdependently | Website Habits of the Mind | strategic reasoning, insightful-ness, persever-ance, creativity, and craftsman-ship | 2001 | Costa and Killick |

| Dispositions | Author/Field | Type of Thinking | Date | Source |
|---|---|---|---|---|
| Applying past knowledge to new situations<br>Remaining open to continuous learning | | | | |
| 34. From the expert consensus description of the ideal critical thinker:<br>The ideal critical thinker is habitually inquisitive, well-informed, trustful of reason, openminded, flexible, fair-minded in evaluation, honest in facing personal biases, prudent in making judgments, willing to reconsider, clear about issues, orderly in complex matters, diligent in seeking relevant information, reasonable in the selection of criteria, focused in inquiry, and persistent in seeking results which are as precise as the subject and the circumstances of inquiry permit. | Facione<br>Philosophy | Critical | 2000 | APA |
| 35. truth-seeking, open-mindedness, analyticity, systematicity, CT self-confidence, inquisitiveness, and maturity of judgment | Facione<br>Philosophy | Critical | 2000 | Facione |
| 36. Critical thinkers:<br>1. seek a statement of the thesis or question;<br>2. seek reasons;<br>3. try to be well informed;<br>4. use credible sources and mention them;<br>5. take into account the total situation;<br>6. keep their thinking relevant to the main point;<br>7. keep in mind the original or most basic concern;<br>8. look for alternatives;<br>9. are open-minded and<br>    a. seriously consider points of view other than their own;<br>    b. reason from starting points with which they disagree without letting the disagreement interfere with their reasoning;<br>    c. withhold judgment when the evidence and *reasons are* insufficient<br>10. take a position and change a position when the evidence and reasons are sufficient to do so;<br>11. seek as much precision as the subject permits;<br>12. deal in an orderly manner with the parts of a complex whole;<br>13. employ their critical thinking abilities;<br>14. are sensitive to the feelings, level of knowledge, and degree of sophistication of others. | Ennis & Norris<br>Philosophy | Critical | 1996 | Ennis & Norris |
| 37. Selected thinking dispositions:<br>1. Seek a clear statement of a problem, a thesis, a question.<br>2. Deliberately examine a variety of viewpoints.<br>3. Seek to be well informed.<br>4. Use credible sources.<br>5. Seek a number of alternatives. | Beyer<br>Education | Skillful<br>Effective<br>functional<br>good | 1987 | Ennis and others |

| Dispositions | Author/Field | Type of Thinking | Date | Source |
|---|---|---|---|---|
| 6. Seek/give reasons.<br>7. Seek/provide evidence.<br>8. Be open-minded.<br>9. Be willing to change a position/judgment when evidence and reasons are sufficient to do so.<br>10. Judge in terms of situations, issues, purposes, and consequences (not in terms of fixed, dogmatic precepts or emotional, wistful thinking).<br>11. Persist in carrying out a thinking task.<br>12. Be slow to believe—be skeptical.<br>13. Be objective.<br>14. Suspend judgment when appropriate/sufficient evidence and reasoning are lacking. | | | | |
| 38. Educator Arthur L. Costa has suggested a list of <u>behaviors</u> that he believes are indicative of an effective thinker. Such an individual, he writes:<br>1. Persists in a thinking task, applying alternative methods until a goal is achieved.<br>2. Deliberately plans how to execute a thinking task by clarifying goals, identifying givens, and carefully selecting methods and data.<br>3. Exhibits flexibility in thinking, approaching a task from a number of perspectives or angles.<br>4. Tells the steps engaged in when executing a thinking skill or strategy.<br>5. Identifies missing data in a problem-solving situation and how to locate it.<br>6. Goes over test answers, papers, and reports to check for accuracy, completeness, and clarity.<br>7. Recognizes discrepancies in the environment and raises questions about them.<br>8. Asks his/her own questions about causation, relationships, hypothetical situations, and stimuli.<br>9. Gives and requests evidence and reasoning in support of assertions.<br>10. Draws on past experience and knowledge and the accumulative knowledge of others.<br>11. Applies knowledge and skills learned in one context to another context.<br>12. Uses and insists on precise language.<br>13. Expresses enjoyment in thinking.<br>14. Expresses pride in the way in which he/she goes about thinking and the results he/she gets. | Beyer Education | Effective | 1987 | Costa |
| 39. good thinkers are characteristically curious, open-minded, persistent, and willing to take risks | Kirby & Kuykendall Education | good | 1991 | Wiggins |
| 40. Attitudes or <u>habits of mind</u>  - These habits, commitments and sensitivities include such things as:<br>• open-mindedness (willingness to withhold judgment and seek new evidence or points of view when existing evidence is inadequate or contentious, and willingness to consider evidence against one's view | Bailin Education | Critical | 1993 | Bailin |

| Dispositions | Author/Field | Type of Thinking | Date | Source |
|---|---|---|---|---|
| and to revise one's view should the evidence warrant it);<br>• fair-mindedness (willingness to give fair consideration to alternative points of view and commitment to open, critical discussion of theories, practices and policies where all views are given a fair hearing);<br>• desire for truth (commitment to having justified beliefs, values and actions);<br>• independent-mindedness (the willingness and personal strength to stand up for one's firmly held beliefs);<br>• an inquiring attitude (an inclination to question the clarity and support for claims one is asked to accept);<br>• respect for high quality products and performances (appreciation of good design and effective performance);<br>• an intellectual work ethic (commitment to carrying out relevant thinking tasks in a competent manner). | | | | |
| 41. The critical spirit, which Siegel views as being of equal importance with the reason assessment component, indicates that the thinker values good reasons and is disposed to assess reasons and to govern beliefs and actions on the basis of such assessment. | Bailin Education | Critical | 1997 | Siegel |
| 42. Ennis also includes a list of tendencies or dispositions in his conception of critical thinking which includes: the disposition to seek a clear statement of the statement or question, to seek reasons, to try to be well-informed, to use credible sources and mention them, to take into account the total situation, to try to remain relevant to the main point, to keep in mind the original or basic concern, to look for alternatives, to be open-minded, to take a position when the evidence and reasons are sufficient, to seek as much precision as the subject permits, to deal in an orderly manner with the parts of a complex whole, and to be sensitive to the feelings, level of knowledge, and degree of sophistication of others. | Bailin Education | Critical | 1997 | Ennis |
| 43. Ennis (1987) sees dispositions as including a person's willingness to be open-minded, well-informed, change positions when the evidence warrants, stick to the point, and be sensitive to the feelings, level of knowledge and degree of sophistication of others. | Arter Education | Higher order thinking | 1987 | Ennis |
| 44. Similarly, Paul (1986) considers "strong sense critical thinking" to include the willingness not only to reason but also to examine one's whole frame of reference and belief system. | Arter Education | Higher order | 1987 | Paul |
| 45. A. Dispositions<br>1. Seek a clear statement of the thesis or question<br>2. Seek reasons<br>3. Try to be well informed<br>4. Use and mention credible sources<br>5. Take into account the total situation | Ennis Education | Critical | 1987 | Ennis |

| Dispositions | Author/Field | Type of Thinking | Date | Source |
|---|---|---|---|---|
| 6. Try to remain relevant to the main point<br>7. Keep in mind the original and/or basic concern<br>8. Look for alternatives<br>9. Be open-minded<br>    a) Consider seriously other points of view than one's own (dialogical thinking)<br>    b) Reason from premises with which one disagrees—without letting the disagreement interfere with one's reasoning (suppositional thinking)<br>    c) Withhold judgment when the evidence and reasons are insufficient<br>10. Take a position (and change a position) when the evidence and reasons are sufficient to do so<br>11. Seek as much precision as the subject permits<br>12. Deal in an orderly manner with the parts of a complex whole<br>13. Use one's critical thinking abilities<br>14. Be sensitive to the feelings, level of knowledge, and degree of sophistication of others | | | | |
| 46. Characteristics of a good thinker (edited by the author to focus on dispositions):<br>listens carefully to other people's ideas;<br>understands the difference between winning an argument and being right;<br>recognizes that most real-world problems have more than one possible solution and that those solutions may differ in numerous respects and may be difficult to compare in terms of a single figure of merit;<br>looks for unusual approaches to complex problems;<br>can strip a verbal argument of irrelevancies and phrase it in terms of its essentials;<br>understands the differences among conclusions, assumptions, and hypotheses;<br>habitually questions one's own views and attempts to understand both the assumptions that are critical to those views and the implications of the views;<br>is sensitive to the difference between the validity of a belief and the intensity with which it is held;<br>can represent differing viewpoints without distortion, exaggeration, or caricaturization;<br>is aware of the fact that one's understanding is always limited, often much more so than would be apparent to one with a noninquiring attitude; and<br>recognizes the fallibility of one's own opinions, the probability of bias in those opinions, and the danger | Nickerson education | Good | 1987 | Nickerson |
| 47. To wonder<br>To be critical<br>To respect others<br>To be inventive<br>To seek alternatives | Lipman Education | No descriptor | 1987 | Lipman |

| Dispositions | Author/Field | Type of Thinking | Date | Source |
|---|---|---|---|---|
| To be inquisitive<br>To care for the tools of inquiry<br>To cooperate intellectually<br>To be committed to self corrective method<br>To feel a need for principles, ideals, reasons, and explanations | | | | |
| 48. These lists of attitudes and dispositions that accompany good thinking generally include being reflective, openminded, curious, persevering, precise, able to tolerate ambiguity, and so forth. Some sources also include internal locus of control and self-esteem as attitudes accompanying effective thinking. | JB Baron Education | No descriptor | 1987 | various |
| 49. the <u>habits of mind</u> as intellectual integrity, open-mindedness, mental alertness, systematic diligence, confidence in the use of reason, intellectual curiosity, and prudent maturity of judgment | Facione General | critical | 1997 | Facione |
| 50. In their positive manifestation, these seven characterological attributes or habits of mind, if you prefer, are named truth-seeking, open-mindedness, analyticity, systematicity, critical thinking self-confidence, inquisitiveness, and maturity of judgment | Facione General | critical | 1997 | Facione |
| 51. List of items assessed by CCTDI:<br>Truthseeking<br>Open-mindedness<br>Analyticity<br>Systematicity<br>Critical Thinking Self-Confidence<br>Inquisitiveness<br>Maturity of Judgment | Insight Assessment General | critical | 2009 | Facione |
| 52. need for cognition and need for epistemic closure | Hofer psychology | No descriptor | 2004 | Caccioppo, Petty, Feinstein, Jarvis, Kruglanski |
| 53. The competencies focusing on the intellectual traits, virtues or dispositions<br>Standard Ten: Fairmindedness<br>Standard Eleven: Intellectual Humility<br>Standard Twelve: Intellectual Courage<br>Standard Thirteen: Intellectual Empathy<br>Standard Fourteen: Intellectual Integrity | Foundation Philosophy and education | Critical | 2006 | Foundation |

| Dispositions | Author/Field | Type of Thinking | Date | Source |
|---|---|---|---|---|
| Standard Fifteen: Intellectual Perseverance<br>Standard Sixteen: Confidence in Reason<br>Standard Seventeen: Intellectual Autonomy | | | | |
| 54. 1. Willingness to Plan<br>2. Flexibility<br>3. Persistence<br>4. Willingness to Self-Correct, Admit Errors, and Change Your Mind When the Evidence Changes<br>5. Being Mindful<br>6. Consensus Seeking | Halpern Psychology | critical | 2003 | Halpern |
| 55. Glaser's description of the ability to think critically includes:<br>an attitude of being disposed to consider in a thoughtful way the problems and subjects that come within the range of one's experiences.<br>Persons who have acquired a disposition to want evidence for beliefs, and who have acquired an attitude of reasonableness | Glaser Education | Critical | 1941 | Glaser |
| 56. Common themes among some scholars on dispositions:<br>a reflective skeptical or questioning attitude, a sensitivity to value- or ideology-laden assumptions, an insistence on appropriate supporting grounds before accepting disputable claims, an appreciation of the various criteria applicable to good reasoning and argument (whether general or subject dependent), skill and judgment in the analysis and evaluation of claims and arguments, and a disposition to be self-reflective, sensitive to one's own possible biases or assumptions. | Reed Education/History | Critical | 1998 | Ennis, Siegel, Lipman, McPeck, Paul, |
| 57. Affective dispositions such as open-mindedness and diligence in seeking relevant information are also necessary to both historical thinking and critical thinking | Reed Education/History | Critical | 1998 | Reed |
| 58. A critical component of this general epistemological orientation is the disposition to process information analytically. Qualities that constitute this disposition, and the self-report measures we used to roughly index these qualities, are:<br>reliance on logic and distrust of intuition (the Head Over Heart Scale; HOH);<br>objectivity and openmindedness to belief revision (the Belief Defensiveness Scale; BD);<br>reflectiveness, cognitive vigilance, and the tendency to monitor one's reasoning (the Need for Cognition Scale; NFC);<br>and understanding the indeterminancy of knowledge and willingness to postpone closure (the Need for Closure Scale; NFCL) | Klaczynski & Robinson psychology | Motivated reasoning | 2000 | Epstein, Pacini, Denes-Raj, Heier, Klaczynski, Fauth, Cacioppo, Petty Kruglanski, Webster, Klem |
| 59. 1. *Intellectual curiosity*: seeking answers to various kinds of questions and problems.<br>2. *Objectivity*: using objective factors when one makes decisions and avoiding being influenced by | Zechmeister & Johnson Psychology | Critical | 1992 | D'Angelo |

| Dispositions | Author/Field | Type of Thinking | Date | Source |
|---|---|---|---|---|
| emotional or subjective factors.<br>3. *Open-mindedness*: being willing to consider a wide variety of beliefs.<br>4. *Flexibility*: exhibiting a willingness to change one's beliefs or methods of inquiry.<br>5. *Intellectual skepticism*: not accepting a conclusion as being true until adequate evidence is provided.<br>6. *Intellectual honesty*: accepting statements as true even when they don't agree with one's own position.<br>7. *Being systematic*: following a line of reasoning consistently to a conclusion.<br>8. *Persistence*: being persistent in seeking to resolve disputes.<br>9. *Decisiveness*: reaching a conclusion when the evidence warrants it.<br>10*. Respect for other viewpoints*: willingness to admit that you are wrong and that others may be right. | | | | |
| 60.  Critical <u>thinking styles</u>:<br>**The Explorer**<br>Looks at all sides of a situation or problem<br>Identifies the core element of a problem or situation<br>Is curious<br>Seeks new developments<br>**The Student**<br>Is diligent<br>Researches alternative solutions to problems<br>Does homework<br>Corrects errors<br>**The Warrior**<br>Accepts challenges<br>Perseveres<br>Faces difficult problems<br>**The Navigator**<br>Guides others<br>Looks ahead<br>Plans a course of action<br>**The Detective**<br>Questions own thoughts and actions<br>Tolerates ambiguity<br>Pursues the elusive element of fact | Feldman Psychology | Critical | 2002 | Feldman |
| 61.  Open mindedness, whole heartedness, responsibility | Dewey | Reflective | 1933 | Dewey |

| Dispositions | Author/Field | Type of Thinking | Date | Source |
|---|---|---|---|---|
| | Education and philosophy | | | |
| 62. Ideal critical thinker:<br>The ideal critical thinker is habitually inquisitive, well-informed, trustful of reason, open-minded, flexible, fair-minded in evaluation, honest in facing personal biases, prudent In making judgments, willing to reconsider, clear about issues, orderly in complex matters, diligent In seeking relevant information, reasonable in the selection of criteria, focused in inquiry, and persistent in seeking results which are as precise as the subject and the circumstances of inquiry permit | Facione Philosophy | Critical | 1994 | APA |
| 63. Inquisitiveness, Open-mindedness, Systematicity, Analyticity, Truth-seeking, CT Self-confidence, and Maturity | Facione Philosophy | Critical | 1994 | Facione |
| 64. A well cultivated critical thinker:<br>● raises vital questions and problems, formulating them clearly and precisely;<br>● gathers and assesses relevant information, using abstract ideas to interpret it effectively comes to well-reasoned conclusions and solutions, testing them against relevant criteria and standards;<br>● thinks openmindedly within alternative systems of thought, recognizing and assessing, as need be, their assumptions, implications, and practical consequences; and<br>● communicates effectively with others in figuring out solutions to complex problems | Paul/Scriven Education and Philosophy | Critical | 2010 | Foundation |
| 65. truth-seeking, open-mindedness, "analyticity," "systematicity," self-confidence, inquisitiveness, and maturity. | Dexter, et al Nursing | Critical | 1997 | Facione |
| 66. truth-seeking, open-mindedness, analyticity, systematicity, confidence, inquisitiveness, and maturity | Walsh & Seldomridge Nursing | Critical | 2006 | Facione |
| 67. Critical thinkers in nursing exhibit these habits of the mind: confidence, contextual perspective, creativity, flexibility, inquisitiveness, intellectual integrity, intuition, open-mindedness, perseverance, and reflection | Staib Nursing | Critical | 2003 | Scheffer and Rubenfeld |
| 68. Attitudes (dispositions)of a critical thinker include a drive to formulate a clear statement of the thesis or question implicit and explicit in the assigned subject matter; a willingness to scrutinize and re-examine attitudes, beliefs, and values; confidence in ability to think and willingness to deal with error and mistakes; a sensitivity to identification and confrontation with problematic situations; a desire to pursue new experiences and a respect for the use of instruction when relevant to thinking processes; a desire to achieve high-level reasoning skills with judgments based on evidence; a willingness to scrutinize personal ideas and values and to articulate and empathize with opposing views without defensive reactions; a curiosity about the relationship between ideas, theories, and systems, as well as a passion | Williams Political Science | Critical | 1991 | Ennis Ruggerio |

| Dispositions | Author/Field | Type of Thinking | Date | Source |
|---|---|---|---|---|
| for insight and understanding; and, finally, a constructive attitude toward argumentation without being consumed by ego protection | | | | |
| 69. A critical thinker exhibits the following dispositions or attitudes: (a) willingness to engage in and persist at a complex task, (b) habitual use of plans and the suppression of impulsive activity, (c) flexibility or open-mindedness, (d) willingness to abandon nonproductive strategies in an attempt to self-correct, and (e) an awareness of the social realities that need to be overcome (such as the need to seek consensus or compromise) so that thoughts can become actions | Halpern psychology | Critical | 1998 | Halpern |
| 70. there was a disposition factor represented by measures of need for cognition, tolerance of ambiguity, and dualistic/relativistic thinking | Ku Psychology | Critical | 2009 | Not stated |
| 71. actively open-minded thinking, openness to experience, reflectivity and need for cognition | Ku Psychology | Critical | 2009 | Sa, Clifford, Stanovich, Toplak |
| 72. The ideal critical thinker is habitually inquisitive, well informed, trustful of reason, open-minded, flexible, fair-minded in evaluation, honest in facing personal biases, prudent in making judgments, willing to reconsider, clear about issues, orderly in complex matters, diligent in seeking relevant information, reasonable in the selection of criteria, focused in inquiry, and persistent in seeking results which are as precise as the subject and the circumstances of inquiry permit. | Facione Philosophy | Critical | 1995 | APA |
| 73. Inquisitiveness, Open-mindedness, Systematicity, Analyticity, Truth-seeking, CT Self-confidence, and Maturity) | Facione Philosophy | Critical | 1995 | Facione |
| 74. It is hard to go very far into the core concept of the critical person, however, without recognizing the centrality of multilogical thinking, the ability to think accurately and fairmindedly within opposing points of view and contradictory frames of reference. | Paul Philosophy & Education | Critical Rational | 1987 | Paul |
| 75. If the student has developed genuine open-mindedness, Ennis claims, he will: (a) Consider seriously from premises with which one disagrees—without letting the disagreement interfere with one's reasoning ("suppositional thinking"); (c) withhold judgment when the evidence and reasons are insufficient | Paul Philosophy & education | Critical Rational | 1987 | Ennis |
| 76. To think critically in this sense requires, as Passmore points out, initiative, independence, courage, (and) imagination. | Paul Philosophy & education | Critical Rational | 1987 | Passmore |
| 77. It also describes one's inclination to use one's critical thinking skills as manifested in the habits of mind known as inquisitiveness, open-mindedness, truth-seeking, analyticity, systematicity, reasoning self-confidence, and cognitive maturity | Facione Nursing | Critical | 1997 | Facione |
| 78. Motivations: | Molden & Higgins | Good | 2005 | Various |

| Dispositions | Author/Field | Type of Thinking | Date | Source |
|---|---|---|---|---|
| Outcome motivated thinking<br>    Directional includes positive self evaluation and positive eval of others<br>    Non-directional includes **desires for** *accuracy* **desires for clarity and conciseness, or** *closure*<br>        Also mentioned need for cognition in the notes of the article<br>Strategy motivated thinking<br>    Promotion focus – promoting positive outcome<br>    Prevention focus – avoidance of negative outcome | Psychology | | | |
| 79. openmindedness, caution, and valuing being well-informed, the dispositions to seek and be sensitive to alternatives, and to be cautious but not totally skeptical | Ennis & Millman Philosophy and education | Critical | 2005 | Ennis |
| 80. A student who has developed critical thinking dispositions will show the inclination to<br>1. approach questions with an open-minded and curious attitude, be informed by multiple relevant perspectives, and be willing to examine questions in a fair-minded way;<br>2. apply critical thinking skills to thinking about issues in a major field of study, general education courses, and everyday lives;<br>3. reflect on how best to answer questions, solve problems, and make decisions in academic and everyday settings. (p.3) | Bensley et al Frostburg State University Education | Critical | 2006 | Frostburg |
| 81. The ideal critical thinker is habitually inquisitive, well-informed, trustful of reason, open-minded, flexible, fair-minded in evaluation, honest in facing personal biases, prudent in making judgments, willing to reconsider, clear about issues, orderly in complex matters, diligent in seeking relevant information, reasonable in the selection of criteria, focused in inquiry, and persistent in seeking results which are as precise as the subject and the circumstances of inquiry permit. (pp. 3-4) | Spicer & Hanks Education | Critical | 1995 | APA |
| 82. 1. inquisitiveness; 2. open mindedness; 3. systematicity; 4. analyticity; 5. truth-seeking; 6. CT selfconfidence; and 7. maturity. | Spicer & Hanks Education | Critical | 1995 | Facione |
| 83. A critical thinker will exhibit the following dispositions or attitudes:<br>Willingness to engage in and persist at a complex task<br>Willingness to plan<br>Flexibility or open-mindedness<br>Willingness to self correct<br>Being mindful<br>Consensus-Seeking (pp. 35-36) | Greenwood Education | Critical | 1992 | Halpern |
| 84. 1. Be curious and inquire about how and why things work.<br>2. Be organized, orderly, and focused in inquiry or in thinking.<br>3. Willingly persevere and persist at a complex task. | NPEC Education | Critical | 2000 | Jones et al |

| Dispositions | Author/Field | Type of Thinking | Date | Source |
|---|---|---|---|---|
| 4. Be flexible and creative in seeking solutions.<br>5. Be inclined to arrive at a reasonable decision in situations where there is more than one plausible solution.<br>6. Apply insights from cultures other than their own.<br>7. Exhibit honesty in facing up to their prejudices, biases, or tendency to consider a problem solely from their viewpoint.<br>8. Monitor their understanding of a situation and progress toward goals.<br>9. Find ways to collaborate with others to reach consensus on a problem or issues.<br>10. Be intellectually careful and precise.<br>11. Value the application of reason and the use of evidence.<br>12. Be open-minded; strive to understand and consider divergent points of view.<br>13. Be fair-minded; seek truth and be impartial, even if the findings of an inquiry may not support one's preconceived opinions.<br>14. Willingly self-correct and learn from errors made no matter who calls them to our attention. (pp. 23-25) | | | | |
| 85. be curious and inquire about how and why things work<br>flexibility and creativity in seeking solutions<br>exhibit honesty in facing up to one's prejudices, biases, or tendencies to consider a problem solely from one's own viewpoint.<br>willingness to persevere and persist at a complex task.<br>being organized, orderly, and focused in inquiry or thinking<br>the inclination to arrive at a reasonable decision in situations where there is more than one plausible solution.<br>find ways to collaborate with others to reach a consensus on a problem or issue<br>monitor one's understanding of a situation and progress towards goals<br>the inclination to apply insights from cultures other than one's own was rated important<br>willingly self-correct and learn from errors made no matter who calls them to their attention<br>be fair-minded<br>seek truth and be impartial, even if findings may not support one's preconceived opinions<br>be open-minded and strive to understand and consider different points of view<br>value the application of reason and the use of evidence<br>be intellectually careful and precise | Jones et al Education | Critical | 1995 | Delphi process with faculty and employers |
| 86. Affective dispositions to critical thinking were divided into two categories (1) approaches to life and | Pierce | Critical | 2006 | APA |

| Dispositions | Author/Field | Type of Thinking | Date | Source |
|---|---|---|---|---|
| living in general, and include such traits as inquisitiveness, trust in reason, and fairmindedness, and (2) approaches to specific issues, questions or problems, and include such traits as clarity in stating the question, diligence in seeking relevant information, and persistence although difficulties are encountered. | Education | | | |
| 87. The disposition to be broad and adventurous. The disposition toward wondering, problemfinding, and investigating. The disposition to build explanations and understandings. The disposition to make plans and be strategic. The disposition to be intellectually accurate. The disposition to ask for and evaluate reasons. The disposition to be metacognitive. | Tishman Education | Good | 1994 | Tishman |
| 88. • …careful attention to what you know, vigilance for what you do not, and the courage to question both of the above categories. <br>• …thinking about an topic, issue, or challenge in a way that sets aside my immediate 'gut' response, so that I can be open and reflective to other possible ways of viewing the challenge… <br>• …thinking deeply, keenly, flexibly, openly, reflectively, with an awareness of self and others, with attention to what is known and unknown, and with humility. | Krupat Medicine | Critical | 2008 | Survey of physicians |
| 89. critical thinking has two important dimensions: a "frame of mind" and a number of specific mental operations. The frame of mind includes an alertness to the need to evaluate information, a willingness to test opinions, and a desire to consider all viewpoints. | Taube Education | Critical | 1995 | Beyer |
| 90. a critical "attitude" consisting of doubt, carefulness, objectivity, and determinism, as well as thinking strategies and thinking skills, in their model of critical thinking | Taube Education | Critical | 1995 | DeNitto and Strickland |
| 91. Paul and Nosich stated that "critical thinking entails the possession and active use of a set of traits of mind" including "independence of thought, fairmindedness, intellectual humility, intellectual courage, intellectual perseverance, intellectual integrity, curiosity, confidence in reason, the willingness to see objections, to enter sympathetically into another's point of view," and "to recognize one's own egocentricity or ethnocentricity | Taube Education | Critical | 1995 | Paul & Nosich |
| 92. The ideal critical thinker is habitually inquisitive, well-informed, trustful of reason, openminded, flexible, fair-minded in evaluation, honest in facing personal biases, prudent in making judgments, willing to reconsider, clear about issues, orderly in complex matters, diligent in seeking relevant information, reasonable in the selection of criteria, focused in inquiry, and persistent in seeking results which are as precise as the subject and circumstances of inquiry permit | Taube Education | Critical | 1995 | Facione/APA |
| 93. According to Ennis (1991, Table 1), the dispositions of the ideal critical thinker are as follows: | Taube | Critical | 1995 | Ennis |

| Dispositions | Author/Field | Type of Thinking | Date | Source |
|---|---|---|---|---|
| (1) To be clear about the intended meaning of what is said, written, or otherwise communicated. <br> (2) To determine and maintain focus on the conclusion or question. <br> (3) To take into account the total situation. <br> (4) To seek and offer reasons. <br> (5) To try to be well informed. <br> (6) To look for alternatives. <br> (7) To seek as much precision as the situation requires. <br> (8) To try to be reflectively aware of one's own basic beliefs. <br> (9) To be open-minded, consider seriously viewpoints other than one's own <br> (10) To withhold judgment when the evidence and reasons are insufficient. <br> (11) To take a position (and change a position) when the evidence and reasons are sufficient to do so. <br> (12) To use one's critical thinking abilities, | Education | | | |
| 94. Siegel identified two components essential to critical thinking: reason assessment, which parallels the thinking abilities outlined so far, and the "critical spirit," which includes attitudes, dispositions, habits of mind, and character traits, all of which combine to produce a "be of reason" characterized by intellectual honesty, objectivity, justice to evidence, and sympathetic and impartial consideration of interests | Taube Education | Critical | 1995 | Siegel |
| 95. The situation of dispositions and traits being an important and largely untested component of mental skills has been known for many years. Wechsler (1943, 1950) identified "nonintellective" factors as untested content in intelligence tests. These "non-intellective" factors include drive, energy, curiosity, anxiety, impulsiveness, persistence, and other temperamental factors | Taube Education | Critical | 1995 | Wechsler |
| 96. It seems plausible that such personality traits as open-mindedness, cognitive complexity, need for cognition, tolerance of ambiguity, and reflectiveness represent the dispositional component of critical thinking, and are characteristic of effective critical thinkers | Taube Education | Critical | 1995 | Taube |
| 97. Truth-Seeking, or the disposition to seek the truth, ask questions, and be honest and objective about pursuing inquiry even if the findings contradict one's interests or opinions; Open-Mindedness, or the tendency to be tolerant of divergent views and sensitive to one's own bias; Analyticity, defined as being alert to potentially problematic situations, anticipating possible results and consequences, and prizing the use of reason or evidence; Systematicity, or the tendency to be organized, orderly, focused, and diligent in inquiry; Self-Confidence, or trust in one's own reasoning processes; Inquisitiveness, or intellectual curiosity; and Maturity, or the disposition to make reflective judgments. | Taube Education | Critical | 1995 | Facione |
| 98. Task orientation and ego orientation | Taube Education | Critical | 1995 | Nicholls |

| Dispositions | Author/Field | Type of Thinking | Date | Source |
|---|---|---|---|---|
| 99. Critical thinkers are disposed to seek reasons, try to be well informed, use credible sources and mention them, look for alternatives, consider seriously points of view other than their own, withhold judgment when the evidence and reasons are insufficient, seek as much precision as the subject permits, among other activities | Norris Education | Critical | 1989 | Ennis & Norris |
| 100. Seek a statement of the thesis or question<br>Seek reasons<br>Try to be well informed<br>Use credible sources and mention them<br>Take into account the total situation<br>Keep their thinking relevant to the main point<br>Keep in mind the original or most basic concern<br>Look for alternatives<br>Are open minded and seriously consider points of view other than their own; reason from starting points with which they disagree without letting disagreement interfere with their reasoning<br>Take a position and change a position when evidence and reasons are sufficient to do so<br>Seek as much precision as the subject permits<br>Deal in an orderly manner with parts of a complex whole<br>Employ their critical thinking abilities<br>Are sensitive to the feelings, level of knowledge, and degree of sophistication of others | McKown Military | Critical | 1997 | Ennis & Norris |
| 101. (a) Open-mindedness, (b) Analycity, (c)Truth-seeking, (d) Systematicity, (e) Self-confidence, (f)Inquisitiveness, and (g) Maturity | Valanides and Angeli Education | Critical | 2008 | Facione |
| 102. Disposition to think critically involves, among other traits, such factors as the inclination to ask challenging questions and follow the reasons and evidence wherever they lead, tolerance for new ideas, willingness to use reason and evidence to solve problems, and willingness to see complexity in problems | Pascarella and Terenzini Education | Critical | 2005 | Facione |
| 103. disposition to weigh new evidence that conflicts with a held belief, to spend a considerable amount of time on a problem before giving up, and to evaluate others' opinions in order to form one's own. They are dispositions toward open-minded thinking and have strong similarities with two epistemological dimensions about the nature of knowledge as defined by Schommer | Mason Psychology | epistemology | 2003 | Baron |
| 104. Inspired by the above definitions, we may tentatively suggest that a critical thinker has the following sorts of dispositions, supported by relevant abilities and attitudes:<br>1. to examine and evaluate claims to knowledge, normative principles, theories, policy | Hare Education | critical | 1999 | Hare |

| Dispositions | Author/Field | Type of Thinking | Date | Source |
|---|---|---|---|---|
| recommendations, and other matters where judgement is called for; <br> 2. to determine if what is presented as evidence and relevant argument merits being so considered, and to what extent it is biased, inadequate, misleading or in other ways deficient; <br> 3. to resist efforts by others to impose ideas on him or her, and to avoid being imposed upon by ideas which are taken for granted in the prevailing intellectual and social climate; <br> 4. to regard situations and issues conventionally deemed to be straightforward as potentially problematic and controversial, to try to attend to the unusual when attracted by the familiar, and to imagine ways in which the existing framework might be transcended. | | | | |
| 105. actively open-minded thinking, need for cognition (the tendency to think a lot), consideration of future consequences, typical intellectual engagement, need for closure, superstitious thinking, and dogmatism | Stanovich Psychology | Critical Rational | 2011 | Not stated |
| 106. individual differences on our index of argument-driven processing can be predicted by measures of dogmatism and absolutism, categorical thinking, openness , flexible thinking, belief identification, counterfactual thinking, superstitious thinking, and actively open-minded thinking. | Stanovich Psychology | Critical Rational | 2011 | Various |
| 107. care that their beliefs be true, and that their decisions be justified; care to present a position honestly and clearly; and care about the worth of other people's opinions | Ortiz Philosophy | Critical | 2007 | Ennis |
| 108. Examples might be the disposition to weigh new evidence against a favored belief heavily (or lightly), the disposition to spend a great deal of time (or very little) on a problem before giving up, or the disposition to weigh heavily the opinions of others in forming one's own. Although you cannot improve working memory by instruction, you can tell someone to spend more time on problems before she gives up, and if she is so inclined, she can do what you say. | Baron Psychology | Rational Intelligent thinking | 1985 | Baron |
| 109. Need for closure | Kruglanski psychology | Decision making | 2003 | Kruglanski |
| 110. Need for cognition | Cacioppo, Petty, Feinstein, Jarvis Psychology | General thinking | 1996 | Cohen |
| 111. Information processing styles, based on Epstein's cognitive experimental self theory, are: <br> Intuitive <br> Rational | Klaczynski, Gordon, Klauth Psychology | Critical | 1997 | Epstein |
| 112. Nine distinct but related personality constructs were defined, as follows: <br> (a) Typical intellectual engagement is the core construct of the hypothesized construct space. Scale items were expected to differentiate among individuals in their typical expression of a desire to engage and understand their world, their interest in a wide variety of things, and their preference for a complete understanding of a complex topic or problem, a need to know; | Goff, Ackerman Psychology | General | 1992 | Goff, Ackerman |

| Dispositions | Author/Field | Type of Thinking | Date | Source |
|---|---|---|---|---|
| (b) hard work items indicate a preference for tasks or goals that are difficult to attain or require persistence; <br> (c) perfectionism describes persons who tend to value high accuracy or excellence; <br> (d) openness involves preference for, or high tolerance of, variety or new experiences; <br> (e) absorption describes situations in which people find themselves so deeply involved in an intellectual activity that cognizance of time and the immediate environment is decreased markedly; <br> (f) distractibility may discourage intellectual engagement by preventing initial or sustained focus on a task or problem; <br> (g) extroverted intellectual engagement involves enjoyment of engagement with others in intellectual activities; <br> (h) introverted intellectual engagement occurs when a person tends to spend much time analyzing their own thinking or wondering about the thinking of others; <br> (i) energy is expected to represent a person's general energy level; and <br> (j) four interest areas were included, namely, interest in arts and humanities, science, social science, and technology | | | | |
| 113. Need for cognition | Verplanken psychology | General | 1993 | Cohen and Cacioppo, Petty |
| 114. 16 habits of mind are: <br> 1. Persisting <br> 2. Managing Impulsivity <br> 3. Listening To Others—With Understanding and Empathy <br> 4. Thinking Flexibly <br> 5. Thinking About our Thinking (Metacognition) <br> 6. Striving For Accuracy and Precision <br> 7. Questioning and Posing Problems <br> 8. Applying Past Knowledge to New Situations <br> 9. Thinking and Communicating with Clarity and Precision <br> 10. Gathering Data through All Senses <br> 11. Creating, Imagining, and Innovating <br> 12. Responding with Wonderment and Awe <br> 13. Taking Responsible Risks. <br> 14. Finding Humor | Costa and Kallick Education | Effective | 2000 | Costa and Kallick; various sources |

| Dispositions | Author/Field | Type of Thinking | Date | Source |
|---|---|---|---|---|
| 15. Thinking Interdependently<br>16 Learning Continuously | | | | |
| 115. Need for closure | Kruglanski & Webster | General | 1994 | Kruglanski & Webster |
| 116. Two primary dispositions described:<br>    Impulsivity/reflection<br>    Fairness/bias | Baron psychology | General | 1985 | various |
| 117. Government metaphor for <u>thinking styles</u>:<br>   *Functions*<br>      Legislative<br>      Executive<br>      Judicial<br>   *Forms*<br>      Monarchic<br>      Hierarchic<br>      Oligarchic<br>      Anarchic<br>   *Levels*<br>      Global<br>      Local<br>   *Scope*<br>      Internal<br>      External<br>   *Leanings*<br>      Liberal<br>      Conservative | Sternberg Psychology | General | 1997 | Sternberg |
| 118. Field Dependence-Independence | Sternberg Psychology | General | 1997 | Witkin |
| 119. Impulsivity-Reflectivity | Sternberg Psychology | General | 1997 | Kagan |
| 120. Need for cognition | Kardash and Scholes Psychology | General | 1996 | Cacioppo, Petty, & Kao |
| 121. Government metaphor for thinking styles:<br>   *Functions*<br>      Legislative | Sternberg Grigorenko, and Zhang Psychology and | Successful intelligence | 2008 | Sternberg |

| Dispositions | Author/Field | Type of Thinking | Date | Source |
|---|---|---|---|---|
| Executive<br>Judicial<br>*Forms*<br>    Monarchic<br>    Hierarchic<br>    Oligarchic<br>    Anarchic<br>*Levels*<br>    Global<br>    Local<br>*Scope*<br>    Internal<br>    External<br>*Leanings*<br>    Liberal<br>    Conservative | education | | | |
| 122. analytical, inquisitive, judicious, open-minded, systematic, truth-seeking and possess cognitive maturity | Willis<br>Industrial psychology | Critical | 2004 | Facione |
| 123. Need for cognition | Cacioppo, Petty, Kao<br>Psychology | General | 1984 | Cacioppo, Petty, Kao |
| 124. Truthseeking, open-mindedness; analyticity, systematicity, critical thinking self confidence, inquisitiveness, maturity of judgment | Facione & Facione<br>Philosophy | Critical | 2010 | Facione |
| 125. cognitive reflection | Toplak, West, Stanovich<br>Psychology | Rational | 2011 | Frederick |
| 126. need for cognition, stimulation seeking, critical thinking, open-mindedness | Ormrod<br>Education | learning | 2011 | various |
| 127. Rational and ethical qualities of critical thinking<br>    Clarity<br>    Depth<br>    Precision<br>    Completeness<br>    Specificity<br>    Fairness | Haase | Critical | 2010 | Haase |

| Dispositions | Author/Field | Type of Thinking | Date | Source |
|---|---|---|---|---|
| Relevance<br>Adequacy<br>Accuracy<br>Evidence<br>Consistency<br>Logicalness<br>Significance | | | | |
| 128. Ennis list:<br>1. Seek a clear statement of the thesis or question.<br>2. Seek reasons.<br>3. Try to be well informed.<br>4. Use credible sources and mention them.<br>5. Take into account the total situation.<br>6. Try to remain relevant to the main point.<br>7. Keep in mind the original and/or basic concern.<br>8. Look for alternatives.<br>9. Be open-minded.<br>a. Consider seriously points of view other than one's own ("dialogical thinking").<br>b. Reason from premises with which one disagrees—without letting the disagreement interfere with one's reasoning ("suppositional thinking").<br>c. Withhold judgment when the evidence and reasons are insufficient.<br>10. Take a position (and change a position) when the evidence and reasons are sufficient to do so.<br>11. Seek as much precision as the subject permits.<br>12. Deal in an orderly manner with the parts of a complex whole.<br>13. Be sensitive to the feelings, level of knowledge, and degree of sophistication of others. | Swartz<br>Education | Critical | 1987 | Ennis |
| 129. truth-seeking, open-mindedness, analyticity, systematicity, critical thinking self confidence, inquisitiveness, and maturity of judgment | McCarthy<br>Military | Critical | 2001 | Facione |
| 130. truth-seeking, open-mindedness, analyticity, systematicity, self confidence, inquisitiveness | Cubukcu<br>Education | Critical | 2006 | Facione |
| 131. truth-seeking, open-mindedness, analyticity, systematicity, critical thinking self confidence, inquisitiveness, and maturity of judgment | Begbie<br>Nursing | Critical | 2007 | Facione |
| 132. truth-seeking, open-mindedness, analyticity, systematicity, critical thinking self confidence, inquisitiveness, and maturity of judgment | Lederer<br>Medicine | Critical | 2007 | Facione |

| Dispositions | Author/Field | Type of Thinking | Date | Source |
|---|---|---|---|---|
| 133. Synthesis of various lists of thinking dispositions:<br>*1. Creative thinking: looking out, up, around, and about*<br>Open-minded<br>Curious<br>2. *Reflective thinking: looking within*<br>Metacognitive<br>3. *Critical thinking: looking at, through, and in between*<br>Seeking truth and understanding<br>Strategic<br>Skeptical | Ritchart<br>Education | Critical<br>Reflective<br>Creative | 2002 | various |
| 134. Effective problem solvers, in contrast, view problems as challenges and are persistent in seeking solutions. If a particular strategy is unsuccessful, they take a different approach. Other attitudes and habits of effective thinking are well known: open-mindedness, flexibility, ability to defer immediate judgment, attention to detail. | McTighe<br>Education | Effective | 1987 | McTighe |
| 135. Provided a more concise summary of her earlier seven dispositions:<br>1. The disposition to pose and explore problems.<br>2. The disposition to critique and test theories and explanations.<br>3. The disposition to seek multiple perspectives and possibilities.<br>4. The disposition to be judicious and reflective. | Tishman<br>Education | Good | 2001 | Tishman |
| 136. Siegel (1988) does also, as well as having a critical spirit, for which he offers several subdispositions: objectivity, intellectual honesty, impartiality, a willingness to conform j udgments and actions to principle, and a commitment to seek and evaluate reasons. | Ennis<br>Philosophy | critical | 1996 | Siegel |
| 137. Facione, Sanchez, & Facione, 1994) offer seven disposition factors:<br>openmindedness, inquisitiveness, systematicity, analyticity, truth-seeking, critical thinking self-confidence, and maturity. | Ennis<br>Philosophy | critical | 1996 | Facione |
| 138. 1. To be broad and adventurous<br>2. Toward sustained intellectual activity<br>3. To clarify and seek understanding<br>4. To be planful and strategic<br>5. To be intellectually careful<br>6. To seek and evaluate reasons<br>7. To be metacognitive | Ennis<br>Philosophy | critical | 1996 | Tishman |
| 139. 1. Care that their beliefs be true, and that their decisions be justified; that is, *care to "get it right" to the extent possible,* or at least care to do the best they can. This includes the interrelated dispositions to do | Ennis<br>Philosophy | critical | 1996 | Ennis |

| Dispositions | Author/Field | Type of Thinking | Date | Source |
|---|---|---|---|---|
| the following:<br>    A. *Seek alternatives* (hypotheses, explanations, conclusions, plans, sources), and *be open* to them;<br>    B. *Endorse a position to the extent that, but only to the extent that, it is justified* by the information that is available;<br>    C. *Be well-informed;* and<br>    D. Seriously *consider points of view other than their own.*<br>  2. *Represent a position honestly and clearly* (theirs as well as others'). This includes the dispositions to do the following:<br>    A. Be *clear* about the intended meaning of what is said, written, or otherwise communicated, seeking *as much precision as the situation requires;*<br>    B. Determine, and *maintainfocus* on, the conclusion or question;<br>    C. Seek and offer *reasons;*<br>    D. Take into account the *total situation;* and<br>    E. Be reflectively *aware of their own basic beliefs.*<br>  3. *Care about the dignity and worth of every person.* This includes the dispositions to:<br>    A. *Discover and listen to others' view and reasons;*<br>    B. *Take into account others 'feelings and level of understanding,* avoiding intimidating or confus ing others with their critical thinking prowess; and<br>    C. *Be concerned about others' welfare.* | | | | |
| 140.  1. The disposition to pose and explore problems.<br>    2. The disposition to critique and test theories and explanations.<br>    3. The disposition to seek multiple perspectives and possibilities.<br>    4. The disposition to be judicious and reflective. | Tishman Education | Good | 2001 | Perkins, Jay, Tishman |

# APPENDIX B - Thinking Disposition Related Competencies Identified for Intelligence Analysts

This table contains disposition-related competencies for intelligence analysts found during the search. **Source** indicates the original source of the list.

| Analyst Characteristics | Author | Date | Source |
|---|---|---|---|
| 1.  Characteristics required for Descriptive intelligence:<br>Self-Motivated<br>Observant<br>Intensely Concentrates | Moore | 2001 | Moore & Krizan |
| 2.  Characteristics required for Explanatory intelligence:<br>Self-Motivated<br>Observant<br>Intensely Concentrates<br>Questions Convention | Moore | 2001 | Moore & Krizan |
| 3.  Characteristics required for interpretive intelligence:<br>Exhibits a Sense of Wonder<br>Self-Motivated<br>Fascinated with Puzzles<br>Exhibits A-ha Thinking<br>Observant<br>Reads<br>Fruitfully Obsessed<br>Intensely Concentrates<br>Takes Variable Perspectives<br>Makes Creative Connections<br>Questions Convention<br>Exhibits a Sense of Humor<br>Playful | Moore | 2001 | Moore & Krizan |
| 4.  Characteristics required for Estimative intelligence:<br>Curious<br>Exhibits a Sense of Wonder<br>Self-Motivated<br>Fascinated with Puzzles<br>Exhibits A –Ha Thinking<br>Observant | Moore | 2001 | Moore & Krizan |

| Analyst Characteristics | Author | Date | Source |
|---|---|---|---|
| Reads<br>Fruitfully Obsessed<br>intensely concentrates<br>Takes Variable Perspectives<br>Makes Creative Connections<br>Questions Convention<br>Exhibits a Sense of Humor<br>Playful | | | |
| 5. O'Connor provided several paragraphs listing characteristics:<br><br>Intelligence analysts must know themselves. They must understand their own lenses that they use to process, filter, channel, or focus information. These lenses are known by many names – mental models, mind-sets, or analytical assumptions.<br><br>Intelligent analysts tend to treat what they expect to perceive as more important than what they want to perceive. They don't engage in wishful thinking; they think reflectively. They have analyzed their own background, not in a soul-searching sense of trying to find what they really want, but in terms of looking at how past experiences, education and training, cultural and organizational norms have influenced them to pay particular attention to some things and not to others.<br><br>Intelligence analysis doesn't involve an open mind. There's no such thing as an open mind, no matter how you define it. Preconceptions are inevitable. Intelligence analysts obtain objectivity by making basic assumptions and reasoning as explicitly as possible.<br><br>Analysts commonly try to shift back and forth from one perspective to another. They try to perceive things from an adversary's interpretation as well as from the United State's point of view. | O'Connor | 2004 | Not stated |
| 6. The attributes of the ideal analyst offered by analysts Interviewed during the course of this project are summarized as follows. The ideal analyst:<br><br>• is a technologist<br>• Is focused (either a specialist or generalist, not both].<br>• Is an Information entrepreneur(as described earlier).<br>• Is comfortable with changing roles as apprentice, peer, trainer, or consultant.<br>• Can communicate (written and oral).<br>• Is a detective<br>• Is imaginative<br>• Is self-starting, self organizing<br>• Has a profession (Intelligence analysis).<br>• Has related hobbies or technology Interests. | Katter, Montgomery, Thompson | 1979 | Surveyed analysts |

| Analyst Characteristics | Author | Date | Source |
|---|---|---|---|
| • Prefers analysis to management.<br>• Can perform multiple, concurrent activities.<br>• Is self-confident.<br>• Has a photographic memory. | | | |
| 7. Moore & Krizan proposed:<br><br>Insatiably curious<br>Self Motivated<br>Fascinated by puzzles<br>Exhibits AHA thinking<br>Observes voraciously<br>Reads voraciously<br>Fruitfully obsessed<br>Takes variable perspectives<br>Makes creative connections<br>Playful<br>Has a sense of humor<br>Has sense of wonder<br>Concentrates intensely<br>Questions conventions | Moore & Krizan | 2005 | Moore & Krizan |
| 8. A significant percentage (21 percent) of those who choose to pursue employment in national security intelligence tend to express the following behavior preferences:<br>orientation to the inner world of ideas rather than the outer world of things and people, tendency to gather factual information through the senses rather than inspiration, proclivity to make decisions on the basis of logic rather than emotion, and an eagerness to seek closure proactively instead of leaving possibilities open. | Krizan | 1999 | MBTI |
| 9. Insatiably curious<br>Self Motivated<br><br>Fascinated by puzzles<br>Exhibits AHA thinking<br>Observes voraciously<br>Reads voraciously<br>Fruitfully obsessed<br>Takes variable perspectives<br>Makes creative connections<br>Playful<br>Has a sense of humor<br>Has sense of wonder<br>Concentrates intensely | Moore & Krizan | 2001 | Moore & Krizan |

| Analyst Characteristics | Author | Date | Source |
|---|---|---|---|
| Questions conventions | | | |
| 10. But, a good intelligence analyst is more than just an analyst. He or she should also have a set of fairly unique personal attributes. Among these are:<br><br>The ability to deal with a high level of ambiguity and lack of structure.<br><br>The ability to be a self-starter.<br><br>The ability to be comfortable and articulate with people in the organization who are considerably more senior then he or she is.<br><br>The ability to get the customer to define what is really needed and why.<br><br>The humility to understand that, as a support person, an intelligence analyst is not an advocate.<br><br>The personal fortitude to push an intelligence finding so that it gets the attention it deserves by senior managers -- even if this means crossing the formal hierarchy of the company. | Sullivan | 2002 | Sullivan |
| 11. Characteristics<br>• Curious<br>• Creative<br>• Conscientious<br>• Passionate | Unknown (RW 615) | Undated | Unknown |
| 12. Hedgehogs and Foxes<br>The hedgehogs have one large, overriding schema, such as "axis of evil," with which they parsimoniously analyze world affairs. Foxes are less wedded to one overarching world view and instead "improvise ad hoc solutions" | Kozlowski | 2011 | Tetlock |
| 13. Characteristics of the intelligence researcher: reasoning ability, accuracy, intellectual honesty, open-mindedness, skepticism, a sense of detachment, patience, diligence, perseverance, and imagination. | Clauser &Weir | 1976 | Unknown |
| 14. High Level reasoning ability, Inductive reasoning, Intellectual flexibility, Writing skill, Memory, Intellectual curiosity, Deliberateness, carefulness, Interpersonal skill, Achievement motivation, Self-discipline, Perseverance | Fischl & Gilbert | 1983 | Unknown |
| 15. Research also demonstrated the following personality traits most often seen in intelligence analysts: "orientation to the inner world of ideas rather than the outer world of things and people, tendency to gather factual information through senses rather than inspiration, proclivity to make decisions on the basis of logic rather than emotion, and an eagerness to seek closure proactively instead of leaving possibilities open. | Ormond | 2002 | Krizan |
| 16. The personal attributes of knowledge workers should ideally include the following:<br>- They can work in multiple domains simultaneously, moving in and out of them, continuously expanding their knowledge, capabilities, perceptions, capacities and networks.<br>- They manage knowledge in the sense of recognising, creating, finding and moving knowledge that is valid, useful and applicable to the issue at hand. They can create ideas, solve problems, make decisions and take | Duvenage | 2010 | Bennet, Alex and David. |

| Analyst Characteristics | Author | Date | Source |
|---|---|---|---|
| effective action, either individually or as a group.<br>- They have foresight to sense the future knowledge needs and acquire that knowledge to handle challenging problems well before they arise. Their understanding of systems and complexities helps them to identify possible future knowledge needs.<br>- They are ongoing learners who have sound discipline, knowledge and a broad competency that spans many dimensions. This implies that they realise that they cannot be experts in all domains and are therefore willing to forego their perspectives and beliefs to adopt a broader understanding of an issue at hand.<br>- They are convergent thinkers who have knowledge of systems, complexities and critical thinking and who can use different approaches and techniques to better understand complex issues.<br>- They develop and nurture their relationship networks to gain knowledge and actions in new environments.<br>- They are information literate. They know how to find, evaluate and use information effectively to solve a particular problem or make a decision.<br>- In knowledge organisations, where change happens rapidly and the creation and use of knowledge to gain a competitive advantage is paramount, the knowledge workers will spend more time learning, thinking and collaborating and less time applying what they already know. | | | |
| 17. The effective knowledge workers (or intelligence analysts) are capable of working "in multiple domains simultaneously, moving in and out of those domains as needed, combining the physical, mental, the intuitive, and the emotional to continuously expand their knowledge, capabilities, capacity, networks, and perceptions. They are convergent thinkers who have knowledge of systems, complexity and critical thinking and who can use different approaches and techniques to better understand complex issues." One would come across the concepts "powers of abstraction", "conceptualisation" and "synthesis" skills, "out-of-the-box" and "heterogeneous thinking" quite often in knowledge-management literature. The research in cognitive and social abilities of the "global worker" informs which type of person intelligence agencies should recruit or co-opt; probably that kind of person who might not pass the outdated vetting procedures and psychological tests. | Duvenage | 2010 | Bennet, Alex and David. |
| 18. Strategic human resource management offers an objective, scientific approach to developing the best possible workforce. It is grounded in the findings that individuals differ on a wide range of psychological characteristics— such as cognitive ability, personality, and values—that predict corresponding differences in educational achievement, job performance, and career success. Some of these characteristics are relatively stable, such as cognitive ability, personality, and values, while others are more malleable, such as job knowledge, job-specific skills, attitudes, and motivational characteristics. | Fingar | 2011 | Unknown |
| 19. 4.1 Accurate memory<br>4.2 Flexibility<br>4.3 Integrity and moral courage<br>4.4 Self-starter | Derbentseva, McLellan, Mandel | 2010 | Interviews with analysts |

| Analyst Characteristics | Author | Date | Source |
|---|---|---|---|
| 4.5 Thirst for knowledge<br>4.6 Thoroughness | | | |
| 20. Insatiably curious<br>Self-motivated<br>Fascinated by puzzles<br>Exhibits "AHA" thinking<br>Observes voraciously<br>Reads voraciously<br>Fruitfully obsessed<br>Takes variable perspectives<br>Makes creative connections<br>Playful<br>Has sense of humour<br>Has sense of wonder<br>Concentrates intensely<br>Questions convention | Derbentseva,<br>McLellan,<br>Mandel | 2010 | Moore &<br>Krizan |

# LIST OF ACRONYMS

| | |
|---|---|
| ACT | American College Test |
| AET | Argument Evaluation Test |
| AOT | Actively Open-Minded Thinking (also AOMT) |
| APA | American Philosophical Association |
| AT | Ambiguity Tolerance |
| CCTDI | California Critical Thinking Dispositions Inventory |
| CCTST | California Critical Thinking Skills Test |
| CEC | Connect-Extend-Challenge |
| CPI | California Psychological Inventory |
| CRT | Cognitive Reflection Test |
| CT | Critical Thinking |
| DMC | Decision Making Competence |
| EFA | Exploratory Factor Analysis |
| FAC | Framework for Analytic Cognition |
| GPA | Grade Point Average |
| GRE | Graduate Record Examination |
| IC | Intelligence Community |
| IQ | Intelligence quotient |
| MBTI | Meyers-Briggs Type Indicator |
| MD | Medical Doctor |
| NFC | Need for Cognition (also as NC) |
| NFCC | Need for Closure Scale |
| NFCS | Need for Cognition Scale |
| NCLEX | National Council Licensure Examination |
| SAT | Scholastic Aptitude Test |
| TDK | Thinking Dispositions Questionnaire |
| TSD-PI | Trait Self Descriptive Personality Inventory |