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AIR COMMAND AND STAFF COLLEGE

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PROMOTING CRITICAL THINKING IN PROFESSIONAL MILITARY EDUCATION

by

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Contents

Page

DISCLAIMER ii

TABLES v

PREFACE vi

ABSTRACT vii

INTRODUCTION 1

BACKGROUND 4
- Importance of Critical Thought 4
- Critical Thinking as an Educational Construct 7
  - Description of Critical Thinking 7
  - Critical Thinking Course Development 10
- Critical Thinking Curriculum Checklist 14

ANALYSIS 17
- Mission Statement 17
- Objectives & Courseware 18
- Standards 19
- Assessment 19
- Levels-of-Learning 20
- Faculty Development 20

SUMMARY 22
  - Recommendations For Senior Leadership 23

GUBBIN'S MATRIX OF THINKING SKILLS 26

EXAMPLE AFFECTIVE BEHAVIORS 28

EXAMPLE CT STANDARDS 29

EXAMPLE CT ELECTIVE SYLLABUS 31

BIBLIOGRAPHY 33

Tables

Page

Table 1 Bloom's Taxonomy of Cognitive Educational Objectives. Adapted from AFMAN 36-2236. 12

Preface

Between the worlds of fact and opinion lies another world—the world of reasoned opinion. It's a world where logic rules over emotion, where process counts as much as outcome. Many of us feel uncomfortable in the world of reasoned opinion because we just don't understand the rules. To arrive at a reasoned opinion we must simultaneously evaluate content, logic, and motive and we must understand our own mental limitations and biases.

In the emerging information age, these skills become increasingly important. Technology geometrically increases the amount of available information but much of it is unreliable. To be successful in this age will require new approaches to thinking and new approaches to learning. Critical Thinking is one such approach that teaches skills necessary to sort through information and quickly spot illogic and bias.

I began this research in an attempt to find a model to improve my own thinking skills. What I found is that the current educational system has not prepared us for tomorrow's challenges. We've been taught what to think but not how to think. For today's military leader, Professional Military Education (PME) offers one last chance to remedy past educational inadequacies. Making improvements to the PME system will itself require critical thinkers—and so the paradox is formed.

I'd like to thank my advisor Lt. Col. Michael Simpkins for his enormous effort, attention to detail and guidance. I'd also like to thank Lt. Col. Christina Lafferty, Lt. Col. Hank Dasinger and Dr. Richard Muller for their time and advice on this important subject.

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Abstract

Critical thinking (CT) is important to professional military education (PME) because it provides a powerful tool to operate in a complex, changing world. Unfortunately, the teaching of such skills has been woefully ignored in American education. This paper examines common elements of successful nation-wide CT programs to develop a simple academic assessment checklist. The checklist is used to assesses the CT curriculum of the United States Air Force's Air Command and Staff College (ACSC)—a PME program for mid-level officers. The Air Force's ACSC CT curriculum has made great strides in improving the cognitive skills of its student body but is still in its infancy. Assessment of the school's program showed that, while some skills and behaviors are taught, the list is far from complete when compared to other nation-wide programs. Furthermore, CT standards, testing, and faculty development efforts are still incomplete.

Part 1

Introduction

Humans are the only creatures whose speech and activity obscures and distorts who and what we are. Our fervent beliefs we confuse with knowledge or proof, our emotionally-held opinions with convictions, our stubbornness with determination, our judgmentalism with judgment, our point of view with reality. We confound fact and opinion, data and interpretation, evidence and conclusion, information and knowledge. And we do all this with ease, with skill if you will, both individually and collectively.

— Richard Paul

Every action ever taken by mankind was first a thought. Every decision, every problem solution, every new invention came only as the result of some specific thought process. The ability for purposeful thought is what elevates humans above the rest of the animal kingdom and yet, sometimes, our most powerful attribute is our most glaring weakness. Instead of forming rational solutions based on environmental realities, humans seem to be innately predisposed to reshape reality to fit pre-ordained answers. Our thinking processes are often anything but rational, and worse, we are, by in large, completely blind-sided about our mental failings.

Faulty thinking drives faulty actions. History is replete with examples. Pelvin attributes Japan's defeat during WWII to its leadership's inability to "critically assess their position as the war turned against them."[1] Feinberg describes the Vietnam War decision-making process as "an example of collective stupidity perpetuated by highly intelligent people."[2]

No amount of good leadership can improve a decision that is flawed from the start. Good leaders must first make good decisions. Good decisions require good thinking and so leaders must understand the capabilities and limitations of their own thought processes. Various terms like logic and reasoning are often used to describe these thought processes. Yet, specifics can allude us. What are the specific thought processes involved in arriving at reasoned decisions and problem solutions? How do our own personal biases limit our thinking abilities? Critical Thinking (CT) is an emerging field in education that attempts to classify and understand these thought processes. Briefly put, critical thinking describes the "mental processes, strategies, and representations people use to solve problems, make decisions and learn new concepts."[3] Educators generally consider both affective behaviors and cognitive skills to be at the core of such mental processes, strategies, and representations. Thus, good critical thinkers are behaviorally disposed to critical thought (affective behaviors) and employ learned processes, strategies, and representations (cognitive skills). Translating these affective behaviors and cognitive skills into measurable teaching objectives is the challenge for educators.

The Air Force has incorporated a CT curriculum into the Air Command and Staff College (ACSC) program. During this ten month course, CT terminology is defined and some CT skills are applied and evaluated. Yet, how well does the school succeed in addressing core critical thinking concepts and educational strategies?

This research assesses the CT curriculum of ACSC against other nation-wide CT programs and theories. The background section lays the foundation of CT. It describes the importance of CT and describes core CT concepts and educational strategies. An assessment checklist is developed by incorporating common aspects of other sample CT programs. The analysis section

of the research assesses the ACSC CT curricula against the checklist, while the summary provides a framework for future activity.

While this research is specifically intended to assess the critical thinking curriculum of ACSC, it has applications for any academic program. The research develops a simple checklist that assesses various elements of a CT curriculum and presents recommendations that can have useful applications for any CT program.

Notes

[1] Richard Pelvin, *Japanese Air Power 1919 - 1945: A Case Study in Military Dysfunction*, ISBN 0 642 22770, (Air Power Studies Centre, Royal Australian Air Force, 1995), 5.

[2] M.R. Feinberg & J.J. Tarrant, *Why Smart People Do Dumb Things*, (New York: Simon & Schuster, 1995), 36.

[3] Robert J. Sternberg, *Critical Thinking: Its Nature, Measurement and Improvement,* ED 272 882 (Washington, D.C.: U.S. Dept. of Education, 1986), 2.

Part 2

Background

More than a decade has passed since then-President John F. Kennedy ordered the invasion of the Bay of Pigs. The invasion was to become one of the greatest disasters in U.S. political and military history. . . The decision to invade, made largely by Ivy-League educated men with some experience in political affairs, represented what from almost any point of view would have to be labeled as a lapse in critical thinking.

— Robert Sternberg

Importance of Critical Thought

The pursuit of better cognitive skills and a military more predisposed toward critical thought is a lofty but vital educational goal. Critical thinking is important to professional military education because it provides a powerful tool to operate in a complex, changing world and because it has practical military applications. Unfortunately, the teaching of such skills has been woefully ignored in American education.

One of the recurring themes of the ACSC curriculum is the changing military-political environment. We live in a complex world that is both multi-polar and multi-cultural, a world where change is occurring at an ever-increasing pace and where the availability of information now far outstrips any human capability for comprehension. Richard Paul asks "how can we adapt to reality when reality won't give us time to master it before it changes itself, again and again, in ways we cannot anticipate?"[1] According to Greg and Renz "changes in society will so

dramatically alter the lives of college students as to make irrelevant much of what they have learned today. The understandings and skills retaining relevance are those which enable individuals to sort through the plethora of information and ideas which confront them."[2] Unfortunately, traditional education in America has largely ignored such valuable skills; stressing "what to think" rather than "how to think." Paul observes that "schools in the U.S. were established precisely to transmit by inculcation self-evident, true beliefs conducive to right conduct and successful 'industry.'"[3] According to Pawlowski, recent educational assessments have concluded that "among other things, students lacked basic critical thinking skills."[4] As a result, very few enter the U.S. military with any higher-order cognitive skills or effective traits. By-in-large, the U.S. Air Force makes little attempt to rectify cognitive short-comings. According to AFMAN 36-2236, 90 percent of the material taught in Air Force schools is at the lower levels of cognition.[5] Thus, while we live in a world that increasingly demands higher-order cognitive skills such as the ability to infer and evaluate, we have inherited an educational system that stresses only lower-order skills like recall and comprehension. Are we intellectually prepared to meet the challenges of the complex, ever-changing information age?

A good many military processes rely on core CT skills. For example, skills of the successful staff officer and commander coincide with recognized CT skills. Army FM 101-5 recognizes "critical reasoning" as an important characteristic of the staff officer. Army FM 100-5 lists "good decision making" as one of two characteristics (along with good leadership) as vital to command.[6] Critical thinking also has important ramifications for group dynamic skills and quality control. Paul links failures in the Total Quality Movement to an emphasis on simplistic procedures and slogans rather than on the critical thinking skills necessary to produce "genuine,

continuous improvements in quality."[7] Thus, while many military processes rely on good critical thinking, the evidence indicates such skills and behaviors may be lacking.

Changes in our environment necessitate basic changes in our approach to education. Educational institutions have begun to respond. Pawlowski observed a "growing dissatisfaction with the current [educational] system and a growing shift from the instructional to the learning paradigm."[8] According to Barr and Tagg, "we now see that our mission is not instruction but rather that of producing learning."[9] Currently, 800 colleges and universities offer courses in critical thinking.[10] In 1981, the California State University system mandated CT requirements as a prerequisite for graduation. Two years later, CT was a core element of the California education system and included grades K - 12 and the State Community College system as well.[11]

So far we have examined the importance of CT in a complex and changing world. We've looked at the failure of traditional education to address the need for higher-level cognitive skills and found evidence that many educational institutions are beginning to adopt a new paradigm that stresses learning over instruction. The development of new curricula to teach CT cognitive skills and affective behaviors is perhaps easier said than done. Pawlowski concluded the problem confronting the CT movement was not in "identifying the necessity of the activity or its integral connection with the curriculum and institutional mission. The difficulty . . . is getting faculty to define, discuss, and fully incorporate it into their learning activities."[12] Understanding the importance of CT in a complex and changing world is vital to developing a viable CT curriculum. Next we look at CT curriculum development.

Critical Thinking as an Educational Construct

Air Force course development is based on a process called Instructional System Development (ISD). This process, outlined in various Air Force manuals, is described as a "deliberate and orderly, but flexible process for planning, developing, and managing high quality instructional programs."[13] The process requires course developers to, among others tasks, determine appropriate levels-of-learning (in accordance with Bloom's taxonomy) and to translate desired learning outcomes into detailed criterion objectives. Criterion objectives are formal written statements that describe observable student performances, measurable standards, and specific conditions or applications. Use of the ISD process is compatible with a CT curriculum. While AFMAN 36-2236 concedes linking desired behaviors to measurable outcomes is prone to errors at higher levels of learning, the manual directs such a process (even at higher levels of learning) because "the value of measuring learning by its outcomes far outweighs the risk of error."[14] The review of literature that follows describes how core CT elements translate into the ISD process. It discusses samples of behavior, levels-of learning, CT standards, assessment instruments, and faculty development. Appropriate samples of behavior incorporate both affective behaviors and cognitive skills. The term "CT skills" will be used to describe both cognitive skills and effective behaviors. First, we must completely understand what is meant by the term – Critical Thinking.

Description of Critical Thinking

The literature reveals a lack of any overwhelming consensus on the descriptive dimensions of critical thinking. Differences in definitions, required skills, scope, and application of critical thinking exist. Tucker observed the term critical thinking was used in an attempt to separate

kinds of thinking that may, in fact, be inseparable. Thus, he concluded no "professional or ideological group means the same thing when they call something critical thinking. In fact, there appear to be great differences in the way the term critical thinking is used in ordinary communication and the way it has been defined in the work of scholars."[15]

Numerous, varied definitions exist. For example, Dr. Richard Paul, a philosopher and prolific writer on the subject, defines critical thinking as:

> A unique kind of purposeful thinking in which the thinker systematically and habitually imposes criteria and intellectual standards upon the thinking, taking charge of the construction of thinking, guiding the construction of thinking according to the standards and assessing the effectiveness of the thinking according to the purpose, the criteria and the standards.[16]

The California State University Mandate, which established the formal requirement for CT instruction in California schools, recognizes:

> Instruction in critical thinking be designed to achieve an understanding of the relationship of language to logic, leading to the ability to analyze, criticize, and advocate ideas, to reason inductively and deductively, and to reach factual or judgmental conclusions based on sound inferences drawn from unambiguous statements of knowledge and belief.[17]

The American Philosophical Association (A.P.A.) presented a consensus statement of 46 education experts based on the Delphi method. The A.P.A. panel concluded:

> We understand critical thinking to be purposeful, self-regulatory judgment which results in interpretation, analysis, evaluation, and inference, as well as explanation of the evidential, conceptual, methodological, criteriological, or contextual considerations upon which judgment is based...While not synonymous with good thinking, CT is a pervasive and self-rectifying human phenomenon.[18]

Each definition is different and taken together they raise as many questions as they answer. What are the common skills of the successful critical thinker? How broad is the scope of critical thinking? What are the applications of critical thought?

Each definition considers common skills that mark a successful critical thinker. For example, the California mandate recognizes abilities "to analyze, criticize, and advocate ideas." No two definitions include the same skills set. This could present a problem to educators who must turn skills into samples of behavior and criterion objectives. However, Sternberg suggests certain core skills exist. In fact, he concluded that agreements as to the nature of critical thinking clearly outweigh the disagreements.[19] Gubbin studied a large number of critical thinking taxonomies and compiled a list of common skills shown in Appendix A.[20] These skills could provide the basis for a comprehensive critical thinking curriculum.

The scope of CT curricula is another area where differences occur. Sternberg suggests differences occur in "how broadly or narrowly the construct of critical thinking is viewed—in its boundaries—rather than in what is viewed to be at the core."[21] The critical thinking field ultimately has its roots in the philosophy of Socrates. As a result, it is often considered a sub-topic of philosophy that deals with logical reasoning skills. Of the programs reviewed in this research, all curricula included logical reasoning skills. Some programs (for example, San Jose State University's General Education Critical Thinking Program[22]) included only these skills. A limited program based only on logical reasoning skills is one possibility. Another possibility would be a program based on elements of philosophy, psychology, and education. At the core of such a program are logical reasoning skills based on philosophy. Psychological theories consider affective behaviors. Educational research, through the works of Bloom and others, provide appropriate teaching methods. Sternberg and the A.P.A. favor this approach. However, alternative theories exist that consider wider scopes to include social, creative, and moral elements. Because there is no broad consensus as to the scope of critical thinking, individual educators are largely free to decide how broad or how narrow to make a CT curriculum. Lack of

consensus also suggests educators make a conscious decision as to the scope of the program from the start.

There is also no consensus as to whether critical thinking skills are generalizable—that they transfer from specific curriculum content to broader environments. This could present a problem to educators if they expect, for example, critical writing skills to transfer to critical decision-making skills. If critical thinking skills do not transfer, then educators must determine specific applications before determining curriculum objectives and teaching methods. McPeck concluded "generalizable thinking skills do not exist and that thinking is always about a subject; consequently, thinking detached from a subject can not exist."[23] Ennis differed; concluding general principles do have application to many subjects and thus critical thinking does "transfer to new situations."[24] Tucker concluded (when considering assessment instruments):

> Given that current evidence is insufficient to resolve the many questions about generalizability of critical thinking skills, the best investigative strategy for now is to create assessments in specific professional contexts. The downside risk of introducing context into this critical thinking model is minimal. If context does not introduce non-trivial changes into the nature of critical thinking, then the effort will have gone mostly into ensuring that the language is suitable and no empirical support will be found for the 'context' dimension.[25]

Thus, it appears the safest measure would be to create a context-specific critical thinking curriculum until further support is found for generalized skills. This means educators should determine specific applications for CT prior to determining CT curricula.

Critical Thinking Course Development

The discussion so far infers educators should work backwards when developing a CT curriculum. First, the required application(s) should be considered. The required application(s) determine program scope and necessary core skills. Necessary core skills form the basis for

samples of behavior and criterion objectives. This section discusses the development of criterion objectives, standards, assessment instruments, and staff development.

Educators should consider both cognitive skills and affective behaviors when developing CT criterion objectives. Air Force Instructional System Development (ISD) methods recognize the importance of this dual approach. AFMAN 36-2236 states "both the behavioristic and cognitive approaches are useful learning theories...perhaps the best approach to planning and managing instruction is an approach which includes features of each major theory."[26] This is important because cognitive skills are not useful if the student is not behaviorally disposed to using them. Like cognitive skills, affective dispositions may not be generalizable. Thus, a student might, for example, be disposed to use critical thinking skills when writing but not when problem solving. Although no consensus could be found as to a comprehensive set of affective behaviors, examples of some appropriate behaviors are shown in Appendix B.

The Air Force ISD process requires general objectives be matched to appropriate levels-of-learning. The process relies on Bloom's cognitive taxonomy. Applying the process to a CT curriculum raises two important questions. First, which levels of learning are appropriate for teaching CT cognitive skills? Second, is Bloom's taxonomy even a reliable model for a CT curriculum? The research suggests that CT involves mainly higher-order cognitive skills. Jones and Ratcliff found "most definitions for critical thinking include skills in applying, analyzing, synthesizing, and evaluating information."[27]

Evaluation (Highest Level)	Judge the value of material for a given purpose.
Synthesis	Put part together to form new patterns or structures.
Analysis	Break down material into components so that the organizational structure may be understood, including the identification of the parts, analysis of the relationships between parts, and recognition of the organizational principles involved.
Application	Use material in new situations including application of rules, methods, concepts, principles, laws, and theories.
Comprehension	See relationships, concepts and abstractions beyond simple remembering of material. Involves translating, interpreting and estimating future trends.
Knowledge (Lowest Level)	Recall previously learned material in essentially the same form as taught.

Table 1 Bloom's Taxonomy of Cognitive Educational Objectives. Adapted from AFMAN 36-2236.

Thus, it appears unlikely that CT can be taught at only the "Knowledge" and/or "Comprehension" levels. This is relevant to Air Force educators because, according to AFMAN 36-2236, "90 percent of the material taught [in Air Force schools] is at the lower three levels of the taxonomy."[28] This statement raises a pivotal question for Air Force educators. If Air Force schools generally stress lower level skills and CT curricula stress higher level skills, what is the proper role of CT instruction?

Paul[29] and Sternberg[30] question the reliability of Bloom as a model for CT curricula. Paul contends the hierarchical nature of Bloom's cognitive taxonomy is antithetical to the principles of critical thinking. Such a hierarchy requires students to accept knowledge before reasoning. Paul contends knowledge can be attained only as the result of reasoning. Sternberg asks whether

Bloom's cognitive taxonomy is not descriptive rather than prescriptive. An in-depth analysis of these arguments is beyond the focus of this research. The important point is that Bloom's taxonomy must be reconsidered by educators before incorporating it as a model for any CT curriculum.

The idea of measurable critical thinking standards is another area that requires additional research. Few of the programs researched included measurable standards. Of the CT definitions included in this paper, only one—the Richard Paul definition—makes any reference to standards. Paul considers the use of "universal intellectual standards" vital to a successful curriculum.[31] Sample CT standards are shown in Appendix C. The ISD process requires standards be applied to all criterion objectives. Thus, to promote, for example, critical reading, writing, and speaking skills would require measurable standards in each of these areas.

Once objectives are linked to measurable standards, educators can consider methods of evaluation. The overwhelming consensus of the experts is that both CT cognitive skills and effective behaviors be tested. According to the A.P.A. "it would be shameful if those assessment instruments which focus only on CT [cognitive] skills drove our CT curriculum and caused the dispositional components of good CT to be neglected."[32] Tests for CT cognitive skills and effective behaviors exist. Whether they measure these traits in a valid and reliable fashion is a question for educators to answer. Educators must also consider whether to accomplish pre-testing, post-testing, or both. Obviously, time and budget constraints will impact any testing decision.

No CT curriculum would be complete without staff development. Without robust staff development, can administrators be sure individual teachers clearly understand scope,

application, levels of learning, and assessment issues? Furthermore, teachers may perceive their CT teaching skills to be higher than they actually are. Pawlowski found:

> Many faculty may erroneously believe that they already include critical thinking in their teaching. According to Das (1994), there is a belief among individual educators that it is a routine matter for them to emphasize critical thinking in their instructional tasks, that indeed they routinely do so and it is a bit of a wonder why it is necessary to discuss it as a problematic issue in the educational field.[33]

According to Paul:

> The single most useful thing a teacher can do is to take at least one well-designed college course in critical thinking, in which the teacher's own thinking skills are analyzed and nurtured in numerous ways. In other words, teachers need a solid foundation in critical thinking skills before they can teach them."[34]

French and Rhoder found most teachers have not been trained to teach critical thinking skills[35] Thus it would seem that a thorough assessment of teacher skills is an important prerequisite for an effective CT program.

This section has examined a number of important aspects of critical thinking and CT curriculum development. Critical thinking has been described in detail. Issues involving samples of behavior (both affective skills and cognitive behaviors), criterion objectives, standards, assessment, levels-of-learning, and staff development have been discussed. What follows is a summary of these issues in checklist format. This checklist will then be applied to assess the ACSC CT program.

Critical Thinking Curriculum Checklist

1. *Mission Statement.* Has the institution formally defined critical thinking, its scope and intended application? Are the results in writing? Have these elements been incorporated into a CT mission statement? Is the mission statement available to the student body and faculty?

2. *Objectives & Courseware.* What specific criterion objectives have been developed to meet program goals? What specific courseware has been established to teach CT samples of behavior (cognitive skills and affective behaviors)?

3. *Standards.* Has the institution established, in writing, appropriate CT standards for reading, writing and speaking/class discussion? Are the standards available to the student body and faculty?

4. *Assessment.* How are student cognitive and affective skills assessed? Are pre and/or post test instruments administered?

5. *Levels-of-Learning.* Is the institution targeting specific levels of learning based on Bloom's Taxonomy of Cognitive Educational Objectives? If so, how does the CT curriculum fit with Bloom's taxonomy?

6. *Faculty Development.* Is a CT faculty development program in place? What percent of instructors have had a formal education in critical thinking?

Notes

[1] Richard Paul, *Critical Thinking: What Every Person Needs To Survive In A Rapidly Changing World,* (Santa Rosa, CA: Foundation for Critical Thinking, 1993), 3.

[2] J.B. Greg & M.A. Renz, "Critical Thinking," in *Teaching And Directing The Basic Communication Course,* ed. L.W. Hugenberg et al. (Dubuque, IA: Kendall/Hunt Pub., 1993), 9.

[3] Richard Paul, Ibid., 3.

[4] Donna Pawlowski & Mary Danielson, *Critical Thinking in the Basic Course: Are We Meeting the Needs of the Core, the Mission and the Students?* ED 428 410, (Washington D.C.: U.S. Dept of Education, 1998), 3.

[5] Air Force Manual (AFMAN) 36-2236, *Guidebook for Air Force Instructors*, Mar 1994, 5.

[6] Army Field Manual (FM) 100-5, *Operations*, June 1993, 2-14.

[7] Richard Paul, Ibid., 11.

[8] Donna Pawlowski & Mary Danielson, Ibid., 4.

[9] Quoted in Donna Pawlowski & Mary Danielson, Ibid., 5.

[10] Elizabeth Jones & Gary Ratcliff, *Critical Thinking for College Students,* ED 358 772, (Washington D.C.: U.S. Dept of Education, 1993), 15.

[11] Richard Paul, Ibid., 3.

[12] Donna Pawlowski & Mary Danielson, Ibid., 9.

Notes

[13] AFMAN 36-2236, Ibid., 1.

[14] AFMAN 36-2236, Ibid., 13.

[15] R.W. Tucker, *Less Than Critical Thinking-Part II,* (The Phoenix Institute, 1996) on-line Internet, 12 November 1999, available from http://www.intered.com/v6n4_ed.htm.

[16] Richard Paul, Ibid., 21.

[17] *Critical Thinking* on-line Internet, 12 November 1999, available from http://www.pacificnet.net/marteney/CriticThink.html.

[18] Peter Facione, *Critical Thinking" A Statement of Expert Consensus for the Purposes of Educational Assessment and Instruction*, (Millbrae, CA: California Academic Press, 1990), 16.

[19] Robert Sternberg, Ibid., 4.

[20] Robert Sternberg, Ibid., 33.

[21] Robert Sternberg, Ibid., 4.

[22] David Mesher, *English 007 Syllabus,* on-line Internet, 12 November 1999, available from http:// www.sjsu.edu/depts/itl/007/syabus.html.

[23] Elizabeth Jones & Gary Ratcliff , Ibid., 10.

[24] Elizabeth Jones & Gary Ratcliff , Ibid., 10.

[25] W.T. Tucker, Ibid., 4.

[26] AFMAN 36-2236, Ibid., 5.

[27] Elizabeth Jones & Gary Ratcliff, Ibid., 5.

[28] AFMAN 36-2236, Ibid., 17.

[29] Richard Paul, Ibid., 217.

[30] Robert Sternburg, Ibid., 7.

[31] Richard Paul, Ibid., 153.

[32] Peter Facione, Ibid., 16.

[33] Donna Pawlowski & Mary Danielson, Ibid., 9.

[34] Richard Paul, Ibid., 218.

[35] L.N. French & C. Rhoder, *Teaching Thinking Skills: Theory and Practice.* (New York: Garland Pub.,1992), 223.

Part 3

Analysis

In this section, the ACSC CT curriculum will be briefly assessed using the previously developed CT checklist. The analysis is based on interviews with several key faculty members. It is not intended to accomplish a comprehensive review of the school's curriculum. Rather, the analysis is intended as an example of the CT assessment checklist applied to a realistic setting. A comprehensive review would require a more formal inspection which is not warranted until senior staff at the school accept the validity of the assessment criteria.

Mission Statement

Has the institution formally defined critical thinking, its scope and intended application? Are the results in writing? Have these elements been incorporated into a CT mission statement? Is the mission statement available to the student body and faculty?

The A.P.A. definition, highlighted in the background section, is the only definition of critical thinking presented to students at ACSC. It is presented during CS-516 "*Critical Thinking, Creativity and Cognitive Complexity*". By default, it is the accepted ACSC definition of critical thinking. The definition was selected through a group effort as part of a specific lesson's development. The definition includes neither scope or application elements. No attempt has been made to link CT skills to specific course applications nor has the question of CT

generalizability been raised. The CT program at the school rests on the un-supported assumption that CT writing skills transfer to staff and command situations.

While the school has not formally adopted a specific CT mission statement. The school's published mission statement alludes to key critical thinking elements. According to the ACSC Mission Statement, the school supports an environment that "stimulates and encourages free expression of ideas as well as independent, analytical, and creative thinking…"[1]

Objectives & Courseware

What specific criterion objectives have been developed to meet program goals? What specific courseware has been established to teach CT samples of behavior (cognitive skills and affective behaviors)?

No specific CT criterion objectives have been developed and published for the school. However, numerous CT skills are recognized in individual course objectives. The Leadership and Command Course includes the objective, "apply critical thinking to decision making and problem solving scenarios."[2] The Communications Studies course includes the objective to "synthesize pertinent background and other support material into a well-reasoned position…"[3] The Independent Research Program (offered on an elective basis) includes the objective "to encourage students to conduct thoughtful, logical, and critical research and analysis."[4]

Specific courseware has been developed to identify and apply some CT skills. CS-516 *"Critical Thinking, Creativity, and Cognitive Complexity"* presents CT definitions[5] while CS-517 *"Cognitive Complexity, Creativity, and Critical Thinking (C3) and Leadership"* presents a few CT applications.[6] Lesson CS-822 *"Making a Claim and Supporting It,"* describes the process of constructing a logical argument.[7] It touches on several core CT cognitive skills but is taught as an elective only. While some cognitive skills and affective behaviors are discussed

during the school year, the list is far from complete when compared to the list of skills and behaviors shown in Appendix A and Appendix B. Furthermore, many of the skills are taught as part of the elective program and thus are not available to every student.

Standards

Has the institution established, in writing, appropriate CT standards for reading, writing and speaking/class discussion? Are the standards available to the student body and faculty?

The Independent Research Program Handbook contains comprehensive writing standards and includes some core CT elements: (1) issue identification & methodology, (2) development, organization & logic, (3) depth & quality of support, critical analysis, (4) conclusions & solutions. It is an outstanding example of CT standards in action and could provide a basis for evaluating skills throughout the academic year. Unfortunately, it is used only in conjunction with the Independent Research Elective and is not available to every student. No written standards for other applications (i.e., reading, class discussion, or problem solving) were found that were available to students and faculty. This raises an important question. Do students know precisely the standards by which they are graded?

Assessment

How are student cognitive and affective skills assessed? Are pre and/or post test instruments administered?

CT writing skills are formally evaluated throughout the academic year. The Nature of War Essay #1, for example, is graded based partly on the students' ability to "analyze the question and to develop a logical, persuasive, well-written essay..."[8] Assessment does not distinguish between cognitive skills and affective behaviors, so there is no way to determine whether a

student performs poorly on a writing assignment because of poor cognitive skills or poor affective behaviors. No pre-testing program has been established to assess CT cognitive skills or affective behaviors, so there is no way to determine the CT proficiency of students entering the school.

Levels-of-Learning

Is the institution targeting specific levels of learning based on Bloom's Taxonomy of Cognitive Educational Objectives? If so, how does the CT curriculum fit with Bloom's taxonomy?

The Air Force ISD process relies on Bloom's taxonomy to develop lesson syllabi. According to the Assistant Dean of Students, Dr. Richard Muller, there is acknowledgment within the school that strict interpretation of Bloom at higher levels-of-learning is not always appropriate.[9] Thus, while required by Air Force regulation, there is some concern that Bloom's Taxonomy is not a sufficient prescript for CT instruction.

Faculty Development

Is a CT faculty development program in place? What percent of instructors have had a formal education in critical thinking?

The school employs a robust faculty development program. However, no specific emphasis has been placed on a comprehensive CT program. No data is maintained listing the CT educational background of instructors. No faculty assessment program is in place to test the CT skills of instructors.

Notes

[1] *What is ACSC?,* on-line, Internet, 6 January 2000, available from http://www.acsc.au.af.mil/acsc/about.html.

[2] *AY2000 Leadership and Command Course,* on-line Internet, 6 January 2000, available from http://cyberbook\lc_cyber\lc_admin\lc_desc.htm.

[3] Ibid

[4] *Independent Research Program Description*, on-line Internet, 6 January 2000, available from http://cyberbook\cs_cyber\cs_admin\ir_desc.htm

[5] *CS-516 Critical Thinking, Creativity, and Cognitive Complexity,* on-line Internet, 6 January 2000, available from http://cyberbook\cs_cyber\cs_lsnpl\cs516lp.htm.

[6] *CS-517 Cognitive Complexity, Creativity, and Critical thinking (C3) and Leadership,* on-line Internet, 6 January 2000, available from http://cyberbook\cs_cyber\cs_lsnpl\cs517lp.htm.

[7] *CS-822 Making a Claim and Supporting It*, on-line Internet, 6 January 2000, available from http://cyberbook\cs_cyber\cs_lsnpl\cs822lp.htm.

[8] *Nature of War Take Home Essay #1,* on-line Internet, 6 January 2000, available from http://cyberbook\nw_cyber\nw_lsnpl\nw600lp.htm.

[9] Dr. Richard Muller, Asst. Dean of Students, interview by author, 28 January 2000.

Part 4

Summary

After examining a sample of CT theories and curricula to determine common elements, six important findings emerged from this research:

1. The increasing complexity and changing nature of the human environment necessitates improved critical thinking skills. These skills have not been taught as part of traditional education nor are they typically stressed in the Air Force educational system.
2. Differences in definitions, required skills, scope, and application of critical thinking exist. This requires course educators to reach consensus on CT descriptive elements before putting courseware into action. Various CT programs and theories include differing skills. The differences in skills are primarily the result of differing program scopes. Common core CT cognitive skills and affective behaviors exist.
3. No evidence could be found to support the generalizability of CT skills. Further research is needed in this area. Until supporting evidence is found, it would be wise for educators to develop context-specific CT programs.
4. The research suggests that CT involves mainly higher-order cognitive skills. This is important for educators relying on Bloom's Taxonomy of Cognitive Educational Objectives. There is some disagreement as to whether Bloom provides a valid model of instruction for CT curricula.

5. Written CT standards and assessment of CT skills are recommended attributes of a successful CT curriculum and required by the Air Force ISD process. A number of CT assessment instruments exist. Educators must decide pre/post-testing issues and whether to assess CT cognitive skills and/or affective behaviors.
6. Faculty development is a key contributor to a successful CT curriculum. Programs that assume faculty possess required CT skills without additional development or assessment are in danger of failure.

Recommendations For Senior Leadership

The Air Force's ACSC CT curriculum has made great strides in improving the cognitive skills of its student body but the program is certainly in its infancy. Assessment of the school's program showed that, while some skills and behaviors are taught, the list is far from complete when compared to other nation-wide programs. Furthermore, only CT writing skills are formally tested. While writing skills are tested, no standards for writing are made available to the student body. Thus, students learn CT writing skills somewhat through trial and error. A number of recommendations from this research can be adopted by the school with little impact on operations.

1. Develop a CT mission statement that includes definition, scope, and applications of the CT program.
2. Develop appropriate standards for reading, writing, and class discussion and make standards available to both the student body and the faculty. The standards published in the AY-2000 Research Program Handbook provide an excellent start. Other CT standards can be found in Richard Paul's *How to Prepare Students for a Rapidly Changing World* (See examples in Appendix C).

3. Establish a working group to consider the applicability of Bloom's Taxonomy of Cognitive Educational Objectives with the CT curriculum. Further research may be required.
4. Assess the CT skills of the faculty as a first step to an improved staff development program. Once faculty skills are assessed, a tailored CT faculty development program can be put into place. One simple approach to faculty development would be to use commercial video tape development programs. *"How to Teach Through Socratic Questioning"* (a three hour series) and *"The How to Teach Series: A Critical Thinking Approach to Teaching and Learning"* (a nine hour series) are available via the internet from www.criticalthinking.org/University/univBookstore.

Like other educational institutions, ACSC is forced to make decisions between breadth and depth. The shear breadth of educational material limits the time available to promote deeper thinking in students. This research uncovered a number of core cognitive skills and affective behaviors that remain untaught in the school's curriculum. Teaching these skills in a comprehensive manner would undoubtedly improve the quality of school graduates, but at what cost? To improve the CT curriculum would require educators to either increase the course-load or substitute CT courseware for other existing lessons. This is a difficult choice made even more difficult because no data exists to show that (1) students don't already possess sufficient skills upon entering the school and (2) CT skills can be significantly improved during the one-year course. Obviously, further research is required before the school can make any rational decision about expanding its CT curriculum.

This research could be accomplished during the academic year with very little impact on school operations. First, the entire student body should be pre-tested and post-tested on both

cognitive skills and affective behaviors. The California Academic Press supplies standardized multiple choice tests for both cognitive skills and affective dispositions. Reliability and validity statistics are available at WWW.calpress.com. Other CT assessment instruments are widely available. Testing would indicate whether the school's current program produces significant CT improvements. It would also allow for comparisons between populations. For example, how do ACSC students compare to other graduate-level students? The research could be further improved by taking a sample population of the student body and subjecting them to an expanded CT curriculum. Such a curriculum could be included as part of the school's existing elective program. A sample CT elective syllabus is shown in Appendix D. While by no means comprehensive, the sample syllabus provides an idea of potential course lessons. Comparing CT elective graduates against students not enrolled in the CT elective would give the school an indication as to the degree CT skills can be improved. Based on the results of this experiment, the school could either (1) drop the CT elective and return to business-as-usual, (2) retain the CT elective as is with no other changes to the overall ACSC curriculum or (3) transfer some or all of the CT elective courseware to the general curriculum. Regardless of the final outcome, the establishment of a CT elective program allows the school to judge the effectiveness of CT education while simultaneously flushing out specific courseware—determining which lessons provide the most "bang for the buck." The strongest advantage of this recommendation is that it can be implemented for the next academic class, quickly providing the cadre with a well-reasoned basis for future CT curricula.

Appendix A

Gubbin's Matrix of Thinking Skills

(Adapted from Sternberg[1])

Problem solving

1. Identifying general problem
2. Clarifying problem
3. Formulating hypothesis
4. Formulating appropriate questions
5. Generating related ideas
6. Formulating alternative solutions
7. Choosing best solution
8. Monitoring acceptance of the solution
9. Drawing conclusions

Decision Making

1. Stating desired goal/condition
2. Stating obstacles to goal/condition
3. Identifying alternatives
4. Examining alternatives
5. Ranking alternatives
6. Choosing best alternative
7. Evaluating actions

Inferences

1. Inductive thinking skills: determining cause and effect, analyzing open-ended problems, reasoning by analogy, making inferences, determining relevant information, recognizing relationships, solving insight problems

2. Deductive thinking skills: using logic, spotting contradictory statements, analyzing syllogisms, solving spatial problems.

Divergent thinking skills

1. Listing attributes of objects/situation
2. Generating multiple ideas (fluency)
3. Generating different ideas (flexibility)
4. Generating unique ideas (originality)
5. Generating detailed ideas (elaboration)
6. Synthesizing information

Evaluative Thinking Skills

1. Distinguishing between facts and opinions
2. Judging credibility of a source
3. Observing and judging reports
4. Identifying central issues and problem
5. Recognizing underlying assumptions
6. Detecting bias, stereotypes, clichés
7. Recognizing loaded language
8. Evaluating hypothesis
9. Classifying data
10. Predicting consequence
11. Demonstrating sequential synthesis of information
12. Planning alternative strategies
13. Recognizing inconsistencies in information
14. Identifying stated and unstated reasons
15. Comparing similarities and differences
16. Evaluating arguments

Philosophy and Reasoning

1. Using dialogical/dialectical approaches

Notes

[1] Quoted in Robert Sternburg, *Critical Thinking: Its Nature, Measurement and Improvement,* ED 272 882, (Washington, D.C.: U.S. Dept. of Education, 1986), 32.

Appendix B

Example Affective Behaviors

(Adapted from Facione[1])

Approaches to Life and Living in General

1. Inquisitiveness with regard to a wide range of issues
2. Concern to become and remain generally well-informed
3. Alertness to opportunities to use CT
4. Trust in the process of reasoned inquiry
5. Self-confident in one's own ability to reason
6. Open-minded regarding divergent world views
7. Flexibility in considering alternatives and opinions
8. Understanding of the opinions of other people
9. Fair-minded in appraising reasoning
10. Honest in facing one's own biases, stereotypes, egocentric or sociocentric tendencies

Approaches to Specific Issues, Questions or Problems

1. Clarity in stating the question or concern
2. Orderliness in working with complexity
3. Diligence in seeking relevant information
4. Reasonableness in selecting and applying criteria
5. Care in focusing attention on the concern at hand
6. Persistence though difficulties are encountered
7. Precision to the degree permitted by subject and circumstance

Notes

[1] Peter Facione, *Critical Thinking" A Statement of Expert Consensus for the Purposes of Educational Assessment and Instruction*, (Millbrae, CA: California Academic Press, 1990), 13.

Appendix C

Example CT Standards

(Two examples of CT standards; adapted from Paul[1])

Purpose - All reasoning has a purpose

Good Reasoners	Bad Reasoners	Feedback to Students
Take the time to state their purpose clearly	Are often unclear about their central purpose	(-) You have not made the purpose of your reasoning clear. What are you trying to achieve? Whom are you trying to persuade?
Periodically remind themselves of their purpose to determine whether they are straying from it	Lose track of their fundamental end or goal	(-) After the 2nd paragraph you seem to wander from your purpose. (+) I like the way you periodically show the reader how the points you are making add up to a central conclusion.
Adopt realistic purposes and goals	Adopt unrealistic purposes, set unrealistic goals	(-) You try to accomplish too much in so short a paper. (+) You make a wise decision not to try to accomplish too much. Accomplishing a little well is almost always better than failing in a grand and sweeping design.

Inference & Conclusion - All reasoning contains inferences by which we draw conclusions and give meaning to data

Good Reasoners	Bad Reasoners	Feedback to Students
Make inferences that are clear and precise	Often make unclear inferences	(-) It is not clear what your main conclusion is. (+) Your reasoning is very clear and easy to follow.
Usually make inferences that follow from the evidence or reasons presented	Often make inferences that do not follow from the evidence or reasons presented.	(-) The conclusion you come to does not follow from the reasons presented. (+) You justify your conclusion well with supporting evidence and good reasons.
Often make inferences that are deep rather than superficial	Often make inferences that are superficial	(-) Your conclusion is justified, but it seems superficial, given the problem. (+) Your central conclusion is well-thought-out and goes right to the heart of the issue.

Notes

[1] Richard Paul, *Critical Thinking: What Every Person Needs To Survive In A Rapidly Changing World,* (Santa Rosa, CA: Foundation for Critical Thinking, 1993), 157.

Appendix D

Example CT Elective Syllabus

(Two examples of CT standards; adapted from Paul[1])

Week 1: Introduction
- What is Critical Thinking and Why is it Important?
- Cognitive Skills and Effective Behaviors
- Intellectual Standards

Week 2: Language
- Definitions and Semantics
- Informative vs. Emotive Language
- Inconsistent Language: Vagueness and Ambiguity, Contradiction and Oxymoron

Week 3: Logic
- Deductive vs. Inductive Reasoning
- Cause and Effect
- Categorical Logic and Venn Diagrams
- If-Then Statements

Week 4: Argument
- Construction of an Argument
- Logical Fallacies

Week 5: Claims and Evidence
- Do Statistics Tell The Truth?
- Scientific Evidence
- Individual Testimony

Week 6: Application
- Historical CT Blunders

Week 7: Application
- Problem Solving and the Decision Process

Week 8: Learning Theory
Traditional vs. Emerging Theory

Week 9: The Affective Dimension
Are Humans Disposed to Critical Thought?

Week 10: Biases
Ego-centric and Ego-social Behavior

Week 11: Application: Bias in the Media
Finding Biases and Fallacy in the Media

Week 12: Self-destructive Behavior
Why Smart People Do Dumb Things

Week 13: Application: Considering Opposing Viewpoints
Advocating and Discussing Difficult Issues

Week 14: Creativity
Creative Problem Solutions and Decisions

Week 15: Harnessing Critical Thinking
Socrates or Sophistry?

Notes

[1] Richard Paul, *Critical Thinking: What Every Person Needs To Survive In A Rapidly Changing World,* (Santa Rosa, CA: Foundation for Critical Thinking, 1993), 157.

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