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Enhancing critical thinking in the political science curriculum

West, Kathryn Susan, D.A.

Idaho State University, 1994

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ENHANCING CRITICAL THINKING
IN THE
POLITICAL SCIENCE CURRICULUM

by

K. Susan West

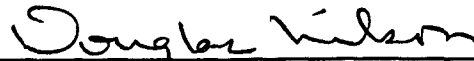
A project submitted in partial fulfillment of the
requirements for the degree of

DOCTOR OF ARTS
IN
POLITICAL SCIENCE

IDAHO STATE UNIVERSITY
1994

To the Graduate Faculty:

The members of the committee appointed to examine the project of K. SUSAN WEST find it satisfactory and recommend that it be accepted.



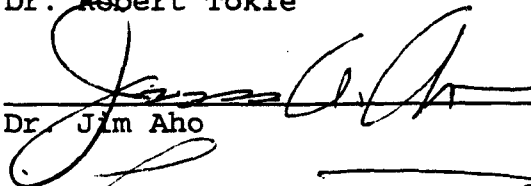
Dr. Douglas Nilson, Committee Chair



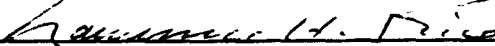
Dr. Neal Gilbertsen



Dr. Robert Tokle



Dr. Jim Aho



Dr. Lawrence Rice

ABSTRACT

Numerous studies in the 1980s demonstrated that the majority of students entering colleges and universities are deficient in their development of critical thinking skills. Critical thinking skills aid students in making judgments about the accuracy, validity, and worth of claims. Many higher education courses claim the development of critical thinking skills as one of their goals, yet the instructors have little background or understanding of how critical thinking skills are fostered and developed. Many courses expose students to large quantities of information, but do not give students the tools to effectively use the material presented.

Based on the theoretical foundations of Piaget and Bloom, this work develops pedagogical methods for critical thinking instruction. The pedagogy is designed and applied to the field of political science; however, it is applicable to most any field.

Lower-level thinking skills, such as the acquisition and retention of knowledge, are most commonly strengthened in lecture classrooms. This work briefly addresses the development of lower-level thinking skills by providing students with a concise series of mnemonic devices, effective in increasing the ability of students to acquire and retain knowledge.

Two pedagogical models, designed to improve students higher-level thinking skills, are introduced. The explicit

model of critical thinking instruction provides students with the opportunity to rehearse specific critical thinking skills. Students engage in metacognition and compare their thinking processes with those of more advanced thinkers. Students are provided with techniques to help them more effectively use and develop specific critical thinking skills.

The implicit model of critical thinking instruction consists of a conglomeration of pedagogical methods. The methods vary from classroom setup to the design of writing assignments. A common thread found in each of the techniques is a reliance on student interaction. The implicit model encourages assignments to be designed in a manner that successively develops critical thinking skills, but does not devote class time to the specific study of particular critical thinking skills.

Three sections of students enrolled in the semester course, Introduction to American Government, were given the Watson-Glaser Critical Thinking Appraisal as a pretest and posttest to the course. The Appraisal is designed to provide an objective measure of critical thinking development. Pedagogy in each of the three sections varied: Section A used traditional lecture, Section B employed the implicit model, and Section C applied the explicit model. None of the sections improved their critical thinking skills to a statistically significant degree. However, regression

analysis revealed statistically significant positive correlations between the number of writing assignments completed (implicit model) and appraisal score, and the number of critical thinking assignments completed (explicit model) and appraisal score. The correlations suggest that both the implicit and explicit models have a positive effect on the development of students' critical thinking skills.

The explicit model of critical thinking instruction may be best utilized in a course devoted specifically to the development of thinking skills. Difficulties with time factors, metacognition, and instructor preparedness make the explicit model difficult to implement in the general political science curriculum. The implicit model, with its immense flexibility, is more easily applied to the political science classroom.

Teaching students to think critically is an important challenge, with consequences that stretch far beyond the higher education environment into the makeup of society. Higher education has spent decades teaching students what to think, now it must enter an era of teaching students how to think.

ACKNOWLEDGMENTS

I wish to express my sincere appreciation to my committee chairperson Dr. Douglas Nilson. His encouragement, support, and critical review of my work has been of great worth. He has been both a mentor and a friend, and I hope that in years to come I will treat students with the respect he has always shown me. I also owe a debt of gratitude to the faculty in the Political Science Department. Their efforts to share the knowledge they have acquired from years of experience has not fallen on deaf ears. Their variety of teaching styles have provided me with many opportunities for learning and growth. And finally, I owe the deepest appreciation to Gary, my husband and soulmate, whose encouragement, faith, and kindness have inspired me to keep going when the journey seemed endless.

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PREFACE

The greatest gift I can give my students is to teach them how to think, not what to think.--S.W.

Every day students are besieged with information and ideas. Some information complements previous learning, while other material contradicts current beliefs. Experts, on whom students may rely for information, frequently disagree with one another. One authority will assert the ozone is thinning, while another will reject the notion as nonsense. One authority will declare a political candidate as unelectable, while another will declare inevitable political victory for the same contestant. One economist will claim the federal deficit is harmless, while another will profess rapidly approaching economic devastation. How can students evaluate the validity of conflicting declarations and determine which of the authorities to believe? Without developing effective critical thinking skills, students are left to embrace whatever is convenient, popular, or most recently learned.

Most higher education courses are highly effective at disseminating information. In a short period of time, students receive knowledge that required decades of study and research to develop. In most cases, students are not required to interact with the information, only to absorb and reproduce it on examinations. Yet in our complex society, the acquisition of knowledge is often not enough.

Students must be able to integrate, evaluate, and apply knowledge to a variety of intricate situations.

College and university courses can do more than disseminate information; they can teach students to evaluate and interact with information. The realm of political science is particularly well suited for the development of critical thinking skills, because it is filled with controversy and debate. Students can become more than informed; they can become part of an informed electorate, possessing the ability to critically evaluate the information they receive.

This project demonstrates the need to improve college students' critical thinking skills, reviews theories of cognitive development, provides mnemonic devices to aid in the acquisition of knowledge, presents two models of critical thinking instruction, and empirically tests the effectiveness of the critical thinking models.

In Chapter One, the findings of recent educational studies are reviewed. The weak performance of American students on higher-order cognitive skills is established. Critical thinking is defined, and the necessity of colleges and universities to teach critical thinking skills in separate courses and across disciplines is examined.

In Chapter Two the cognitive development theories of Jean Piaget and Benjamin Bloom are presented. Their works combine to provide the theoretical backbone of this project.

The contributions of Piaget suggest that instructors need to have greater understanding of the level of cognitive development of their students, and adapt learning to appropriate developmental levels. The works of Bloom provide a taxonomy on which to base the cognitive difficulty of assignments.

Chapter Three provides a concise summary of mnemonic devices useful in the acquisition and recall of knowledge. Because knowledge is the foundation on which critical thinking skills are built, it is useful to supply students with tools that can quickly enhance and enlighten memory skills.

In Chapter Four, the explicit model of critical thinking instruction is presented. Based on the works of Barry Beyer, the explicit model provides methods to teach students specific critical thinking skills. Included in the chapter is a detailed examination of critical thinking components. These components include differentiating between verifiable facts, values, and reasoned judgments; differentiating between relevant and non-relevant information; evaluating the credibility of sources; identifying ambiguity and unstated assumptions, detecting bias, identifying logical fallacies and inconsistencies, and evaluating the strength of a claim.

The implicit model of critical thinking instruction is presented in Chapter Five. This model does not specifically

endorse the teaching of critical thinking components, but offers pedagogical techniques to encourage interaction and the exercise of critical thinking skills. Implicit techniques range from using the Socratic dialogue, to developing effective written assignments, to restructuring the classroom environment in an effort to promote the exercise of critical thinking.

Chapter Six contains an assessment of the implicit and explicit models of critical thinking instruction. Three sections of the semester course Introduction to American Government were administered the Watson-Glaser Critical Thinking Appraisal as a pretest and posttest to the course. Each of the sections were taught using different pedagogical techniques, and the effects of the instructional methods on critical thinking were objectively assessed by the appraisal. The methodology, findings, and discussion of the study are included in this chapter.

Chapter Seven summarizes the project. Future directions for research and teaching are suggested. The project concludes with a hope for an educational system that fosters and encourages students' critical thinking ability.

CHAPTER ONE

CRITICAL THINKING IN HIGHER EDUCATION

In *Asking the Right Questions*, Neil Browne and Stuart Keeley describe two different thinking styles entitled the "sponge approach" and the "panning-for-gold approach."¹ The sponge approach attempts to have students absorb as much information as possible. The information students learn becomes a base for future instances requiring more difficult thinking. The sponge approach is relatively passive, emphasizing concentration and memorization.²

In contrast, the panning-for-gold approach requires students to enter the streams of knowledge, sifting through gravel and silt in an effort to uncover grains of gold. Active participation is required as students try to determine which parts of the information they have received is of worth. The work can be difficult and tedious, yet the rewards are great. The panning-for gold approach emphasizes interaction with knowledge; the sponge approach emphasizes acquisition of knowledge.³

¹M. Neil Browne and Stuart M. Keeley, *Asking the Right Questions: A Guide to Critical Thinking* (Englewood Cliffs, NJ: Prentice Hall, 1990), p. 3.

²Ibid.

³Ibid.

A student employing the sponge approach will carefully read material, underline important points, and attempt to remember every fact and detail. The student's primary purpose is to understand what the author has to say. Likewise, a student utilizing the panning-for-gold approach will read the same material hoping to gain new ideas. However, while reading, the student will go beyond acquiring knowledge, ask significant questions, examine the author's logic, and identify important omissions. The student may make notes in the margins and question the author's claims. Through meaningful interaction with the material, the student has become a critical thinker.⁴

Students who develop the ability to think critically have a greater ability to reach solutions, try new ways of doing things, and do not have to accept information as truth just because it is published. Critical thinkers not only know how to obtain information, they know how to interpret and use information.

THE NEED FOR CRITICAL THINKING

Over the past decade, the media, scholars, politicians, and parents have described the American educational system as "in crisis" a "failure" and in such decline that our "nation is at risk." Numerous educational studies in the

⁴Ibid., pp. 3-4.

early 1980s precipitated concern over American students' educations.

While differing in many aspects, educational studies agree that an increase in higher-order thinking skills is one of the most pressing educational reforms needed. Higher-order skills include those used in analysis and interpretation of reading, problem solving, inquiry, logic, reasoning, and proficient writing. The *National Assessment Findings and Educational Policy Questions* by Rexford Brown, noted that the decrease in achievement scores was not due to a lack of basic skills but incompetence in "higher-order skills such as inference, analysis, interpretation or problem solving."⁵ The National Commission on Excellence in Education reported in *A Nation at Risk* that

many 17-year-olds do not possess the "higher order" intellectual skills we should expect of them. Nearly 40 percent cannot draw inferences from written material; only one-fifth can write a persuasive essay; and only one-third can solve a mathematics problem requiring several steps.⁶

The *Action for Excellence* report, by the Education Commission of the States, emphasized that today's work force needs skills such as

⁵Rexford Brown, *National Assessment Findings and Education Policy Questions* (Princeton, N.J.: National Assessment of Educational Progress, 1982), cited by Marilyn Clayton Felt, *Improving Our Schools: Thirty-three Studies That Inform Local Action* (Newton, MA: Education Development Center, Inc., 1985.), p. 70.

⁶National Commission on Excellence in Education, *A Nation at Risk: The Imperative for Educational Reform* (Washington, D.C.: U.S. Department of Education, 1983), p. 9.

analysis and evaluation, computer literacy, problem solving, critical thinking and decision making, communication, organization and reference, ability to synthesize, creativity, ability to apply concepts in a wide range of situations.⁷

From a five year study of high schools, Theodore R.Sizer concluded that teachers should be less concerned with importing information and more concerned with teaching students how to use it. Students need to learn the skills of inquiry, complex thinking, application, and judgement.⁸ The study *On Further Examination* "attach[ed] central importance to restoring the traditions of critical reading and careful writing."⁹ Numerous other studies concur in the need for teaching students higher-order cognitive skills.¹⁰ In short, educators need to teach students how to think critically.

⁷Task Force on Education for Economic Growth, Education Commission of the States, *Action for Excellence: A Comprehensive Plan to Improve Our Nation's Schools* (Denver: Education Commission of the States, 1983), pp 1-2.

⁸Sizer, Theodore R., *Horace's Compromise: The Dilemma of the American High School* (Boston: Houghton Mifflin, 1984), pp. 106, 109.

⁹*On Further Examination: Report of the Advisory Panel on the Scholastic Aptitude Test Score Decline* (New York: College Entrance Examination Board, 1977), p. 46.

¹⁰See also *Report: Advisory Commission on Articulation Between Secondary Education and Ohio Colleges* (Columbus, OH: Ohio State Board of Regents/State Board of Education, 1981); Mary Anne Raywid, *The Current Status of Schools of Choice in Public Secondary Education* (Hempstead, N.Y.: Project on Alternatives in Education, Hofstra University, 1982); and Marilyn Clayton Felt, *Improving Our Schools: Thirty-three Studies That Inform Local Action* (Newton, MA: Education Development Center, Inc., 1985).

If students are entering colleges and universities with limited critical thinking skills, the responsibility falls on higher education instructors to teach and enhance students' critical thinking abilities. As Stephen Young noted, the pedagogical "role of the teacher is changing from a dispenser of information to a facilitator--helping students acquire skills in solving problems and making decisions."¹¹

CRITICAL THINKING DEFINED

Critical thinking does not have one definitive definition. Some scholars narrowly equate critical thinking with the classic logic of Aristotle, while others define critical thinking more broadly. Robert Ennis, a prominent critical thinking scholar, broadly describes critical thinking as "reasonable reflective thinking that is focused on deciding what to believe or do."¹² Ennis' critical thinking categories include creativity and an open minded disposition as well as specific skill groups such as identifying and clarifying arguments, judging the credibility of a source, making reasonable inferences, and

¹¹Stephen S. Young, "The Next 'Revolution' in Education," *The Futurist* 20 (1986):60.

¹²Robert H. Ennis, "A Taxonomy of Critical Thinking Dispositions and Abilities," in *Teaching Thinking Skills: Theory and Practice*, eds. Joan Boykoff Baron and Robert J. Sternberg (New York: W. H. Freeman and Co., 1987), p. 12.

deciding upon an action.¹³ Paul Dressel and Lewis Mayhew describe specific skills needed to achieve critical thinking. These include the ability to identify central issues, recognize assumptions, evaluate evidence, and draw warranted conclusions.¹⁴

Researchers at Alverno College suggest that a uniform definition of critical thinking may not be appropriate for all subjects.¹⁵ Critical thinking may be need to be defined differently for an art history course than for an economics course. For this project, critical thinking is operationally defined according to Barry Beyer's definition: "precise, persistent, and objective analysis of any claim, source, or belief to judge its accuracy, validity, or worth."¹⁶ Use of Beyer's definition allows for continuity throughout this project, since it corresponds with the critical thinking abilities tested in the Watson-Glaser Critical Thinking Appraisal.

A student who has the skills necessary to think critically but does not use them, or only uses them to

¹³Ibid., pp. 12-15.

¹⁴Paul Dressel and Lewis Mayhew, *General Education: Explorations in Evaluation* (Washington D.C.: American Council on Education, 1954), p. 39.

¹⁵Lucy S. Cromwell, ed., *Teaching Critical Thinking in the Arts and Humanities* (Milwaukee, WI: Alverno Productions, 1986), p. 2.

¹⁶Barry K. Beyer, *Developing a Thinking Skills Program* (Boston: Allyn and Bacon, Inc., 1988), p. 61.

reinforce currently held conceptions, cannot be considered a true critical thinker. Ennis identified several dispositions which characterize a critical thinker. A critical thinker is open-minded, able to think dialogically, able to reason from an opposing points of view, and able to withhold judgment until sufficient evidence is presented. Moreover, a critical thinker is willing to take a position, and change that position when warranted. A critical thinker looks for alternatives, strives for precision, and is sensitive to the feelings and thinking skills of others.¹⁷

Critical thinking skills are easier to measure and teach than are critical thinking dispositions. Little research has been done that describes how to transmit critical thinking dispositions. Modeling dispositions and discussing their importance are two somewhat limited methods that have been suggested. It seems feasible that as critical thinking skills are mastered, critical thinking dispositions will naturally follow. However, this hypothesis has not yet been proven. Because of these limitations, the design of this project heavily emphasizes the instruction of critical thinking skills.

¹⁷Ennis, "A Taxonomy of Critical Thinking," p. 12.

CRITICAL THINKING DISTINGUISHED FROM PROBLEM SOLVING

While problem solving and critical thinking are often used interchangeably, they are not synonyms. R. R. Allen and Robert K. Rott note an important distinction.

Critical thinking begins with a previous claim, conclusion or product and considers the question, "Of what truth or worth is it?" Problem solving, on the other hand, begins with a perceived problem and asks, "How might this difficulty be resolved?"¹⁸

Problem solving is more encompassing than critical thinking. To effectively solve problems, critical thinking skills are often engaged. However, a student who thinks critically may not be solving a particular problem. In Beyer's hierarchy of thinking strategies and skills, problem solving strategies are ranked as more complex than are critical thinking skills.¹⁹ John R. Hayes, a problem solving instructor at Carnegie-Mellon University, suggests that four elements must be included in a problem solving course: "(1) information acquisition (memory and learning), (2) decision making, (3) problem solving (representation and search) and (4) creativity."²⁰

¹⁸As summarized by John P. Madison, "Critical Thinking in the English Classroom," *English Journal* 60:8 (November 1971), p. 1136.

¹⁹Barry K. Beyer, *Practical Strategies for the Teaching of Thinking* (Boston: Allyn and Bacon, Inc., 1987), p. 44.

²⁰John R. Hayes, "Teaching Problem-Solving Mechanisms," in *Problem Solving and Education: Issues in Teaching and Research*, eds. D. T. Tuma and F. Reif (Hillsdale, NJ: Lawrence Erlbaum Associates, 1980), p. 143.

INDEPENDENT DEVELOPMENT OF CRITICAL THINKING SKILLS

Inherent in being human is the ability to reason. Since all people think, is there a need to teach critical thinking skills in the college and university classroom? Will critical thinking skills develop independent of formal training? Raymond Nickerson addressed these questions and concluded,

what we need to teach, and to learn, for that matter, is not how to think in an absolute sense, but how to think more effectively--more critically, more coherently, more creatively, more deeply--than we often, perhaps typically, do. To be sure, all people classify, but not equally perceptively; all people make estimates, but not equally accurately; all people use analogies, but not equally appropriately; all people draw conclusions, but not with equal care; all people construct arguments, but not with equal cogency.²¹

Some instructors reject the notion that critical thinking skills must be taught, and assume that critical thinking evolves naturally. They believe that the instructor's role is to provide students with a base of information, upon which the students will independently build critical thinking skills. E. M. Glaser rejects such propositions stating "[t]here is little evidence that students acquire skill in critical thinking as a necessary byproduct of the study of any given subject."²²

²¹Raymond S. Nickerson, "Why Teach Thinking?" in *Teaching Thinking Skills: Theory and Practice*, eds. Joan Boykoff Baron and Robert J. Sternberg (New York: W. H. Freeman and Co., 1987), p. 28.

²²E. M. Glaser, "Critical thinking: Educating for Responsible Citizenship in a Democracy," *National Forum* 65:24-27.

In Benjamin Bloom and colleagues' *Taxonomy of Educational Objectives: Handbook 1, Cognitive Domain*, they assert that lower cognitive processes of recognition, recall, and association are not adequate to thoroughly understand material. Higher cognitive processes such as analysis, synthesis, and evaluation of significant issues must be used to truly master material.²³ Furthermore, as higher cognitive skills are exercised, lower cognitive processes must be employed. However, use of lower cognitive processes do not require use of higher cognitive processes.²⁴ Thus, teaching techniques which emphasize memorization and recall do not inherently develop the higher-order cognitive skills involved in critical thinking.

Without an information base, it is impossible for students to effectively identify, evaluate, or construct arguments. Consequently, it is important to give students tools to simplify the acquisition and recall of information. However, the dissemination of information should not be paramount if critical thinking skills are to be developed. Bloom warns,

Because of the simplicity of teaching and evaluating knowledge, it is frequently emphasized as an educational objective out of all proportion to its

²³Benjamin S. Bloom et al., eds. *Taxonomy of Educational Objectives, Handbook I: Cognitive Domain* (New York: Longmans, Green, 1956), p. 36.

²⁴Louis E. Raths et al., *Teaching for Thinking: Theory, Strategies, and Activities for the Classroom* (New York: Teachers College, Columbia University, 1986), p. 86.

usefulness or its relevance for the development of the individual.²⁵

Similarly, U.S. Government professor Thomas Atwater cautions,

If we are committed to teaching critical thinking in basic U.S. Government classes, the provision of information about U.S. government and politics cannot be allowed to smother the pursuit of this goal in a welter of encyclopedic detail and demands for memorization. *Provision of information should be ancillary to the development of critical thinking skills, or at most co-equal to it.* (Italics added.)²⁶

In sum, all people use critical thinking skills. However, they do not all use them equally well. The development of critical thinking skills can be greatly accelerated and enhanced if taught in college and university courses. Classes which focus on the dissemination and recall of knowledge do not inherently foster the development of critical thinking abilities. Instead, a pedagogical emphasis must be placed on developing critical thinking skills before such abilities will significantly increase.

THE ROLE OF HIGHER EDUCATION IN TEACHING CRITICAL THINKING

Because students are entering colleges and universities with inadequate critical thinking skills, it is important for higher education institutions to provide students with the opportunity to learn to think critically. But on whom

²⁵Bloom, p. 34.

²⁶Thomas Atwater, "Critical Thinking in Basic U.S. Government Classes," *PS: Political Science and Politics* 24 (June 1991):209-11.

does this responsibility lay? Is it the obligation of the philosophy department or academic skills program to provide every student with a course in thinking skills? Are students able to transfer thinking skills learned in one department to other non-related areas?

Scholars debate whether thinking skills should be taught in separate courses or infused into the curriculum. Robert Sternberg summarizes the debate, noting that separate programs,

(1) are less likely to be overpowered by knowledge-based curriculum and hence become nonprograms, (2) allow students to get a clear sense of just what the thinking skills are, with less danger of their simply being mixed in with other learning processes and hence losing their identities, and (3) can be evaluated more easily outside of specific content areas.²⁷

In contrast, programs infused into the curriculum

(1) do not require a wholly separate course, which may not fit into school priorities, (2) seem to run less risk of fostering inert knowledge about thinking skills--that is, knowledge that is never applied outside the thinking-skills classroom, and (3) reinforce the thinking skills throughout the curriculum, rather than conveying the message that thinking skills are something apart from other curriculum.²⁸

Single-course offerings in thinking skills can be effective and some students develop the ability to transfer

²⁷Robert J. Sternberg, "Questions and Answers about the Nature and Teaching of Thinking Skills," in *Teaching Thinking Skills: Theory and Practice*, eds. Joan Boykoff Baron and Robert J. Sternberg (New York: W. H. Freeman and Co., 1987), p. 254.

²⁸Ibid.

the skills across disciplines. However as D. N. Perkins noted,

Contemporary research shows that instruction offered in one context often does not transfer to other contexts, so that thinking skills taught out of the context of subject matter instruction may well have little impact on performance in the subject areas. . . In contrast, teaching thinking through content dissolves the whole problem of transfer.²⁹

While teaching a separate course in thinking skills is much easier than changing teaching methods throughout the curriculum, Chet Meyers asserts that teaching critical thinking skills across disciplines is more effective. He notes,

teachers in all disciplines play a crucial role in the development of students' critical thinking abilities. Just as students will not become proficient writers merely by taking a year of composition but must be required to practice good writing in all their classes, so students will develop good critical thinking skills only by being challenged to practice critical and analytical thinking in the context of all the different subjects they study.³⁰

Debate will continue over whether thinking skills should be taught separately or infused into the curriculum, yet as Sternberg notes, the issue does not have to be viewed as a contest. The best solution may be a "mixed model in which thinking skills are taught as a separate course at the same time that they are infused and reinforced throughout

²⁹D. N. Perkins, "Knowledge as Design: Teaching Thinking Through Content," in *Teaching Thinking Skills: Theory and Practice*, eds. Joan Boykoff Baron and Robert J. Sternberg (New York: W. H. Freeman and Co., 1987), p. 63.

³⁰Chet Meyers, *Teaching Students to Think Critically* (San Francisco: Jossey-Bass, 1986), p. 5.

the entire curriculum."³¹ The mixed model approach has the advantage of encouraging thinking skills where ever possible, without throwing the burden on one department or course.

This project provides two models for critical thinking instruction. The implicit model may be best suited for widespread application across the curriculum, while the explicit model may be best employed in a course of its own. As Sternberg noted, a mixed model approach maximizes students' opportunities to improve critical thinking skills.

THINKING CRITICALLY--WITH PASSION

Critical thinking is often explained as rational, logical, reasonable, unemotional thinking. Consequently, it is often viewed as dry, passionless, and unfeeling. Richard W. Paul suggests that the dichotomy between reason and passion is a false one, and that critical thinking includes emotions, energy, and passion. He explains

All action requires the marshaling of energy. All action presupposes a driving force. We must care about something to do something about it. Emotions, feelings, and passions of some kind or other are at the root of all human behavior. . . A passionate drive for clarity, accuracy, and fair-mindedness, a fervor for getting to the bottom of things, to the deepest root issues, for listening sympathetically to opposing points of view, a compelling drive to seek out evidence, an intense aversion to contradiction, sloppy thinking, inconsistent application of standards, a devotion to truth as against self-interest--these are essential commitments of the rational person. . . There

³¹Sternberg, p. 255.

is nothing passive, bland, or complacent about such a person.³²

What could be more heartening than students who develop a deep rooted desire and passion think critically about issues? Improving college instruction to promote critical thinking is a necessary and noble goal.

SUMMARY

Educational studies demonstrate that American students perform poorly on higher-order cognitive skills. Critical thinking requires use of higher-order thinking skills, and is defined as precise, persistent, and objective analysis of any claim, source, or belief to judge its accuracy, validity, or worth.

Critical thinking skills are unique, and while frequently used in problem solving, critical thinking is not identical to problem solving. All students possess critical thinking ability, yet all do not employ them equally well.

College and university instruction can be designed to improve students' critical thinking skills. Courses which emphasize the dissemination of material do not inherently enhance critical thinking abilities. By revising curriculum and pedagogical techniques from passive observation to

³²Richard W. Paul, "Dialogical Thinking: Critical Thought Essential to the Acquisition of Rational Knowledge and Passions," in *Teaching Thinking Skills: Theory and Practice*, eds. Joan Boykoff Baron and Robert J. Sternberg (New York: W. H. Freeman and Co., 1987), p. 142.

active learning, students' critical thinking abilities can be improved. Offering separate courses in thinking skills as well as infusing thinking skills instruction throughout the curriculum maximizes student opportunities to improve critical thinking abilities, and allows them to engage in a passionate pursuit for clarity, accuracy, and fair-mindedness.

CHAPTER TWO

THEORIES OF COGNITIVE DEVELOPMENT

In order to improve critical thinking skills, it is essential to have some understanding of how intellect develops. Therefore, a brief review of the dominant theories of cognitive development is helpful in understanding why one pedagogical technique may be more effective in developing thinking skills than another pedagogical technique. In recent years, the works of Swiss psychologist Jean Piaget have had a tremendous impact on the field of cognitive development and lead to numerous reforms in curriculum. Likewise, the contributions of Benjamin Bloom and colleagues have furthered knowledge of cognitive development and encouraged their own series of curriculum reforms. These scholars' works lay the theoretical foundations for this research and are reviewed throughout this chapter.

PIAGET'S MODEL OF COGNITIVE DEVELOPMENT

Piaget dedicated his life to the study of how cognitive development occurs. He published his first writings during the 1920s and actively continued in his pursuits throughout the next fifty years. Piaget's fundamental hypothesis about

learning asserts that knowledge is more than a mental copy of object or event. He states, "To know an object is to act on it. To know is to modify, to transform the object, and to understand the process of this transformation, and as a consequence to understand the way the object is constructed."³³ True understanding is more than a mental reproduction of an idea, situation, or object, it is the deeper knowledge and more advanced mental structures that is achieved through interaction.

Piaget described the interaction with objects or events as an assimilation, accommodation, equilibrium process. Learning develops as individuals experience interactions and assimilate the results of the interactions. After assimilation, learners accommodate the results of the interaction into their current mental structures. If the interaction produces results that conflict with the current mental structure, the mental structure must be accommodated to fit the new information (which in effect creates new mental structures) or the information is discounted, limiting the assimilation process. Piaget believed that individuals always strive for a state of equilibrium-- physical or mental harmony. When a discovery creates a state of disequilibrium for an individual, more information

³³Jean Piaget, "Development and Learning," *Journal of Research in Science Teaching* 2 (1964): 176.

must be obtained so that a state of equilibrium can be again reached. John L. Phillips, Jr. instructs,

...structures continually move toward a state of equilibrium, and when a state of relative equilibrium has been attained, the structure is sharper, more clearly delineated, than it had been previously. But that very sharpness points up inconsistencies and gaps in the structure that had never been salient before. Each equilibrium state therefore carries with it the seeds of its own destruction.³⁴

Thus, through the process of assimilation and accommodation, equilibrium and disequilibrium, cognitive growth takes place.

Piaget suggests that inquiry-centered instruction is the best method to encourage cognitive growth. However, as Renner notes,

the learner must move from a state of equilibrium; one cannot move him. That of course, means that just telling the learner that his views of something are skewed does no good; he himself must make that discovery. He must be confronted with contradictory or new evidence that will disturb his equilibrium. That new and/or contradictory evidence must be his own, and the only way he gains that evidence is through inquiry.³⁵

While the assimilation/accommodation process is central to the creation of new mental structures, Piaget identified four other factors that effect cognitive development:

³⁴John L. Phillips, Jr., *The Origins of Intellect: Piaget's Theory* (San Francisco: W.H. Freeman and Co., 1969), p. 10, cited by Renner, p. 11.

³⁵John W. Renner, ed., "Learning and Piaget," in *Research, Teaching, and Learning with the Piaget Model*, (Norman, OK: University of Oklahoma Press, 1976), p. 12.

maturation, experience, social transmission, and equilibration.³⁶

Physical maturation of the human body is one factor affecting cognitive development. As the body matures physically, mental structures develop allowing individuals to accomplish that which was previously impossible for them to do. Such genetic influences on cognitive development are what Piaget refers to as maturation.

Experience is a second factor affecting cognitive development. Piaget divides experience into two categories: physical and logical-mathematical. Physical experience is gained through interacting with objects and the environment. For instance, if children feel bricks and detect their rough texture, or throw rocks into the water and watch them sink, or come to any other understanding of the physical property of objects, they are gaining physical experience.

Logical-mathematical experience occurs when individuals are able to gain knowledge from operations performed on objects rather than from the objects themselves. Piaget uses the example of a child counting pebbles. At some point the child learns that ten pebble arranged in a circle is the same amount as ten pebbles arranged in a row, or in any other order. The child has not learned a property of the pebbles, but a property of ordering--independent of the

³⁶Jean Piaget, "Development and Learning," *Journal of Research in Science Teaching*, 2 (1964):178.

pebbles. In logical-mathematical experience actions become internalized and are referred to as operations.³⁷

Social transmission is a third factor playing a role in cognitive development. Social transmission is the knowledge that individuals learn from interacting with other individuals. Piaget maintains that as individuals interact socially with others, shared understanding of language is learned, preparing individuals for increased cognitive development. To advance cognitive development one must be able to communicate with others. If the language development of the receiver is below the level of the speaker, the receiver will not understand what is being said and cannot assimilate the information. For instance, envision the difficulties language would play if a political scientist were to attend a lecture on thermo-dynamics. In such a situation, language barriers would likely prohibit any cognitive development from occurring.

A final factor affecting cognitive development is equilibration. Equilibration integrates the previous three factors into itself, and is difficult to distinguish as a separate factor. Equilibration means, "coming into equilibrium,"³⁸ and is essentially the movement of an individual from a state of disequilibrium to a state of

³⁷Ibid., pp. 179-180.

³⁸John L. Phillips, Jr., *Piaget's Theory: A Primer* (San Francisco: W. H. Freeman and Co., 1981), p. 29.

equilibrium, as described above in the assimilation/ accommodation process. Yet more than just reaching a state of relative equilibrium, equilibration is a "progressive organization of knowledge in a stepwise fashion."³⁹ Equilibration, therefore, leads to higher and more advanced mental structures.

Cognitive development is thus dependent on the assimilation/accommodation process and the factors of development. Piaget delineates four stages of cognitive development. Each of the stages is characterized by distinct mental abilities, and as individuals move from one stage to another they are able to accomplish that which was previously too difficult for them. The stages are presented in a hierarchy; lower stages must be mastered before higher levels can be learned. The stages are presented in Table 2.0.

TABLE 2.0 Piaget's Stages of Cognitive Development

Cognitive Development Stages
1. Sensory-motor stage (0 to 2 years)
2. Pre-operational stage (2 to 7 years)
3. Operational stage (7 to 16 years)
A. Concrete-operational thought (7 to 11 years)
B. Formal-operational thought (11 to 16 years)

³⁹Jonas Langer, "Implications of Piaget's Talks for Curriculum," *Journal of Research in Science Teaching* 2 (1964): 208.

Sensory-motor Stage

The Sensory-motor stage occurs from birth to approximately two-years of age. Through touch, sight, smell, sound, and taste the child explores the world and delights in discovery. During this stage the child learns that objects are permanent, and begins to develop language skills. Rudimentary notions of space, time, intentionality, and causality are developed in this stage.

Pre-operational Stage

Pre-operational thought usually emerges at two years of age and continues through approximately seven years of age. In the preoperational stage a child could be described as "perception-bound--he sees, he decides, and he reports. In short he thinks, but he cannot think about his own thinking."⁴⁰ During this stage, children have not yet developed the ability to do simple mental experiments with information. Pre-operational thought is characterized by egocentrism, irreversibility, centering, states and transformation, and transductive reasoning.⁴¹

Egocentrism, simply put, means that the child cannot see the world from any other point of view other than his own. The second trait of preoperational thought is

⁴⁰Renner, p. 23.

⁴¹Ibid., p. 24.

irreversibility. In this stage the learner cannot trace the thought process back to its starting place. For instance, a child may understand that she has a sister, but is not able to determine whether her sister has a sister.⁴² A third trait, centering, refers to the child focusing on one aspect of an object, incident, or phenomenon. For instance, a child may focus on the length of an object and not be able to understand any discussion of volume or width. A fourth characteristic of preoperational thought is called states and transformations. Children are able to determine the original state of a process, and the final state, but they cannot understand that the final state is a function of each of the intermediate states.⁴³ For instance when asked to diagram the growth of a plant, children in the preoperational thought category could draw the first and final states, but would not draw any of the intermediate stages of growth. A final characteristic of preoperational thought is transductive reasoning, which lasts only until about four years of age. Piaget describes this as reasoning from particular to particular, rather than from general to particular (deduction) or particular to general (induction).⁴⁴

⁴²Ibid., p. 26.

⁴³Ibid., p. 29.

⁴⁴Ibid., p. 31.

Operational Stage

Perhaps of greatest importance to this work is Piaget's classifications of operational thought. Piaget divides operational thought into two categories: concrete-operational and formal-operational. Piaget suggests that concrete-operational thought is usually developed between the ages seven and eleven, and formal-operational thought is entered between the ages eleven and sixteen.

Concrete-operational Thought

Individuals in the concrete-operational stage can think about their own thinking, as long the thinking is based on concrete objects or actions. This stage is termed "concrete-operational" because the starting point of thinking is always some real system of objects or relations that the learner can perceive.⁴⁵ Concrete-operational individuals are able to reverse thought back to its starting point, and perform mental operations with the data they have gathered from concrete objects. Classification, seriation, ordering, spatial and temporal operations are all achievable to the concrete-operational thinker. Mobility of thought is achieved in the concrete operational stage, and individuals are able to shift back and forth between their own viewpoint

⁴⁵Jean Piaget, "The Theory of Stages in Cognitive Development," in *Critical Features of Piaget's Theory of the Development of Thought*, ed. Frank B. Murray (New York: MSS Information Corp., 1974), p 117.

and the viewpoint of others. Concrete-operational thinkers are able to focus on several aspects of a situation at the same time, and are able to grasp an understanding of states and transformations, that is, they understand that a final state of a phenomenon is a function of the intermediate states.⁴⁶

Formal-operational Thought

In formal-operational thought individuals can think in the abstract and no longer need objects to manipulate. They are able to think about their own thinking and determine possible consequences or implications of the thought. In formal-operational thought, abstract possibilities are as real to individuals as reality is in the here and now.⁴⁷ Formal-operational individuals are no longer reliant on direct perception or action for the basis of theorizing. They have the ability to determine the validity of hypotheses and consider the inferences that would follow if the hypotheses were true.

Two characteristics indicate that an individual most likely has entered the formal-operational stage. When performing experiments, the formal-operational thinker has

⁴⁶Phillips, "The Origins of Intellect," pp. 82-117.

⁴⁷John W. Renner, ed., "Formal Operational Thought and Its Identification," in *Research, Teaching, and Learning with the Piaget Model*, (Norman, OK: University of Oklahoma Press, 1976), p. 65.

the ability to keep all variables constant except for the one being manipulated, and understands the "all-other-things-being-equal" notion. Further, the formal-operational thinker has the ability to understand the "if, then, therefore" construct, common to propositional logic.⁴⁸

Upon studying the stages of cognitive development, many assume that there is clear line of demarkation from one stage into another. This is not the case. Researchers have found that students may perform pre-operationally in one area, and concrete-operationally in other areas. As intellectual and physical development progress, the learner moves deeper and deeper into each category, until intellectual skills which were once impossible for the learner are able to be obtained. Thus, the entire intellect does not evolve in perfect unison, certain traits may outdistance others as intellect develops.⁴⁹

Ages of Cognitive Development

The age in which a learner moves from one stage into another varies substantially. Piaget has provided guidelines to the ages, yet warns that "although the order of succession is constant, the chronological ages of the

⁴⁸Hermine Sinclair, "Piaget's Theory of Development: The Main Stages," in *Critical Features of Piaget's Theory of the Development of Thought*, ed. Frank B. Murray (New York: MSS Information Corp., 1974) p, 76.

⁴⁹Renner, "Learning and Piaget," p. 22.

stages vary a great deal."⁵⁰ Several students of Piaget have suggested that the time frame needed to obtain formal-operational thought is much longer than that Piaget suggested; some researchers have indicated that many adults never even reach formal-operational thought.

John W. Renner and Donald G. Stafford performed a broad based study to determine the operational level of 588 secondary school students. Their detailed research indicates that only 33 percent of graduating seniors are able to perform at the formal-operational stage, a time frame several years behind that which Piaget suggested.⁵¹ A somewhat less meticulous study performed by Lawrence Kohlberg and Carol Gilligan found that 53 percent of people 16-20 years of age performed at the formal-operational level; 65 percent of people 21-30 years of age performed at the formal-operational level, and between the ages of forty-five to fifty the percentage of formal-operational thinkers dropped to 57 percent. While Kohlberg and Gilligan's findings are significantly higher than Renner and Stafford's

⁵⁰Piaget, "Cognitive Development in Children," p. 178.

⁵¹John W. Renner and Donald G. Stafford, "The Operational Levels of Secondary School Students," in *Research, Teaching, and Learning with the Piaget Model*, ed. John W. Renner (Norman, OK: University of Oklahoma Press, 1976), p. 97.

findings, they still indicate a surprising low attainment of formal-operational thought.⁵²

Joe W. McKinnon studied the cognitive levels of students attending a variety of college and university institutions. His research confirmed that of Renner, Stafford, Kohlberg, and Gilligan, indicating that only 50 percent of college freshman were able to think at the formal-operational level.⁵³

EFFECTIVENESS OF INTERACTIVE CLASSROOMS

Because such a large percentage of college freshman are unable to exercise formal-operational thought, changes in traditional curriculum must be made to better develop cognitive abilities. Piaget asserted that inquiry-centered learning is fundamental to cognitive development. If so, is it possible to increase the percentage of students obtaining the formal-operational thought level by creating more interactive, inquiry centered classrooms? Research indicates that it is.

⁵²Lawrence Kohlberg and Carol Gilligan, "The Adolescent as Philosopher: The Discovery of the Self in a Postconventional World," *Daedalus: Journal of the American Academy of Arts and Sciences* 100 (Fall 1971): 1065.

⁵³Actual percentages varied slightly from institution to institution. See Joe W. McKinnon, "The College Student and Formal Operations," in *Research, Teaching, and Learning with the Piaget Model*, ed. John W. Renner (Norman, OK: University of Oklahoma Press, 1976), p. 117.

A study performed by F. Elizabeth Friot found that inquiry-centered courses had a significant effect the cognitive development of eighth and ninth grade students. Those courses which encouraged students to interact with objects, events, and situations were more effective in moving students into the formal-operational level than traditional science courses.⁵⁴

At a private university, McKinnon compared the effect of an inquiry-centered science course and a traditional introductory science course on students' cognitive levels. The new course, *Forum for Scientific Inquiry*, emphasized the use of questioning, classifying, hypothesizing, verifying, restructuring, interpreting, and synthesizing.⁵⁵ Meanwhile, the traditional introductory science course relied heavily on lecture and textbook readings. Students were randomly assigned to each course. Each student was tested on five Piagetian tasks as a pretest and posttest to the course. McKinnon found that ten percent of the students enrolled in the traditional science course moved from the concrete-operational stage to the formal-operational stage, while twenty-two percent of students enrolled in the

⁵⁴F. Elizabeth Friot, "Curriculum Experiences and Movement from Concrete Operational Thought," in *Research, Teaching, and Learning with the Piaget Model*, ed. John W. Renner (Norman, OK: University of Oklahoma Press, 1976), pp. 79-89.

⁵⁵McKinnon, p. 118.

scientific inquiry course moved from the concrete-operational stage to the formal-operational level.⁵⁶

INSTRUCTIONAL IMPLICATIONS OF PIAGETIAN THEORY

Study of Piagetian theory suggests that instructors must recognize the cognitive development levels of their students and adapt teaching styles to the needs of their students, rather than automatically assume that college and university students are able to think at the formal-operational thought level. Because so many freshman remain in the concrete-operational stage, the style of teaching must be redesigned to maximize interaction in the classroom, and provide an environment conducive to student initiated inquiry and exploration, thus maximizing opportunities for students' intellectual development and growth. Eleanor Duckworth summarizes Piagetian theory suggesting,

As far as education is concerned, the chief outcome of this theory of intellectual development is a plea that children be allowed to do their own learning. . . Good pedagogy must involve presenting the child with situations in which he himself experiments, in the broadest sense of the term--trying things out to see what happens, manipulating symbols, posing questions and seeking his own answers, reconciling what he finds one time with what he finds at another, comparing his findings with those of other children.⁵⁷

In short Piaget instructs that learning must be an active process initiated by the learner's own internal

⁵⁶McKinnon, p. 118-123.

⁵⁷Eleanor Duckworth, "Piaget Rediscovered," *Journal of Research in Science Teaching* 2 (1964): 173.

desire. Active to Piaget includes not only acting on material things but also

means doing things in social collaboration, in a group effort. This leads to a critical frame of mind, where children must communicate with each other. This is an essential factor in intellectual development. Cooperation is indeed co-operation.⁵⁸

Social interactions among students should be encouraged to provide a variety of perspectives and present experiences that when assimilated lead to more advanced mental structures. In addition, Piaget suggests that active learning can be engaged in through appropriately structured language use. While listening to lecture does little to acquire deep understanding of material, use of Socratic questioning techniques (see Chapter Five) are helpful in engaging students in the construction and evaluation of their own knowledge.⁵⁹

BLOOM'S CONTRIBUTION TO COGNITIVE DEVELOPMENT

At the 1948 convention of the American Psychological Association, a group of college examiners agreed to develop a taxonomy of educational objectives to help clarify the meaning of educational terms and facilitate communication between the examiners. A committee was formed, and over the

⁵⁸Jean Piaget, "Conference on Cognitive Studies and Curriculum Development, 1964," cited by Duckworth, p. 174.

⁵⁹Constance Kamii, "Pedagogical Principles Derived from Piaget's Theory: Relevance for Educational Practice," in *Piaget in the Classroom*, ed. Milton Schwebel and Jane Raph (New York: Basic Books, Inc., 1973), p. 203.

next several years they tackled the task of classifying educational objectives. The committee attempted to classify both cognitive and affective abilities; however, only the cognitive domain is of concern to this work.

Taxonomy of Educational Objectives: Cognitive Domain

The work of the committee culminated in the publication of *Taxonomy of Educational Objectives: Cognitive Domain, Handbook 1*, edited by Benjamin S. Bloom. The taxonomy provides a hierarchy of skills which comprise intellectual development, and illustrates them with numerous examples. The taxonomy is divided into six main categories, beginning with the most simple skills and ending with the most complex. It should be noted however, that the most complex skills utilize the most basic skills, rather than being performed independent of them. For instance, in order to perform the complex skill of synthesizing material one must be able to perform the more basic skill of recalling information. A condensed version of the taxonomy follows in Table 2.1. The exact wording of the taxonomy was of spirited debate among the contributors; therefore, the wording will be quoted directly.⁶⁰ The examples provided in the taxonomy have been deleted except where viewed as necessary to clarify a definition.

⁶⁰Bloom, pp. 201-207.

TABLE 2.1 Taxonomy of Educational Objectives--Cognitive Domain

**Condensed Version of the Taxonomy of Educational Objectives--
Cognitive Domain**

1.00 KNOWLEDGE

Knowledge is defined as the recall of specifics and universals, methods and processes, or patterns, structure, or setting. Recall involves little more than to bring to mind material in a form close to that which it was presented.

1.10 KNOWLEDGE OF SPECIFICS

The recall of specific and isolable bits of information. . .

1.11 KNOWLEDGE OF TERMINOLOGY

Knowledge of both verbal and nonverbal symbols. . .

1.12 KNOWLEDGE OF SPECIFIC FACTS

Knowledge of dates, events, persons, places etc. . . .

1.20 KNOWLEDGE OF WAYS AND MEANS OF DEALING WITH SPECIFICS

Knowledge of the ways of organizing, studying, judging, and criticizing. This includes the methods of inquiry, the chronological sequences, and the standards of judgment within a field. . . This knowledge is at an intermediate level of abstraction between specific knowledge on the one hand and knowledge of universals on the other. . .

1.21 KNOWLEDGE OF CONVENTIONS

Knowledge of characteristic ways of treating and presenting ideas and phenomena. For purposes of communication and consistency, workers in a field employ usages, styles, practices, and forms which best suit their purposes and/or which appear to suit best the phenomena with which they deal. . .

1.22 KNOWLEDGE OF TRENDS AND SEQUENCES

Knowledge of the processes, directions, and movements of phenomena with respect to time.

1.23 KNOWLEDGE OF CLASSIFICATIONS AND CATEGORIES

Knowledge of the classes, sets, divisions, and arrangements which are regarded as fundamental for a given subject field, purpose, argument, or problem.

1.24 KNOWLEDGE OF CRITERIA

Knowledge of the criteria by which facts, principles, opinions, and conduct are tested or judged.

1.25 KNOWLEDGE OF METHODOLOGY

Knowledge of the methods of inquiry, techniques, and procedures employed in a particular subject field as well as those employed in investigating particular problems and phenomena. The emphasis here is on the individual's knowledge of the method rather than his ability to use the method.

1.30 KNOWLEDGE OF THE UNIVERSALS AND ABSTRACTIONS IN A FIELD

Knowledge of the major schemes and patterns by which phenomena and ideas are organized. These are the large structures, theories, and generalizations which dominate a subject field or which are quite generally used in studying phenomena or solving problems. . .

1.31 KNOWLEDGE OF PRINCIPLES AND GENERALIZATIONS

Knowledge of particular abstractions which summarize observations of phenomena. These are the abstractions which are of value in explaining, describing, predicting, or in determining the most appropriate and relevant action or direction to be taken.

1.32 KNOWLEDGE OF THEORIES AND STRUCTURES

Knowledge of the body of principles and generalizations together with their interrelations which present a clear, rounded, and systematic view of a complex phenomenon, problem, or field. . .

INTELLECTUAL ABILITIES AND SKILLS

Abilities and skills refer to organized modes of operation and generalized techniques for dealing with materials and problems. . . The abilities and skills objectives emphasize the mental processes of organizing and reorganizing material to achieve a particular purpose. The material may be given or remembered.

2.00 COMPREHENSION

This represents the lowest level of understanding. It refers to a type of understanding or apprehension such that the individual knows what is being communicated and can make use of the material or idea being communicated without necessarily relating it to other material or seeing its fullest implications.

2.10 TRANSLATION

Comprehension as evidenced by the care and accuracy with which the communication is paraphrased or rendered from one language or form of communication to another.

*The ability to understand non-literal statements (metaphor, symbolism, irony, exaggeration).

*Skill in translating mathematical verbal material into symbolic statements and vice versa.

2.20 INTERPRETATION

The explanation or summarization of a communication. Whereas translation involves an objective part-for-part rendering of a communication, interpretation involves a reordering, rearrangement, or a new view of the material.

2.30 EXTRAPOLATION

The extension of trends of tendencies beyond the given data to determine implication, consequences, corollaries, effects, etc., which are in accordance with the conditions described in the original communication.

3.00 APPLICATION

The use of abstractions in particular and concrete situations. The abstractions may be in the form of general ideas, rules of procedures, or generalized methods. The abstractions, may also be technical principles, ideas, and theories which must be remembered and applied.

4.00 ANALYSIS

The breakdown of a communication into its constituent elements or parts such that the relative hierarchy of ideas is made clear and/or the relations between the ideas expressed are made explicit. Such analyses are intended to clarify the communication, to indicate how the communication is organized, and the way in which it manages to convey its effects, as well as its basis and arrangement.

4.10 ANALYSIS OF ELEMENTS

Identification of the elements included in a communication.

*The ability to recognize unstated assumptions.

*Skill in distinguishing facts from hypotheses.

4.20 ANALYSIS OF RELATIONSHIPS

The connections and interactions between elements and parts of a communication.

*Ability to check the consistency of hypotheses with given information and assumptions.

*Skill in comprehending the interrelationships among the ideas in a passage.

4.30 ANALYSIS OF ORGANIZATIONAL PRINCIPLES

The organization, systematic arrangement, and structure which hold the communication together.

*The ability to recognize form and pattern in literary artistic works as a means of understanding their meaning.

*Ability to recognize the general techniques used in persuasive materials, such as advertising, propaganda, etc.

5.00 SYNTHESIS

The putting together of elements and parts so as to form a whole. This involves the process of working with pieces, parts, elements, etc., and arranging and combining them in such a way as to constitute a pattern or structure not clearly there before.

5.10 PRODUCTION OF A UNIQUE COMMUNICATION

The development of a communication in which the writer speaker attempts to convey ideas, feelings, and/or experiences to others.

5.20 PRODUCTION OF A PLAN, OR PROPOSED SET OF OPERATIONS

The development of a plan of work or the proposal of a plan of operations. . .

5.30 DERIVATION OF A SET OF ABSTRACT RELATIONS

The development of a set of abstract relations either to classify or explain particular data or phenomena, or the deduction of propositions and relations from a set of basic propositions or symbolic representations.

*Ability to formulate appropriate hypotheses based upon an analysis of factors involved and to modify such hypotheses in the light of new factors and considerations.

6.00 EVALUATION

Judgments about the value of material and methods for given purposes. Quantitative and qualitative judgments about the extent to which material and methods satisfy criteria. Use of a standard appraisal. . .

6.10 JUDGMENTS IN TERMS OF INTERNAL EVIDENCE

Evaluation of the accuracy of a communication from such evidence as logical accuracy, consistency, and other internal criteria.

*The ability to indicate logical fallacies in arguments.

6.20 JUDGMENTS IN TERMS OF EXTERNAL CRITERIA

Evaluation of material with reference to selected or remembered criteria.

*The comparison of major theories, generalizations, and facts about particular cultures.

*Judging by external standards, the ability to compare a work with the highest known standards in its field--especially with other works of recognized excellence.

As instructors, many decisions about curriculum development and teaching methods must be made. The taxonomy provides a sounding board to evaluate the effect of the curriculum or techniques on students' thinking skills. In many courses, the sole purpose of the class seems to be to provide students with knowledge. But as the taxonomy indicates, knowledge ranks as the lowest category in the cognitive domain. To improve students' critical thinking skills, instructors must provide experiences that utilize higher levels of thinking skills. The taxonomy can be an

important instrument for instructors who wish to classify the intellectual difficulty of the work they assign.

SUMMARY

The contributions of Piaget and Bloom add greatly to the understanding of cognitive development. Piaget's lifelong studies indicate that students learn best when inquiry-centered learning situations allow them to encounter new information that challenges their state of mental equilibrium. More advanced mental structures are developed as students accommodate new information.

Piaget classified mental development into four stages: sensory-motor, pre-operational, concrete-operational, and formal-operational. Researchers have discovered that many adults never enter the level of formal-operational thought, and approximately 50 percent of freshmen entering college remain at the concrete-operational stage. This research has important implications for curriculum development, suggesting that instructional techniques need to emphasize student interaction and provide concrete explanations to aid in the understanding of abstract material.

The work of Bloom and his colleagues provides a standard by which the mental difficulty of assignments can be measured. As the difficulty of assignments increases, more critical thinking skills are required to complete the assignment. However, as Piaget noted, instructors must be

aware of the mental stages of development of their students and challenge them at their current level of development, rather than trying to force them to perform mental exercises that are too far above their level of competence. Piaget and Blooms' contributions to the understanding of cognitive development provide instructors with several integral tools to use in the evaluation and development of curriculum materials.

CHAPTER THREE

MNEMONIC DEVICES TO AID IN LOWER-LEVEL THINKING SKILLS

Mnemonic devices are tools that aid in the improvement of memory. It may seem somewhat unusual to include a chapter on mnemonics in a study emphasizing the development of critical thinking skills. However, it is impossible to think critically about ideas one does not know. As Bloom's taxonomy indicates, knowledge must be obtained before higher-order thinking skills can be engaged in. Therefore, it is important to provide students with methods which will allow them to more easily acquire and remember knowledge. Mnemonic devices are particularly useful for introductory students who are faced with learning a tremendous number of new concepts and specialized language as they become acquainted with new fields of learning. In a few concise pages, this chapter presents mnemonic devices that can easily be transferred to students to enhance their acquisition and retention of knowledge.

Pages of psychology literature are filled with studies which strive to understand how memory acquisition, retention, and retrieval works. The theories hypothesized in such studies are not of primary importance to this project; rather, the emphasis here will be on the tools

psychologists have found useful in the retention and retrieval of information.⁶¹

BACKGROUND

Mnemonic devices follow simple principles that consistently result in memory improvement. First, they require the learner to pay **attention** to the information. Many times students will say they forgot a concept when they have never paid adequate attention to store the information in the first place. For instance, when introduced to a new person many people "forget" their name within a matter of seconds. However, in most cases adequate attention was not initially given and the name was never stored in memory.

Second, mnemonic devices make information **meaningful** to the learner. Abstract concepts such as numbers are made important by connecting them to concrete ideas and objects. Third, mnemonic devices require the learner to **organize** the material in meaningful ways. Instead of randomly trying to remember a list of concepts, mnemonic devices present tools to classify and organize the material, making it easier to recall. And finally, mnemonic devices require the learner to **monitor** the material, helping to determine whether the

⁶¹Many of the mnemonic devices presented in this chapter are more fully discussed in Diane F. Halpern's comprehensive book *Thought and Knowledge: An Introduction to Critical Thinking* (Hillsdale, NJ: Lawrence Erlbaum Associates, 1989), pp. 44-85 and in Donald A. Norman, *Memory and Attention: An Introduction to Human Information Processing* (New York: John Wiley and Sons, Inc., 1976), pp. 130-155.

material has been sufficiently acquired, stored, and available to be recalled.

KEY WORDS AND IMAGES

The most common mnemonic devices are those which employ key words and images. Concepts are narrowed to key words or tied to key words and are visualized in the learner's mind. For instance, introductory students learning about the Senate's rule of filibuster and cloture often forget that cloture ends a filibuster debate and requires 60 votes to be invoked. By visualizing this concept the idea becomes easy to remember. Cloture sound similar to culture (as in throat culture). By visualizing a Senator, wearing a large number 60 on his suit, coughing and gagging as another senator tries to cut off debate by choking him around the throat, the abstract notion of cloture has now become a dynamic visual scene that would be difficult to forget.

Ideas are most easily remembered if they use images which are vivid and detailed, unusual, extraordinarily large, or unusually tiny, and if motion is involved. If motion is visualized coming toward one's own body, particularly the face, it becomes even easier to remember. When lists of ideas need to be learned, recall is improved if each item is visualized emerging or interacting with the item just preceding it. Moreover, if students create their own images or words they are more likely to remember them

than if they are presented with a visualization created by another.

This Old Man

As children, many Americans learned the song *This Old Man* which goes something like this. "This old man, he played one, he played knick-knack on my thumb, with a knick-knack patty-whack give the dog a bone, this old man went rolling home. . ." The "This Old Man" mnemonic is a simple take off from this song that becomes very useful for memorizing lists of up to ten items. First the following poem is memorized.

One is a thumb
Two is a shoe
Three is a tree
Four is a door
Five is a hive
Six is a sticks
Seven is heaven
Eight is a gate
Nine is a vine
Ten is a hen⁶²

Students simply connect the first concept they want to learn by visually picturing it attached to a huge thumb, and the second concept is attached to a shoe, etc. For instance, Constitutional Law students often have difficulty remembering which rights are protected in each of the first ten amendments to the Constitution known as the Bill of Rights. The "This Old Man" technique helps the student to organize and attend to the information. A student may

⁶²Modified from Norman, p. 134.

create the visual image of religious leader Billy Graham preaching (free speech) to a crowd while giving them two thumbs up (one for the establishment clause and one for the free exercise clause), while Peter Jennings reports on the event and gives the viewers the thumbs up sign (free press), and cameras follow assembly members (right to assembly) giving the thumbs up sign as they leave to assembly carrying stacks of petitions to the U.S. Capitol building (right to petition government).

The right to bare arms is protected in the Second Amendment and can be visualized by a machine gun blowing up a tennis shoe. The Third Amendment protects citizens from having to quarter soldiers in their houses and can be visualized by viewing a log cabin made out of trees with a "no soldiers allowed" sign hanging over the front door. Likewise, the rights protected by the Fourth through Tenth Amendments can be easily memorized by using the same techniques.

Loisette Phonetic System

Another system that uses keywords to improve memory recall was created in 1896 by A. Loisette.⁶³ This system is designed to make abstract numbers easier to recall by connecting them with concrete words and images. Initially,

⁶³A. Loisette, *Assimilative Memory or How to Attend and Never Forget* (New York: Funk and Wagnalls, 1896), cited by Halpern, pp. 71-73.

the system appears somewhat complicated, but its practicality makes learning the system well worth the effort. The Loisetete system attaches each of the consonant sounds in the alphabet to the numerical digits zero through nine. Vowel sounds are then added between the consonants allowing a number to be turned into a word.

<u>Digit</u>	<u>Consonants</u>
0	S or Z or soft C (as in cider)
1	T or D or TH
2	N
3	M
4	R
5	L
6	SH or J or CH or soft G (as in giant)
7	K or hard G (as in go) or hard C (as in cat) or Q or NG
8	F or V
9	B or P

For instance, the membership of the House of Representatives has been set at 435. Using the Loisetete system, the numbers 4, 3, and 5 become the consonants R, M, and L respectively. Then to create a word, vowels are added between the consonant sounds as necessary. For instance, 435 could become "remail" which is easy to associate with Congress since they use their franking privileges to send out great quantities of mail every year. To remember there are 27 Amendments to the Constitution a student could create the work "NIKE" (N=2, K=7) and visualize a pair of Nike shoes running across the Constitutional Amendments.

To make the Loisette system easier to learn, the following mnemonics may be used.⁶⁴

0= Z or S or soft C	zer0
1= T or D	T has one vertical stroke, or a TD (Touch-Down is made by the number 1 team)
2= N	N has two vertical strokes, and turned on its side looks like a 2
3= M	M turned on its side looks like a 3
4= R	fouR
5= L	L is equal to 50 in Roman Numerals
6= Soft G or J or CH or SH	G looks like the number 6
7= Q or NG or K or Hard C or Hard G	?? (Question mark) looks like the number 7, or a Key looks like the number 7
8= F or V	8 is my FaVoreight (favorite)
9= P or B	P looks like the mirror image of the number 9.

First efforts at using this system are rather cumbersome, but once it has been mastered, numbers of any length are easy to remember and conversion times between the phonic sound and the number are minimal.

RHYMES AND RHYTHM

Using rhymes to remember data is a technique familiar to most students since grade school. From learning the alphabet "ABCDEFGH--HIJKLMNPO..." to remembering dates and places "In 1492 Columbus sailed the ocean blue" rhymes are useful tools. Rhymes work effectively not only because they use words that rhyme, but also because of the meter to which the words are set. Phrases created with equal numbers of

⁶⁴Modified from Halpern, p. 72.

syllables, set to familiar chant rhythms, or set to music are more easily recalled than those which are not.

METHOD OF LOCI

When material needs to be learned in a linearly sequence, or a list of items need to be remembered, the method of loci (also known as the method of placement) is particularly useful. This technique requires the learner to associate the items to be remembered with a linearly sequence that is familiar to the learner. A linearly sequence may be parts of the body (head, shoulders, knees, and toes) or a route regularly taken to school or work. The learner simply visualizes the item to be remembered at each of the sequential locations. For instance, if students wanted to remember the four types of congressional committees they could visualize a conference committee on their head (with members from both houses shouting at each other), a select or special committee on their shoulders, a joint committee on their knees (easy to remember because the knees are a joint), and a standing committee on their feet (standing of course). The student only needs to mentally walk through the route to recall the items to be learned.

FIRST LETTERS

The first letter mnemonic is frequently used by students when preparing for exams. It simply requires the

student to combine the first letters of each of the terms to be remembered into a word. A well known first letter mnemonic is the name "ROY G. BIV" reminding the student of the order of the wavelengths in the visible color spectrum: red, orange, yellow, green, blue, indigo, and violet. Vowels may be added to the first letters when necessary to create a meaningful word out of the letters. Or, in some cases it may be easier to remember key words through combining the first syllables of each word in the list.

The first letter mnemonic also works well when giving a speech without notecards. The first letter of each of the points in the speech can be combined into one word, allowing for better organization and presentation.

Mort Herold suggests using the acronym IRAC to remind the student of the important elements to remember from constitutional law cases.⁶⁵ IRAC is the first letter mnemonic for Issue, Rule, Application and Conclusion.

NARRATIVE STORIES

A final type of mnemonic presented in this chapter is known as narrative stories. This technique is useful when it is necessary to memorize a list of terms, especially if terms seem unrelated. For instance, suppose students were preparing for an exam on the development of political

⁶⁵Mort Herold, *You Can Have a Near-Perfect Memory* (Chicago: Contemporary Books, 1982), p. 182.

parties, and wanted to remember the following key words: Whigs, Jeffersonians, Federalists, Democratic-Republicans, Jacksonian, Democrats, Republicans, two-party system. The students could create and visualize a short narrative story to improve their recall ability. The story could go as follows. **Jefferson** and **Jackson** each wore **whigs** 2 the **party** at the **Federalist** building. At the party, the **Democrats** sat on one half the room while the **Republicans** sat on the other. The participants gasped when some **Democratic-Republicans** began dancing with each other.

In a 1969 study, Bower and Clark tested college student's abilities to recall twelve lists containing ten words apiece. One group was instructed to create and visualize narrative stories, while a control group was not. The researchers found that long-term recall for the students using the narrative story technique averaged ninety-three percent of the words, while long-term recall for the control group averaged only thirteen percent of the words.⁶⁶

SUMMARY

In Bloom's taxonomy of learning skills, lower-level thinking skills must be obtained before higher-level thinking skills can be mastered. The mnemonic systems presented in this chapter are simple techniques to help

⁶⁶Gordon H. Bower and Michal C. Clark, "Narrative Stories as Mediators for Serial Learning," *Psychonomic Science* 14 (1969):181-182.

students acquire, organize, recall, and monitor the myriad of data they are presented with. These techniques are simple to learn and teach, yet are of great value to students.

CHAPTER FOUR

THE EXPLICIT MODEL OF CRITICAL THINKING INSTRUCTION

Mnemonic devices are useful in the development of lower-level thinking skills, but to improve higher-level thinking skills other instructional techniques are required. Chapters four and five provide two models of critical thinking instruction: the explicit model and the implicit model.

The explicit model, as explained in this chapter, requires instructors to model and teach specific critical thinking skills and dispositions. It also allows students with the opportunity to practice specific critical thinking skills, such as detecting bias, and suggests ways in which to improve the effectiveness of those skills. Through metacognition, the explicit model demonstrates to students the different manner in which experts and novices execute thinking skills. Perhaps an analogy will illustrate the point. In baseball, all players know they need to run past first, second, third and home base in order to score a run. However, more advanced players have learned how to step on each base to maximize speed and alter their direction as they head towards the next base. Without someone explicitly teaching beginning baseball players the art of base running,

many will never learn to run bases as effectively as they could. Likewise, without explicit critical thinking instruction, students will not learn to think as effectively as they are capable of.

This chapter lists and explains those skills commonly viewed as components of critical thinking. After the skills are introduced, the instructional techniques of the explicit model are explained and applied to the political science curriculum.

CRITICAL THINKING SKILLS

A critical thinker has the ability and willingness to use particular thinking operations. Yet scholars do not conclusively agree on which critical thinking skills students should master. Ennis' *A Taxonomy of Critical Thinking Dispositions and Abilities* is probably the most comprehensive list to date. Ennis details four pages of critical thinking categories, including dispositions such as creativity and open-mindedness, as well as specific skill groups including identification, clarification, credibility, inference, deduction, and action determination.⁶⁷ In an earlier work, Dressel and Mayhew suggested that the most essential critical thinking skills consist of the ability to identify central issues, recognize assumptions, evaluate

⁶⁷Ennis, "Taxonomy of Critical Thinking," pp. 12-15.

evidence, and draw warranted conclusions.⁶⁸ Table 4.0 summarizes the critical thinking skills most frequently emphasized by thinking skills scholars.

TABLE 4.0 Critical Thinking Skills

CRITICAL THINKING SKILLS
1. Distinguishing between verifiable facts and value claims
2. Distinguishing between relevant and non-relevant information, claims, or reasons
3. Determining the factual accuracy of a statement
4. Determining the credibility of a source
5. Identifying ambiguous claims or arguments
6. Identifying unstated assumptions
7. Detecting bias
8. Identifying logical fallacies
9. Recognizing logical inconsistencies in a line of reasoning
10. Determining the strength of a claim

SOURCE: Beyer, "Practical Strategy," p. 44.

The following section defines and explains the critical thinking skills emphasized in this project.

CRITICAL THINKING SKILLS--DEFINITION AND EXPLANATION

1. Distinguishing between verifiable facts, value claims, and reasoned judgement.

Beyer suggests that students need to be able to distinguish between verifiable facts and value claims. Statements which are or could be backed by objective evidence are considered verifiable facts. Subjective

⁶⁸Dressel and Mayhew, p. 39.

judgements about the worth of items or ideas are considered value claims.⁶⁹

Paul recommends that a third category, reasoned judgment, be added to fact and opinion. He notes that thinking skills programs which reduce all statements into categories of fact or opinion tend to eliminate the need for "dialogical thinking."⁷⁰ Dialogical thinking occurs when the arguments of the opposing point of view are constructed and considered. For instance, a jury trial with presentations from both the prosecution and the defense helps the jury to see the strengths and weaknesses in each side's arguments. Without hearing from the opposition, most jurors would tend to view the case from only one frame of reference and not use dialogical thinking.⁷¹

Paul notes that many important issues "do not reduce to unadulterated fact or arbitrary opinion."⁷² Indeed, they require the use of reasoned judgement. Two people with differing frames of reference and assumptions can interpret the same "facts" very differently. As Paul states,

some of what is apparently empirically true is also arguable. And we are often faced with the problem of deciding which facts are *most* important, which should be made central, and which should be deemed peripheral or even irrelevant. Then, typically, there are

⁶⁹Beyer, "Developing Thinking Skills," p. 337.

⁷⁰Paul, p. 141.

⁷¹Ibid., p. 129.

⁷²Ibid., p. 141.

possibilities for alternative arguable interpretations and implications.⁷³

Thus, critical thinkers need to be able to discern the difference between fact, opinion, and reasoned judgement.

2. Distinguishing between relevant and irrelevant information claims, or reasons.

Determining whether data or arguments are germane to the task at hand is the basis of discerning relevance. It requires students to compare and contrast information with the thesis or topic being examined. Ideas and arguments that correspond closely with the topic at hand are considered relevant, while information or claims that are peripheral to the subject under consideration are considered irrelevant.

For instance, during the past year one of the issues that has been of great debate in this community, is whether or not a display of a Ten Commandments statue on the county courthouse lawn violates the U.S. Constitution. In many letters to the editor, citizens claimed that because the statue was donated by a veteran's group, and not purchased with county funds, that the statue should be allowed to stand. While this point is interesting, it is irrelevant to whether the display of a religious monument on government property is constitutional.

⁷³Ibid., p. 141.

3. Determining the factual accuracy of a statement.

Being able to determine whether a factual claim is accurate and consistent with other facts is an important critical thinking skill to be learned. This skill requires students to evaluate if the statement is generally accepted as factual knowledge, to consult credible sources to verify or refute information, and to conduct research to replicate findings. This skill is useful when evaluating the validity of factual claims used to solve problems, to persuade people, or to form generalizations.⁷⁴

Ennis adds that facts drawn from observation statements have differing degrees of reliability. Observations which are made by an alert, impartial observer are more reliable than observations which are not. Direct observations which are or could be corroborated, and which are made at the time of the incident are more accurate than those that are not. And observations made by persons who have good access, quality sensory equipment, and a reputation for veracity are more accurate than statements which do not have such qualifications.⁷⁵

⁷⁴Beyer, "Developing Thinking Skills," p. 338.

⁷⁵Robert H. Ennis, "A Concept of Critical Thinking," *Harvard Educational Review* 32 (1962):90.

4. Determining the credibility of a source.

Closely related to determining the accuracy of factual information is determining the credibility of a source. Ennis and Beyer each suggest that authorities and other sources are most credible when: a source has a reputation for veracity, the source has expertise in the area of the statement, the source does not stand to profit from (or have a conflict of interest with) the likely consequences of the statement, the source used appropriate methods to reach the advocated position, and when the source's statement coincides with statements made by other sources.⁷⁶

For instance, the 1947 Kinsey report estimated the number of male homosexuals as 10 percent of the U.S. population. This number became accepted as conventional wisdom, and for many years went unchallenged. However, a 1993 study conducted by the Battelle Human Affairs Research Center in Seattle found that only about two percent of the men surveyed had engaged in homosexual sex and that one percent considered themselves exclusively homosexual.⁷⁷ Which of these sources is credible? Students need to learn how to look for additional evidence, be wary of potential conflicts of interest, and understand statistically valid

⁷⁶Beyer, "Developing Thinking Skills," p. 330; and Ennis, "A Concept of Critical Thinking," pp. 106-107.

⁷⁷"Social Science and the Citizen," *Society*, 30 (July/August 1993):2-3.

methods in order to accurately judge the validity of a claim or source.

5. Identifying ambiguous claims or arguments.

Many arguments contain vague and ambiguous statements. Students need to recognize such statements rather than blindly accepting them as accurate. In determining whether a claim is too vague, students must decide, "is this claim sufficiently detailed for my purposes?"⁷⁸ For instance, the statement "health care in America needs dramatic reform" is easy for most people to agree with. However, such a claim is vague and does not indicate which reforms are needed. More details need to be provided before the statement can add strength to a health care reform argument.

6. Identifying unstated assumptions.

Students should be able to identify unstated assumptions and premises that necessarily must be true in order for a stated conclusion to be true. This skill is useful when trying to identify the strength, accuracy, and validity of an argument or claim, and when trying to understand the author's point of view. Frequently unstated assumptions can be discovered by looking for if . . . then statements or by looking for concluding words such as thus, consequently, or so. By finding missing links between

⁷⁸Ennis, "A Concept of Critical Thinking," p. 88.

conclusion and the accompanying reasons, students can identify unstated assumptions. In addition, by asking "what else must be true if I am to accept this conclusion?" other unstated assumptions can be found.⁷⁹

For example, in the summer of 1992, Los Angeles exploded in rioting and fire after white police officers were found innocent of racial motives in the beating of Rodney King. President George Bush blamed the violent rioting on President Johnson's Great Society Programs of the 1960s. If Bush's conclusion is to be evaluated effectively, several unstated assumptions must be identified. For instance, Bush is assuming that government spending on the poor leads to the breakdown of families, government spending on the poor leads to violence, and that government spending on the poor leads to moral decay and lawlessness. When these assumptions are identified, it becomes much easier to determine the validity of Bush's conclusion.

7. Detecting bias.

Being able to detect a one-sided argument or slanted view is very useful. Bias can be blatant or subtle, and is frequently found in attempts to persuade. Looking for bias helps students to understand an author's point of view and judge the accuracy of data or claims. Clues to detecting bias include looking for emotionally charged statements,

⁷⁹Beyer, "Developing Thinking Skills," p. 351.

over-generalizations, one-sided presentations, imbalance, and opinions stated as facts.⁸⁰

An editorial in the Idaho State Journal demonstrates how difficult it is for some to detect bias. In a response to a letter attacking Rush Limbaugh, Catherine Winward states, "Mr. Limbaugh always shows both sides of each issue, although there really is no need. The national media always provides the liberal side."⁸¹ More experienced critical thinkers would find the Rush Limbaugh program as a bastion of conservatism. Most issues are presented clearly from the conservative viewpoint and a balanced presentation from the liberal viewpoint is rare on the program. Winward's statement shows her own personal bias, rather than exposing that of the editorial she is attacking.

8. Identifying logical fallacies and inconsistencies in a line of reasoning.

Identifying and understanding logical fallacies and inconsistencies can be a useful tool to help evaluate the strength of an argument or claim. While logic courses often have students learn to identify several dozen reasoning errors, only the most common logical fallacies are

⁸⁰Beyer, "Developing Thinking Skills," p. 325.

⁸¹Catherine Winward, "Fan of Rush," *Idaho State Journal*, 9 December 1993, p. D4.

emphasized in this project.⁸² Some common fallacies include association effects, *ad populum*, *ad hominem*, false dilemma, red herring, shifting words, slippery slope, and circular reasoning.

Association effects occur when two events, items, or people are tied closely together. Guilt by association occurs when an authors tries to taint a product or person by tying them with some negative event or situation. For instance, saying that an Aryan Nations group was endorsing a candidate would taint the candidate, even if the endorsement was not sought. On the other hand, virtue by association tries to tie a person or product to a positive event or situation. This technique is frequently used in commercials by getting a celebrity to endorse a product, or in academics by associating works with Harvard, Yale, or other prestigious institutions.

The *ad populum* fallacy occurs when an author appeals to group-approved attitudes rather than the real issue. Even if "a majority of citizens believe" or "everybody knows" or "most Americans' feel" a certain way, it does not mean those citizens are right or that they based their judgments on appropriate evidence. Broad claims of support tend to focus away from the real issue and try to persuade readers to support the popular viewpoint.

⁸²For explanations of additional fallacies see, Halpern, pp. 176-209, and Browne and Keeley, pp. 119-128.

The *ad hominem* fallacy occurs when an author engages in name calling and attacks a person or their background rather than addressing the real issue. Frequently emotionally charged and biased words are used to discredit the person. For instance, in the 1992 Presidential campaign George Bush called Bill Clinton a "bozo" rather than stating the reasons why he believed Clinton to be unqualified for the presidency.

A false dilemma, or false dichotomy, occurs when the author makes a problem appear as if there were only two alternative solutions to choose from, while in reality there may be many choices or alternatives. False dilemma fallacies oversimplify the issue. To identify false dilemmas, look for phrases like "either--or," "the only alternative is," "the two choices are," or "because A has not worked, only B will." For example, people have argued that if you don't like the way things are going in America then get out. This "love it or leave it" philosophy does not recognize additional alternatives like loving America and making some changes. The argument only sets up two choices, thus committing the false dilemma fallacy.

A logical fallacy called a red herring occurs when the reader is diverted from the real issue. Red herrings are one of the most frequently made logical fallacies, but can be spotted easily if you focus on the real issue and what evidence is needed to support it. For example, in the

following argument a red herring has been made.

"Homosexuals should not be allowed in the military, their presence suggests public approval of homosexuality and will lead America down the road of moral decay and disintegration." The real issue is the effect of homosexuals on military preparedness and effectiveness, not the moral decay of America.

A logical fallacy known as shifting words occurs when an author uses two terms that have different meanings as if they had the same meaning. For example, an radio announcer argued that the League of Women Voters did not support the recent school bond, so others were encouraged to oppose it as well. Being opposed to the bond would mean to firmly disagree with it. Not supporting means you do not firmly agree with the issue. It may mean that you are indifferent to the bond issue, or unsure about the issue. By shifting words, the author tries to persuade you to accept a particular position.

The slippery slope fallacy occurs when an author suggests that if a course of action is begun it cannot be stopped. One college student committed the slippery slope argument while debating whether drinking should be permitted in college dormitories. He said, "if we let the university tell us where we can drink, pretty soon they are going to be telling us when to go to bed, what to wear, and what to

eat." This is a prime example of the slippery slope fallacy.

A final fallacy that is frequently committed is known as circular reasoning. In this fallacy, the premise is simply a restatement of the conclusion. For instance, note the circular reasoning in this statement, "we need to cut welfare spending, because we spend too much on the poor." The reason provided is simply a restatement of the conclusion.

9. Determining the strength of a claim.

Arguments or claims usually consist of two parts: the premises and the conclusion. The premises, or reasons, are the statements used to provide support for the conclusion. The conclusion is the belief the author is trying to persuade the reader to accept as true or probably true.

Determining the strength of a claim is the most comprehensive of the critical thinking skills mentioned. To do so adequately, each of the previously addressed skills are frequently employed. The conclusion and evidence must be identified, and each argument must be examined for relevancy, accuracy, bias, credibility, unwarranted assumptions, and logical fallacies. By utilizing all these skills, students have the opportunity to rationally appraise the strength of a claim.

**PEDAGOGY OF THE EXPLICIT MODEL OF CRITICAL THINKING
INSTRUCTION**

Beyer is one of the principle advocates for the explicit teaching of critical thinking skills. In *Practical Strategies for the Teaching of Thinking* he provides three closely related strategies to improve students' critical thinking skills. Beyer calls these strategies the inductive, directive, and developmental methods.⁸³

Each of the three models is comprised of the same elements, they simply vary in the order in which the elements are performed, and to the amount of direction given by the instructor. The developmental strategy essentially merges the inductive and directive strategies; therefore, it is the strategy which is presented in this project.

Six steps form the developmental strategy.⁸⁴ First, the skill is introduced. At this stage, it is important to inform the students that learning the skill itself is the object of the lesson. Applying the skill to political science material is useful; however, knowledge gained from that material should be viewed as supplementary to the primary goal of learning the critical thinking skill. During the introduction, the skill is named and synonyms provided. A working definition of the skill is given, and

⁸³Beyer, "Practical Strategies," pp. 96, 102, 117.

⁸⁴Ibid., p. 117.

ways in which the skill can be used are suggested. Finally, an explanation of why the skill is worth learning is offered.

The second step in the developmental strategy is to execute the skill. The skill is applied the best that one can to a given task. Beyer suggests working in pairs, triads, or groups to complete this step. The subject matter used in the assignment should be fairly familiar to the students and appropriate for the course.

Third, the students reflect on what was done. Students are asked to explain what occurred in their thought processes as they tried to complete the task. They are asked to identify and sequence the mental steps they went through to complete the process. During reflection, clarification of procedures and criteria is made. Focus is kept on the skill and steps to perform the skill rather than on the material itself.

Explanation and demonstration comprise the fourth step. The instructor explains and demonstrates any key rules or operations eliminated or misapplied by the students. Explanation of the importance of the rules is given, providing students with understanding of how and why a procedure or rule is used.

Fifth, the skill is applied to new data. Students use the instructor-introduced rules and procedures to complete another task. The task should be similar to that originally

completed, allowing the students to more easily apply the new skill using the techniques gained through reflection and explanation. Students again may work in pairs or groups, allowing them to detect how others complete the process differently than themselves.

The sixth step is to review the skill. During review, the definition of the skill is reviewed or revised. Students report on the mental processes they went through to complete the skill, and the rules and processes that seem to constitute the skill are summarized. The relationship between this skill and others is stated, and the value of the skill is reinforced by describing a number of situations in which the skill can be applied.

Depending on the amount of class time available, the timing of the steps can be varied. For instance, it may be more feasible to complete steps one through four in class, and then have students complete step five (application) at home. When class resumes, step six (review) could occur, providing more flexibility for the classroom.

It is also beneficial to present the skills to be learned in a hierarchical fashion, beginning with the skills easiest to master and ending with those that are most complex. Bloom's taxonomy is a useful guide to help determine the level of difficulty of each of the critical thinking components.

Tables 4.1 and 4.2 provide examples of the discussion and application that may be used to teach students to determine the credibility of a claim and identify logical fallacies.

TABLE 4.1 Determining the Credibility of Sources and Claims

<p>CRITICAL THINKING ASSIGNMENT</p> <p>GOAL: To determine the credibility of sources and claims. DEFINITION: Credibility is the believability or reliability of a source or claim USEFULNESS: Many circumstances require a person to determine credibility. For instance:</p> <ol style="list-style-type: none"> 1. During campaign season many political commercials make claims that opponents say are untrue (Kempthorne & Stallings; Bush & Clinton...). Determining the credibility of claims is helpful in determining who to vote for. 2. Most papers you are required to write ask you to cite sources and provide evidence for particular positions. If you use credible sources, your paper will have more legitimacy than if you use non-credible sources. (Citing a refereed journal is more credible than citing the Idaho State Journal). 3. Credibility must be determined in your private life as well. For instance, if you are buying a car you must determine how credible the claims of the salesperson are in order to know if you are getting a good deal or not. <p>STEPS: Criteria for determining credibility</p> <ol style="list-style-type: none"> 1. Is the claim made in the author's field of expertise? 2. Does the author have a reputation for accuracy? 3. Does the author have a conflict of interest with the claim? 4. Were appropriate methods used to prepare the claim? 5. Does the claim agree with other credible sources? 6. Is there a risk to the author's reputation if the information is published? 7. Was the claim written at the time of the event, or much later? 8. Is the claim from an eyewitness or from a second hand source? 9. Is there an absence of bias, "loaded" or emotionally charged words? <p>HINTS:</p> <ol style="list-style-type: none"> 1. Are you having trouble getting started? <ol style="list-style-type: none"> A. Ask yourself, "to what extent the author had the opportunity to get detailed, accurate information." B. Ask yourself, "to what extent might this author have hidden motives in preparing this source--or motives that might conflict with being accurate and objective." 2. What should you do if-- <ol style="list-style-type: none"> A. You can not find any information about the author? Compare the claim with other credible sources. B. You can not find any sources to compare the claim with? Try to find criticism and comments made in articles that review or critique the claim. 3. Things to remember-- <ol style="list-style-type: none"> A. Sources with a reputation for accuracy may still contain bias. Authors do make mistake, and do write for specific purposes. B. Accounts written for private use (diaries, letters, etc.) are usually more credible than accounts written for public use. C. Libraries contain a good deal of information about author's lives, skills, and publications. <p>ASSIGNMENT: Using the criteria for determining credibility, evaluate the accuracy of the attached campaign ad. BE SPECIFIC. Go through the ad claim by claim. If any of the claims, authors, or sources are questionable then explain why using the criteria listed above.</p> <p>SOURCE: Adapted from Barry K. Beyer, <i>Developing a Thinking Skills Program</i>, pp. 330-31.</p>

TABLE 4.2 Identifying Logical Fallacies

<p>CRITICAL THINKING ASSIGNMENT</p> <p>GOAL: To identify logical fallacies. DEFINITION: Logical fallacies are errors in logic that weaken or invalidate an argument.</p> <p>FALLACIES TO BE LEARNED:</p> <ol style="list-style-type: none"> 1. ad hominem (attacking the person, not the argument) 2. ad populum (appealing to group-approved attitudes) 3. false dilemma (presenting only two choices) 4. red herring (diverting the reader from the real issue) 5. shifting words (using two terms with different meanings as the same term) <p>[a broader discussion of these fallacies was presented in class, providing students with a better understanding of the fallacies. Refer to "Identifying Logical Fallacies and Inconsistencies in a Line of Reasoning."]</p> <p>USEFULNESS: Many conclusions are based on reasoning that is weak or invalid. In order to determine the strength and believability of an argument, the reasoning should be evaluated.</p> <p>APPLICATIONS:</p> <p>--Writing papers requires the use of logic and reasoning. As college students, developing strong, reasoned arguments and good communication skills is an important part of your education, and those students who are better at these skills often earn better grades.</p> <p>--In today's media age, we are inundated with commercials and short newsclips which make arguments filled with logical fallacies. Being able to recognize and identify fallacies allows viewers to make their own judgements about a claim or product.</p> <p>STEPS:</p> <ol style="list-style-type: none"> 1. When looking for logical fallacies the first step is to identify the conclusion. What does the author want you to believe? 2. Second, identify each of the reasons the author gives to support the conclusion. 3. Examine the reasons given. Has the author strayed from discussing the advantages and disadvantages of the issue? If so, a logical fallacy has likely been made. 4. Evaluate the conclusion based on the strength of the reasons given. Strong conclusions will have strong arguments. <p style="text-align: center;">ASSIGNMENT * ASSIGNMENT * ASSIGNMENT * ASSIGNMENT</p> <p>For each of the following passages you are asked to 1) identify the author's conclusion; 2) state the reasons the author lists for support; and 3) identify the logical fallacies being made.</p> <p>KEEP MONUMENT</p> <p>We would like to voice our concern over the monument with the Ten Commandments on it and whether it should be allowed to stay on the grounds of the Bannock County Courthouse.</p> <p>Our country was founded on Christian principles. Our founding fathers set up our government based on the belief of God. The majority of Americans have this same belief. It was not purchased by our taxes, but was a gift. .</p>

TABLE 4.2--Continued

The ACLU has been fighting (and winning) against the rights of the majority of the citizens of this country. Why should this small groups tell the majority of us who believe in a high being, no matter what religion we are, what can or can't be done? What about our rights as the majority? . . . We need to let the ACLU know that they are fighting against the beliefs of the majority of the people in this country.

--S. Howerton, L. Topham, and B. Archibald, ISJ 11/23/92

MONUMENT BELONGS

Ten Commandments--why? Believe in God or don't... The commandments are or should be what is known as law or common sense, which is lacking very strong in this nation and the entire world... The police station and every church also should have them shown. Today's high crime rate is mostly due to lack of education and respect. The Ten Commandments should be a first priority in education, and should be taught at all schools at all ages...

--D. Gregersen, ISJ 11/26/92

OUTRAGED BY SUIT

...Mr. Albanese say it's nothing personal. It is personal. He is trying to make the county pay money to get something done because he feels the line between church and state has been crossed. That's money that we, as taxpayers, work hard for. What is he and the ACLU going to do next? Try to get everyone in the county to quit praying for their government officials?...

And while we are at it, doesn't *freedom of religion* also mean the right to *freely practice your religion*? That, to me, would include the government not spending tax dollars to fight against religion.

FLUORIDATION: (from Browne and Keeley, pp. 119-120)

Fluorine is the most toxic chemical on earth; it is so powerful in its corrosive effect that it is used to etch glass. The idea of putting the sort of chemical into our drinking water is just insane. Fluoridation is a menace to health.

Additionally, many medical associations are opposed to fluoridation. For instance, the Texas Medical Association declined to recommend it. It's not hard to explain why some doctors favor fluoridation. For instance, one of its leading advocates has been Dr. Danger, Dean and Research Professor of Nutrition at the State University Medical School. In the past 6 years, Dr. Danger received over \$350,000 from the food processors, the refined-sugar interests, the soft-drink people, and the chemical and drug interests. Every true nutritionist know that it is refined sweets, soft drinks and refined flour that are the basic causes of defective teeth. Is it any wonder that the processors of these food are so active in helping the chemical interests to cover up for them?

Author's conclusion:

List two examples of shifting words:

List the ad hominem:

List the ad populum:

SUMMARY

Critical thinking consists of both skills and dispositions. Critical thinking dispositions include the willingness to examine opposing views, suspend and change

judgements, maintain open-mindedness, think dialogically, and exercise sensitivity to the views of others. The critical thinking skills emphasized in this project include distinguishing between facts, values, and reasoned judgments; determining relevancy, accuracy, and credibility of claims; identifying ambiguous claims and unstated assumptions; detecting bias and logical fallacies; and determining the strength of a claim.

The explicit model of critical thinking instruction provides students with the opportunity to learn specific thinking skills. Beyer's developmental strategy suggests that the skills be taught through a six-step process: introduction, execution, reflection, explanation/demonstration, application, and review. Through this process, students have the opportunity to examine their own thinking processes, and learn more efficient thinking methods from others.

Critical thinking is not passionless. It is a rich and challenging pursuit. If students develop a fervent desire to think critically they will have been well served by higher education.

CHAPTER FIVE

THE IMPLICIT MODEL OF CRITICAL THINKING INSTRUCTION

Unlike the explicit model of critical thinking instruction, the implicit model does not have a uniform pedagogical approach to teach each critical thinking skill. In fact, the implicit model does not advocate direct instruction of critical thinking components. Instead, the implicit model of critical thinking instruction provides a conglomeration of pedagogical methods that combine to create an environment and structure assignments in a manner that will exercise and develop critical thinking skills.

The implicit model contains a composite of pedagogical techniques. One technique may be more appropriate for a particular learning situation than another technique. However, each of the techniques follow one common guideline: they strive for student interaction in the learning process. The implicit model is built on Piagetian theory and prompts students to execute higher level thinking operations as classified in Bloom's taxonomy.

LIMITING THE LECTURE

One of the most difficult challenges instructors face when beginning to teach critical thinking skills is

balancing interaction and lecture. The lecture method is an efficient way to disseminate large quantities of information to large numbers of students in a very short period of time. When instructors adopt a more interactive approach they are forced to reduce the amount of material they cover by as much as 30-40 percent.⁸⁵ Obviously, instructors must be firmly convinced that the gains in students' thinking skills will outweigh the loss of material presented.

Research has demonstrated that the average adult listener can maintain moderate concentration for about 22 minutes;⁸⁶ a time frame that is less than half of the traditional 50 minute class period. McKeachie cites studies which indicate that students remember approximately 70 percent of material presented in the first ten minutes of a lecture, but only 20 percent of material presented in the last ten minutes.⁸⁷ With students concentrating for less than half a class period, and only passively involved with the subject, little material becomes implanted in students long-term memory. Certainly students with good memorization skills are able to learn material long enough to succeed on

⁸⁵Meyers, p. 56.

⁸⁶James E. Stice, ed., "Further Reflections: Useful Resources," in *Developing Critical Thinking and Problem-Solving Abilities* (San Francisco: Jossey-Bass Inc, 1987), p. 101.

⁸⁷Wilbert J. McKeachie, *Teaching Tips: A Guide for the Beginning College Teacher*, 8th ed., (Lexington, Mass: Heath, 1986), cited by Bette LaSere Erickson and Diane Weltner Strommer, *Teaching College Freshmen* (San Francisco: Jossey-Bass, Inc., 1991), p. 97.

exams, but quiz them a semester later and one will unfortunately find most of the material forgotten.

If the lecture is not the panacea of learning, then which pedagogical techniques are effective at increasing students' long-term recall and critical thinking skills? Piaget contends that techniques which encourage students to interact and enter into inquiry are the most effective at increasing cognitive development. Similarly, other researchers have found that as the number of student's senses involved in the learning process increases, the greater the retention rate.⁸⁸ And a 1977 study by Daryl Smith found a significant positive correlation between students' critical thinking skills and student participation, peer-to-peer interaction, faculty encouragement, and use of student ideas.⁸⁹

This is not to suggest the lecture be eliminated. Students do not have the ability to critically think about material they have not been exposed to. The lecture is a good method to introduce new material, raise questions, note problems, clarify and demonstrate difficult or abstract concepts, and model critical thinking skills.⁹⁰ The challenge is to balance lecture with more interactive forms

⁸⁸Stice, p. 101.

⁸⁹Daryl G. Smith, "College Classroom Interactions and Critical Thinking," *Journal of Educational Psychology* 69 (1977):180-190.

⁹⁰Meyers, p. 58.

of teaching. An examination of some of the more interactive approaches to teaching is now in order.

CREATING AN INTERACTIVE CLASSROOM

Classroom Discussion

Many instructors believe that as the number of students enrolled in a course increases the amount of classroom discussion must necessarily decrease. While it is certainly more difficult to generate discussion in large classrooms it is not impossible. Asking the right questions plays an important role in students' willingness to respond.

Several types of questioning are ineffective. In the course of my lectures I have frequently stopped and asked, "are there any questions so far?" Students correctly interpreted this to mean, "Is my presentation clear?" rather than a serious invitation to question or challenge the material I presented. This type of questioning does little to stimulate classroom discussion. A second type of ineffective questioning is the "read my mind game." An instructor asks a question with a specific answer in mind, and students try to guess what the instructor is thinking.⁹¹ It is far more effective to ask questions that present problems, allow students' to make judgements, and to seriously desire student responses.⁹² Meyers suggests

⁹¹Ibid., pp. 59-60.

⁹²Ibid., p. 60.

starting each class period with a controversy or problem solving exercise to get discussions started. This captures student interest and focuses their attention to the issue at hand. When controversies are used, students are usually willing to form an opinion, opening the entire class or smaller groups to discussion.⁹³ Specifics on use of controversies and problem-solving exercises are detailed in the section "Problem-Solving Exercises and the Popular Media."

The Socratic dialogue is a powerful tool to stimulate student thought and test student logic. In the Socratic dialogue, a student takes a position on a topic, and then the instructor challenges the position by asking questions. The questions are designed to explore the depth and consistency of the student's position by exposing implications and possible undesirable consequences of the position. During questioning, the student qualifies the position, and once again faces questioning from the instructor. Probing continues until the student reaches a point at which he violates the position originally set forth. Then the instructor tests the position for consistency. If the student adopts a new position the process may continue.

The Socratic dialogue forces a student to follow a train of logic to completion and reveals weaknesses in the

⁹³Ibid., p. 62.

line of reasoning. Instructor questioning is designed to clarify a position, test relevance, reveal consistency, and determine specificity. Frequently the Socratic style uses analogies to challenge the positions held by students. Participation in a Socratic dialogue should clarify a student's position and facilitate more complex reasoning skills.⁹⁴

For instance, in a discussion on reproductive rights one student stated that women should have the right to determine whether or not a pregnancy should continue. The instructor asked if that was an absolute right. The student responded, "yes." The instructor asked if that meant the women could abort the baby at 9:59 am on the day she was scheduled to have a caesarean section at 10:00 am. The student, naturally uncomfortable with this implication said "well, no..." The instructor asked why reproductive rights should be absolute when freedom of speech is not an absolute right. The instructor continued probing the student until she concluded that reproductive rights were not absolute.

When effectively employed, the Socratic dialogue can be very forceful in developing strong, cohesive arguments. It must be administered with care, however, in order to avoid creating the feeling that a voiced opinion is subject to attack.

⁹⁴Joyce and Weil, pp. 261-263.

Creative Silence

Many instructors are uncomfortable with moments of silence in their classrooms. Frequently instructors will ask a question, and if no student responds within one or two seconds, instructors will answer the question themselves. Yet, moments of silence and reflection allow students to digest the many complex concepts that have been discussed and encourage individual creative thought.⁹⁵

Silence need not be a negative aspect in the classroom. It may be appropriate to give students five minutes to think over the material that has been discussed and develop one question or thought on the subject. When a question is asked, instructors do not have to respond to the first hand up. They can wait until several students raise their hands, and encourage response by saying "I want almost everyone to think of an answer" and wait until almost every student's hand is up. Some students think more slowly than other students, and thirty or forty seconds of silence allows them to create their own answer rather than being dependent on the instructor or fast-response students for their ideas.

Classroom Space

To encourage interaction and critical thinking, the most desirable classrooms are those which have moveable seating arrangements. The traditional college lecture

⁹⁵Meyers, p. 63.

classroom has seating designed so all students can see the instructor, but not other students. The implication of this is clear: knowledge of importance flows from the instructor to the students, not from student-to-student or student-to-instructor. Lecture halls with bolted down chairs are especially challenging to work with.

In small classrooms, it is possible to move chairs into circles, semi-circles, rectangles or other configurations which allow for students to see each other. Larger classes are less flexible but can be modified by having students sit on top of tables, on steps, or in the lecture area when small-group work is desired. Certainly the greatest challenge comes with classes enrolling several hundred students. The large size of such classes effectively prohibits alteration of the physical environment and restricts most discussion or small group work to labs.

Small-Group Work

Dividing a large class into smaller groups provides students with opportunities to interact with other students, and allows the instructor to interact with a few students at a time. Small-group work may fit some students' learning styles better than lectures, and provides students who may be uncomfortable talking in large groups the chance to participate in a less intimidating way. It also provides

students with the opportunity to engage in social transmission, a necessary factor for cognitive development.

Stephen Brookfield lists several intellectual purposes of group discussions. He notes that small-group discussion can help students explore a variety of perspectives, assist in finding new perspectives, emphasize the complexity of issues, help students recognize the assumptions underlying their ideas, increase intellectual agility, and encourage active listening.⁹⁶

Dividing the class into groups of 4-6 seems to work well. Larger groups offer more diversity yet tend to leave some students out; smaller groups offer less diversity and restrict dynamics. Small-group work can offer a change of pace from the lecture, and works well as both a pre- and post lecture activity. Often small groups are given a question or problem to address. While students discuss the problem, the instructor circulates through the groups offering help and noting areas of confusion. When the allotted time is over, each of the groups (or perhaps a sampling) present their findings to the entire class. The responses may lead to further class discussion, or require feedback and comments from the instructor.

In order for small groups to stay on task, it is essential that each group be accountable for the work they

⁹⁶Stephen D. Brookfield, *The Skillful Teacher* (San Francisco: Jossey-Bass, 1991), pp. 93-94.

have done. A presentation, written summary, or tabulation of opinions may encourage participation. While small-group work sounds simple to execute, it truly requires careful planning and practice. Clear, detailed instructions and specific goals for the exercise will help avoid the perception that the instructor is unprepared, or too lazy to prepare an effective lecture. Additionally, careful preparation for a post-group discussion is essential to integrate and emphasize the main points learned in the exercise.

Role-Play

Role-play is another method to involve students in the learning process. Role-play can be done in front of the entire class, or orchestrated so that the class is divided into several groups with role-plays transpiring at the same time. For students assigned parts in the role-play, involvement in the learning process is guaranteed. These students must grapple with the problem or dilemma set forth, and discover how their character would act, feel, and participate. As Erickson and Strommer observed, "the differences between talking about a situation and being in the situation, even when it is make-believe, are subtle but powerful."⁹⁷ After the presentation, most members of the

⁹⁷Erickson and Strommer, p. 115.

class are ready to elicit responses and participate in an active class discussion.⁹⁸

For instance, when discussing the role of the media in politics, it may be educational to have several students adopt the role of reporters from different newspapers or magazines: the Idaho State Journal, the Conservative Digest, The New Republic, or the National Inquirer. The students could be asked to report on an issue of current debate. The role-play should illustrate the different viewpoints and bias of differing publications, and help dispel the myth that all writing is fact.

WRITTEN ASSIGNMENTS

Written assignments can be creatively designed to develop students' critical thinking skills. In the traditional college and university classroom, the term paper is often the only opportunity students have to practice critical thinking skills. When properly done, term papers require students to organize, classify, summarize, analyze, detect bias, and evaluate the validity of sources and arguments. Yet often the results of term papers are disappointing. Students sometimes seem more concerned with the number of pages and format for references than the

⁹⁸A particularly useful resource for role-play and simulation ideas is Charles Walcott, ed., *Simple Simulations 2: A Collection of Simulations/Games for Political Scientists* (Washington D.C.: American Political Science Association, 1980).

quality of the work. Students who have not mastered individual critical thinking skills are ill-prepared to pull together a quality term paper that requires use of many critical thinking skills and formal-operational thought.

Meyers suggests that the inordinate amount of time spent researching, writing, and grading term papers is not the best method to develop students' critical thinking skills. He argues that it is more effective to assign a series of short written assignments that develop critical thinking skills in a stepwise fashion. Short assignments give students nearly immediate feedback and are easier to grade than a stack of term papers that may not be returned for several weeks.⁹⁹ Bette Erickson and Diane Strommer agree, suggesting that instructors, particularly of freshman courses, assign "writing-to-learn" exercises rather than long term papers. Writing-to-learn assignments are typically short, perhaps a few sentences or a paragraph. They are designed to help students make material meaningful by putting in their own words, connecting it to their own experience, and organizing it in a purposeful way. Summarizing, paraphrasing, sentence completion, concept mapping and word association are quick techniques that enhance student comprehension.¹⁰⁰

⁹⁹Meyers, p. 72.

¹⁰⁰Erickson and Strommer, pp. 115-117.

Written assignments should focus on real problems and issues rather than being too abstract and distant.¹⁰¹ Students asked to write a paper entitled "Freedom and Order-A Delicate Balance" will likely compose a dispassionate piece that focuses on terminology. If however, students are asked to write an essay analyzing how Governor Cecil Andrus' executive order banning smoking in all government buildings (including the university) relates to freedom and order, students are much more likely to use critical thinking skills to compose a quality, interesting essay. The more specific topic allows students to use their own concrete experience as a foundation to build on, and bridges the gap between concrete and formal-operational thought.

Clear, detailed instructions are also essential to effective written assignments. Meyers found that frequently when students have missed the point of an assignment it was due to a legitimate misinterpretation of the instructions. Meyers suggests showing assignments to several colleagues before distributing them in class. If colleagues are unclear on the instructions it is certain that students will be as well. The more detailed and clear the instructions are the more likely it is that students will achieve the goals intended by the instructor. Note the differences in potential interpretations between the following assignments. Assignment one: "Compare and contrast the Bill of Rights

¹⁰¹Meyers, p. 73.

with the Virginia Declaration of Rights." Assignment two: "Using brief quotes from the Bill of Rights and the Virginia Declaration of Rights reveal the similarities and differences between the two documents. Using these documents as evidence, make several generalizations about the colonists' views on rights in 1776. Are there any rights included in the Virginia Declaration of Rights that you feel should have been included in the Bill of Rights? Why? What impact would they have made on your life today?"

To improve critical thinking skills, Meyers suggests assigning five types of written assignments: brief summaries, short analytical papers, popular media exercises, outside projects, and written simulations.

Brief Summaries

Summarizing requires students to do more than just condense material. Summarizing is a skill that requires students to identify central issues, set priorities, and become familiar with new terms and concepts. For students who are new to a field, summarizing can be particularly difficult, yet extremely useful. In order to translate unfamiliar material into one's own words, students must grasp the central meanings of new vocabulary and distinguish between the essential and non-essential elements of a passage. Brief summaries are quick to grade and let the instructor know if students have mastered the fundamental

points of a lecture or passage of material.¹⁰² Erickson and Strommer include summarizing and paraphrasing as two effective writing-to-learn techniques, and suggest that grading of writing-to-learn exercises be done randomly, if at all.¹⁰³ Four applications of short summaries are presented in Table 5.0.¹⁰⁴

TABLE 5.0 Short Summaries

APPLICATION OF SHORT SUMMARY ASSIGNMENTS
A. LECTURE--In your own words, briefly describe the four main points from today's lecture.
B. READING ASSIGNMENT--In three brief paragraphs, highlight the central ideas from Chapter 7 of <i>American Government</i> . Focus on the concept of voter alienation, and provide an example from your own experience.
C. VIDEO--Today's viewing of <i>Gideon's Trumpet</i> should have helped you to understand the importance of the right to a fair trial. If you had to describe to a 12-year-old the central issues involved in a fair trial, what would you say?
D. CLASS DISCUSSION--In our discussion today on federal budgeting we have talked about many different issues. Which points were most helpful to you in understanding why it is difficult to balance the federal budget?

¹⁰²Ibid., p. 75.

¹⁰³Erickson and Strommer, p. 115.

¹⁰⁴Meyers, p. 76.

Short Analytical Papers

The second type of writing assignment suggested by Meyers is a series of short analytical papers. This type of assignment is a particularly good substitution for the traditional research paper. The series begins by using fundamental critical thinking skills and builds towards the use of more complex analytical skills. Tables 5.1 - 5.4 demonstrate the increasingly difficult assignments.¹⁰⁵

TABLE 5.1 Short Analytical Assignment #1

Introduction to American Government Written Assignment 1
<p>Please read the <i>Declaration of Independence</i>, written by Thomas Jefferson.</p> <p>For the first section of your essay, describe the main points Jefferson is expressing to his readers. That is, reduce the essay to its major arguments and line of reasoning. This section of your essay should be one to two pages in length. State the main points in your own words without using any direct quotes.</p> <p>In the second section of your essay, play the role of a political scientist, and speculate on the role this document plays in understanding the themes of freedom and order that we discussed in class. In other words, reflect on the way Jefferson's declaration highlights the themes of freedom and order. This section of your essay should be two double-spaced typed pages.</p> <p>Skills involved in this assignment:</p> <ul style="list-style-type: none"> * summarizing a passage in your own words * recognizing themes presented in class * pondering the impact Jefferson had on freedom and order in the U.S.

¹⁰⁵The ideas presented in Tables 5.0-5.4 draw closely in format from the examples presented in Meyers, pp. 77-82.

TABLE 5.2 Short Analytical Assignment #2

Introduction to American Government Written Assignment 2
<p>Similar to Assignment One, this assignment asks you to recognize and summarize main points of a document. In addition it requires you to compare and contrast documents by noting their similarities and differences.</p>
<p>Background: During the early 1800s, great debate occurred over the nature of the union. Many southerners believed that the states were more powerful than the federal government, leading to South Carolina's secession from the union. Northerners disagreed, and the debate over federalism contributed to the Civil War.</p>
<p>Read the excerpts from Daniel Webster's <i>Second Speech on Foot's Resolution, Reply to Hayne</i>, 26 Jan. 1830 and John Taylor's <i>Construction Construed and Constitutions Vindicated</i>, 1820. Write a four to six page essay that includes the following:</p>
<ol style="list-style-type: none">1. A one to two page summary of Webster's view of federalism and the arguments he uses to support his position. (Use your own words).2. A two page section comparing Webster's view of federalism with that of Taylor.3. A one page reflection on why either Madison or Hamilton would have probably opposed Taylor's position.
<p>Skills used in this assignment:</p> <ul style="list-style-type: none">* summarizing a passage in your own words* recognizing federalism as an additional issue deepening the freedom and order themes* recognizing similarities and differences among authors* reflecting on the implications of historical documents

TABLE 5.3 Short Analytical Assignment #3

Introduction to American Government
Written Assignment 3

This assignment requires you to explore some contradictory views on the First Amendment right to free speech.

Read the following articles:

1. Justice Brandeis, concurring opinion in *Whitney v. California*, 1927
2. Harry S. Truman, *Veto Message Withholding Approval of the Internal Security Act of 1950*
3. Justice C. J. Vinson, *Dennis v. U.S.*, 1951

Then write a five to six paged article that fulfill the following requirements.

1. In two pages summarize in your own words the main points of the Brandeis and Truman documents.
2. In one page, argue for or against the proposition that the Brandeis and Vinson articles can be combined to present a common outlook on the view of free speech from the period of 1920 to 1950. Do the positions of the men complement or diverge from each another? Use brief quotes to support your position.
3. In the last two pages, summarize Truman's main points. Evaluate one of the points by either defending or attacking it, keeping in mind the lectures, readings, and discussions we have had.

Skills involved in this assignment:

- * summarizing main points of an argument
- * developing and supporting an argument
- * comparing the ideas presented in one document with those in other documents

TABLE 5.4 Short Analytical Assignment #4

Introduction to American Government Written Assignment 4
<p>Suppose President Clinton is creating a commission to aid several of the Soviet republics in their transition from a communist society to a democratic society. The commission includes several linguists, lawyers, business leaders, doctors, and humanitarians. However, none of the members are trained political scientists and none are familiar with the freedom and power themes we have discussed throughout the semester.</p> <p>For your final assignment, write a six to eight page essay arguing for or against the President including a trained political scientist on the commission. Your assignment should include the following:</p> <ol style="list-style-type: none"> 1. In introduction of two pages in which you argue for or against the political scientist to be included on the commission. Outline your argument provide evidence for your position. 2. In the following five or six pages, imagine yourself as a token political scientist appointed to be on the commission. You are to submit a report to the commission, detailing a few major issues, concepts, and themes in political theory that are crucial to the transition of the Soviet republics. Limit yourself to a few main points, and back up your position with evidence from our class discussions, readings, and studies. Include analysis and explanation. Use proper citation methods. <p>Skills involved in this assignment:</p> <ul style="list-style-type: none"> * Application of political theory to a modern day problem * Summarizing, comparing, evaluating sources, and creating cohesive arguments.

Popular Media Exercises

One of the difficult tasks instructors face is building bridges between concrete and abstract concepts. Meyers suggests that use of the popular media is a particularly

effective means to bridge the gap. Relating current events happening on campus, in popular television shows, or in movies to the topic being studied is one technique that can assist in bridging gaps and arousing interest.¹⁰⁶ Use of the popular print media is particularly helpful, since it is written for a mass audience and avoids the difficulties associated with academic jargon.¹⁰⁷

Meyers recommends distributing a short newspaper or magazine article at the beginning of class. The article focuses students' attention to the issue at hand, and can serve as a point of discussion for a small groups or the entire class. Usually five minutes are allotted to read the article and answer several key questions. Then students share their responses with small groups. The issues and questions raised often form the basis for a classwide discussion.¹⁰⁸

Assignments based on the popular media also have the benefit of challenging many students' inaccurate belief that if something is in writing it must be true. Assignments that encourage students to question the perceptions, position, and point of view of an author are useful in

¹⁰⁶Meyers, p. 62.

¹⁰⁷Ibid., p. 78.

¹⁰⁸Ibid., p. 62.

developing a healthy dose of skepticism about articles in the print media.¹⁰⁹

Short articles can be used to present new concepts, reinforce previously learned concepts, or contrast theories taught in class with theories presented in the media. An example of a short assignment using current controversies is presented in Table 5.5.

TABLE 5.5 Problem Solving Using the Popular Media

Introduction to American Government Problem Solving Using the Popular Media
<p>Read the attached article on Wisconsin's welfare reform plan.</p> <ol style="list-style-type: none"> 1. Summarize in your own words the main points of the author's arguments. 2. How does the author's interpretation of the causes of long-term welfare dependency differ from that we read in the Charles Murray piece? 3. Do you think the Wisconsin plan will end long-term dependency on the welfare system?

Outside Projects

Projects which require students to apply the material learned in class to an outside setting are valuable vehicles to connect abstract theory and everyday reality. Students who see government in action are more likely to digest material and understand political theory than are students

¹⁰⁹Ibid., pp. 79-81.

whose learning takes place only in the classroom. Watching or participating in a television interview, and then noting the difference between the entire interview and the few seconds that are shown on the nightly news will teach students more about sound bites and photo opportunities than any class discussion. Other activities such as attending a government hearing or city council meeting will familiarize students with government officials and allow them to see politicians in action.

Meyers warns that outside projects must not be left too open ended. Written instructions provide students with guidelines as to what they need to be looking for and learning about.¹¹⁰ For instance, rather than just having students attend a city council meeting where they may show up, read a magazine, and leave, it would be more useful to have students attend the meeting with certain goals in mind. Students could watch for political interaction between council members, keeping a special watch on the chairperson. Do the other members seem to rubberstamp the chair's decisions? Are there any obvious (or subtle) divisions between the council members? Are there ideological beliefs that seem to divide the council? Having a clear goal in mind for the students and providing clear, detailed instructions will allow for students to maximize their learning from an outside project.

¹¹⁰Ibid., p. 81.

Written Simulations

Using simulations as a basis for writing assignments is a fifth technique advocated by Meyers. Simulations have the advantage of creating a "real world" context that many writing assignments lack. Citing the work of Robert Gremore, Meyers recognizes the importance of including "rhetorical situations" in writing assignments.¹¹¹

According to Gremore, a rhetorical situation has three elements: a particular topic, a particular audience and a particular purpose. Professional writers almost always have an audience and purpose in mind, which helps them select a topic and organize a piece. Yet often in college settings, students have a weak and unclear sense of a rhetorical situation. Assigned topics are often vague and esoteric, leaving students unclear about the purpose. And with the instructor as the audience, many students attempt to "psyche out the instructor" spending a great deal of time and consternation attempting to figure out what the instructor wants the student to write.

From personal experience, I know some of my worst papers were written for a professor who assigned students to write on a narrow topic of which the professor was one of the top experts in the field. My classmates and I felt frustrated as we tried to figure out the purpose of writing

¹¹¹Robert Gremore, "Designing Writing Assignments for Your Class," Unpublished paper, Prairie Writing Project, Metropolitan State University, St. Paul, MN, 1983, cited by Meyers p. 83.

on a topic that our professor was so intimately acquainted with. If we challenged any of our professor's views we felt our paper would be slashed to pieces. Our pea-sized knowledge of the subject was nothing compared to the mountains of knowledge he had accumulated through years of research in the subject. As students, we played the game and spent a great deal of time reading our professor's papers and trying to write what we thought he wanted to hear. Indeed, we lacked a clear sense of a rhetorical situation.

Yet in another course, this same professor assigned a simulation topic that had a clear rhetorical situation. Our assignment was to imagine ourselves as the city's lawyer. We were to determine the liability of the city in the situation where the Building Inspector had certified a building as structurally sound, yet after a short time the building collapsed. The audience was the city council, the purpose was to determine the liability of the city, and the relevance of the topic to the real world was clear to us, for Pocatello was facing a similar situation. As students we researched Idaho laws, and balanced accountability, responsibility, and efficiency. Many critical thinking skills were exercised in order to complete the assignment.

In the first assignment, little high-level thinking occurred. We did our best to regurgitate our professor's views, but did little evaluation of them. In the simulation

paper, we researched, discussed, evaluated, and put together an original piece. We thought for ourselves. I viewed the simulation paper as a positive growing experience, while the other paper was a frustrating negative experience. And in the end, the simulation paper was well done, while the other was disappointing to myself and the professor.

Position/Counter-Position Essay

Assigning students to write persuasive essays can be an effective method to encourage critical thinking skills. Persuasive essays require students to take and defend a position, and allow students to grapple with logic, evidence, appeals to emotion, etc. In well-crafted essays, students will address and answer the claims made by the opposing point of view. However, most frequently, students gloss over the opposing viewpoint's arguments rather than fully responding to them. In light of this, the position/counter-position paper can aid students in learning how to recognize and respond to positions which run counter to their own beliefs. The position/counter-position technique requires the student to write two separate essays. In the first essay, the student studies an issue, takes a position, and argues for the position. In the second essay, the student is asked to argue for the opposing viewpoint. As students struggle to do this, they may find that it is difficult to argue for a position to which they do not

personally agree. The task forces students out of their comfort zones, and places them in a situation where they must go beyond emotion and deal with logic and evidence.

This technique is particularly useful for political science students preparing for law school. It is no secret that the best lawyers are those who know what their opponents arguments are going to be and who are prepared to address such claims.

Compare and Contrast Essay

Closely related to the position/counter-position essay is the compare and contrast essay. This technique helps students to understand how differing theories or frameworks offer explanatory power to a particular event. For instance, students could be asked to write a short essay explaining how a power elite theorist would account for the savings and loan bailout. Then, in a following assignment, students may be asked to explain the savings and loan bailout according to the views of a pluralist theorist. In each instance, the student examines the differing theories and gains a better understanding of their strengths and weaknesses as they are applied to a specific problem.

Richard Wolters, philosophy instructor at Doane College, uses this technique in his ethics courses.¹¹² At

¹¹²Richard M. Wolters, "Critical Thinking and Transference Across Time," in *Teaching Critical Thinking in the Arts and Humanities*, ed. Lucy S. Cromwell (Milwaukee: Alverno

the beginning of the term he presents students with an ethical problem that they are asked to answer according to their own moral sense. Then, throughout the semester, the same problem is repeated word for word on each of the exams. However in each of the ensuing cases, the students are asked to answer the dilemma based on the theories and frameworks they have learned from studying the works of various philosophers: Bentham, Mill, Aquinas, Kant, Nietzsche, and Dewey.¹¹³

Wolters discovered that this technique forces students to examine a situation from a variety of perspectives. It also allows the instructor to monitor a student's thinking skill as each succeeding essay is compared with the student's original answer. The uniform problem provides a reference point to which the instructor can turn to model reasoning skills. And finally, it teaches students that there is a nexus between general laws and rules and specific situations.¹¹⁴

Examining situations from a variety of perspectives is fundamental in moving students to higher levels of cognitive

Productions), 1986, pp. 51-61.

¹¹³Wolters poses the following situation, "A small town has been terrorized for years by a bully. People are genuinely terrified of him, but he's always been clever enough to stay out of jail. Finally, on one of his trips to town, a mob collects around him. Someone has a rifle and shoots and kills the bully." Students are instructed to "imagine they are the person with the rifle. Do they shoot the bully? Why or why not?"

¹¹⁴Wolters, pp. 58-59.

thought as well as higher levels of moral reasoning.¹¹⁵ Such experiences help students to move from seeing the world in a "dualistic" mode where all ideas and events can be classified as right and wrong, to a viewpoint encompassing multiple perspectives and deeper understanding of the relativity of value systems.

Analogy and Metaphor

Clever use of analogies and metaphors is one of the writing techniques that distinguishes the works of interesting political authors from those who are less engaging. A metaphor is a type of analogy which notes the similarities between objects which are normally considered dissimilar.¹¹⁶ Without realizing it, most people use analogies to help explain new experiences. If we want to understand the English House of Lords and House of Commons, we draw analogies from our previous experience with the U.S.

¹¹⁵See Lawrence Kohlberg, "The Cognitive Developmental Approach to Moral Education," in *Moral Education. . . It Comes with the Territory*, eds. D. Purpel and K. Ryan (Berkeley, CA: McCutchan Publishing Corporation, 1976), p. 190.

¹¹⁶Technically, there are grammatical differences between analogy, metaphor, and simile. An analogy is an extended likeness striving to demonstrate that the rule or principle between one thing being discussed also holds for a quite different thing being discussed. A metaphor is a comparison which figuratively asserts one thing to be something else (e.g., I am the bread of life). A simile makes comparisons using "like" or "as" (e.g., ye are as sheep without a shepherd). See Frederick Crews, *The Random House Handbook*, 4th ed. (New York: Random House, 1984). This discussion centers around metaphorical or figurative language; therefore, the grammatical distinctions are not relevant.

Senate and U.S. House of Representatives. Well-crafted analogies and metaphors have the ability to build bridges between the familiar and unfamiliar.

Being able to understand and create analogies is a high-level thinking operation, often found on college entrance examinations and other tests of intelligence. Normally, the tests require the student to compare the relationship between a first pair of words with a second pair, and determine whether the comparison is substantive or not (e.g., water:crops :: food:humans). The creation of analogies and metaphors require the creator to compare and contrast items, determine the fundamental essence of an idea or object, and artistically create expressions that reflect the similarities.

Analogies can be used to persuade, solve problems, and create new products or ideas. Good analogies will make a point vivid, clear, more easily understood and remembered, while ineffective analogies distort a picture and draw feeble comparisons.

In *Synectics*, William J. J. Gordon describes four types of analogies: personal, direct, symbolic, and fantasy.¹¹⁷ Personal analogies are helpful to increase awareness of a complex phenomenon. They require students to imagine themselves participating in the phenomenon. What would you

¹¹⁷William J. J. Gordon, *Synectics: The Development of Creative Capacity* (New York: Harper and Row, 1961), pp. 33-56.

do? How would you feel? Who or what would you be dealing with? What pressures would you have? This technique may provide a perspective and understanding not seen when approaching the phenomena from a distance. For instance, greater understanding of the problems of the welfare system could be obtained by visualizing oneself in the role of a welfare coordinator. What will you do upon arriving at work? What meetings will you have? Who are your clients? What is your paperwork like? Such an approach is vivid and allows a different perspective on the welfare problem than is normally seen.

Gordon also recommends the use of direct analogies, which attempt to find answers to problems by making comparisons with other fields of learning. For instance, Gordon accredits Alexander Graham Bell as using this technique. Bell stated, "it struck me that the bones of the human ear were very massive indeed, as compared with the delicate thin membrane that operated them, and the thought occurred that if a membrane so delicate could move bones relatively so massive, why should not a thicker and stouter piece of membrane move my piece of steel. And the telephone was conceived."¹¹⁸

Utilizing visual imagery and quantitative symbols is the centerpiece of symbolic analogies. Instead of describing a problem with words, pictures or quantitative

¹¹⁸Ibid., p. 41.

formulas are used to express the problem. By creating a symbolic diagram, a solution to the problem may be seen that was not clear beforehand.

A final type of analogy suggested by Gordon is called the fantasy analogy. With this technique the imagination is let loose and the mind is free from current restraints to create wild solutions to problems. The ideas may be impractical today, but with some modification could be useful sometime in the future.

Mary Alice Muellerleile, literature instructor at the College of Saint Catherine, implemented a series of assignments that required students to create metaphors to respond to a text, rather than traditional cognitive analysis which asked the students about the main characters, plot, and setting.¹¹⁹ The metaphor assignments were designed to help students grasp the image, meaning, and feeling of a literary work, rather than focus on facts such as a character's age, occupation, or looks.

The metaphors created by the students were rich and colorful, interesting to read, and effective in capturing the meaning of a text. Muellerleile concluded that by creating metaphors the students were understanding texts more easily, integrating personal experiences into their studies, writing more effectively, and experiencing greater

¹¹⁹Mary Alice Muellerleile, "Thinking in Images," in *Teaching Critical Thinking in the Arts and Humanities*, ed. Lucy S. Cromwell (Milwaukee: Alverno Productions, 1986), pp 29-36.

intellectual excitement and interest than students who completed the traditional types of analysis.¹²⁰

Requiring literature students to create metaphors may seem more appropriate than having political science students do so. However, the most interesting of political writings are clever in their use of metaphors, and student would benefit by mastering similar writing techniques. Columnist Jim Trotter wrote an article suggesting that if Ronald Reagan enjoyed the Teflon presidency then Bill Clinton is experiencing the flypaper presidency--because everything seems to stick.¹²¹ Such images make the author's point in a clear, vivid, and succinct manner.

COMPUTER-AIDED LEARNING

As computers continue to become more accessible to students, their value as instructional tools increases substantially. While an instructor's time and ability to interact one-on-one with students is severely limited, particularly in large classes, computers have the potential to help fill the need for individualized instruction. The variety of applications for computers in the classroom is tremendous. For example, computers can be used to simulate the intricacies of city and regional planning, to crunch

¹²⁰Ibid., 31.

¹²¹Jim Trotter, "Now it's the flypaper presidency--everything seems to stick to Bill Clinton," *Idaho State Journal*, 1 August 1993, p. B6.

numbers in methods classes, or to serve as a test bank to help students better prepare for examinations.

A study of computer use in five Michigan colleges found that computers were especially useful in creating visual images, reinforcing unclear concepts, processing data, and modeling phenomenon.¹²² Louis Kleinsmith instructs over 500 freshman and sophomore students enrolled in Introductory Biology. He designed several biology tutorials that allow students to voluntarily use a computer lab to reinforce and explain materials taught in the biology lecture. Student use of the biology problem sets averaged two sessions per week. If a student entered a wrong answer, the computer would explain why the answer was incorrect. The tutorials also offered broader explanations that may not have been fully covered in the lecture, but which aid in understanding the concepts.¹²³

Kleinsmith tracked student test scores for seven years prior to creation of the tutorials and three years afterward. He found that average test score rose from 65 percent to 81 percent after the introduction of the computer tutorials. Even more striking improvement was found in a section designed for students with remedial science

¹²²Jerome Johnston and Susan Gardner, *The Electronic Classroom in Higher Education*, The Regents of the University of Michigan for National Center for Research to Improve Postsecondary Teaching and Learning, 1988, VHS, 55 min.

¹²³Ibid.

background. Prior to the tutorials, the average test score for student in the remedial section ran 20 percent below the overall average. After the tutorial was introduced, the remedial sections class averages ran only one percent below the overall average, suggesting that the tutorial was helping those students who needed guidance the most. Furthermore, Kleinsmith suggests that the extensive use of the program provides evidence of its value. Prior to exams, waiting lists to use the tutorials have reached lengths of 150 students.¹²⁴

Computer simulations have many of the benefits previously mentioned in the "written simulations" section. Raymond Tanner, a political science instructor, uses computer simulations to imitate an international conference on political negotiations. Each student is assigned a role in a government agency, and is connected through a computer conferencing network. The students must study their role extensively, determine the importance of events, and participate in the exercise of power.¹²⁵ Many packaged computer simulations can be purchased which offer practical applications to political theories studied in the classroom. A city and regional planning class may benefit from use of a program which has students act as if they are members of the Los Angeles County Commissioners and requires students to

¹²⁴Ibid.

¹²⁵Ibid.

develop the county budget, plan for physical improvements, and forecast future growth, all while dealing with day to day political realities. A series of simulation programs known as Supplementary Empirical Teaching Units in Political Science (SETUPS) are available from The American Political Science Association.¹²⁶ The series includes simulations such as *The Dynamics of Political Budgeting, Elections and the Mass Media*, and *Presidential Popularity*.

A political science methodology course would benefit from use of statistical packages which eliminate the need for much of the traditional number crunching, and allow emphasis to be placed on interpretation and analysis. Programs can even be purchased which offer simplified instructions in how to interpret and analyze the meanings of input and output in statistical programs.¹²⁷ Modeling of macro-economic formulas could help students to visualize the effects of government spending, interest rates, and import-export balances. Such programs may free up instructional time and allow more material to be covered in a semester. Indeed, the potential of the computer in the higher education classroom is just beginning to be explored.

¹²⁶The American Political Science Association, 1527 New Hampshire Avenue, N.W., Washington, D.C. 20036.

¹²⁷Ibid.

SUMMARY

The implicit model of critical thinking instruction is a collection of pedagogical techniques that encourage the exercise and development of critical thinking skills. The techniques vary in style and application, but uniformly require student interaction in the learning process.

Interactive pedagogical techniques reduce the quantity of time available for lecture and limit the amount of material students are exposed to. However, the interactive techniques seem to increase students' cognitive development and long-term retention of material. Thus, the quantity of material students are exposed to is decreased, but the long-term understanding of material is increased.

The pedagogy of the implicit model suggest that classrooms be designed to foster student interaction. Discussions should involve as many students as possible, both in class-wide debates and small-group work. Socratic dialogues exemplify and develop sound logic and reasoning. Role-play involves students in the learning process and provides a basis for healthy discussion.

Writing methods are helpful in constructing critical thinking skills. Brief summaries and essays, increasingly challenging analytical works, position/counter-position papers, compare and contrast essays, written simulations, and metaphor creation assignments all have a valuable effect on the development of critical thinking skills.

In addition, computer-aided assignments involve students in the learning process and can be designed to foster thinking skills. Computer simulations, statistical software, and test banks each offer possibilities to increase student involvement and participation.

The implicit model of critical thinking instruction has wide applicability. The collection of methods can be used across the curriculum, and unlike the explicit model, most of the techniques are simple to adapt and merge well with current curriculum. As more of the techniques common to the implicit model of critical thinking instruction are applied in the classroom, students' thinking skills and cognitive development will improve.

CHAPTER SIX

ASSESSMENT AND APPLICATION

Assessing the effectiveness of students' critical thinking skills is a difficult and important challenge. Unlike many skills which are easily recorded, measuring one's ability to think is an imprecise science. Particularly at the college level, where most students spend only between ten and sixteen weeks in a course, modifying and measuring changes in students' thinking skills is a significant challenge.

At the start of this project, the Beyer's works persuaded the author that the explicit model of critical thinking instruction provided the most effective techniques to improve students' critical thinking skills. After applying the explicit model in the college classroom, the author no longer supports widespread application of the explicit model of critical thinking instruction. Due to the constraints of the college classroom, lack of student and teacher background, and time limitations, it is not feasible for all instructors to explicitly teach critical thinking skills. Explicit instruction of critical thinking skills is effective, but the pedagogy and limitations of the model make the explicit technique most appropriate to be employed

in a course devoted exclusively to thinking skills, rather than being intermixed in political science courses. This is not to imply that instructors across the curriculum are exempted from the responsibility of teaching critical thinking skills. All instructors bare the responsibility to create classroom environments, projects, and assignments that require and allow students to progress in critical thinking skills. Through use of the pedagogy associated with the implicit model of critical thinking instruction, this goal can be achieved.

This chapter then, becomes an analysis of why the explicit model of teaching critical thinking skills is best left to be administered by critical thinking specialists in a course of its own, and why the implicit model is the most effective way for the vast majority of college instructors to improve students' critical thinking skills.

METHODOLOGY

Numerous tests have been designed and can be purchased to test critical thinking skills.¹²⁸ Throughout the critical thinking literature, the Watson-Glaser Critical Thinking Appraisal¹²⁹ appears to be one of the most highly

¹²⁸For a concise summary see C. Blaine Carpenter and James C. Doig, "Assessing Critical Thinking Across the Curriculum," *Assessing Students' Learning* no. 34., ed. James H. McMillan (San Francisco: Jossey-Bass, Summer 1988): 33-46.

¹²⁹Available through the Psychological Corporation, Harcourt Brace Jovannovich, Publishers.

regarded of such tests. The appraisal consists of 80 multiple-choice questions designed to measure five aspects of students' critical thinking abilities: drawing sound inferences; recognizing assumptions; reasoning by deduction; drawing conclusions; and evaluating arguments. The test comes in two Forms, A and B, one of which is used as a pretest and the other as a posttest. The sixty-minute exam is scored locally, yet includes standardized scores from nationalized testing.

To provide an objective measure of students' critical thinking skills, the Watson-Glaser Critical Thinking Appraisal was administered as a pretest and posttest to three sections of the Introduction to American Government course at Idaho State University. Each of the three sections was taught by different instructors using a variety of pedagogical methods. In section A, the traditional lecture format was used. In section B, lecture was combined with a series of extensive writing assignments. In section C, lecture, occasional small-group activities, and the explicit teaching of critical thinking skills took place.

Approximately fifty students were enrolled in each of the three sections of Introduction to American Government. Participation in the Watson-Glaser Critical Thinking Appraisal was optional, with students' scores on the appraisal having no bearing on class grades. The identities of each student were self-coded to provide anonymity.

Section A could most aptly be described as the typical Introduction to American Government classroom. The professor was a highly competent lecturer with over twenty years of experience to draw upon. Most of class was spent in lecture, with some time allocated for questions or to engage in discussion of the topic at hand.

Section B likewise emphasized the importance of lecture, but combined this with a series of writing assignments common to the implicit model of critical thinking instruction, including the position/counter-position paper described in Chapter Five. Students were required to respond weekly to a controversial political question and were graded according to whether or not they presented both sides of the issue. Periodically, students completed a "five minute essay" in which the last five minutes of class were devoted to summarizing or commenting on the lecture just given. Exams also contained short essay questions requiring students to develop and express arguments.

Section C, taught by the author, devoted classtime towards the explicit teaching of critical thinking skills. Initial plans were to teach eight different critical thinking skills throughout the semester--approximately one every two weeks. However, once faced with the constraints of the classroom, the author recognized the idealism of the goal. Instead, five critical thinking skills were taught

and reviewed over the semester. They consisted of: determining facts, opinions, and reasoned judgement; distinguishing relevant from irrelevant claims; recognizing unstated assumptions; determining the credibility of sources; and identifying logical fallacies.

As each new critical thinking skill was introduced, classtime was devoted to discuss the goal of the assignment; explore the definition, usefulness, and application of the skill; present the steps required to perform the skill; and provide several examples of the skill being applied. Ideally, time would remain so that the students could perform the skill in class, ask questions, and then apply the skill several more times during a homework assignment.

In addition to the critical thinking exercises, small group activities were used on a half-dozen occasions, and discussions and comments were regularly encouraged.

FINDINGS

Each of the three sections were given the Watson-Glaser Critical Thinking Appraisal as a pretest and posttest to the course. Participation in the appraisal was optional,¹³⁰ making the results of the survey somewhat difficult to interpret. Over half of the students participated in only the pretest or the posttest, while less than 40 percent of

¹³⁰Optional participation was mandated by the University Human Subjects Committee in compliance with federal regulations governing the testing of human subjects.

students completed both exams. Thus data for both groups will be presented since it varies slightly.

Table 6.0 contains the scores achieved by all participants completing the appraisal.¹³¹ National testing provided standardized norms for a variety of subgroups. Raw scores on the appraisal range from 0-80, with the national average for freshmen in four-year colleges calculated at 53.8 with a standard deviation of 9.2. The average raw scores for sections A, B, and C were 53.4, 49.5, and 50.0 respectively, corresponding with national percentile rankings of 45, 35, and 35 respectively.

When the pretest and posttest scores for all students participating in the appraisal were compared, only minimal changes occurred over the course of the semester. Section A's average scores declined 0.6 points, Section B's average scores declined 2.6 points, and Section C's average class score increased 0.8 points, corresponding with a change in national percentile rankings of 0, -10, and 5 respectively. The Student's *t* test was used to determine if the changes in the mean scores of each section were statistically significant. None of the changes in the mean scores were; therefore, chance may provide the best explanation for the modest fluctuations.

¹³¹Incomplete exams were not included in the analysis. Students must have attempted to complete each section in order for their scores to be compiled.

The voluntary nature of the appraisal allowed for students to self-select into and out-of the study. Participation in the pretest was high, partially due to students' curiosity and greater interest levels in the course early in the semester. Participation in the posttest was unfortunately much lower. By the end of the semester, students' time becomes very valuable as other courses and assignments compete for attention. When students realized there was no penalty for missing the posttest, many chose not to be included. In order to provide some incentive, Section B offered extra credit to students who participated in the appraisal. This may have inadvertently lured students who "needed" extra credit into the posttest and pushed those who were satisfied with their expected grade (possibly the brightest students) out of the posttest, thereby creating a downward force on the average class score and offering further explanatory power to the relatively larger drop in average class score.

TABLE 6.0 Appraisal Scores (all participants)

APPRAISAL SCORES (ALL PARTICIPANTS)									
SEC.	PRE TEST mean	NATIONAL %	POST TEST mean	NATIONAL %	NET CHANGE mean	NET CHANGE %	STUDENT'S t	n pre-test	n post-test
A	53.4	45	52.8	45	-0.6	0	-0.27	40	24
B	49.5	35	46.9	25	-2.6	-10	-1.05	43	19
C	50.0	35	50.8	40	0.8	5	0.44	45	36

When the scores of those students completing both the pretest and posttest were examined, a similar pattern emerged. The changes in the mean scores for sections A, B, and C were -0.4, -1.5, and 2.4 respectively. The scores represent a change in the national percentile rankings of 0, -10, and 10 respectively. Yet once again, when applied to the stricter standards of the *Student's t* test, none of the changes in the mean scores can be considered statistically significant. The findings are represented in Table 6.1.

TABLE 6.1 Appraisal Scores (students completing both pretest and posttest)

APPRAISAL SCORES (STUDENTS COMPLETING BOTH PRETEST AND POSTTEST)								
SEC.	PRETEST mean	NATIONAL %	POSTTEST mean	NATIONAL %	NET CHANGE mean	NET CHANGE %	STUDENT'S t	n
A	53.0	45	52.6	45	-0.4	0	-0.14	21
B	47.8	30	46.3	20	-1.5	-10	-0.54	15
C	48.6	30	51.0	40	2.4	10	0.92	22

Further testing was done among those completing both the pretest and posttest to determine whether any correlation existed between scores on the appraisal and self-projected course grade, class standing (freshman, sophomore, junior, senior), percentage of writing assignments completed, and number of critical thinking assignments completed. In all three sections, class standing and self-projected course grades had no discernable relationship to appraisal outcomes.

A positive correlation was discovered between the percentage of writing assignments completed and net change in appraisal scores, as well as with the number of critical thinking assignments completed and net change in appraisal scores. Regression analysis was performed to determine the strength of the relationships between the variables. When the percentage of writing assignments completed was plotted with the net change in appraisal scores, the strength of the correlation was $R=.64$ and $r^2=.41$, where the degrees of freedom were 13 and the level of significance was less than 0.05. Thus, the data suggest that 41 percent of the variance in the net change in appraisal scores in Section B can be explained by the percentage of writing assignments completed.

Similarly, as the number of critical thinking assignments completed increased so did the net change in appraisal scores. Regression analysis revealed a correlation level of $R=.46$ and $r^2=.21$, where the degrees of freedom were 20, and the level of significance was less than 0.05, suggesting that 21 percent of the variance in the net change in appraisal scores in Section C can be explained by variation in the number of critical thinking exercises completed.

When interpreting these results one must be careful. It may be possible that some other factor has influenced the change in appraisal scores creating a spurious relationship.

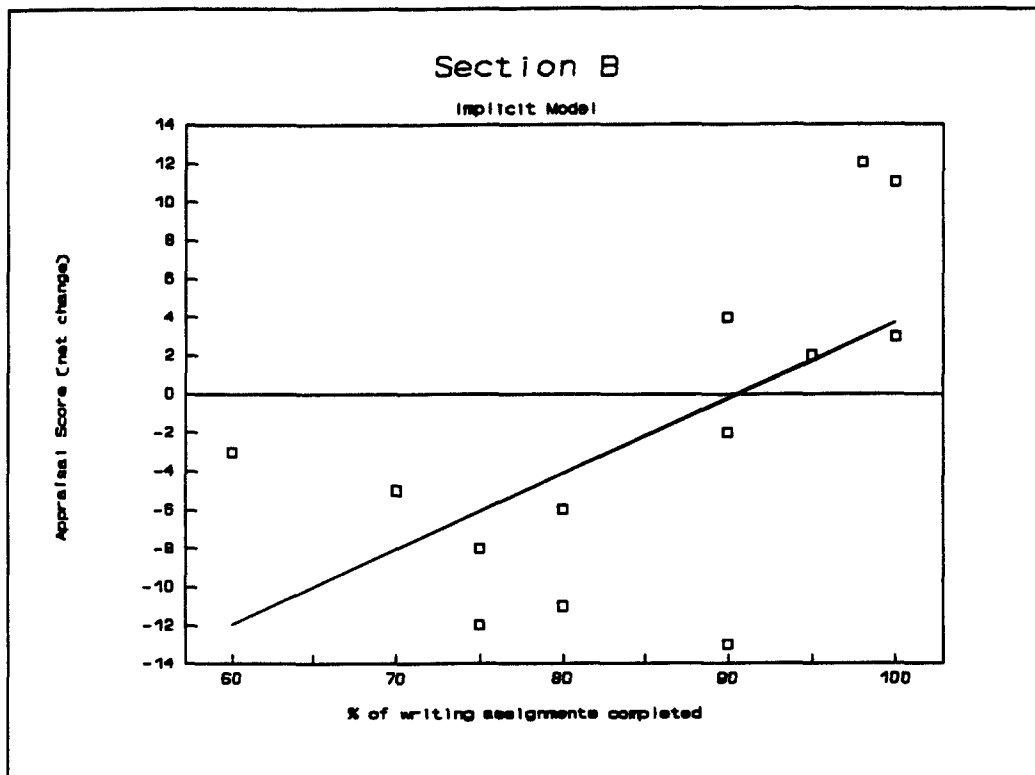


Figure 6.0-- Writing Assignments Completed v. Net Change in Appraisal Score

Researchers Bernadette M. Gadzella, Kent Hartsoe, and James Harper found that the brightest students are those who improve their critical thinking most readily.¹³² If this is the case, does the analysis simply demonstrate that the brightest students, who were likely to complete a very high percentage of their writing and critical thinking assignments, were those with the highest improvement in appraisal scores? To answer this question, the data was sorted by pretest score and correlated with net change in

¹³²Bernadette M. Gadzella, Kent Hartsoe, and James Harper, "Critical Thinking and Mental Ability Groups," *Psychological Reports* 65 (1989):1019.

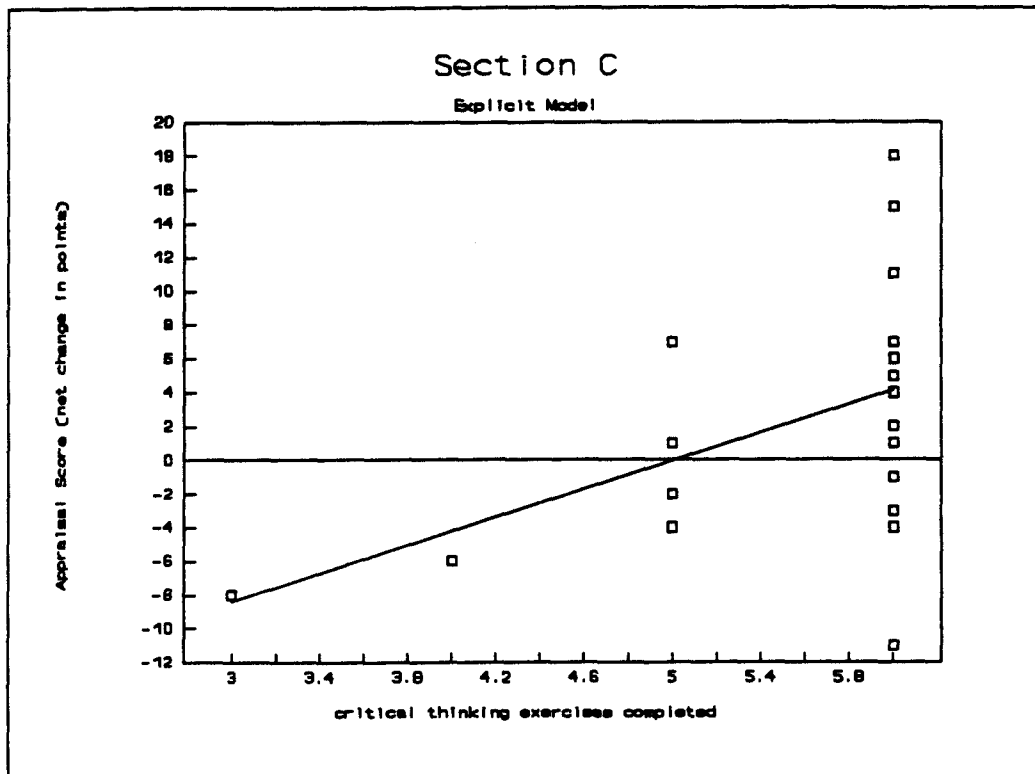


Figure 6.1--Critical Thinking Assignments Completed v. Net Change in Appraisal Score

appraisal scores, thereby determining whether those students who entered the class with the highest critical thinking skills were the same students who improved their scores the most. Surprisingly, in all three sections no relationship existed between pretest score and net change in appraisal score, thus disconfirming the theory.

It appears then, that both the implicit and explicit models of critical thinking as applied in this experiment had a positive effect on appraisal outcomes. As the number of writing assignments completed increased so did net change in appraisal scores. Likewise, as the number of critical

thinking assignments completed increased, the net change in appraisal scores increased. Thus each model offers legitimacy to the teaching of critical thinking skills at the college level.

LIMITATIONS

A number of limitations should be noted. First, as mentioned previously, students were allowed to self-select into the study and a random sample was not obtained. The effects of the self-selection factors may be most prevalent in Section B, where extra credit was given for completing the appraisal. It is possible that the students who were not performing as well as desired in the course (those who "needed" points) were those who completed the posttest, having the effect of overrepresenting more marginal students and skewing the results downward.

Second, the lack of a universal definition of critical thinking makes objective changes in thinking skills difficult to measure. It may be possible for students to have improved thinking skills, but not improved scores on the Watson-Glaser Critical Thinking Appraisal. While widely recognized as being one of the most credible measurement devices for assessing critical thinking, the appraisal only attempts measurement in five areas. Thinking skills may have improved in areas not assessed on the appraisal.

And third, time limitations have a significant effect on the study. It may be unreasonable to assume that critical thinking skills can be improved substantially when meeting only three hours/week for sixteen weeks. Perhaps a study covering several semesters would provide a time frame more reasonable to assess changes in thinking skills.

ANALYSIS

While overall class averages on the Watson-Glaser Critical Thinking Appraisal did not increase substantially, a positive correlation was found between the percentage of writing assignments completed and appraisal outcomes, and the number of critical thinking assignments completed and appraisal outcomes, demonstrating that each model has a positive effect on critical thinking skills. Given this, which model is best suited for teaching critical thinking skills in the political science classroom? Qualitative, rather than quantitative, reasons lead the author to believe that the implicit model is best suited for the political science classroom.

The explicit model of critical thinking instruction has merit; however, its limitations make widespread use of the model challenging. In theory the model sounds desirable, but when faced with the constraints and realities of the college classroom it becomes difficult to implement. After applying the model for one semester, a number of factors

convinced me that the explicit model of critical thinking instruction skills belonged in a course devoted exclusively to thinking skills. These factors will now be addressed.

Introduction to American Government is a survey course, designed to introduce students to approximately fourteen different areas of political science. When faced with the large amount of curriculum that is expected to be introduced, spending a significant amount of classtime directly teaching thinking skills was an incredible challenge--one that I greatly underestimated. Each day that was devoted to discussing thinking skills could not be spent directly teaching political science. Was the trade off worth it? As the semester drew on, time limitations weakened my commitment to the explicit model of critical thinking instruction. Not only did the explicit model require a significant amount of in-class time (approximately one hour per skill), it also required an inordinate amount of out-of-class time to evaluate and comment on the critical thinking homework. For a classroom of approximately fifty students, between six and eight hours were spent grading each critical thinking assignment. With a more uniform assignment design, grading time could have been reduced by as much as fifty percent, yet would have still commanded a significant time commitment.

A second factor that weakened my commitment to the explicit model was students' inexperience with

metacognition. Most people never stop to analyze the thinking processes they go through to achieve a given end. Similarly, very few of the students were able to describe even vaguely any of the steps they mentally go through to determine the difference between a fact and a value, or deciding how they would determine the credibility of a source. According to Beyer's instructions for the explicit model of critical thinking instruction, being able to describe a thinking process as one goes through it is fundamental to the program. After a number of unsuccessful attempts at having students describe their metacognition processes, I abandoned the technique and found it more effective to simply provide the students with a list of steps that advanced thinkers may use to accomplish a particular thinking process.

Not only were the students inexperienced with metacognition, quite frankly, so was I. As an instructor my background was in political science, not psychology or education. While familiarity with critical thinking skills can be learned from reading books and journals, I was not convinced that I had the background and skills to explicitly teach critical thinking skills. Continuing research into the area has increased my comfort level, yet few instructors have the time or desire to spend hundreds of hours researching the subject. Therefore, it is likely that many instructors would share in my feeling of inexperience, and

perhaps be more effective by providing for implicit critical thinking experiences rather than attempting to explicitly teach them.

Perhaps the greatest frustration students experienced with the critical thinking assignments was a discomfort with the level of abstraction. As Meyers mentions in his writings, frequently when students turn in assignments that do not meet an instructor's expectations, the instructor has failed to provide clear, explicit directions. Particularly with the design of the first assignments, room was left for students to legitimately misunderstand the instructions. Many students wanted to know exactly how each answer should be written and needed numerous examples of how it was to be done. The assignments were designed more open, allowing the students to explain their thinking processes as they completed each step of the assignment. In retrospect, highly detailed, specific instructions and examples would improve the assignment design and reduce the level of abstractness. At the same time, a more uniform approach would help the instructor by reducing grading time.

Additionally, students were frustrated by a lack of clear-cut right and wrong answers. Some students seemed to need immediate confirmation on whether they had correctly assessed part of an assignment. If a mechanism was developed to provide immediate feedback to students, the assignments would be of greater benefit.

FUTURE DIRECTIONS

Additional research in this area is needed to more clearly evaluate the effectiveness of critical thinking instructional techniques. It would be interesting to repeat the study using a random sample, expanding the time frame, and broadening the study across more classrooms. Many of the pedagogical techniques described in Chapter Five were not used in any of the classrooms evaluated in this study. Repeating the testing after applying those techniques to the classroom may shed important light on the subject.

The explicit model of critical thinking instruction may be most effectively applied in an class devoted exclusively to developing thinking skills. However, recognizing that this would severely limit the number of students who become familiar with the subject, computers may provide a second alternative. In colleges and universities that provide faculty with quality computer assistance, a computer program could easily be designed that offers students the opportunity to practice and learn specific thinking skills. Such a program would alleviate several of the problems associated with the critical thinking assignments used in this study. First, computers provide immediate feedback to the students and can offer detailed explanations why one answer would be better than another. Second, a well-written computer program could offer numerous examples to the

students and avoid the abstractness that students are uncomfortable with. Third, computers can easily tabulate student scores and thus reduce the grading time required of instructors. And fourth, computer-aided critical thinking skills does not interfere with limited classroom instruction time, allowing more flexibility for the instructor to utilize techniques common to the implicit model of teaching critical thinking skills.

SUMMARY

Three sections of Introduction to American Government students were given the Watson-Glaser Critical Thinking Appraisal as a pretest and posttest to the course. Each of the sections used different pedagogical techniques: Section A relied on the traditional lecture method; Section B used lecture combined with extensive position/counter-position writing assignments; and Section C used lecture, small-group work, and the explicit model of critical thinking instruction.

In each of the sections, the median class score underwent only modest changes, none of which can be considered statistically significant according to the Student's *t* test. When the data was reduced to include only those who completed both the pretest and posttest some interesting findings arose. No correlation existed in any of the sections between class standing and appraisal score

or projected course grade and appraisal score. However, a positive correlation was found between the percentage of writing assignments completed and net change in appraisal scores, as well as the number of critical thinking assignments completed and net change in appraisal scores. This suggests that both the implicit and explicit models have a positive effect on critical thinking outcomes.

Completion of the critical thinking assignments offers some explanation for the differing outcomes on the appraisal, but evidence does not suggest that the pedagogy of the explicit model is significantly more effective than the position/counter-position writing techniques common to the implicit model. Therefore, until stronger evidence suggests otherwise, it may be as effective to implicitly design assignments and classes for the development of critical thinking as to explicitly teach critical thinking skills. The explicit model of teaching of critical thinking sounds feasible in theory, but when placed within the constraints of the classroom becomes difficult to implement. The value of the explicit model must be weighed with the difficulties encountered with time and measurement limitations, student inexperience with metacognition, instructors' limited backgrounds, and the abstractness of the subject.

Critical thinking is a difficult area to teach and assess. Because the subject has more depth than most

instructors are prepared or able to deal with, the explicit model of critical thinking instruction may be most appropriate for a course devoted specifically to developing thinking skills. Nonetheless, the importance of improving students' thinking skills suggests that all classrooms would be improved by redesigning courses to implicitly provide for the development of critical thinking skills.

CHAPTER SEVEN

CONCLUSION

Like a carpenter without tools, a student without critical thinking skills is of limited use. Critical thinking skills enable students to make better judgments about the accuracy, validity, and worth of the world about them. As instructors, we have the responsibility to provide our students with knowledge, and perhaps more importantly, to furnish them with tools to effectively use the knowledge they gain.

Numerous reports published in the 1980s demonstrate that most students entering college have limited higher-level thinking skills. Furthermore, studies demonstrate that nearly half of freshman students are not able to think at the formal-operational thought level. The lack of cognitive development results in many students finding college courses too abstract, and contributes to the low retention rate of college freshman. Consequently, instructors need to evaluate the cognitive level of their students, and adjust teaching styles to encourage cognitive development.

Tradition holds that college instruction rely primarily on lecture. This long standing custom is effective in

relaying a large quantity of information in a short period of time. However, in lecture settings, students have little opportunity to interact with the information given. Researchers, influenced by the works of Piaget, have demonstrated that cognitive development increases most rapidly in courses which are interactive and inquiry based. If the cognitive development of students is a primary goal of college instruction, then instructors need to alter their courses to allow for greater interaction and inquiry.

Bloom's *Taxonomy of Educational Objectives* provides a formula to measure the cognitive difficulty of tasks assigned to students. If the work assigned to students is too far above their current cognitive levels, frustration and apathy occur rather than cognitive development. Thus, instructors are faced with the difficulty of assigning work that will increasingly challenge students yet not overwhelm and discourage their efforts.

The exercise of higher-level thinking skills requires the use of lower-level thinking skills. Lower-level skills, as classified by Bloom, consist primarily of the acquisition and retention of knowledge. With minimal instructional effort, students can be provided with mnemonic devices which simplify the memorization and retention of knowledge, making lower-level skills more easily managed and developed.

Higher-level thinking skills and attributes used in critical thinking are more challenging to develop. Two

models may be used to teach students critical thinking skills. The explicit model suggests that instructional time be spent practicing specific critical thinking skills. The explicit model allows for students to compare the manner in which they execute a critical thinking skill with the manner in which more advanced thinkers may execute the skill. Drawbacks to the explicit model include the significant amount of classtime required to discuss and practice each skill, the difficulty faced by students unaccustomed to metacognition, and the abstractness associated with trying to identify the specific steps executed to complete a mental task.

The implicit model of critical thinking instruction consists of a conglomeration of teaching methods. While the methods vary, they are consistent in their attempt to have students interact with the material presented. The classroom environment, discussions, and writing assignments are each designed to foster student interaction, subsequently developing students' thinking skills. The implicit model of critical thinking instruction includes a great deal of flexibility, allowing for different instructional techniques to be applied as deemed appropriate. Drawbacks to the implicit model include a reduction in the amount of material covered in the course, and in most cases, an increase in the amount of time spent evaluating assignments.

Both the explicit and implicit models of critical thinking instruction demonstrated a positive correlation with the development of critical thinking skills, as measured by the Watson-Glaser Critical Thinking Appraisal. While the findings of this study are subject to significant limitations, they do appear to indicate that improvement in critical thinking skills can be fostered using both the implicit and explicit models.

For perhaps more subjective, rather than objective reasons, the explicit model of critical thinking instruction may be best employed in a course of its own. The pedagogical techniques of the explicit model blend well in thinking skills courses, but are troublesome to mesh with the standard political science curriculum. In a thinking skills course, time would be available to adequately address each critical thinking skill, and students could be provided with training in metacognition, aided by the guidance of a qualified instructor.

The implicit model of critical thinking instruction more closely blends with the material traditionally taught in the political science curriculum. The pedagogical techniques can be applied and altered to fit appropriately with the topic at hand. While time is not specifically devoted to the discussion of critical thinking skills, it may be appropriate on a particular occasion to provide students with some tips on how to determine if a source is

credible or some other specific critical thinking skill. However, for the most part, the pedagogy of the implicit model provides opportunities for student interaction, assigns tasks that successively increase in cognitive difficulty, and presents ample opportunity to build bridges between concrete and formal levels of thought.

While this project cannot claim to have discovered one foolproof, tried-and-true method to improve students' critical thinking skills, it has presented sound principles on which to build. Continuing research into the effects of pedagogical methods on students' critical thinking skills will certainly both verify and clarify the findings of this project.

The art of teaching is a gift for some, and a learned skill for others. It is hoped that this work will be of some assistance to those of us who are learning step-by-step and day-by-day to better our teaching proficiency. In no way is this work viewed as a exhaustive study of the pedagogy of critical thinking instruction. Instead it is deemed as a first step in a lifelong pursuit of mastering the art of teaching.

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