Faculty Interests - Faculty Needs: Creating Meaningful Critical Thinking Training

Patricia Wilber

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FACULTY INTERESTS—FACULTY NEEDS:
CREATING MEANINGFUL CRITICAL THINKING TRAINING

by
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A. B.,
B. A., University of North Dakota, 1991
M. A.,

A Dissertation
Submitted to the Graduate Faculty
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for the degree of
Doctor of Philosophy

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2000
This dissertation, submitted by Patricia Wilber in partial fulfillment of the requirements for the Degree of Doctor of Philosophy from the University of North Dakota, has been read by the Faculty Advisory Committee under whom the work has been done and is hereby approved.

Chairperson

This dissertation meets the standards for appearance, conforms to the style and format requirements of the Graduate School of the University of North Dakota, and is hereby approved.

Dean of the Graduate School

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To the participants, you are wonderful teachers and learners who never cease to improve the learning in your classrooms. You are an inspiration not only to me, but to all who are privileged to work at your side.
DEDICATION

This project is dedicated to my parents, Gladys and James Pratt, who taught me to never not finish what I had begun. It is also dedicated to my husband Russell, and sons Matthew and Michael, who learned to become self-sufficient so I could become a full time student—again.
ABSTRACT

Helping students improve their critical thinking and writing abilities is a challenge for university instructors. Although they are experts in their specific disciplines, most of them struggle developing appropriate and successful critical thinking activities for their students since they have limited knowledge of instructional methods that improve student thinking. Often they rely upon professional development programs on their campuses to assist them with their pursuit. The Writing Across the Curriculum Program at a mid-western university offered assistance to faculty and provided a place to examine this process.

A qualitative study employing workshop observations and follow-up interviews was used to determine the impact of one-hour workshops on faculty’s critical thinking assignments. Six full-time faculty from different disciplines participated in the study. The research asked if faculty would alter their critical thinking and writing assignments after attending three one-hour sessions that provided for peer review of their assignments and student papers.

The findings indicate that three of the six participants immediately altered their assignments based on information they received at the workshops, and that all the instructors reported gaining useful strategies to improve their current critical thinking and writing activities. Short-term workshops do help instructors improve their instructional
designs. An unexpected finding was the number of existing university-based barriers that exist that interfere with faculty attempts to make students more thoughtful. Class size, grading practices, lack of rewards for critical thinking initiatives, lack of departmental support, and student resistance to challenging assignments all impact on student attainment of critical thinking and writing abilities. Recommendations suggest that measurable improvement in student critical thinking and writing abilities will depend on the university faculty and administrators' ability to develop a comprehensive, campus-wide program that emphasizes this learning.
CHAPTER ONE

INTRODUCTION

Where do good teachers go for help when they are dissatisfied with student learning? How do they determine what’s not working, pedagogically, and why it’s not working—when their expertise is discipline specific? How do they connect with other teachers who share their level of dissatisfaction? Where do they find assistance, when they can steal a few minutes away from other duties to analyze the learning situation?

This is the story of six good teachers searching for help. They are all active participants in The Writing Across the Curriculum (WAC) program at a four year university, but they could be good teachers at any level of instruction, kindergarten through graduate school. They are “good” teachers because they:

- pay attention to society’s changing intellectual demands
- keep current in their discipline
- assume responsibility for helping students to learn
- push themselves to be better instructors

None of these teachers is a saint. They make mistakes with their students and get angry and frustrated. They are like many other teachers world-wide who recognize that learning in their classes could be better if they had more time to prepare, fewer students to work with, better pedagogical research information, and students more motivated to learn. The difference between these six and many other teachers is that the fire to change and make a difference is still burning deeply in their being. Despite all the barriers and
and make a difference is still burning deeply in their being. Despite all the barriers and problems, they are asking for help to make changes that will initially increase the amount of work they do.

I believe this story will be of interest to a variety of educators. Teachers will see themselves, and perhaps know better how to ask for assistance when facing educational changes or dissatisfaction with their students’ learning. Although the teachers involved in this project were interested in using writing to promote critical analysis by students in their classes, the lessons learned from their stories could be applied to varied pedagogical concerns.

Institutional directors of professional growth or institutional reform activities will be able to note how faculty interact at short term workshops and perhaps devise better methods for capturing and applying the information gleaned from faculty participants. Follow-up activities that respond to faculty needs are often not included in initial planning, because they are unknown at that stage. The story of these teachers’ interactions will demonstrate the importance of needs assessment activities at all program sessions, so that knowledge sharing and training adjustments can be on-going.

And lastly, administrators can perhaps use this story to broaden the criteria they currently use to allocate dollars for faculty development or institutional change programs. The way these six teachers identified problems and solutions suggests a modification of typical spending plans.
Project Background

In the early 90's a Writing Across the Curriculum (WAC) program was funded by a sizable grant at the university where I was pursuing a graduate degree in English. Faculty were invited to utilize newly created WAC resources, attend faculty writing improvement peer sessions, and participate in student-focused training sessions. Improving student writing in discipline-based and liberal studies courses, and using writing to improve student thinking and understanding (Writing to Learn), were often the focus of the student-focused activities. Since I was interested in both composition instruction and ways to use writing in the study of literature, I secured permission to attend WAC monthly brownbag sessions, two day retreats, and two week summer faculty development sessions for a period of two years.

These sessions introduced me to a diverse group of campus faculty whose interest in WAC ran from "ways to produce grammatically correct papers," to "using writing to promote creative design in engineering projects." Individuals came from all disciplines with varying levels of instructional experiences. The noon brownbags were often attended by twelve to fifteen faculty, with new faces appearing each month to participate in the announced WAC topic discussion. Instructors shared problems and ideas freely and the group often reviewed very specific activities that promoted writing and learning. Six faculty participated in the paid two week WAC training session in the summer and a dozen attended a two-day summer workshop. Each of these longer sessions provided faculty with training on how to implement WAC activities in their courses and opportunities to develop materials and lessons.
My role at these sessions was as an unofficial participant-observer. As the participant with experience teaching composition, I was able to share my own experience fostering writing improvement and answer questions about revision groups, commenting on student papers, and an array “how to teach writing” questions. In my observer role I not only learned ways to promote student thinking and learning by listening to seasoned faculty discuss their use of writing to learn activities, but also surveyed the scope of problems and interests of the attending teachers. Dozens of teachers attended the brownbags over the course of two years, so I was also able to note those faculty with a strong passion for improving learning in their classes.

I also became aware of the faculty’s varying preferences for WAC training session formats from their program assessment comments. Not surprisingly, there was a range of preferences. Some disliked the one-hour, monthly brownbag sessions finding it difficult to become mentally engaged with the WAC topic in the middle of a busy day. This group liked being shut away for a few days to immerse themselves in the topics. Others, the majority, preferred the brownbags because they could squeeze them into their busy schedules and often gain a useful teaching or learning strategy in just one hour.

In addition to the formal WAC activities I participated in during these two years, I collected information about writing activities in discipline-specific assignments through a survey and faculty interview project, observed a writing-intensive course for a semester, and collaborated with aviation faculty on dual credit projects for aviation and business and technical writing classes. I also read extensively about the national growth of Writing Across the Curriculum and Writing to Learn projects in higher education, and the major
changes in composition theory. I was fascinated by the implications of using writing as a tool to help students clarify their thinking about the subject matter they were learning. That process of writing and thinking critically had the potential of a double payback for students--better writing and clearer thinking. Considering the importance of those skills for all students, I was encouraged to develop a research project that worked with WAC participants on my campus who shared my interests.

Two possible areas of investigation emerged from my WAC/campus experiences and readings. Since the majority of faculty attended the brownbags to share and hear about writing, and writing to learn activities, I was interested in determining the sessions' impact on changing faculty instructional modes. My initial research questions were:

1. Would faculty change the design and evaluation (written comments on student papers) of their written assignments if they had the opportunity to review the effectiveness of their own and other faculty’s critical thinking assignments?

2. Would consecutive brownbag workshops, which provided this review of critical thinking assignments, impact on faculty use and analysis of writing to learn activities in their instruction?

Because I wanted to continue my role as observer-participant in WAC programs, I decided that a qualitative study would add to my understanding of using writing to promote learning and would reveal information useful to other educators as well. My experiences interacting with other faculty made me recognize the potentially important information I could gain from studying the ways groups of educators support each other as they struggle with broadening their instructional scope and activities.
Area of Investigation

The purpose of this qualitative study was three-fold. First, I wanted to determine if six highly motivated faculty from different disciplines would change the design and evaluation of their critical thinking assignments if they had the opportunity to review the effectiveness of their own and other faculty’s critical thinking assignments. Second, I wanted to know if three consecutive brownbag workshops, which provided this review of critical thinking assignments, would provide enough time and content to impact on faculty use and analysis of writing to learn activities? Third, I wanted to gather information for administrators of faculty development programs about the kind of assistance faculty working with critical thinking and writing assignments needed to be successful.

Participant Interests

The participants in this study all required analytic assignments using critical writing in their courses. They each taught introductory and advanced courses in their respective departments, and worked with classes ranging from twenty to eighty.

These individuals were already convinced that graduates in their programs needed to think critically about their disciplines and were determined to improve the instruction they provided to facilitate this. They were asking questions such as: How do students learn to identify main ideas and evaluate their importance? What can I say to students to help them clarify their thinking, without giving them the answer? How do I push students to take risks and postulate their own theories? How do I grade critical writing assignments in classes of eighty to one hundred? What comments on papers do students
find most helpful? This study brought faculty together so they could ask and answer these questions.

Research Premises

There were several premises underlying this project.

• Teachers attempting to implement new instructional strategies can collectively identify critical problems and generate useful solutions.

• Faculty from different disciplines have knowledge of how to think (make knowledge) and write critically within their specialized areas. The challenge lies in developing instructional methods to help their students learn how to think and write critically in their newly selected majors.

• Instructional strategies and methods that promote critical thinking and writing are, if customized, applicable across disciplines.

• Teachers experiencing high levels of dissatisfaction with student learning will try new instructional methods.

Limitations of the Study

The study was limited by its duration and the inability of the researcher to collect numerous sets of student critical writing assignments. The interviews, which determined the impact of the workshops on the faculty’s assignments and instructional methods, were held at the end of the school year, six to eight weeks after the workshops. Two or three semesters of additional assignments and follow up interviews could have further demonstrated the workshops’ long-term impact.
The six faculty provided a set of student papers at the time of the order to note long-term changes in assignments and responses to student papers would need to be reviewed over time to determine the impact information gaining by faculty at the workshops on their required student assignments. Descriptions of faculty beliefs, knowledge and needs in the area of critical thinking and writing were obtained in this short-term study I did not, however, attempt to get statistically significant evidence of instructional changes.

Terms and Definitions

The following terms and definitions were used in this study:

**Critical Thinking**  A set of teachable and testable skills related to argument or hypothesis formation and testing, and problem solving. Also an inquisitive, questioning mindset that utilizes skills to assess the surrounding world.

**Higher Order Critical Thinking Skills**  Complex analytic skills that require more advanced cognitive functions such as analysis and synthesis of information, hypothesis formulation and testing, comparison, etc. Recalling facts or imitating a process would be considered a lower level thinking skill.

**Critical Writing**  Writing that expresses opinions and/or evaluations after some form of analysis has taken place.

**Writing Across the Curriculum**  An educational movement, popular in the United States for over twenty years, that promotes incorporating numerous and increasingly more complex written assignments throughout a student’s school years in all subject
areas. The purpose of the long-term, cross-disciplinary writing is to provide extensive practice in different rhetorics and hence produce competent writers.

**Writing to Learn** A part of the Writing Across the Curriculum Movement that stresses the use of writing to learn disciplinary content, in addition to writing improvement.

**Professional Development** Activities directed at employees (teachers) to enhance their skills and knowledge. Professional Development Programs exist at most colleges under a variety of titles.

**Summary**

This qualitative study reviewed and analyzed the interaction of six faculty at a major mid-western university as they shared and critiqued each other's critical thinking and writing assignments. Its goals were to: 1) report the impact of sharing ideas and evaluating each other's critical thinking assignments on faculty assignments and instruction; 2) assess the impact of three one-hour brownbag workshops on faculty use and analysis of writing-to-learn instruction, and 3) determine the beliefs, knowledge and needs of six faculty who regularly promote critical thinking and writing activities in their courses so that more useful professional development workshops could be developed by program administrators.

Chapter Two will review the literature on critical thinking; Chapter Three will describe the methodology used and profiles the six faculty participants; Chapter Four will report and analyze the interaction between the faculty at the three workshops; and
Chapter Five will present findings and make recommendations about helping faculty to improve critical thinking instruction.
CHAPTER TWO
LITERATURE REVIEW

As higher education faculty attempt to promote critical thinking in their curriculum, many of them attest to their own lack of knowledge about the subject. While all have thought critically in their lives (their professional status attests to this), few have formally studied theories about improvement of critical thinking abilities or been involved with classes or seminars that model ways to accomplish this. WAC programs, because of their writing-to-learn emphasis and the assistance they give instructors as they attempt to improve student analytic writing, intersect with critical thinking issues, but tend to focus on writing issues, rather than those related to thinking (Applebee, 1984). Certainly, there are colleges and college systems that have introduced campus-wide critical thinking programs through staff development. For example, Minnesota Community Colleges have studied critical thinking infusion into their curriculum for over five years. Individual departments have committed themselves to fostering critical thinking abilities in their students. But more common is the lone instructor—dissatisfied with student performance in labs, on tests, in written critiques—who begins to tinker with her/his curriculum and instructional methods.

The faculty involved in my research project shared an interest in improving their students’ ability to think critically about issues within their chosen majors or disciplines.
They wanted these budding anthropologists, engineers, occupational therapists, industrial technicians, and aviators to be capable of performing at a professional level on the job, or in graduate school. Frustration with student “thinking” (often appearing in their curriculum as hypothesis formation and testing, problem solving, report/article critiques, or theory application and evaluation) had caused this faculty to question instruction and evaluation methods, and student performance outcomes. In their discussions and interviews they did not reveal a familiarity with current critical thinking theories, movements, and the resulting debates that often appear in journals of education, cognitive psychology, composition and philosophy—all well outside their range of professional readings.

This chapter presents a review of current literature in the fields of critical thinking theory and instructional applications. The information should be useful, not only to teachers developing curriculum and instructional methods, but to those who develop training to assist teachers. The current information raises important questions that must be considered by those who promote increasing students’ analytic abilities.

Historic Overview

One might think that “teaching” and developing student critical thinking always go hand in hand. But that has not been the case in western societies. Most of us would correctly cite the scenes of young Greek students clad in togas under an olive tree testing syllogisms with their Socrates-like mentor as early proof of teacher-directed critical thinking. Yet we can also remember the oppression Copernicus and Galileo endured during the Middle Ages for directing a critical eye at accepted theory, and we conjure up
a classroom quite pedagogically removed from the group under the tree. At different times throughout the centuries, depending upon the prevailing educational philosophy and the individual teacher, students were required to fit into a slot on a continuum ranging from trained parrot to critical thinker and valued maker of knowledge.

In our own country's short history, that continuum has been maintained. In the 1800s some college programs were entirely based upon classical models of logic and rhetoric. Meyers reports, "Though the term critical thinking was not much in vogue in those days, the teaching of various forms of argument, syllogisms, propositional reasoning, and other logical operations was clearly seen as necessary to produce graduates with the keen thinking abilities appropriate to their chosen profession and standing in society (3). However, other programs in higher education relied on student recitation as the dominant mode of scholarship. Russell (1991), in his curricular history of composition, suggests that recitation involved using writing (in notebooks and on essay exams) to respond to teacher-directed questions in preparation for classroom oral presentations across disciplines. He suggests that in the hands of talented instructors this written/oral process would foster both thinking and communication abilities. But in other hands, thinking was not a dominant part of the process (38, 44). He presents a Yale student's description of this practice from the 1860s.

In a Latin or Greek recitation one [pupil] may be asked to read or scan a short passage, another to translate it, a third to answer questions as to its construction, and so on; or all this and more may be required of the same individual. The recitor is expected simply to answer the questions put to him, but not to ask any of
his instructor, or dispute his assertions. If he has any inquiries to make, or controversy to carry on, it must be done informally after the division has been dismissed (39).

Although this classroom may be described as student centered, since student performance dominated, emphasis was placed on correctly pronouncing, translating and describing the work under study, certainly on the parrot end of the continuum. Right and wrong were well established in this system and the professor’s role was to provide enough practice so that right prevailed.

Russell reports at the turn of the century, after the rise of industrialism and the resulting highly specialized sciences and technologies, recitation-based study of classical subjects—Greek, Latin, rhetoric and mathematics—was gradually replaced by a faculty lecture format in information-based disciplines (37-8). Ideally, subject matter experts were to pass on the latest research findings to students who would take notes, compare them to outside readings and discuss these multiple sources of information and theory on essay exams. It didn’t take students long to figure out ways of passing these tests (reviewing old notebooks and tests, buying pre-written test answers from others) and avoiding the critical analysis of current discipline findings that the early lecturers hoped for (77). So as the emphasis of faculty shifted from teaching to research, many students found ways to short cut themselves out of a critical thinking approach to higher education.

That is not to say that during these periods there were not instructors who resisted student passivity and who pushed them to step back and critically view information
(especially in the Progressive Era and the General Education Movement), but the emphasis on students as active thinkers and learners and creators of knowledge, although recurring throughout the century, never gained dominance. Instructors' interest in developing student analytic abilities was fighting two strong impulses: students desire to take the easy way out and faculty's interest and/or pressure to spend the majority of their time doing research in their fields.

In 1999 students are still bounced along this think/don't-think continuum during K-12, undergraduate, and graduate studies, despite years of discussion about the importance of teaching students to critically assess their world. Diane Halpern, in the introduction to Thought and Knowledge, states, "Traditionally, instruction in how to think has been a neglected component in American education. Students were more often taught what to think than how to think" (xi).

Recent Interest in Critical Thinking

Capossela suggests the publication of national student assessments like A Nation at Risk (1983), Involvement in Learning (1984), and The Writing Report Card: Writing Achievement in American Schools (1986) made the public aware of student deficiencies in critical thinking abilities and created a sense of urgency to resolve the problem (1). The resulting explosion of critical thinking research carried out by cognitive psychologists, educators, and philosophers has expanded discussions of effective methods of teaching critical thinking from the philosophic to the observable and the quantifiable (Ennis, Halpern, McPeck, Paul).
McPeck, an early proponent of teaching critical thinking within disciplines, reports that while published critical thinking research was sporadic before 1980, it became overwhelming in diversity and quantity by the middle of the decade (ix). This heightened interest in developing student analytic abilities is also evidenced in K-12 education, both in textbook emphasis and state-mandated curriculum policies. Kitchener reports across discipline references to terms such as critical thinking, problem solving, reasoned judgment, reflective thinking, and critical inquiry in elementary and secondary texts and curricula (75). Additionally, elementary and secondary state standards in education documents incorporate critical thinking language and recommend related activities. The North Dakota Language Arts Standards for grades one, eight and eleven frequently use the terms “compare,” “contrast,” “organize,” “analyze,” “counter-argue,” “question,” and “reflect,” in the prescribed standards and in the accompanying performance activities (Standards 1-6).

College catalogs also emphasize critical thinking performance outcomes for their admitted students. Once again the terms critical inquiry, reflective thinking and judgment appear (Kitchener 76). Business firms, across industries, demand employees at all levels with strong analytic and problem solving skills (Simser). There are an array of conferences that foster discussions of critical thinking and teaching. Web sites direct teachers to Internet chat rooms for discussion of critical thinking and to information from critical thinking centers. Sonoma Community College’s Center for Critical Thinking, the Ohio Center for Critical Thinking Instruction, and Montclair State University’s Critical Thinking Resource Center are established centers offering current information on
research, instruction, library and bibliographical resources. In 1999, the federal Educational Research and Instructional Clearinghouse (ERIC) lists 105 articles from the selection Critical Thinking Research. Critical thinking is a hot topic in the United States and perhaps it is exactly because it has generated discussions in education, psychology, and with employers that it is such a difficult term to pin down.

Defining Critical Thinking

Definitions of critical thinking are as numerous as the number of educators involved in the current scholarly discussion. Toni-Lee Capossela, in her article “What is Critical Writing?” suggests that each author of an article on critical thinking begins with “an elaboration of the author’s definition--and an explanation of how it is superior to its predecessors” (1,2). Although most authors agree that critical thinking involves higher level cognitive abilities (re-calling facts would be considered a lower level thinking activity, while evaluating or doubting facts would be considered higher level), definitions of critical thinking and philosophical approaches to teaching it are quite varied. Most definitions fit into two areas. Critical thinking as a set of teachable and testable skills related to argument or hypothesis formation and testing and problem solving. Alternatively, critical thinking can be seen as an inquisitive, questioning mindset that utilizes skills to assess the surrounding world.

Critical Thinking as a Set of Skills

Critical thinking is often defined as the successful demonstration of specific skills that fall into three broad categories: formal and informal logic, hypothesis formation and testing, and problem solving. Barnet and Bedau suggest two skills-focus definitions: “In
thinking critically about a topic, we try to see it from all sides before we come to a conclusion. . . . Thinking critically involves a twofold activity: Analysis--separating the parts of the problem, trying to see how things fit together and Evaluation--judging the merit of our assumptions and the weight of the evidence in their favor” (4).

According to Halpern, “The term critical thinking is used to describe thinking that is purposeful, reasoned, and goal directed (5). She adds, “As you read through this book, you’ll become aware of the ways that language influences thought, learn some strategies for approaching and solving problems, develop the skills needed to reason clearly and make sound decisions, understand how hypothesis is tested and how to use probabilities . . . and apply this knowledge to a wide range of situations” (xvi).

Each of these writers suggests critical thinking involves a set of learned skills that lead thinkers to end results. Linking critical thinking to specific skills in limited or generalized settings has, and continues to be, extremely popular. Perhaps this is the case because the teaching of independent skills, like analysis, is manageable for instructors. Students can focus on acquiring and mastering one “thinking” skill at a time. For example, students can be taught to examine magazine feature articles for loaded or emotional words so they might perceive the writer’s agenda and better evaluate the provided information. With repeated practice, students will acquire the skill and their level of mastery can be evaluated. Teachers in all disciplines create skill-related critical thinking activities like this to help their students learn to “logically organize an argument,” or “develop and test a hypothesis.”
Critical thinking texts from the 1960's often asked students to apply the techniques of formal logic (syllogistic reasoning, argument development, and exploring fallacies) to specific situations. Students were asked to identify an arguable idea and the audience to present it to, to develop a set of assertions and proofs, order them appropriately, and choose a specific language to enhance the possibility of persuasion. Usually inductive and deductive reasoning was discussed and the types of fallacies, "ways to argue badly," that interfere with sound critical thinking (Barry and Rudinow 209).

When you look through these texts, it seems that most of the students' efforts are consumed with learning the language of logic and evaluating formal arguments. Elements of this practice are found in recent critical thinking texts, although they are part of a more varied approach to argument development. Seigel suggests that many educators interested in teaching critical thinking to students became frustrated with the formal logic approach because they believed it "did little to enhance the reasoning ability of students, especially with regard to the sort of reasoning required in ordinary, everyday situations" (75). Many authors suggest that formal logic procedures, while at times useful for certain analytic functions and certainly helpful in presenting arguments, were not flexible enough to meet the demands of "ill-structured" situations requiring creative development and application of various reasoning skills. Out of this dissatisfaction grew the Informal Logic Movement whose adherents propose teaching students specific skills to apply to "everyday " problems (Blair, Fernside, Holsher, R. Johnson, Scriven).
Commonly listed skills are linear ordering, classification, creating a premise or hypothesis, evaluating evidence/arguments, and analysis and synthesis of information.

Other authors of critical thinking texts using a skills approach concentrate on teaching skills related to the experimental or scientific method of inquiry (Kitchener 79). This method involves observation, formulating hypotheses, testing the validity of the hypotheses, and drawing conclusions in every conceivable subject area. This might include discussions of deductive and inductive hypothesis formation, operational definitions, populations and samples, and variables. (Halpern 222). However, features of this approach, especially hypothesis formation and testing, can also be noted in critical thinking programs based in literature analysis and appreciation (Rubin 103-113).

Perhaps the most popular method of improving student critical thinking is to teach skills that improve problem-solving abilities. Many problem-solving texts provide a basic plan students can use to analyze and solve presented problems. For example, Halpern’s chapter on problem solving instructs students to determine a situation’s “initial state” (where you are), “goal state” (where you want to be), and “problem space” with its variety of “solution paths” (where you must choose the best means of achieving your goal from all possible paths) (350). There are specific skills to be learned to accomplish identification of each problem component and with frequent practice students learn to apply these skills to a variety of problems. Even “ill defined” problems with unclear goals and hard to define solution paths can be overcome if students practice prescribed analytic skills (Halpern 355). Jenseth (1993) reports that a majority of the 1600 ERIC “critical thinking” articles he reviewed for his research related to problem solving (130).
Critical Thinking as a Mindset

A second definition of critical thinking describes it as a reflective, questioning process—an attitude, disposition or mindset related to intelligence and personality traits (open-mindedness, tolerance of uncertainty, wholeheartedness). Perhaps John Dewey, in his text *How We Think* (1910), began the discussion of critical thinking as a mindset. His often quoted definition of critical thinking, “active, persistent, and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it and the further conclusions to which it tends,” describes an attitude, rather than a set of distinct skills (6). In the summary of his chapter, “What Is Thought?” he states:

Reflective thinking [his preferred description of the critical thinking process] is always more or less troublesome . . . it involves willingness to endure a condition of mental unrest and disturbance. Reflective thinking, in short, means judgment suspended during further inquiry; and suspense is likely to be somewhat painful. The most important factor in the training of good mental habits consists in acquiring the attitude of a suspended conclusion and in mastering the various methods of searching for new materials to corroborate or to refute the first suggestions that occur. To carry on systematic and protracted inquiry--these are the essentials of thinking. (13)

In “Educational Goals and Reflective Thinking,” K. Kitchener (1983) suggests that Dewey’s conception of critical thinking describes not only an attitude, but also assumptions about the nature of knowledge, i.e., that “absolute knowledge” does not exist
Dewey believed "that permanent uncertainty is really a part of the knowing process and that the knower plays an essential role in constructing fallible solutions to problems." This description of critical thinking differs markedly from a skills definition, which often assumes that critical thinking's purpose is to follow a set of steps that will lead to the right answer, as in this textbook statement: "hypothesis testing is one way of finding out the truth about the world (Halpern 223)." Perhaps Capossela best describes the Dewian approach to critical thinking as "a complex, transactional, context-based web of activity involving the whole person" (2-3).

A more recent proponent of the mindset approach to critical thinking, educator/philosopher John McPeck, states that critical thinking "refers to a certain combination of what we might think of as a willingness, or disposition (call it an attitude if you like), together with the appropriate knowledge and skills, to engage in an activity or problem with reflective skepticism" (42). He further qualifies his definition in two ways. First, critical thinking is used when "standard or rational thinking" don't work and the thinker is forced to search for different paths. Second, critical thinking is "subject specific" and therefore requires "considerable knowledge of the subject area in question (42-3). Capossela, Duldt, Meyers, Nickerson, Perkins, and Smith, as well as a host of other current critical thinking authors, define critical thinking as a mindset that relies upon domain specific knowledge and skills. This definition was additionally endorsed by the American Philosophical Association at their annual meeting in 1990 (Facione 1990).

Although proponents of critical thinking as a reflective process put their students through many of the same operations as skills proponents--testing arguments, hypothesis
formation, and problem solving—they also would develop activities that help students adopt the questioning, uncertain, dissatisfied attitude that makes the thinking process reflective.

In summary, Dewey's approach to what he called "reflective thinking" has been validated and expanded by practitioners over the last thirty years. Anyone who has struggled to help students think critically recognizes that this is a complex process. Successful students need an understanding of the topic, repeated practice devising questions and analytic processes, and a willingness to express their own ideas and challenge the accepted. A combination of knowledge, skills, and critical attitude seems to promote effective critical thinking instruction.

Issues Impacting on Teaching Critical Thinking

Instructors attempting to help students think critically have to consider the pedagogical impact of teaching applicable skills and/or developing a critical attitude. Although related, these approaches certainly call for a different classroom emphasis. The literature suggests that instructors also must contend with two additional questions regarding critical thinking. First, is critical thinking domain or context based with little or no carry over of abilities among disciplines or settings? This opens up questions about the usefulness of teaching generalized critical thinking curriculum. Second, is learning to think critically tied to human developmental levels as suggested by William Perry. For example, do students have to be developmentally ready to question information from authorities—a prerequisite for theory evaluation? These concerns expand questions of what one teaches to develop critical thinking ability in students, to questions of where,
and when one might teach critical thinking. For example, what would be the appropriate difference in expectations of a technical article critique in a sophomore level engineering course versus a junior year class?

Generalizing Critical Thinking Abilities

Can teachers help students develop a critical, questioning view of multiple disciplines or domains? We might agree that once students developed a critical eye for things amiss in anthropology methodology, they might also use that same questioning mindset when looking at the methods section of an engineering report. We'd probably expect some attitude carry over. But what about the skills used to critique the two methodologies? Since anthropological methods differ from those in engineering, would students need to develop discipline-specific skills to evaluate each methodology? The literature says yes and no. Research says maybe.

Dewey (1933) and McPeck (republished 1990) each insist that, in order to think critically, one has to think about some troublesome situation or problem that is complex in nature. The complexity is the reason it requires reflection or inquiry. If it were a familiar or everyday problem, one would use familiar strategies or common sense to solve it. Therefore, in order to qualify as critical thinking, complexity is required (McPeck 12-13). In McPeck's view, one must have sufficient knowledge of a subject area to understand its basics before one can "be critical of it" (43). For him, discipline specific knowledge and skills are prerequisites for reflective or critical thinking (20).

Chet Meyers (1986), in his text Teaching Students to Think Critically, supports McPeck's view that the "core ingredient of critical thinking is the foundational or
epistemic knowledge of a given discipline" (6). Both authors support the view that the best critical thinking instructors are discipline experts who can provide students with a theory and a knowledge base and then teach them the critical methods used within the discipline (Meyers 13, McPeck 45).

In 1988 and 1989, the American Philosophical Association called together forty-five scholars to discuss issues related to critical thinking. Half of the participants in the Delphi Project, were philosophers and the other half were leaders in critical thinking research from education, social and the physical sciences (Facione, 21). This group formally debated generalizable and domain specific applications of critical thinking. Facione reports:

One implication the experts draw from their analysis of critical thinking skills is this: While critical thinking skills themselves transcend specific subjects or disciplines, exercising them successfully in certain contexts demands domain-specific knowledge some of which may concern specific methods and techniques used to make reasonable judgements in those specific contexts. (10)

Opposing this view are adherents of the Informal Logic Movement who believe that critical thinking includes common thinking strategies, as well as complex ones, that can be generalized. Stephen Norris, in his essay "Thinking About Critical Thinking," states this viewpoint: "Many people advocate the promotion of critical thinking ability because they take it to be applicable to a wide variety, if not all areas, of human concern"
(71). The scope of this belief can be appreciated by scanning the *Introductions* of past and current critical thinking texts. Text goals often include teaching the reader certain general thinking skills or strategies that they'll be able to apply to future critical thinking situations. Tuma and Reif (1980), in the Preface to *Problem Solving and Education*, speak of promoting a conference where diverse academics review “more convincingly successful projects effective in teaching widely useful problem solving skills” (my emphasis) (XI). These authors speak of “the problem solving process” and a “methodology of problem solving behavior that would be general . . . useful to all disciplines and professions,” clearly presenting the belief in across discipline, generalizable critical thinking skills (5).

A more recent example of the belief in generalizable critical thinking seems to show the influence of the domain-specific theory, although cross-over of skills is still suggested. Biddle and Clark (1993) suggest that “a method used by a history teacher to show students how to gather and interpret facts may be adapted to the business management classroom. A technique for teaching students to use the scientific method may be adapted to the writing classroom. Teaching in all the disciplines...should help students manage a particular body of information using particular strategies that they can adapt to use with more content or work in life itself”(3). While this view seems to suggest teaching critical thinking skills in specific disciplines (rather than in a generalized critical thinking class, for example), it implies, that with modification, certain critical thinking approaches or skills may be useful across domains.
Diane Haipern, the cognitive psychologist, in her 1998 article, "Teaching Critical Thinking for Transfer Across Domains," states that "numerous studies have shown that critical thinking, defined as the deliberate use of skills and strategies that increase the probability of a desired outcomes, can be learned in ways that promote transfer to novel contexts" (449). (See also Elder, Gibson, Mottershead, Paul, and Zohar). Like Dewey, McPeck and Meyers, Halpern demands that only complex, higher order analytic processes be considered "critical thinking," but unlike these three, she believes that complex skills and attitudes can be taught and then generalized successfully across unrelated domains (451).

Further research and information about domain-specific critical thinking strategies is critical to all instructors who develop courses that promote critical thinking and to the students taking them, because all parties involved need to discuss issues of skill carry-over. With the jury being out in this area, it behooves subject matter instructors to pay attention to research generated in their own disciplines, since these studies can present critical thinking instructional strategies that work for students in these majors. The current research indicates that students need, at a minimum, some basic knowledge in a particular setting, and appropriate critical skills and attitudes (especially self-assessment of progress) in order to successfully perform higher level analytic functions.

Critical Thinking and Developmental Theory

Many teachers who promote analytic activities in their courses, whether it be critiquing a journal article, or synthesizing the effectiveness of fiction components, like plot, characterization, and setting, are frustrated by the students' poor performance. Even
when the processes are repeatedly modeled by the instructor and supported by individual conferences and peer groups, large numbers of students fall short of faculty expectations. Instructors frequently question their assignments and methods, and students' resistance to thinking critically. Certainly there can be deficiencies in each of these areas, but developmental theorists suggest that poor performance may be related to human schooling and experience (See Perry, Kitchener, Shapiro).

Cognitive psychologists have long theorized about and investigated human developmental levels (Perry 1998, Piaget 1977). In terms of education, these theories promote matching instruction to a developmental level to maximize learning. For example, the primary school practice of teaching reading to six year olds is based upon research demonstrated that most children at age six can not only learn to read, but also can retain the process. Many four year olds can also learn to read, but retention of content is less dependable. Human developmental theory has impacted on instructional and curriculum design.

William Perry's 1970's research report *Forms of Intellectual and Ethical Development in the College Years: A Scheme*, is perhaps the seminal work for cognitive developmental positions in young adults and adults. Perry, working with Harvard and Radcliff students over their college careers, recorded students' perceptions of learning and knowledge making. He and his associates determined developmental positions for these young adults that trace their erratic and sometimes recursive moves along a "helix of cognitive maturity" (97). Educators interested in teaching higher level cognitive skills that ask students to judge, to expand theories, to make connections between seeming
disparate ideas and produce new ones, have been paying attention to the possible connection of these abilities and Perry's developmental levels to students in higher education. Perry defines the following "positions" of cognitive development for adult learners:

1. **Basic Duality** The student views the world in opposing ways—right/wrong, good/bad. Authorities give knowledge; the student learns it.

2. **Multiplicity Prelegitimate** The student appreciates all-knowing authorities who make them solve Prelegitimate problems that give true knowledge and help them find the right answers.

3. **Multiplicity Legitimate Subordinate** The student notes authorities disagreeing among themselves as authorities work to find the right answers.

4. **Multiplicity Correlate or Relative Subordinate** The student believes all authorities' opinions are equally valid when the right answer is not given. The student notes times when authorities want her/him to prove and evaluate opinions, rather than discovering the right answer.

5. **Relativism** The student believes everything is relative to its context and thinks about ways of thinking. Theories are not truths, but ways of examining ideas. Relativism pervades all areas of life.

6. **Commitment Foreseen** The student first realizes that she/he must make her/his own decisions in all areas of life and communicate those decisions.

7. **Initial Commitment** The student makes a commitment in some area.
8. Orientation in Implications of Commitment  The student experiences the implications of commitment and explores issues of responsibility.

9. Commitment  The student develops several commitments and recognizes she/he must at times chose between them because of external factors. The student recognizes that life is full of commitments and choices and that factors will continue to make her/him reconsider commitments.

Although Perry's scheme is controversial and has been questioned on issues of gender and class representation in the studies (See Belenky, Clinchy, Goldberger and Tarule on women; Bizzell on class), additional research in both areas lends credence to the existence of similar cognitive developmental positions for those outside the Harvard experimental group (See Capossela, "Using." 53, 54, 62). Since evolving critical thinking theory connects to developing in students a reflective, questioning attitude, as well as complex skill acquisition and application, Perry's cognitive developmental positions have important instructional implications. If young adults and adults are situated along a developmental continuum that ranges from binary thinkers (authorities teach me right and wrong) to committed relativists (I make the best decision I can in a given context.), then instructors attempting to develop questioning attitudes and critical thinking strategies need to be aware of this.

Shapiro's 1984 research project with University of Maryland undergraduates validated a connection between demonstrated complex writing abilities and Perry's developmental levels. In a quantitative study of 70 essays, Shapiro found a statistically significant correlation between students' developmental levels and writing competency
(topic ideas, organization, vocabulary, and style) and writing context (making adjustment for audience and purpose). Perry's position 4 (Multiplicity Correlate) and position 5 (Relativism Subordinate) directly correlated with student abilities (125-126). These positions demand recognition of multiple opinions and readiness to evaluate ideas based on the student's knowledge.

Caposella believes that Perry's developmental scheme has connections to students' acquisition of critical thinking abilities and attitudes. She notes parallels between Perry's highest developmental level, Committed Relativism, where individuals take responsibility for their decisions and recognize their fallibility, and Dewey's analytic concept of "reflection," in which "with respect to education, no separation can be made between impersonal, abstract principles of logic and moral qualities of character" (Dewey 34). Halpern's "metacognitive monitoring" component in her four-part critical thinking model also refers to the moral responsibility of thinkers to continuously monitor the quality of their own analytic processes and products: "Metacognitive monitoring skills must also be made explicit and public so that they can be examined and feedback can be given about how well they are functioning" (454).

If Perry's findings are consistent across student populations, and growth up the scale is directly related to schooling and not age or intelligence, then all faculty promoting student critical thinking activities need to be aware of the developmental barriers they might be up against (215). Issues of sequencing and repeating critical thinking activities across all courses in a given major become critical if graduates are to enter the workplace
or graduate school functioning at the higher critical thinking levels required in those professional areas.

Summary

One wishes there were verifiable assumptions about improving student critical thinking so facilitators could offer effective guidance to instructors anxious to promote critical thinking in their courses. But this is not yet the case. While critical thinking theories and philosophies abound, empirical research results are only slowly appearing and are difficult to assess because they range across disciplines and appear in diverse publications. Despite the lack of quantitative results, critical thinking specialists are asking important questions that need to be explored by all those concerned with improving student thinking as professionals in their fields.

• Is the level of critical thinking needed by successful professionals in the workplace dependent upon teaching students specific thinking skills, or developing questioning/reflective attitudes, or both?

• Can critical thinking abilities be generalized across situations and domains and therefore be taught in informal logic or problem solving classes for all students? Or is critical thinking domain specific and best learned when situated in discipline specific courses?

• Is critical thinking success closely tied to the developmental levels suggested by Perry? For example, can a critical attitude be expected only in students who are already beyond dualistic thinking?
Chapter Three of this study reviews the project's research methodology. It also profiles the participants' knowledge of critical thinking theory, instruction, and the types of critical thinking and writing assignments they use.
CHAPTER THREE
RESEARCH METHODOLOGY AND FACULTY PROFILES

Methodology

Qualitative research provides a way for the researcher and the project participants to work together to investigate a problem or opportunity of mutual interest, often with the researcher recording data by means of observations, interviews, and/or document collection (Glesne and Peshkin 1992, 11, 24). There are numerous approaches to qualitative study. Harry F. Wolcott, in “Posturing in Qualitative Inquiry,” suggests that all qualitative studies have “dual facets joined in complementary opposition . . . the ideas that drive the work and the inquiry procedures with which researchers pursue them” (6). He limits “idea driven research” to three types: theory-driven ideas, concept-driven ideas, and reform or problem focused ideas directed toward redress (7).

This study typifies a problem-oriented project. Faculty were struggling to create assignments that successfully fostered critical thinking and critical writing for their students. Each participant desired to “reform,” or more precisely, improve their instruction and enhance student learning outcomes. As an aspiring administrator, I was curious to see if faculty collaboration about teaching critical thinking and writing would impact classroom assignments and evaluation. Without question, I was looking for information that could lead to faculty training seminars that provided both needed and useful information.
This research was not theory driven, but rather used the analysis of participant responses at the workshops and in the interviews to generate “descriptive findings” that would be of use to others involved in faculty development programs (Wolcott, 21). Adherence to qualitative research procedures was critical if the information was to be useful to readers. Since observations and interviews are interactive processes between researcher and participants, it was necessary to find ways for the researcher to step back and analyze collected data and her own role in that process.

Qualitative researchers (see Glesne and Peshkin 1992, Howe 1988, Mishler 1986) support flexibility and responsiveness by researchers, but also suggest structural procedures that support the investigative process. Wolcott labels three possible types of procedures that are the mainstay of qualitative research: experiencing, “which includes watching and listening; enquiring, “in which the researcher’s role becomes more intrusive than that of a mere observer,” and examining, “in which the researcher makes use of materials prepared by others”(19). This study required all three procedures, with “experiencing and enquiring” being the most extensively used techniques because of the workshop interaction and interview format.

Organization of the Study

The project had three components: three interactive workshops spaced one week apart, two sets of student papers with faculty comments, and follow-up interviews. The workshops were held for one hour each week for three weeks in a private conference room convenient to all participants. Boxed lunches were provided by WAC grant funding.
In Workshop One, "Identifying Evidence of Critical Thinking in Student Writing," participants were asked to bring sample student papers (with their comments) to the session. Prior to the workshop, participants received a list of eight critical thinking skills developed by Biddle and Clark to suggest types of skills commonly identified and were asked to reflect upon activities in their writing assignments that could be categorized as critical thinking activities (8).

Workshop Two, entitled, "Responding to Inadequate Thinking in Student Writing," participants were asked to bring examples of inadequate student thinking in papers so that the group could discuss ways to 1) give useful comments to the students that would help them to clarify the expression of their ideas and 2) analyze possible problems with the assignment. In the final workshop, "Creating/Improving Critical Thinking Written Assignments," participants were invited to present any troublesome written assignment to the group for review and advice.

Additionally, faculty were asked to supply two sets of student papers. The first set was to be used during the seminars to discuss various topics related to promoting and evaluating critical thinking and to focus on the comments faculty regularly used to respond to students. A comparison set, collected during the late spring follow-up interviews, was to be used to determine if the faculty had altered their assignments or comments on students' papers based on the information gained during the three March seminars.

Participants were interviewed approximately six weeks after attending the workshops to determine their reaction to the information gained, to determine if they had
implemented any changes in either a written assignment design or their comments to students on critical thinking assignment papers, and to elicit background information about them as educators. Interviews lasted between one and two hours, and occurred in the faculty member's office. All activities were recorded and later transcribed.

Data Collection and Interpretation

The aim of data interpretation is to be as true to actual participant statements as possible and to develop meaningful themes that enable a reader to note connections and differences. Themes emerge with repeated reading of the participants' statements. The researcher then develops codes or abbreviations to identify the themes as they appear in the transcripts and notes the frequency of their appearance, the participant involved, and the setting or any special circumstance surrounding the expression. For example, when reviewing the six participants' interview and workshop transcripts for their stated interests related to critical thinking and writing, I annotated all interest statements with the letter "I," listed them, and then looked for commonalities and themes so that I could report the findings. This process was repeated when identifying: faculty backgrounds, expressed training needs, critical thinking knowledge gaps, and new critical thinking ideas acquired at the workshops.

Following each workshop and interview I compiled notes and impressions of the interaction and later used them to verify and add to the transcripts that came from the recordings. After analyzing the data describing of the participants’ knowledge, interests, needs, interaction in the workshops, and critiques of the workshops, I again reviewed the presented material for themes and conclusions. These are presented in Chapter Five.
Workshops

I had a dual role as workshop leader and observer; I was “experiencing” the interaction of the six faculty, but also “inquiring” into their beliefs, knowledge and practices using critical thinking and writing assignments with students. Based on my WAC experiences, I selected the workshop topics and directed all associated activities. Each of the three sessions was taped and later transcribed for analysis. Each week, I listened to the recorded session in order to determine topic additions or adjustments for the next workshop. For example, research on the impact of grades on student critical thinking was shared in Workshop Two since the group had spent time discussing grading concerns in Workshop One. Additionally, a recap of discussion highlights was sent to each participant after the first two workshops, so the group could review topics before the next workshop. Appendix A lists the important discussion topics from Workshop One and Appendix B describes the highlights of Workshop Two.

I was initially concerned about my role as workshop leader, instead of participant, since it would give me the ability to control the direction of the discussion and inhibit faculty discussion of their own interests. Actually, this role enabled me to increase participation by asking each instructor for clarification of statements before we moved on to other topics. I was also able to remind the group of earlier stated comments or interests, since I had reviewed previous workshop tapes. The workshop recordings verified the diversity of comments from the group and revealed that most interaction was between the faculty.

My background as composition instructor was both useful and problematic because these teachers asked me, instead of each other, questions about writing pedagogy throughout the three
sessions. I received more questions than others in the group about composition instructional methods, which is not surprising since we were discussing student writing. The weakness in this process was that Peter and Julie had more experience than I did in writing-to-learn pedagogy. While they did offer suggestions, I believe Julie and Peter would have answered more questions if I hadn’t been available.

Interviews

For the interviews, which lasted one to two hours, I prepared a set of open-ended questions that appear in Appendix C. Although an attempt was made to ask questions consistently to each participant, their interpretation of the question, related clarifying questions to the interviewer and my clarification/response, altered the answers given. Mishler reports the fallacy of assuming consistency in interviewer-respondent questions and answers based on the voicing of the same questions to participant (43-44). He concludes that analysis of interview data must presuppose that the conversation between interviewer and each participant is not based on consistent interpretation of questions (53-54). “A question may more usefully be thought of as part of a circular process through which its meaning and that of its answer are created in the discourse between the interviewer and the respondent as they try to make continuing sense of what they are saying to each other” (53). It is assumed that the participants’ answers in these interviews were influenced by the exchange of follow-up questions and answers between interviewer and participant to clarify meaning. This factor was acknowledged in data analysis.

Each participant agreed to record the interview and a transcript was created for analysis purposes. In the interviews, my primary role was that of researcher. Since I had participated in WAC sessions or collaborated on teaching projects with all the participants prior to the research
project, the researcher-as-interviewer role was uncomfortable at first. Instead of a give and take of ideas about a particular problem or opportunity, I was taking down their every word. However, once the participant began describing instructional change and using writing, I became absorbed in listening for possible follow-up questions, and was able to relax. There was a brief “sharing of ideas between teachers” in all of the interviews that put me back in a co-participant role, but I worked to keep this to a minimum to encourage the collection of information.

**Student Papers**

Two sets of student papers with comments were collected from the participants at the first workshop in March and the interview sessions in late April. I decided not to include them in the research project since four of the six participants expressed embarrassment at the quality of their comments on student papers and admitted their need for improvement. Additionally, despite the announced Workshop Two topic, *Responding to Inadequate Thinking in Student Writing*, very little discussion concentrated on actual faculty comments (except for individuals to note how inadequate they were). The interest was in developing ways to improve the student’s thinking process; one-on-one or small group discussions were the recommended process, rather than written comments that prevented a conversation between teacher and student. Under the circumstances, it did not seem ethical to report any information about changes in the participants’ comments on student papers since they did not receive concentrated information at the workshops on this topic.

**The Participants**

While listening to campus faculty at WAC sessions discuss their student writing activities it became apparent that they came to these activities with different motives. There were
individuals working to improve their students' ability to write like professionals in their selected majors (patient plans in nursing, project proposals in engineering, a research article for publication in industrial technology). This group was working towards the production of a specific product. They were most interested in adherence to a pre-determined structure and with the elements of effective composition: clarity, logical organization, and conciseness (depending on the major and audience), in addition to paragraph transitions, and correct grammar and spelling.

Others in the sessions were equally concerned with weak student written documents, but were also tinkering with using writing to learn or evaluate a concept, a theory, an article, or very often, to have students demonstrate the ability to stretch their thinking about a topic. As a composition and soon-to-be literature teacher, I was interested in the work of both groups and took many months deciding on a research topic. In the end, it was my exposure to writing process pedagogy (See Applebee, Briton, Emig, Faigley, and Langer) and inexperience with using writing to learn with my own students that drew me to the latter group of faculty and an investigation of the emerging writing and thinking pedagogy.

I invited seven regular WAC session attendees, all interested in improving student writing and critical thinking in their respective disciplines, to participate in the project. Six of the seven faculty who agreed to participate in the workshops actually participated. Four attended all three sessions, while two, Joe and Ross, each missed one workshop. I believe my dual role as experienced classroom teacher (I returned to graduate school after ten years in the classroom) struggling to include critical thinking activities in my university classes, and graduate student needing reliable and complete information for my
research topic, helped me to gain a high level of cooperation from the six participants. Additionally, interaction at WAC functions prior to the study enabled most of us to experience each other's views and interests. Although only Joe and Dale were colleagues, the other participants had informally met each other before while attending WAC functions.

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<th>Name</th>
<th>Discipline</th>
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<td>0-5 years</td>
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<td>Dale</td>
<td>Aviation</td>
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<td>Elizabeth</td>
<td>Anthropology</td>
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<td>Joe</td>
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<td>Julie</td>
<td>Occupational Therapy</td>
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<td>Peter</td>
<td>Chemical Engineering</td>
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<td>Ross</td>
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Taking an in-depth look at these six participants and determining their pedagogical background, their beliefs about critical thinking and writing, and their knowledge of critical thinking pedagogy should help readers understand the diversity within this group. The next section offers the profiles of six good teachers trying to implement writing to learn activities in their classes to improve student critical thinking abilities.

Faculty Profiles

Dale

Teaching pilots to think critically in the classroom and the cockpit is a major focus of Dale's teaching. Since he trains students for a profession that has little room for error, he feels compelled to continuously develop critical attitudes and problem solving skills, so students will be able to approach unpredictable and often dangerous situations.
He reports past students' complaints about not having strategies for effectively solving problems on the job, and he attempts to correct this deficiency. After four or five years at the university, "when I started feeling like my head was above water," he began experimenting with different ways to promote problem solving and effective communication in the aviation department. "all of the thinking I do along those lines is designed to try to get students to think and improve their writing--and the two are so closely tied together. . . . So the writing is just another way to get them to think."

He laments that teaching students to think is tough work and regularly doubts the success of his efforts. For Dale, distracted students pose considerable problems because of their resistance to the hard work required in analytic and written activities. His response to the inadequate thinking presented to him in written assignments is his now infamous RD (re-do the assignment). He makes students re-do assignments until they get it right--using writing and conferencing to push them to improve their reasoning and communication process. The extra time this process takes (an estimated fifty percent increase in time spent with students) seems worthwhile because of the improvement in clarity of thinking and expression he notes for many students. But he's the first to admit that he regularly fails to motivate everyone.

To further encourage critical thinking, Dale requires students to come to class with questions from homework readings that are then used to direct the class discussion. Often he's disappointed with the lack of student preparation, but he persists. He hopes with time and repeated assignments they'll begin to take responsibility for their own learning and recognize that developing inquiry skills will be useful to them in their future
personal and professional lives. He tells his present students of calls from aviation graduates saying, "My boss told me since I'm a college graduate, I can go find the answer to the question."

Over the years, Dale has also expanded his tests to include essay questions that require applying learned information, concepts and/or theories to unfamiliar material, to give students an appreciation of real life problem solving. These activities have earned Dale a reputation as a hard nose. He knows students think carefully before registering for one of his courses because of the tough assignments, yet there are those who express appreciation for his efforts to make them meet high standards and expand their thinking and communication abilities.

Dale noted the problem of not having adequate time to cover course content, develop skills and attitudes related to career success (like timeliness and following directions), and still provide his students with the opportunity to develop as thinkers and problem solvers. He recognizes that developing critical skills in students is complex and extremely time consuming. He suggests that discipline-based demands, like teaching pilots to navigate and fly, consume time that might otherwise be used to create a "teaching thinking environment." He also believes that "training students to work within certain limits" is a teaching priority in aviation and disagrees with those who suggest that developing critical skills demands an open and free environment. He feels creative thinking and problem solving are not necessarily inhibited when limits are enforced. Dale sees all creative thinking as having a setting which imposes limits.
Dale requires a variety of critical thinking attitudes and skills of his students in written assignments, but an equally important skill that Dale promotes is following instructions to the letter, an important skill for pilots. All of his assignments reward students for their ability to adhere to directions precisely. He insists that students resubmit their work to him as many times as it takes to get it right, which creates a great deal of extra work for him. He reports that a number of his peers respect his demanding treatment of the student pilots, but that the same group also resents the extra time he puts in to accomplish his goals for them. "I’m setting standards for them, which doesn’t sit well."

One of his favorite activities is working one-on-one with students who are really trying to learn. He enjoys supporting students' inquiry processes (by asking questions) and works with them to recalculate problems or improve communication in written work. The student academic improvement from this personal interaction encourages him to keep spending the extra time, on the sometimes less rewarding, group projects.

*Dale’s Views on Critical Thinking*

- Discipline requirements (including learning to follow directions) are a priority and take time away from developing students’ critical approaches to thinking and learning.

- A good content base must be learned before students can be expected to think critically within their discipline.
• Effective problem solving and analytic reasoning is related to developing a "questioning" attitude as well as acquiring specific problem solving skills. Both are needed by successful pilots and other professionals.

• Creative problem solving and thinking takes place within some limits. Limits don't necessarily inhibit creativity, but are natural to most life situations.

• Analytic thinking and writing is hard work for most students. Many avoid it and some may not have the intellectual ability to succeed in challenging analytic activities.

_Dale's Pedagogical Interests_

• Promoting competency-based learning

• Understanding learning processes

• Raising thinking and writing standards for aviation students

• Revamping aviation courses to include more problem solving and activities that promote independent learning

_Elizabeth_

Relatively new to university teaching, Elizabeth is committed to educating students in archeology and anthropology in non-traditional ways. From her professor father and brief classroom experiences as a graduate teaching assistant, she came to her faculty position determined to reduce lecture time, increase active student learning, and improve student critical thinking and writing. She reports that she quickly "plummeted from a belief in lecture" and tried to shift a share of the responsibility for learning to students despite their desire for "lectures and a final." These endeavors have brought her
satisfaction, frustration, and mostly piqued her curiosity about teaching, especially as it
relates to writing-to-learn and extending thinking.

Because of her fields' often competing theories, Elizabeth focuses curricula on
foundational information from the archeological record, research methodology, and an
array of competing theories. In her lower division classes she uses textbooks and
professional articles to expand the students' information base, and to point out the
differing theories developed by professionals within the discipline. She often asks
students to research and present topics to the class (individually or in groups) and to
review theories and evidence presented in professional articles. In upper division classes
individual students present comprehensive topics to the class (which serve as the basis
for professional research papers), critique multiple articles, and develop and test alternate
hypotheses.

Much of her teaching is directed at developing the critical attitudes students need to
evaluate the often highly controversial material in her discipline. In the two semesters I
worked with Elizabeth, her classroom procedures evolved to meet the challenge of
developing critical writing abilities, as well as critical attitudes. Freshman and
sophomores often find it tough going to evaluate theories and evidence presented in
professional journal articles. Many of them summarize information, rather than
attempting to evaluate it. Originally, Elizabeth thought students could carry out this
activity with little assistance, but she came to appreciate the need for repeated practice
that modeled methods of evaluation. "I've got to take more time on these critiques. Do
some article analysis in class on overheads . . . make them [students] do one and a
revision.” Also her efforts have shifted to teaching components of an evaluation process, and being less concerned with the “correctness” of the final product. Although she demonstrates a standard critique format, she’s most concerned with evidence of “substance, linkage and support” [for expressed views] in the students’ writing. While she believes all these analytic abilities are important, linkage and extension of ideas are critical to student learning in her discipline. Elizabeth is concerned that students not stay “riveted in the particulars of the original ideas, but are able to think in metaphors and analogies to extend ideas.”

She readily admits this is difficult. Quite often students make incorrect extensions -- because they don’t have enough information or misinterpret the main point. Elizabeth repeatedly notes this on student papers, but has been unhappy squelching student risk taking by giving low grades to these missed attempts at extending and linking “disparate” ideas. In small classes she can verbally reward these attempts or write detailed comments on student papers, but in her large sections she admits to being beaten by the volume of work. “After reading the sixtieth missed reading or idea extension, I just write “no” in the margin. Think of what that says to them.” Numbers of students clearly impact on re-teaching and encouraging student analytic development for Elizabeth.

Elizabeth is at times frustrated by how long it takes students to develop critical attitudes. After a semester of diligent critical thinking instruction and activities in an introductory course, she reports “I saw little growth in the understanding that they [students] were supposed to be critical. They gave lip service to that idea--used phrases
like 'in my opinion or I thought'--but they really didn’t achieve a critical view.” She hopes to see growth over extended time, perhaps two or three semesters, and not necessarily in one set of critiques required during a fifteen week course. She also believes that having multiple courses under their belts will give students the needed disciplinary knowledge to confidently critique an “expert’s” writing--something novice students seem reluctant to do even when they perceive inconsistencies in arguments presented. Elizabeth worries a lot about time--especially the time spent on teaching analytic attitudes and processes and not anthropology/archeology content. She persists because understanding in both fields is dependent upon critical evaluation.

Like Dale, she struggles with students who resist putting the effort into developing critical writing and thinking skills. She feels many of her students don’t appreciate the time involved in developing critical thinking abilities and are reluctant to spend it when they are aware. They often work for grades only.

Elizabeth’s Views on Critical Thinking

- Archeology and anthropology demand critical attitudes. Students constantly need to evaluate theories and evidence in order to understand issues and suggest connections. Few students have these attitudes.

- Students need to write critically about the materials they study so they can enter the continuous debates within the discipline. Specific analytic skills and attitudes are needed to accomplish this goal.

- Critical thinking abilities develop with continuous modeling by the instructor and practice by the students.
• Students are capable of developing useful hypotheses that contribute to the
  archeology/anthropology knowledge base.
• Class size and content demands severely limit the time needed to effectively develop
  students analytic abilities.

Elizabeth's Pedagogical Interests
• Developing effective writing-to-learn activities
• Motivating students to develop critical attitudes and become independent learners
• Learning about varied instructional methods that promote critical thinking in
  individuals, small groups, and large groups

Joe

Joe never planned to teach. After being dropped into teaching pilots at various
aviation schools around the country, he settled into the role of instructor at the university.
Right away he was not satisfied with his teaching and student learning. "I have yet to
have a class go exactly the way I think it should have gone. There's something that could
have been done better . . . an example that could have been done, notes organized in a
better way, a problem for them to solve and it's never ending." Joe never had a true
mentor, but rather initially observed what other teachers did, and listened to student
comments about assignments from other classes to get new ideas for instruction.

He has come to enjoy interactive classes, with fewer formalized written projects
and tests, because he and his students get to share ideas and learn from each other.
Currently this is feasible only in his smaller, upper division courses where students have
already mastered required understanding about piloting different sized engine planes. He
struggles to assess student learning in this instructional setting, since it is unfamiliar territory for him. “I think it builds up the students . . . now did they learn anything? I don’t know.” He believes students enjoy these “exchange of information and ideas” sessions because they are active participants, and not recipients of lecture topics from the instructor. “They like it when they can come up with something that nobody else has come up with . . . and, boy, that’s a good feeling.”

Normally, Joe relies on objective tests to assess student learning. He combines short answer, fill-ins, multiple choice, and true and false questions, not because he thinks they are best, but because it makes handling the numbers of tests to grade manageable. He believes explanatory questions that would force the student to pull information together and would promote better learning, but with his numbers that is not an option.

Joe describes his written responses on student papers as “poor” since they tend to take over the student work by making too many suggestions. “I like to comment . . . but then I’m writing the paper almost sometimes.” He attributes this style of responses to his own experiences as a divinity student, where paper comments were long and helpful. He notes student writing problems, especially with the sophomores, who may have an idea but struggle to put it into words or sentences to communicate it clearly.

Because his department restructured courses, Joe is dissatisfied with the “rushing through material” he’s caught up with. He’s experimenting with covering a few topics well, to increase student learning, and he’s planning on writing-to-learn activities to do this. He believes, from discussions at WAC sessions, that his curriculum designs should
require more problem solving and time for students to wrestle with finding solutions before he helps them.

Although Joe’s department supports innovation, the work loads are heavy and there is little time to bring faculty together to discuss curriculum. He tells of having to work independently and not depend on others to be the driving force for change. WAC has provided support for his ideas and given him additional ones to use with his students.

Joe’s Views on Critical Thinking

- Students need time to think about problems if they are to generate acceptable solutions. Either they don’t take the time to do this or reflection is not built into assignments to promote it.
- Student performance in discussions is difficult to assess, but learning outcomes are sometimes achieved.
- Students can learn relevant information from each other that will help to make them better pilots.

Joe’s Pedagogical Interests

- Helping students learn to clearly express their ideas in writing
- Promoting independent learning attitudes in students through coaching
- Balancing time to cover curriculum content and promote student thinking and writing
- Assessing methods that demonstrate gains in student thinking

Julie

After six years of teaching occupational therapy (OT), Julie believes she’s beginning to foster in her students the appropriate critical thinking abilities needed in
their clinical work. Because of the ineffective instruction she received as a student in this area, she's been struggling to find instructional methods and the appropriate content to foster competence in diagnosis, theory application, and treatment plan development—all critical skills for an occupational therapist. Two OT instructors have acted as informal mentors for Julie during her six years at the university and collaborated with her as she attempted to correct the learning deficiencies she identified. She relies on them for ideas/solutions and also as sounding boards for her ideas before she implements them. Because of them, she has become active in both Writing Across the Curriculum and Instructional Development programs and been introduced to the OT publications and professional groups that support instructional improvement.

In addition to assessing patient needs and theory application, occupational therapists must be able to explain their treatment plans to patients, nurses, and physicians not familiar with the discipline’s language. Translation of theories and detailed explanation of treatment plans to these groups require students to select, synthesize, and summarize important information, and then effectively communicate it in understandable language. In OT, critical attitudes and specific critical thinking skills, as well as writing and speaking clearly, are paramount to success in the profession.

In a theory class that Julie was assigned to teach, student ability to appropriately discuss theory application on end-of-term tests and then later in actual clinical situations became the major goal of her instruction. Since typical lecture of content material did not prepare students for either type of assessment, she developed a technique called “breathing with students.” She reduces her prepared lectures to a few major points.
ignoring lesser bits of information she originally thought were important. Students are directed and redirected through activities that help them comprehend and apply the information to diverse problem settings. This is done in steps with constant written and oral discussion and analysis between Julie and the students. It enables her to check content “understanding,” a major concern for an instructor who routinely releases novice practitioners onto the public. Students acquire both critical attitudes and skills related specifically to the situation and the material. Julie adjusts the process to group needs, thus her description of “breathing”--inhaling and exhaling with students. Her students increased their grades on the course final from an average grade of 68 to one of 89. (She used the same test over a period of three to four years, so the increase is significant).

Julie uses writing to facilitate learning as well as improvement in communication. Again relying on her own problematic experiences as a student, she feels it’s important to list detailed directions and evaluation criteria in her required writing-to-learn or research assignments. After a group discussion of one of her assignments, however, she reported that her grading criteria lists sometimes produced the desired formats, but not necessarily clear thinking. “I list criteria in terms of the contents I expect in the paper . . . if their needs to be an abstract, introduction, literature review . . . but I don’t, in my criteria, spell it out to have thinking in there. I just assume that it’s all going to tie together and make sense . . . I presume there will be thinking. It will all be logical. It will all be orderly!” Despite efforts to verbally emphasize the thinking aspect of the assignment, students pay more attention to the format and are frustrated by their resulting low grades. Julie has
come to recognize the need to develop other methods of support for the required thinking process and not just the final paper format or behavior outcome.

Julie is experimenting with sequential learning to provide the necessary structure to improve thinking. With the help of a few colleagues, she has broken assignments into learnable critical thinking skills that she helps students develop over the semester and pull together into a complex product at the term’s end. This enables students to become proficient over time, synthesizing new abilities only after achieving competence in all required skills.

Julie has been experimenting with requiring reflective journals and peer review of written case study reports as a means to improve the thinking and communication skills her students need as professionals. She’s waiting to see if her efforts will produce improved performance with the seniors when they are involved in clinical experiences.

She shares her colleague’s concern for adequate time to help students rethink their errors, and is especially concerned that her terse written comments on student papers discourage rather than encourage the required re-thinking. After the twentieth misinterpretation of a point, her comments are often negative and don’t suggest a course of action for the student. She has concluded that instructor comments on papers don’t produce the desired level of improvement she wants, especially when she is teaching large sections of students. She and her colleagues are trying to determine other activities for these large numbers of students.

Julie’s attempts to develop analytic abilities in occupational therapy students are noticeable in all aspects of her curriculum. Like Elizabeth she has come to realize that
these abilities come with repeated practice over time and not in one assignment. But unlike Elizabeth, because of her six years of teaching experience, she’s had time to test and refine various instructional procedures and activities and also note improvement in student performance. She has additionally found that performance on the analytic/problem solving activities in her classes is now a strong indicator of performance in the senior year clinical experience for students. These successes have encouraged Julie to experiment more and this accounts for the frequency and variety of critical thinking activities in all her classes.

Julie’s Views on Critical Thinking

• Students need time to develop critical abilities—both to reflect on their learning and to practice them.
• Students need an adequate base of discipline knowledge to think or write critically about it.
• Most students can learn the critical thinking attitudes and abilities they need as occupational therapists if given appropriate instruction and activities. “Breathing” with students greatly facilitates this.
• Students can learn critical skills effectively with group sharing of processes and ideas. They enjoy learning from each other when given the opportunity.
• Time limits imposed by class size often diminish the effectiveness of comments on student papers that should be encouraging student rethinking of important issues.

Julie’s Pedagogical Interests

• Using writing to improve learning needed for clinical performance
• Assessing carry-over of learning from class activities to clinical behavior
• Reading about innovations in instruction
• Using evaluations to test content and encourage effort
• Using reflective journals to encourage application of knowledge
• Getting her department to discuss instructional methods
• Using case studies to improve learning

Peter

Peter’s interest in developing chemical engineers’ analytic and writing abilities evolved as he moved his classes away from the fifty minute, three times a week outpouring of information approach to learning, and developed what he calls a “holistic” approach, where students are actively thinking and writing as budding chemical engineers, in and out of class, throughout the semester. “I’ve also begun to feel that the vast majority of my teaching occurs outside the classroom . . . and that can just be casual conversations in the hallway or that could be students one-on-one or one-on-five in your office. . . . Just walking through and answering questions when they have them. Having an open door policy so that students can ask questions when they have them. So it’s at their convenience and not mine.”

He reports formulating long and short-term knowledge, attitude, and skill goals for each class he teaches and then determining the appropriate instruction, activities, writings, and assessments to help students reach those goals. Because of his own enjoyment of writing, he believes he can make a contribution to engineering education by developing ways for students to use writing to learn and to become better communicators.
To help students think, learn, and communicate their ideas, Peter has used a variety of writing activities: reflective, creative design journals; formalized lab reports; novels and article critiques; shorter, but more frequent research papers; and complex essay test questions. Sophomores through seniors are required to practice functioning as chemical engineers in increasingly complex ways as they work their way through Peter's courses.

His department, as a group, has committed to improving the analytic and communication abilities of their program majors and Peter has found support for his experimentation through Writing Across the Curriculum and Instructional Development programs, as well as his own reading in learning theory.

Peter believes the most important instructional activities he uses are those that “help students to select strategies for self learning . . . . I'm trying to get the students to start looking and saying 'when I don't have this, what things am I going to do to help me learn?'” Because of this concern, for Peter, it is important to model the way chemical engineers attack problems, both the traditional methods, like going through prescribed steps to test a hypothesis, and the non-traditional, erratic tentative starts and stops involved in other critical thinking situations. Peter believes it is especially important for students to recognize that professionals' thinking is not always clear cut and efficient. “I mean as painful as it is, I try and do things like this in class [extending an idea to other areas] . . . where I do it off the top of my head and show them my flawed thinking style and thinking skills. I don’t do that so they copy . . . but because I want them to get an impression [of the process].”
Peter has established a comprehensive instructional program that promotes student critical thinking. After a short lecture to introduce material, he uses group work, especially pairs of students working on specific problems, to give students support as they attempt to find solutions. He then encourages students to share and compare their methods, not only to clear up confusion, but so class members appreciate the possibility of multiple solutions, and learn to evaluate them. All of this promotes confidence in self learning. His sophomore engineering students read, discuss, and prepare journal entries for the work, *The Soul of the New Machine* (that details the environment and human interaction in a technical project with a short time line), so they can appreciate the pressures engineers routinely encounter and evaluate behaviors and practices in the field.

In addition to his non-traditional instructional program, Peter has developed assessments that encourage and evaluate student critical thinking. Early on, he recognized that letter grades could discourage creative or risk-taking processes necessary for chemical engineers. He believes engineering students will learn one method for solving a problem and the "rivet themselves" in it. They are afraid to risk a new method for fear of receiving a low grade. Peter believes faculty grading is mostly to blame for student reluctance to take chances. "We whack them if their extension [idea] is different from the one we had in mind." But he also admits that most of his assignments are very prescriptive because he’s teaching discipline-required procedures and formats where creativity is not appreciated.

He tends not to use letter grades on assignments that are meant to encourage “creative or free thinking.” He’s trying to get students to focus on the process of
generating ideas and not on “getting an A.” I ask them to create a “design or something that’s extremely open ended . . . that the answers can vary tremendously and all be correct,” and he uses a 1-5 point system to evaluate creativity and “how well you [students] communicated your idea back to me.”

Peter has had problems as he stretches his instructional repertoire to include more analytic activities. He reports that it easy for teachers not to clearly explain processes or just assume that students share their understanding of methods. For example, he pointed out that students might not know his expectations for an effective article critique if “I haven’t clearly defined what I’m looking for and what I want.” For him, modeling, and defining terms and expectations are important to the development of student critical attitudes and skills.

Students can also inhibit developing critical skills if they resist instructors’ attempts to move beyond passive classroom roles. Peter reports resistance among chemical engineering students to move beyond text books and lecture notes when searching for information, and strong initial resistance to creatively extending ideas and taking a side in an argument with no clearly “right” side. “Our students have a terrible time doing something like that because they want to know what the right answer is. . . . I don’t think they’re thinking clearly through [the problem]. Additionally, on written assignments he’s noted some students who seem to say “I’m going to do a real cruddy job on this. I’m just going to turn it in and get a railroad marginal grade.” They won’t put in the effort to improve their writing or “comprehensive skills.” He does believe that the majority of students eventually (after a semester or two) come to believe that his
assignments will “help them to learn on their own,” and are of value in their future careers.

*Peter’s Views on Critical Thinking*

- Student critical attitudes and specific analytic abilities need to be incorporated throughout the chemical engineering three-year curricula.
- Students are capable of learning critical methods if instructors model processes, provide a knowledge base, and clearly define and explain terms and expectations.
- Students need time to reflect on and to practice critical thinking skills if they’re to be successful problem solvers.
- Faculty have to develop new grading techniques to encourage critical thinking experimentation and risk taking.
- Critical abilities and attitudes promote independent learning -- an extremely important aspect of professional engineering.

*Peter’s Pedagogical Interests*

- Using his ability as a strong writer to promote student written assignments in his program
- Using group learning strategies
- Developing instruction that reflects students’ varied learning styles as determined by Myers-Briggs
- Developing writing-to-think assignments
- Using journals to extend learning
Ross

Ross expects more of his industrial technology students than he did previously. “If anything, I’ve become more strict over time. I’ve made a conscious effort, since I’ve moved into the college ranks, to include more communication type activities in my course work.” He regularly asks students to analyze new technological information, to prepare assessment reports and then present the information to groups, mimicking the workplace behavior expected of his graduates. Students are required to repeat various activities that give them repeated practice thinking and writing. He finds that with his “abstract” and “article critique” assignments student show major improvements between the first time they try one and the tenth. He believes he rewards improvement as well as the final product, and from his own experience with an encouraging instructor, he’s learned to write positive comments in the margins of student papers, as well as questions about problem areas (his sample papers indicate this).

But he’s the first to admit his limitations with writing. He’s attended the WAC-sponsored faculty writing seminar, working to improve his own clarity and form, and asked for a grammar and usage review so that he could better help his students improve. He knows the importance of polished technical writing and precise evaluations for anyone entering the field of industrial technology. “They [students] have to be able to communicate via the written word . . . The technology is going to come and go because of the dynamics of the technology, but the communication is always going to be there.” New graduates in his field are assuming management roles, in addition to traditional roles
as trainers and technical experts, so they are required to support and create precise written communication between engineers and technicians.

In addition to concentrating on written communication improvement with his students, Ross sees the development of "confidence and competence" as main goals. During their senior year capstone research project, which requires team development, assessment, and presentation of a comprehensive project, Ross has replicated workplace team meetings. Students must be prepared to update the group on their activities, then the entire group assesses and reports progress on the project and adjusts activities as needed. He has seen them grow in technical competence, as well as in individual confidence as they work as professionals do, and learn from each other.

He also has developed assignments that provide diverse team work opportunities. For example, in the senior capstone project students must choose to take either a leadership or support role. They also have the option of "rotating" roles as their project progresses to benefit from the strengths of each group member, and to give everyone similar opportunities as group members. Ross gives his students choices continuously throughout their program. He wants them to experience a "real world" employment culture where their responsibility will be to advise management of the best technical options available to the company.

Ross, his fellow instructors, department chair, and dean all support aligning instructional activities in Industrial Technology to corporate functions. "I get great support from my dean and department chair. They're always encouraging us to do things that are going to get our students into the mainstream, and by mainstream I mean our
industry.” Ross reports that he takes students into companies, and they audit practices and create professional reports to present to the corporate clients. He also has received financial support to attend national seminars dealing with science and technology to assist in curriculum upgrading. He modifies what he learns to fit into his courses, monitoring and reporting success and failure. However, his emphasis of instructional innovation interferes with professional writing in his field. Despite his department’s reputation as a teaching and service area, he still feels pressure to write articles and be involved with research. He doesn’t have the time to both publish and be innovative in the classroom.

He believes that many of his current practices are grounded in experiences gained from junior and senior high school teaching, as well as his current collaboration with department members. “I assimilate and pick up the best from all the people that I’ve been involved with over the course of time.” He has had a few informal mentors during his teaching career, who assisted him with instruction and curriculum, but he also enjoys trying out an idea that he hears at WAC sessions or conferences. Whenever a WAC session topic promises to address a particular problem he experiences with his students, he attends.

Aside from writing problems, Ross notes that his students have difficulty evaluating technological developments and written reports/articles on those developments, two key areas for his graduates. They also struggle with synthesizing ideas to develop new ones. He has altered his instructions in these areas to provide for more one-to-one or small group discussions, so he can model a “step-by-step” process of examining material for understanding and then synthesis with other information. He
shares written samples of the integration of multiple ideas with students so they can learn this difficult skill by using examples.

Ross' Views on Critical Thinking

- Students can learn to become both technically competent and to demonstrate confidence as professionals if given repeated and increasingly more challenging practice learning required material and skills.
- Students benefit from small group discussion and models as they learn higher level analytic skills like synthesis of multiple ideas.
- Students can learn analytic skills from each other.
- Students should be rewarded for improvement and not just the final product.

Ross' Pedagogical Interests

- Making classroom activities "real world"
- Building confidence in students so they demonstrate leadership
- Promoting group learning strategies
- Providing technical models to aid students with assignments
- Teaching students technical writing and presentation of information

This group of educators share the following beliefs or concerns:

<table>
<thead>
<tr>
<th>Belief or Concern</th>
<th>Faculty Supporting</th>
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</thead>
<tbody>
<tr>
<td>Students need time to process information and be analytic. This can't be rushed.</td>
<td>All</td>
</tr>
<tr>
<td>Critical thinking activities are extremely difficult in large lecture classes.</td>
<td>All</td>
</tr>
<tr>
<td>Students can learn critical skills from each other and invent knowledge</td>
<td>All</td>
</tr>
<tr>
<td>Analytic experiences need to occur</td>
<td>All</td>
</tr>
</tbody>
</table>
regularly for students throughout their college program if an advanced ability is to be cultivated.

| Content knowledge is needed before analytic activities can be successful. | Dale, Julie, Peter, Ross |
| Critical/questioning attitudes are needed before analytic activities can be successful. | Dale, Elizabeth, Julie, Peter |
| Critical thinking and problem solving skills need to be taught to students. Many don’t have them when they begin college. | Dale, Elizabeth, Julie, Peter |
| Analytic activities need to be modeled by faculty to aid students. Critical thinking in most life experiences occurs within limits and does not allow for total freedom to generate ideas. | Elizabeth, Joe, Julie, Peter, Ross |
| Grading of critical thinking should meet the assignment outcomes which may call for other than letter grading. | Peter |
| Student analytic efforts should be rewarded for the process and effort and not for the correctness of the end product. The goal is to reward the learning process. | Ross |

The faculty involved in this study have a wide range of experience teaching critical thinking and writing to their students, and each tends to go about the process in ways based on his/her disciplinary needs and personal experience. A more detailed analysis of their critical thinking and writing knowledge base and training needs appears in Chapter Five. Chapter Four presents the interaction of these articulate, motivated participants at the workshops and assesses the usefulness of that format in the promotion of critical thinking pedagogy.
CHAPTER FOUR
WORKSHOP REVIEWS

Current critical thinking theory and research information provide jumping off
topics for critical thinking training seminars. However, the most valuable source of
information is the faculty themselves. They have a wealth of knowledge about the kind of
thinking needed for professional success in their disciplines. They regularly use the
analytic procedures that success in their discipline demands, and they are aware of their
students' accustomed learning style and the inherent barriers to the kind of critical
thinking and writing they are trying to promote.

Chapter Three profiled the six teacher-participants, providing background
information about their understanding of critical thinking instruction and their efforts to
improve critical thinking and writing assignments for their students. This chapter
chronicles their working together. It describes three conversations centered around
student papers or assignments that were supposed to demonstrate analytic abilities. It
reveals the enormous power of collaboration among bright educators struggling together
to help improve student learning.

During the three workshops faculty used writing samples and assignments from
their courses to discuss critical thinking and writing, and problems they experienced
trying to promote these activities. The papers and sample assignments directed the
discussions, so the participants' comments were connected to their actual classroom
practices. I have edited the discussions so that the written presentation examines one topic at a time, rather than the sometimes disjointed sequence produced through informal conversations.

Workshop One

The first workshop was designed to elicit the group’s views on categories of critical thinking they were actually using in their class assignments, to assess the quality of student work received, and to determine the knowledge and skills students would need to improve. Prior to the session, the six participants reviewed one of their own student papers for evidence of critical thinking. At the workshop they shared their student papers and then debated, labeled, and listed thinking processes they considered critical. No attempt was made to rank or screen the types of critical thinking observed, but only to note and evaluate the ways students gave evidence of thinking in their written assignments and to identify barriers to thinking. Since the student papers showed inadequate thinking and communication of ideas, at the end of the workshop, the faculty chose one especially troublesome skill and brainstormed each skill or knowledge component needed by students to successfully perform this assignment.

Because few of the participants were familiar with the popular language of critical thinking, two weeks prior to the meeting I asked them to consider eight critical thinking processes identified by Biddle and Clark in their text as a jumping off point when they examined student papers (8). I additionally informed them of the possible division of critical thinking process into “skills” and “attitudes.”
This group of terms is commonly found in texts that discuss critical thinking:

- selecting ideas
- interpreting
- connecting ideas
- classifying ideas
- extending ideas
- drawing conclusions
- applying ideas
- creating hypotheses

**Finding Evidence of Critical Thinking**

Dale, the aviation professor, began the examination of student papers. His assignment asked students to compute navigational distances using trigonometry three separate ways and to compare the answers to computer calculations. His goals were to make students aware of the complexity of a computerized flight management system and to give them confidence that they could self-compute flight direction if the computer system failed. Dale read one student’s conclusion section to the group. “I found that virtually every one of Pat’s thinking skill items (selecting ideas, connecting ideas, extending ideas and so forth) exist in this conclusion. Which really kind of surprised me. I never thought about it this way before.” Dale explained that his student was not especially strong in aviation, but had done well on the assignment because of his inquisitive attitude and ability to admit when he didn’t understand. He thought the comment, “I was puzzled by this,” was a notable indication of analytic thinking in the attitude arena.

He’s saying something is not right here. We call that the phlegmiest feeling. It’s a word used by the Brits which means confused, slightly disoriented, more a feeling down here (points to abdomen) than a logical thought. We train each pilot to use that as a tool. Because if they’re in a cockpit, it may be the only tool they
have to find out that something’s not right. . . So I think we need
to add to the list here, is that in the thinking process, we need to
learn to use feelings as input data.

Dale was also impressed that his student sought assistance once he had
determined that he was “puzzled.” At one point the student says, “The last formula
assignment really lost me.” Dale thought, “He couldn’t handle that one. He tried
numerous times to compute it and couldn’t get it to work. He’s asking to see this one in
class. Beautiful!” But in another section of the assignment the student gave up when he
was confused. Dale says, “It’s just that he failed when he was puzzled to go back and
look and see if there was really a problem.” Dale told the group that he re-taught the
information in the class session following the assignment so that he could praise the
student’s admission of not being able to complete the assignment, and of using a “gut
feeling” to note that something wasn’t quite right.

Although Dale’s goals and assignment grading were directly related to
computation and comparison of information, his discussion revealed a strong secondary
interest in cultivating a questioning or doubting attitude in his students, his “phlegmiest
feeling.” Another faculty member noted the discrepancy in what faculty value in student
performance and what they actually give grades for. Grading was noted as a barrier to the
promotion of non-typical critical thinking attitude building, because it often related to a
final product rather than the critical process. As others reviewed their student papers,
faculty noted problems with the emphasis they had given through their grading structure.
Peter, the chemical engineer, brought student papers from a journal assignment that required students to respond to the text, *The Soul of a New Machine*. This human and environmental account of technical development in one corporation was chosen, not only to expose students to the working environment during technical development projects, but also to practice a variety of critical thinking activities: critical review of processes, discovery, exploratory thinking, and extension of ideas.

However, an articulated main focus of the assignment was to give students practice utilizing their “impressions” as they read reports or observed activities in their field. For example, one of his writers responding to the text questioned company policies and actions. “I can’t believe this company was successful. I don’t like the way they managed it.” Peter’s journaling activities required his students to reflect on their feelings and his grading and the assignment structure supported the process. He believed “impressions” would drive students to analyze further . . . to doubt and question the correctness of the observation. “I guess I’m trying to get students to recognize that the impressions they get after doing something or reading something are very important to further skills of analysis.”

Dale wanted aviation students to learn to use feelings to identify danger or situations that could become life threatening. For him, the critical thinking process included feeling troubled, as well as the process of gathering information and analyzing it to identify the problem and then determine a solution. Although Peter’s chemical engineering students weren’t faced with life threatening problems, he believed, like Dale,
that “gut” feelings would drive students to be more analytical and to make the informed decisions required in the engineering profession.

Elizabeth, an anthropologist, and Ross, an industrial engineer, each brought papers that challenged students to link information and draw conclusions. Their professions value linking information to previously learned theories, situations, or facts. The nature of anthropology demands using the historical record and anthropological evidence to develop and substantiate theories. Linking disparate information leads to new theory formation, or clarification of information. Elizabeth stated, “They [freshman and sophomores] were able to pick up on some key words or say, ‘This is a model we discussed four weeks ago when we were talking about . . . Could this new idea be connected to the other one?’” Her sample student papers indicated that few students could perform this skill well.

She reported to the group that despite stressing the importance of this skill to her students, modeling connections of ideas and information in class, and providing for student practice, few students could successfully find and describe anthropological connections in the information she provided through readings and classroom presentations. Elizabeth included critical thinking assignments in all her classes, despite their size, and admitted to being frustrated and challenged by the undertaking in her large sections.

Ross’s students, who would serve as technology advisors for future employers, needed to be able to link or extend knowledge to evaluate new technology information often occurring in periodicals and trade journals. His article critique assignment required
students to read for and describe specific main ideas and then, “analyze and evaluate those ideas against what we’ve been discussing in lectures and demonstrations/activities in our laboratories and then draw a conclusion.” He added, “I want them to be able to analyze information . . . the purpose being, in our field, there are so many things that they’re going to have to evaluate (new happenings, new ideas, new techniques, new materials, new tools) and make a decision of whether they can use that in their company. Is that person giving you information that’s beneficial? Is this person giving you information that’s totally off track? Is it futuristic?” Ross decided that his assignment’s purpose was to help students synthesize information from different sources in order to make sound professional decisions about corporate changes or upgrades. The task was difficult for his students and he expected problems with initial assignments, but noted improvement with later attempts.

Julie, the occupational therapist, brought a sampling of student papers using journal entries to describe occupational therapy theories in terms understandable to lay people. “I ask students to summarize a theory in their own words, and they were not able to use handouts or copy things from their books. It has to be in their own words . . . their own language. I suggest to them lines that they might use to explain that theory to a nurse, or a social worker, or someone in a human service profession.” She felt students were practicing selecting appropriate information, synthesizing it and then summarizing it in non-technical language for a specific audience. She additionally used the activity to monitor theory understanding by students and felt the theory interpretation activity, because of its thinking, writing, and translation, improved student understanding
considerably (as evidenced on test scores). Lastly, Julie used this journal assignment to challenge students to apply the theory to a real life situation. “Say someone is depressed. Talk about what kind of problems they have and how those (problems) would be dealt with according to this theory. How would OT’s deal with those particular problems?”

She had adjusted this assignment and fine-tuned it so that students recognized the importance of the preliminary steps, i.e., understanding the theory well enough to explain it to a lay person, so that they could develop a plan to apply it to a particular therapy problem. Julie believed that individual discussion with her students, as they worked through this and other assignments, was critical to student success.

Joe, from aviation, led a discussion about needing adequate time to think through information. “If we’re going to have critical analysis and thinking, then students have to have time to think...sitting up in bed at three in morning. That’s what it’s going to take.” Joe described a process of reading, re-reading, percolating ideas, synthesizing ideas, organizing ideas, in order to effectively communicate them. Elizabeth echoed his concern for giving students the time to work on an assignment, “It’s difficult to discover what’s residing in an article to be criticized unless you’ve (students) taken the time to really, carefully investigate it several times.” She suggested that time would foster the needed syntheses of information.

Joe additionally believed, like Dale, Peter and Ross, that an important thinking skill was being able to determine that you needed more information before offering a decision, recommendation, or solution to a problem. They believed faculty needed to model research practices in their field and repeatedly give students practice with diverse
situations so that they came to know how and when to seek more input. Joe believed that in addition to understanding the need to seek more information, students needed to learn to take the necessary time to clarify their thinking about the information. They gain insight by taking a few days to just reflect on the problem. Having the time to think through the situation and gather information was as important as having the necessary research skills to find the needed data. Rushing decision making was not going to produce the best results. There was agreement among the group that providing adequate time for complex critical thinking assignments and motivating students to utilize that time was necessary but extremely challenging.

In an hour's time the faculty identified evidence of the eight Biddle and Clark critical thinking processes in the student writing samples and noted fifteen others:

<table>
<thead>
<tr>
<th>Skill Based Critical Thinking</th>
<th>Critical Thinking Attitudes</th>
</tr>
</thead>
<tbody>
<tr>
<td>translating information</td>
<td>recognizing and using a feeling</td>
</tr>
<tr>
<td>identifying the need for more information</td>
<td>applying impressions</td>
</tr>
<tr>
<td>identifying themes</td>
<td>discovering</td>
</tr>
<tr>
<td>identifying support for ideas</td>
<td>questioning</td>
</tr>
<tr>
<td>sifting ideas</td>
<td>criticizing</td>
</tr>
<tr>
<td>organizing ideas (in logical order)</td>
<td>developing a personal reaction</td>
</tr>
<tr>
<td>identifying bias</td>
<td>developing curiosity</td>
</tr>
<tr>
<td>analyzing information</td>
<td>struggling with unclear information</td>
</tr>
<tr>
<td>synthesizing information</td>
<td>estimating</td>
</tr>
<tr>
<td>decoding information</td>
<td>taking time to consider thoroughly</td>
</tr>
<tr>
<td>determining usefulness</td>
<td>challenging unclear data</td>
</tr>
<tr>
<td>determining main/important ideas(s)</td>
<td></td>
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</tbody>
</table>

Complexity of the Critical Thinking Process

As the group discussed the variety of critical thinking skills and attitudes their students had demonstrated in the chosen assignments, they were able to discuss students' lack of preparedness to successfully demonstrate those skills, as it often had been at
WAC sessions. In order to better understand the complexity of preparing students for critical thinking activities, the group brainstormed instructional strategies and knowledge elements needed to perform Elizabeth's and Ross's "linking or extending an idea." This particular critical thinking skill was selected as it was used in all the participants' disciplines. To focus the brainstorming, Elizabeth offered the following example:

My students were reading an essay that talked about the linkage between smallpox and blood type. The students, who cleverly succeeded in extending these ideas, talked about how natural selection shaped the distribution of blood types in the world's population, and how that might be related to the distribution of smallpox. They are going beyond smallpox and blood type to talk about evolutionary theory and how that might be helping us to account for observations that were made.

The group determined the following preliminary steps for students to successfully "link or extend an idea."

1. Establish a foundational knowledge base about the topic (vocabulary, concepts, principals, theories)
2. Understand the original idea and be able to articulate it in writing
3. Identify needed resources
4. Understand discipline specific research techniques
5. See faculty modeling of acceptable ways to link or extend an idea within the discipline
6. Practice linking or extending increasingly more complex ideas
7. Be able to link disparate ideas
8. Evaluate thinking as extending takes place
9. Be comfortable taking risks
10. Understand that taking a wrong step is a valuable learning experience and often necessary to successfully linking one idea to another
11. Be able to think in metaphors or analogies so they note commonalties

As the list grew, Peter commented that students often are taught by their departments that only certain links or extensions of ideas, which are departmentally sanctioned, produce letter grades of “A.” Variations from what is known and valued by faculty can bring punishment in the form of lower grades on assignments. Dale added, “In the process of extending ideas, we tend to squelch them when they have a wrong one (idea). At least they interpret that we do. We’re training them not to extend ideas!” The group agreed that “right and wrong” thinking on the part of instructors, and the corresponding grade actually discouraged students from taking risks and attempting the creative links that are often necessary for extending an idea. Peter added that he believed that appropriately rewarding this type of risk taking promoted the independent learning important in all professions. He tried to develop assignments that regularly helped students select strategies for self learning. In essence, students get so used to materials given to them . . . it’s sifted, it’s polished, and normally given to them along with concrete assignments to reinforce it. I’m trying to get the students to start looking and say, “When I don’t have this, what things am I going to need to help me learn?”
Dale and Peter debated if linking or extending an idea could be considered as part of hypothesis formation and testing. Dale saw the similarities since the process of linking or extending an idea had to involve testing or evaluating the “linkage proposal” as the student thought through the possibilities. To him, this was a form of hypothesis testing throughout the extension process. Peter, on the other hand, described the process of linking or extending an idea as “going out on a limb and perhaps sawing it off behind you.” He added, “It’s a creative type process where I’m not worried so much about the correctness of something or even trying to come up with something that is universally true. But it’s a creative aspect of my thinking. And that’s why I would differentiate it from coming up with a hypothesis.”

The group was silent when I asked them if linking or extending an idea might involve both Dale’s and Peter’s critical thinking processes. Although each of them required their students to link or extend ideas as they matured in their selected majors, the acceptable behaviors/processes in the faculty’s disciplines or their personal preferences limited the ways that they assigned and valued students’ linking or extension of ideas. The group seemed quite surprised, but interested, in the variety of ways they used this process, which accounted for the extensive list of preliminary learning required of students. There were a number of “ums and ahs” heard in the room as they discussed their different views.

They were surprised at the amount of preliminary work needed to give students the attitudes and skills necessary to extend ideas within their disciplines. As we reviewed the list of needed attitudes and skills that had been generated, I asked the group, “If you
were going to do this [help students to develop evolutionary theory by connecting small pox and blood type], where would the teaching come in beyond just giving them the reading assignment and directing them to extend an idea to some other area? Where might you have to do some pre-teaching before they’d ever make sense of it?” Ross commented, “Everywhere!” Dale believed that an instructor needed to check for comprehension of a knowledge base, as well as, an understanding of the concept to be linked or extended. Joe and Peter thought modeling the “idea linking or extension” was most important. Peter said, “I don’t think we show them enough how we do things; what we think and how we write and how we put these things together. Once they see that, it helps them.”

Finally, Joe and Ross brought the group back to a discussion of the enormous amount of time needed to prepare students for critical thinking assignments and to support them as they attempted the actual assignment. Joe believed, “We’ve got to give the assignment early and give them time to work it through.”

Researcher’s Observations

The faculty invited to participate in these workshops were motivated to improve the analytic skills of their students, so their high level of engagement in the discussion was not a surprise, nor was their honesty in admitting that some of their instructional processes were not working. I selected this group of faculty from the three dozen I had met over the course of two years because they were all somewhat frustrated with student performance, felt they might have contributed to the ineffective learning, and were hungry to improve. Even the more experienced faculty, who had been working to
develop student critical attitudes and skills, were not completely satisfied with their results.

During the first activity, all six participants identified critical thinking processes in both categories as they examined their student papers, despite being "primed" with a skills based critical thinking vocabulary. For this group of educators, critical thinking ranged from specific teachable skills (organizing ideas logically) to critical attitudes (developing curiosity). A Dewian sense of "uneasiness" necessary for reflective thinking was also identified (struggling). While reviewing discipline-based assignments and the corresponding specific critical thinking skills needed to complete them, the participants all noted the need for, or evidence of, critical attitudes. This dual approach to critical thinking was evident in each participant's assignments. This suggests that despite the separation of these processes for many in the current critical thinking debate, this group of faculty attempted to develop both critical attitudes and skills in their students, although only Julie and Peter actually rewarded students for their demonstration of critical attitudes.

After the discussion of a faculty tendency to grade end products and not the higher risk critical thinking processes and attitudes that were components of the assignments, Dale and Elizabeth each remarked that their assignments' grading systems were discouraging students from developing needed analytic attitudes. Dale was also surprised at the number of thinking skills and required attitudes in his class's navigational problem. The structured workshop activity had initiated discussion of the complexity of
critical thinking assignments, but it was the further sharing of practices by the group members that led to the grading issue.

The inappropriateness of traditional grading procedures for critical thinking activities was the most discussed issue at Workshop I and was also mentioned in the follow-up interviews. Julie and Peter, who had each experimented with analytic attitude and skill assignments, had scrapped an A-F grading scale whenever they were attempting to foster risk taking and creativity. The others did not seem to have needed information on alternative grading and listened attentively to Julie and Peter's descriptions of their practices. Follow-up interviews indicated uncertainty about evaluating the creative side of learning.

The faculty was also concerned about the resistance of many students to the time and effort needed to complete critical thinking activities. Each of them gave examples of students either not appreciating the level of work involved or not committing to the required effort. In light of the skills and attitudes that the group had determined to be needed to "extend an idea," the impact of developmental age might have suggested other reasons for the resistance. Faculty were not aware of the amount of schooling needed to bring their students to the levels required to "extend an idea." When you review the steps the group created, and equate a Perry level for each, it appears that this critical thinking activity contains attitudes that appear at the higher end of Perry's scale. For example, Relativism requires confidence to make sense of incomplete information and evaluate. The Applied Relativism level would be needed to take risks and recognize that making a mistake is a learning experience.
Here are the steps needed for students to successfully “link or extend an idea” and the associated level:

<table>
<thead>
<tr>
<th>Steps</th>
<th>Perry’s Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Establish a foundational knowledge base about the topic</td>
<td>1</td>
</tr>
<tr>
<td>• Understand the original idea and be able to articulate it in writing</td>
<td>1</td>
</tr>
<tr>
<td>• Identify needed resources</td>
<td>6</td>
</tr>
<tr>
<td>• Understand discipline specific research techniques</td>
<td>1</td>
</tr>
<tr>
<td>• Observe faculty modeling of acceptable ways to link or extend an idea within the discipline</td>
<td>3</td>
</tr>
<tr>
<td>• Practice linking or extending increasingly more complex ideas</td>
<td>4</td>
</tr>
<tr>
<td>• Link disparate ideas</td>
<td>6</td>
</tr>
<tr>
<td>• Evaluate thinking as extending takes place</td>
<td>8</td>
</tr>
<tr>
<td>• Be comfortable taking risks</td>
<td>8-9</td>
</tr>
<tr>
<td>• Understand that taking a wrong step is a valuable learning experience and often necessary to successfully linking one idea to another</td>
<td>9</td>
</tr>
<tr>
<td>• Be able to think in metaphors or analogies so they note commonalties</td>
<td>8-9</td>
</tr>
</tbody>
</table>

Since both Elizabeth and Ross were using the “extend an idea” activity with newcomers to the discipline, usually at the sophomore level, they would need to give considerable more practice to help students acquire the appropriate attitudes and skills, and lower their performance expectations. If Perry is correct, with adequate schooling and development of critical attitudes and skills over time, one would expect senior level students to successfully complete this critical thinking assignment at the level indicated in the list. Not being aware of Perry’s theories, the group spent time discussing ways to reward students for working hard (which in itself, is fine), rather than on ways to build student skills over time.

Ninety minutes may seem like a short period of time, but this group of faculty generated considerable information about fostering critical thinking and roadblocks that
interfere with the complex process. I noted the following areas as problem sites that faculty needed to be aware of while developing assignments.

1. Determining all abilities/skills/knowledge students needed to complete an assignment

2. Awarding students credit for the critical thinking processes that were often more challenging than the final products produced

3. Monitoring student progress so intervention could be provided when appropriate or requested by the student

4. Establishing a network of faculty peers to seek advice from when attempting new critical thinking assignments

5. Considering the implications of Perry's developmental levels for young adults and adults on instructional design

Workshop Two

The workshop was created to give faculty an opportunity to discuss responses to examples of inadequate student critical thinking. During the one-hour luncheon workshop, the group reviewed two anthropology assignments requiring students to critique journal articles. Additionally, since Workshop I had generated interest in appropriate grading of student critical work, I brought the group results of Langer and Applebee's two year investigation of critical thinking, How Writing Shapes Thinking, because it lent credence to their own thinking about the impact of grades.

Applebee's and Langer directed a project to assess connections between writing, learning, and critical thinking in the California public schools in the mid 1980s.
Curriculum specialists worked with teachers to revamp curriculum so that students' analytic skills would increase in measurable ways. Despite appropriate attitudes, team and mentor support, and curriculum advice, these researchers found that faculty undercut their efforts because of “binary” thinking about grading students’ work. I made the report available to the group and summarized the grading portion of the results to them while they were getting settled.

Applebee and Langer suggest that all of us (instructors) have been so trained to objective testing (right-wrong and true-false), that even when we grade an essay, we tend to think this way. We grew up with it, and it’s the only kind of schooling and evaluation that most of us have been familiar with. Even grading an essay, we tend to say you either got (covered) all the right points or you didn’t. And that foggy area, which is “thinking” or identifying things you don’t know well . . . that questioning stuff . . . well we’ve never had an opportunity to be rewarded for it, so we don’t reward our students (47, 136-137).

The faculty in the California project undercut their own success because the kids picked up on it quickly. They saw that there was no reward for independent thinking and questioning. When the final grade came down on the papers, what they were seeing was “I got a bad grade; I’m writing what he wants [now]” (47).

Ross asked, “What you’re saying is that even though we give them something that’s creative, defend your position type of situation, what we have is (a) preset, preconceived criteria within our mind that we want them to write to. And that’s what we’re evaluating against?”
I agreed with his synopsis and added, "Yes and it tends to be binary. We either say, OK they stated a hypothesis or they didn’t. And we don’t give any credit for the missed hypothesis . . . which is often what we see. From our discussions last time, we all agreed that the misses were evidence of critical thinking, too. So what do you think of their findings?"

Elizabeth added, "I’m terrified by how relevant this is to me. Just this morning I was grading a paper and in the margin I wrote NO! And then I realized, what am I doing to this student? He’s going to feel totally slammed. He was totally off! And I was mad because it was the sixtieth essay I’d read like this."

"I have the same problems," Peter reported, "but I’m wondering if in some regards evaluation and grading are not always going to be counter to open thinking on particular things . . . and I think inevitably we’re going to wind up stifling some student’s creative interests because maybe they showed good insight and stuff like that, but it was so poorly done that they wind up getting a C, and they interpret that as saying, “I screwed up and didn’t do well.”"

Dale added that "The evaluations I’m doing, particularly on seniors, only about 10% of the grade is given for creative thinking. The rest is given for all the other things that our society probably feels is more important--following directions, timeliness. Really not giving much credit for creative thinking and it’s a shame. But there are some other things we have to teach them that are pretty important, too. . . . It’s not a ‘teach thinking’ environment. That’s a negative way of looking at it."
Julie believed that she used the binary evaluation process as well. "In the last mid-term, when the students got their grades back they would say, 'I was just trying to be creative with this theory and make it work for this population.' And I think, 'Well yes, but it's not exactly right.' And I'm thinking in terms of right and wrong... however, they might have some valid points by stretching the theory. How do new theories develop if you don't stretch existing theories?"

“One of the ways I've tried to deal with that, with limited success, is to create different assignments," suggested Peter. "Like aviation, in engineering we have some set things that students need to learn from a technical viewpoint, and so some assignments are very cut and dried. Then I have other assignments—like a design—that's extremely open ended and answers can vary tremendously and all be correct. It's a very creative process. Grading is based more on how you (students) communicated your creative idea back to me. But students still complain and they say they have no creativity left by the time they are seniors; that we have stamped it out of their system by that time." Joe thought, "We start about seventh or eighth grade to get creativity out of kids," and Elizabeth thought it might occur "even before that."

Peter seemed the least surprised by the Applebee and Langer information about grading’s impact on student risk taking in analytic processes. He had already altered the grading of his assignments that demanded creative critical thinking or problem solving. Julie and Dale seemed to be somewhat familiar with the research findings, while they seemed new to Elizabeth, Ross, and Joe.
**Student Paper Reviews**

The first student paper the group looked at was an article summary in archeology. The students were asked to determine the author’s main point and evaluate the evidence offered to prove it. Since article reviews and summaries are common assignments in all disciplines, the group selected Elizabeth’s students’ papers for analysis. The consensus was that this type of assignment was appropriate for introductory level classes although many students struggle with doing it in an acceptable manner. Faculty were asked to note evidence of thinking and then determine how they might respond to students who “missed” important points.

*Paper One: Were Clovis Progenitors in Beringia?*

In C. Vance Haynes’ paper on “Were Clovis Progenitors in Beringia?”, the author makes very strong points to support his thesis. It seems logical that people moving over the land bridge would have brought Clovis technology with them. They would have made this trip in search of animals for food and clothing. Since these people would have been looking for new and better sources of food, it would have required them to move into Canada and later down into Mexico and South America.

An essential point is made when the author states a fact about Siberia and far eastern U.S.S.R. He has defined the Dyuktai culture as a technology of wedged-shaped...
cores, microblades, and bifaces used by people hunting Pleistocene megafauna at least as early as 18,000 years ago. By 10,000BP, a clearly related culture is in Alaska (Haynes, 1982). Although the information clearly makes a strong point, he admits that there is a meager amount of information. For instance, the only explanation he can come up with to solve the problem of an area that has no microblades is that another separate culture must have existed. This seems to be a weak assessment because how could two cultures in close proximity not use the same technology. It would seem logical that some transfusion would have occurred.

After reading this paper. It appears to be well written and organized. The author has compiled the facts, and has pointed out the weak points and tried to support why he feels the way he does. For this reason I believe that Clovis technology did move from the U.S.S.R. into North America.

Faculty Analysis

Elizabeth suggested the student totally missed the main point of the article, but then tried to organize an argument based upon the misinterpretation “The [article] point
was that Clovis technology developed here after the people came. They [came] at a time much more ancient than the technology. So it’s thinking, but it’s inadequate thinking. It’s not tying into the actual observed truth about the archeological record.”

Julie noted the student stated that it seemed “logical that people moving over the land bridge would have brought Clovis technology with them,” and then moved to give “some reasons it seemed logical for that. So they [writer] seem to have some backup for why they’re thinking about a particular thing. It’s hard to follow in terms of their grammar and sentence structure.” Ross concurred, “They [writer] made the assumption that they (ancient peoples) brought it with them rather than taking a look at the question as to whether or not they brought it with them or if they developed it here.”

Dale noted student “thinking” in the next to the last paragraph when the student says, “This seems to be a weak assessment because how could two cultures in close proximity not use the same technology.” He states, “There was some thinking that went on there even if the writing was a little difficult.”

Peter was concerned with the student’s belief that if a piece is published, it has credibility.

I love the last paragraph though because it seems to [say] if it’s written down and in a book or something, that it must be good. When you read through these (student papers) you see a lot of this. “I thought the article was easy to understand. After reading it, it appears to be well written and organized by the author.” And so I think this is something that we have to overcome [with] students,
that they feel that just because it is written down somewhere, that it's well done.

Dale added that the student was also using feelings because he said, “Basically, because I trust the author, I believe the Clovis technology did move from Russia.” Despite the fact that the student missed the main point of the article, and the resulting thinking was off track, the group agreed the writer did make an effort to reason and then communicate her reasoning.

The group identified evidence of the student’s thinking critically in the following categories:

- She collects some facts the author presented to back up her assumptions.
- She identifies an argument that seems illogical.
- She identifies gaps in the data.
- She uses her feelings to evaluate the author’s credibility.

To further examine the issue of appropriate grading of “thinking” activities, I asked the faculty to discuss how they would “grade” this critique. Peter wanted to know assignment details, i.e., homework or test, when in the semester it had been assigned, and how much practice the students had been given.

Elizabeth explained that it was the first critique in a series of seven or eight during the semester, but the students had had classroom experience finding a main point and supporting evidence. She had awarded the critiques points 0-10 (with 10 being the best).
Peter and Julie debated between the letter grades B and C. Peter thought a grade of B would not discourage the student, but thought it important to communicate that the student needed to “work a little bit on your logic and thinking.” Julie thought a C was appropriate “because they didn’t get the point, they missed it, and I think giving them a C is more motivating... an A or B for a lot of students is just fine. I think a C suggests they really should move.”

Ross decided on a low B or a high C. “I would probably put red ink all over it trying to get them to understand what we’re trying to do with this particular assignment—so in successive ones [assignments] they would be able to build on their skills as far as analysis and evaluation.

Dale suggested a “Re-do”, a clear message that the work was not good enough to be submitted for grading. “I’ve sort of operated for a long time on the philosophy that if you put a lot of red ink on the paper and give them a grade, the students going to take a look and say “oh well” and move on to the next task and never really perfect this one. Then when they go out in industry they’re going to go into that first job expecting that if they do a 70% job, it will be considered a good job.”

Peter added that it was his custom to think about learning goals when determining how to grade assignments like this. “Am I attempting to help the students to learn, to evaluate and to write effectively, or am I trying to use it as a mark to evaluate their position in the course? My goal would be for my students, by the end of the course, to be able to do this effectively. If I’ve discouraged the students in the first weeks of the course, I’ve lost them for the next fourteen. And so I think at the beginning of a course
when you’re introducing students to a new style of thinking, you have to be careful about discouraging them too much. Or they’re going to essentially say ‘I can’t do this; I don’t have the ability to do this.’”

Julie suggested that she might tell the student outright that he/she had missed the point and needed to re read the article. Elizabeth repeated her concern with giving very terse comments, rather than directing the student to reexamine the article when she was faced with large numbers of student critiques. “There’s always the forty-third paper that you get and you kind of get tired. My comments get shorter and shorter.” Dale commented “You end up writing a lot, but you do have to include a Thank You for this effort.” There was not consensus among group members about grading a paper of this quality although encouraging the student to rethink and rewrite the piece was included in each faculty’s suggested comments.

Paper Two: A Pox Upon Our Genes

Because of time restraints, the group spent approximately fifteen minutes examining the second student paper, which reduced both the breath and the depth of comments. Elizabeth again set up the assignment for the group since this was another required article critique from her introductory anthropology class. The article theorized that there was a relationship between blood type and resistance to smallpox. This is the student’s critique of the article.

“A Pox Upon Our Genes” was an article written by Jared Diamond. The main topic of the story is about a virus called Smallpox. Smallpox is not common today
because the virus has not been passed on and would be very hard to keep alive in this day and age. Jared Diamond explains to us the reason why the Smallpox virus doesn’t spread throughout the population and there are many reasons such as the fact that animals can not be infected by the Smallpox virus, there are four different blood type and they have a big effect on whether the virus can transfer or not. The four blood type are A, B, AB, and type O. Each one of these types has different antibodies, so some people are more susceptible to Smallpox than other people. To sum up what Jared Diamond said is that in a small population the Smallpox virus can die off much easier than in a large population.

Jared Diamond told us about some of the studies he along with Dr. F. Vogel and Dr M. R. Chakravartti did. First he explained the different blood types which told us how important it was to the experiment he did. Jared Diamond agreed with Dr. F. Vogel and Dr. M. R. Chakravartti’s experiment. He considered them to be correct. He stated that they used a much less biased set of “experimental” subjects, and that a set of control subjects
matched better to the experimental subjects, and a greater selective effect of the Smallpox virus.

I thought that this article was easy to understand and comprehend. The vocabulary was at a good level, and understand the concepts he mentioned about the Smallpox virus being spread, and why it is no longer a problem today.

Faculty Analysis

Elizabeth had awarded the student five out of ten points for the critique since it was one of the first critique assignments for the semester. She indicated to the student that the student’s summation of the author’s main point was “not his key point” and wrote in the margin: “linkage?, bias?, facts?” This was one of about fifty papers she graded. Elizabeth explained that the student had missed the article’s main idea and incorrectly suggested that smallpox eradication was related to population size. After making this erroneous assumption, the student then abruptly switched topics and detailed research evidence to support the idea that blood type impacted on susceptibility (which was the correct thesis) to support her missed interpretation.

The group struggled to find evidence of thinking in the student’s paper. Peter and Julie instead suggested ways to help the student start over with the assignment. Peter thought the student didn’t know what he/she wanted to say, “I would suggest to this student to do an outline before they start writing. That may help the student to organize their thoughts prior to writing.” He and Julie also thought, if the group was small
enough, asking the student a series of clarifying questions would help give direction.

Peter suggested: “What are we trying to do with this assignment? What is it that you got out of this article and what is the purpose or what are you trying to answer in your written assignment? Julie added, "What (do you) conclude from this fact? Where would you go with it? You’d almost have to go back through all that.”

Julie questioned if the student understood what bias was, since part of the assignment was to identify examples of it. Elizabeth reported spending twenty minutes of class time discussing examples of bias with the class. “Without that I think they would have been confused. Yes, they had some clues.”

Julie continued generating questions she would ask of the student. “What’s the conclusion? What’s the main point? [She continued thinking of questions to give the student some direction.] What was easy to understand? You seem to be struggling with relating the information about experiments to the main points of the article. How does any of this relate to what you would consider to be the main point of the article? What do you conclude from these facts?”

Dale was stumped by this jumbled attempt at writing a critique. “I really had a hard time deciding whether there was any thinking in that one. There really wasn’t any conclusion. Somehow we’ve got to get across to people like this that this (pointing to the last paragraph) doesn’t constitute a conclusion.”

Elizabeth asked the group about the amount of written response they would write on a paper like the one being examined. “Do you all get into the pattern of telling what
the main point was in your comments and then in your subsequent comments telling how (the student) could have related this paragraph to what I've identified as the main point?"

Julie thought she didn't usually have enough time when correcting a group of student papers to give the main point or try to direct the student to find it. She had earlier suggested that a conference would be more appropriate so that she could work with the student and their understanding.

The faculty did not find evidence of critical thinking in the this paper, but rather discussed ways to help the student re-examine the author's messages. Because this paper came from a large lecture course, Elizabeth asked the group about appropriate and useful written comments to write on a paper of this low quality. Peter and Julie each felt that the most effective way of helping the student writer was in a conference, where they could ask very directive questions to help her find the author's main point and supporting details. This further emphasized the concerns with promoting critical thinking assignments in large sections.

Researcher's Observations

Each of the faculty identified evidence of critical thinking in the student papers. They had little difficulty determining adequacy and inadequacy of thinking expressed after asking a few questions of Elizabeth about her assignments. Despite coming from different disciplines, they were able to note the flagrant gaps in logical thought and discussion of main ideas and supporting details. Each had considerable experience writing successful critiques, and all had differing amounts of experience assigning and grading student written critiques of articles. After one reading and a brief discussion with
their peers, they collectively identified the strengths and weaknesses of the two student papers, and could strategize ways to improve the thinking and the writing. While Ross suggested, “I would probably put red ink all over it trying to get them to understand what we’re trying to do with this particular assignment.” Julie, Peter, and Dale all recommended one-on-one conferences to help the students recognize where they needed to rethink and re-do their first written effort.

Elizabeth had brought the group samples of the most and least successful critiques from her class and the group decided to look at the weaker ones. After listening to the comments and recommendations from the experienced faculty, three points became obvious to me as facilitator. First, according to the group, Elizabeth’s critiques were typical of many college students’ first attempts at critical analysis expressed in written format. Often the thinking missed the desired mark and the writing was formulaic, with an opening, some indication of main idea [often clouded or wrong], supportive evidence, and a conclusion.

Secondly, although all the faculty could clearly articulate the learning outcomes they hoped their students would achieve in the assignments, some had difficulty recognizing the complexity involved with achieving those outcomes and didn’t focus on the critical process itself. For example, Julie, Peter, and Dale each described assignments that supported students, to varying degrees and with varying amounts of intervention, as they worked on critical thinking projects. None of them were completely satisfied with the results, but they each recognized the need for a multiple step approach to the completion of their assignments. They used faculty-student or student-student
conferences, peer review, or critique sheets to support their students as they worked on their projects. Others used less intervention and focused on the final product. Ross and Elizabeth used written comments on a series of similar assignments (seven article critiques during the semester) to give students repeated practice learning to create the desired products. For Elizabeth, student numbers made more intervention during the process difficult to achieve. She was dissatisfied and frustrated with the results of many student submissions and obviously searching for ideas to improve her teaching.

Finally, from their comments it seemed to me that the more experience a faculty member had reading student attempts at analysis, the more willing they were to note small, units of evidence of student critical thinking. Peter, Julie, Ross, and Dale, who were most experienced helping students to think critically, were ready to give the student author of Paper One credit for any evidence of thinking skills in the paper. They noted clear expression, logical thinking, and appropriate use of evidence, despite the fact that the student had missed the main point of the article. Elizabeth, who created the assignment and was a less experienced instructor of critical thinking activities, clearly had difficulty valuing the student’s effort since the student missed the author’s point. Ross also had difficulty finding evidence of “thinking” in the paper. If my observation is valid, it would behoove those facilitating faculty critical thinking training to provide faculty who are less experienced with analytic assignments with substantial practice reading actual student papers. It would perhaps make them more comfortable with the very messy student attempts to write critically, make them aware of common errors and strategies to correct them, and persuade them to provide encouragement.
An analysis of all the skills, attitudes, and knowledge required to write an article critique needs to be completed, and a discussion of student developmental level would be helpful. Each of these students misread the author’s main point, so certainly the “reading level” of the articles needs to be considered. Identifying a main idea and supporting details might be challenging for a novice in the discipline if he/she is unfamiliar with the discipline’s terms and language and can’t understand the written meaning. However, this is normally possible for college-aged readers, and would fall at the lowest level of Perry’s scale (Basic Duality Level, where students believe everything is right or wrong and experts tell them the correct answers). However, students at this level would have difficulty evaluating “bias” and an author’s opinion, since they would believe everything that the author said to be correct. Evaluation and determining bias appear to demand placement at Perry’s Relative Subordinate Level. This is four developmental levels above the initial Basic Duality level. Ross’ information that his sophomore students show marked improvement on their article critiques over the semester may indicate that repeated “schooling” in all the elements needed to complete a successful article critique will move students up the developmental ladder.

As a facilitator, I was most surprised by the group’s response to the question about Student Paper One, “How would you grade this?” The discussion immediately turned to a debate about the appropriate letter grade. Was “C” or “B” most appropriate? Since Julie and Peter had used non-letter grading systems in their classes when promoting creative thinking activities, it was unexpected for them to be drawn into a letter grade discussion. They had already indicated that other forms of grading could be used for
creative thinking assignments. Additionally, the entire group seemed surprised at the amount of knowledge and skills needed to "extend an idea" during the first workshop's activity and of the complexity of grading attitudes.

But most surprising, and perhaps revealing, was the group's ability to put aside Applebee and Langer's findings about discouraging students' analytic efforts by assigning grades using a "right" or "wrong" philosophy that was discussed at the beginning of the workshop thirty minutes earlier. The immediate jump to give the student a "B" or a "C," seemed to reflect the researchers' findings about faculty being trapped in familiar grading behaviors.

Peter's comments did eventually bring the group back to a discussion of the assignment's purpose: to produce a grade for the grade book, or to promote thinking. And certainly Dale's decision that the paper needed to be re-written before grading, and Julie's and Peter's comments about conferencing with the student so that she could help her identify the correct main idea, indicate a desire to avoid Applebee and Langer's grading "trap." However, in response to the "How would you grade this?" question, all but Dale jumped into a letter grade debate.

I felt that this workshop was less useful to the participants than the first because the topic was too complex for a one-hour session, and I didn't realize the source of the complexity until after I left the group and listened to the session tapes. Although everyone was experiencing inadequate student thinking in their student papers, the participants were at very different places in promoting thinking through written assignments. Elizabeth was interested in improving her written responses on the student
papers so that students would have a better idea of how to correct their problems, Ross seemed satisfied with his "red ink" correction approach, and Julie, Peter and Dale had each moved beyond commenting on poor drafts and recognized the need for alternative interaction with students to foster improvement, i.e., working one-on-one, team reviews, and re-dos. Those more experienced with inadequate student thinking and writing were aware of the complexity of the problem and had moved beyond faculty comments on papers and re-writes. I don’t believe either Peter or Julie would have suggested that they had all the answers, but they already had information that could have moved Elizabeth beyond her quest for better responses on her fifty or sixty student papers. The topic of the workshop should have been "How to help students improve when they try and fail in their first attempt to learn a new critical thinking skill" and not, "Responding to inadequate thinking in student drafts."

In retrospect, I believe it would have been more useful to focus again on the complexity of each participant’s assignment and then to determine instructional strategies to promote the desired learning outcomes. Consideration of Perry’s developmental levels might have influenced the discussion of learning strategies since "critical attitude" is an ability needed for these assignments. If the whole group had brainstormed instructional strategies, I’m guessing that the list would be extremely comprehensive.

Although the student paper review was less than effective, the discussion about right-wrong grading based on the Applebee and Langer report did surprise a number of the participants. In the interviews, faculty reported seriously rethinking their grading practices and the effect on inhibiting student risk taking. This was true for all but Peter,
who had already altered his grading practices, and Dale who believed that most critical
training assessment would need to hit the mark to receive a high grade. This seems
contradictory, since Dale could easily find examples of “thinking” in Elizabeth’s sample
papers. Dale seemed to struggle with rewarding incomplete work.

A final surprise revealed in Workshop Two was discovering the difficulty
Elizabeth and Julie had finding anything of value in the sample student papers. Since
they are both supportive, and open to new ideas, their adherence to binary evaluation of
open-thinking assignments, the right-wrong syndrome, was puzzling. This suggests an
important area for future training, since the research found this type of grading
destructive to developing student critical thinking abilities.

Workshop III

In this workshop the faculty agreed to help one another with troublesome, critical
thinking assignments that involved writing. During the one hour session Joe and Dale
each presented assignments from aviation that the group analyzed and offered
suggestions for improving. Julie reported on an assignment revision her department had
just completed to improve critical thinking results. Finally, the group discussed using
guides or templates to help students as they struggle with new analytic writing
assignments.

Review of Faculty Assignments

Joe’s Assignment

In Joe’s Multi-engine Instructor class, inexperienced flight instructors learn to
develop and use lesson plans to teach new pilots theoretical information and applied
piloting skills. "They have to teach not only cognitive knowledge, but they have to teach
someone how to do something with their hands, and so it's a very interesting process."
The student-instructors needed to be taught how to prepare lesson plans. Joe was
struggling with inadequate class and personal time to verify the appropriateness of the
submitted lesson plans the students developed and to give them adequate practice using
them. He gave up on trying to review each submission. He was also dissatisfied with
students responding to the various plans since only one or two could be reviewed in a
fifty minute period.

Julie, who had extensive experience reviewing her occupational therapists' treatment plans, suggested using overheads.

Is it possible to just take one person's and make an
overhead real quickly and go through it? Delete the name so only
that person knows it's theirs. You could ask, What are the
comments that people have on this objective? How could it be
written differently? How would you have written it? How does the
whole thing flow? Just as a class, go through evaluating one
person's so that when they bring one to class, they never know if
it's theirs that you are arbitrarily choose.

Dale suggested another strategy:

One thing that has been effective for me is I'll go through a
paper real quickly and just put a question mark after things I'm not
real comfortable with, and hand it back to them like that. It drives
them nuts because they don’t know why I put a question mark on it. They’ve looked at it, they’ve analyzed it, I hope, and they haven’t found what the problem is with it. The ones that found the problem, I never hear from.

Joe asked if they were required to rewrite the assignment and Dale replied, “They’re not re-writing it, but they’re thinking, I hope! If there is a question mark on it, I ask them to think about it. And maybe that’s all you can do other than your normal classroom stuff or taking maybe one or two (student papers) and sticking them up there and talking about them.”

Julie saw similarities between the problematic patient treatment plans that occupational therapy students must learn to do and Joe’s pilots’ lesson plans.

When we went back and looked at the treatment plans, we found that we were requiring them to do a lot of different things. We’re requiring them to summarize, to clarify. You know when you think of all the different thinking skills . . . sometimes what happens is the student can do treatment plans, treatment plans, treatment plans, and make the same kind of mistakes because they always get their summaries wrong. They always get their objectives wrong. So now instructors, instead of just assigning treatment plans, maybe one time after a scenario [they ask students] to summarize the main issues that you think this person will have a problem with. So essentially what you are doing as the
instructor is breaking down the pieces of the plan. That way you know which part of it people are having a hard time with, without having to go through the whole seven steps every time for every student. It’s like taking it apart and teaching them a sequential way and then maybe at the end of the semester have the comprehensive treatment plans.

They’re just so unfocused. They’re trying to do all this stuff and it’s like they press it down in one area, and then the bubble comes up over here. And then press down in a different area and something else comes up.

There were smiles all around the table in response to Julie’s bubble paper-analogy and Joe commented that “That’s an idea. You just deal with one aspect.”

Dale’s Assignment

Dale was impressed with the results of peer review of term papers before the final drafts were turned into him for grades. “Peer review is fantastic; it really works.” In a senior aviation class, the required research papers had to be peer reviewed by three class members so the readers would be exposed to the information and also gain editing experience. Dale noted improvement in both the final drafts’ cohesiveness and the communication of ideas, despite inconsistent performance by the student reviewers. He admitted to being overwhelmed by the amount of reading he had generated for himself. There were 120 students in the two sections. Assigning the reviewers and monitoring the paper exchange was time consuming, and the student reviews were often poorly prepared.
"They get the paper and they don't do the peer reviewing because it's not worth enough points for them to make the effort."

The group considered two issues related to the assignment: 1) the number of points given for each review compared to the amount of time it would take to review and edit a research paper, and 2) the number of reviews required for the students to complete. Joe thought it feasible to increase dramatically the point value of the reviews, and had experienced similar problems with an assignment where students were given very low point value for their review work. I added information from my own experience with revision groups in composition classes where high point values for the reviewer's efforts improved the quality of their responses to the writers. Dale asked numerous questions about my system and seemed shocked that I gave almost as much credit for the written peer revision submissions as I did for the original paper.

Concerning the second issue of the number of student papers required of each student, Dale was concerned that the only fair way to insure that each writer received at least some valuable criticism was to give them two or three reviews. Because of attrition, students often only ended up with one or two reviewers. Others understood his concern, but thought the amount of work for students and instructor was enormous.

**Julie's Mid-Term Exam Question**

Faculty at the Occupational Therapy Department's end-of-year retreat reviewed ways to improve students' thinking and writing assignments. Using Bloom’s Taxonomy, they evaluated the level of thinking in all their required written assignments across the program. Julie had long been dissatisfied with the mid-term exam that required students
to match treatment plan theory to specific patient needs and setting. She was aware that justification was a higher order thinking ability and was trying to improve students’ performance in this area. She reported to the group that her peers had agreed to continue teaching segments of complex assignments, as she had explained earlier, to give the students the time to concentrate on one new skill at a time as they were learning.

After listening to the conversation about Dale’s problem with peer revision, she decided to try awarding more points to the “justification” segment of the mid-term, so that students would concentrate on building their skills in that more complex area. “I was thinking of that just now. Maybe this (mid-term) needs to be broken up so that you get so many points for your summary and so many points for applying it, and your rationale.”

Elizabeth thought the idea of breaking assignments into smaller parts would help her with the article critique assignment. “Maybe I need to have somewhere else in the class where they (students) have practice defending, practice rationalizing, practice justifying. They don’t seem to really know what to do with those terms.”

**Supplemental Topics**

The group also addressed ways that they might have papers reviewed in large sections. Chemical Engineering hired English Department teaching assistants to review certain aspects of student written drafts for organization, grammar, spelling, and usage. The instructors evaluated the content, and in that way had the time to require more written assignments and spend time with students. Occupational Therapy hired a therapist to grade a twenty page “activity analysis” project for them. This individual’s performance had improved over time and became more appropriate when the grader sat
in when the faculty gave the assignment to the students. In this way the grader had the same expectations as the students concerning the assignment.

Peter, Dale, Julie and Joe also used various forms of criteria/evaluation sheets to let students know the specific requirements for an assignment and give students more useful information about what was expected up front. Julie brought up a problem with her evaluation sheets. "I list the criteria in terms of content that I expect in the paper—an abstract, introduction, literature review, the summary. My criteria tend to be related to: Is it there? Is it complete? Is it accurate? But I don't, in my criteria, spell it out to have thinking in there. I just assume that it's all going to tie together and make sense. The students feel they've met every piece of my criteria, but the part that's missing is they didn't think and they didn't tie things together."

The discussion lead to how criteria sheets or assignment templates could restrict student creative thinking, since they all agreed that students liked templates and wanted to know exactly how to format a paper, what to include and how long it needed to be. Joe supported using models or templates completely. He felt they enable students to get it right sooner and guided them through the production process. Both Peter and Dale felt there were appropriate times for templates...when students were inexperienced or prescriptive documents were required, but not appropriate if creative work was wanted. They also appreciated that senior students should need less support and be able to determine the best format for completing an assignment.
Researcher's Observations

Despite being very quiet during this session, Elizabeth, when asked about her article critique problems, commented, “I’ve gotten several really good ideas today on how to deal with that problem.” Julie and Joe mentioned that they were each going to try increasing the value of the important sections of a multi-part assignment to see if the students wouldn’t perform better. Joe was also going to try using Julie’s overhead idea to improve his instructor pilots’ lesson plans.

Dale didn’t commit at the workshop to how he felt about giving more point value for peer revision in his large research assignment, or the suggestions from faculty about reducing the required number of reviews for each student. However, in his interview he said he planned to increase the value of the peer review efforts. And lastly, Peter seemed to have previously considered all of the issues discussed at the session. There didn’t seem to be any audible “ah has” from his direction during the hour.

As a facilitator, I was pleased that the instructors more experienced with teaching critical thinking gave advice so openly to those faculty struggling to resolve their curricula management problems. But I was concerned about providing new and useful ideas for Peter.

I thought Julie’s information about her department’s retreat was valuable for the group to hear because it illustrated the “departmental approach” to integrating critical thinking outcomes into the Occupational Therapy curricula. She explained her peers’ recognition of the need to divide complex assignments into learnable skill units, to build skills upon skills, and to provide adequate practice time. While Julie and her peers in OT
were using Bloom’s Taxonomy to evaluate the level of their program assignments, they were also determining discrete critical thinking skills and ways to sequence their acquisition by students throughout the three-year program. Perry’s theories about developmental levels would add another dimension to their planning. Justification of a treatment plan and the willingness to reassess its effectiveness would require Julie’s students to operate at Perry’s Applied Relativism Level (Level 8). Since Julie wanted them to be comfortable with their decisions, communicate them to others, and be prepared to reevaluate them as needed, this assignment would be best suited to seniors after lots of other assignments developing critical attitudes.

A number of programs at the university were already dividing complex outcomes into sequenced learning events spread throughout the student’s two to three years as a program major. Nursing and engineering were also involved in this process and their faculty had a wealth of experience, successes and failures, attempting to do this. Considering the difficulty and complexity of the assignments these faculty were attempting with their students and their dissatisfaction with many student analytic written products, becoming involved with these other departments would give them a variety of models to consider as they attempted to increase students’ success.

Three individuals received comprehensive assistance with their assignment in one hour, and the other two participants were able either to share their expertise (Peter) or to find the discussion applicable to their assignments (Elizabeth). In the follow-up interview, Joe, who received most of the allotted time, thought the seminar would have been better if it had run for two to three hours so that faculty could have spent more time
on the assignment review activity. He enjoyed receiving usable ideas from his peers to resolve his assignment problems.

Summary

The six faculty readily shared problems and ideas at the three workshops. Despite coming from different disciplines, they were able to assist each other with assignments once they understood the focus and learning outcomes. These instructors can understand new/foreign concepts and procedures quickly, which makes their input at workshops especially useful to those needing assistance with their assignments.

The workshops provided faculty with an opportunity to learn about critical thinking instructional techniques and issues. The interaction at the workshops also revealed numerous problems with critical thinking projects. This suggested that topics for future seminars should more closely meet their expressed needs. Chapter Five will elaborate on the usefulness of the three workshops.
CHAPTER FIVE
FINDINGS, ISSUES, and RECOMMENDATIONS

Would faculty change the design and evaluation of their critical thinking and writing assignments if they had the opportunity to review the effectiveness of their own and other faculty's assignments? Would three consecutive one hour workshops impact on the implementation of these changes? This brief qualitative study generated far more information than the answers to these two questions as it collected information about each participant's critical thinking instructional interests, problems, and needs. It also provided knowledge that college faculty, administrators, and directors of professional development programs might use to create relevant training programs. The beginning of this chapter reports findings gained from observing faculty interaction at the workshops and conducting the follow-up interviews. This is followed by a discussion of supplemental issues identified by the faculty that are interfering with their attempts to promote critical thinking. The last section makes recommendations to faculty leaders and administrators in the areas of overcoming campus-based barriers to improving student critical thinking and writing abilities, improving faculty professional development programs, and finally, funding needed initiatives.
Findings

Findings Related to the Workshops' Impact

Working collaboratively at three workshops did impact on participants' design and evaluation of critical thinking instruction and assignments. The participants reported in the follow-up interviews that they had made or planned to implement changes in their assignments. The interviews took place in late April and early May, approximately six to eight weeks after the three workshops. The instructional methods, content, and grading changes indicated in the chart were revealed in responses to interview questions.

<table>
<thead>
<tr>
<th>Name</th>
<th>Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dale</td>
<td>Changed the value given for peer revision work on senior research project. Recognized the need to give credit for analytic processes in his assignments.</td>
</tr>
<tr>
<td>Elizabeth</td>
<td>Planned to reduce the number of written assignments and use peer groups and conferences to address content problems. Planned to do more pre-teaching and modeling for complex assignments.</td>
</tr>
<tr>
<td>Joe</td>
<td>Determined major topics for a course and asked students to discover and investigate information. Reduced the amount of lecture.</td>
</tr>
<tr>
<td>Julie</td>
<td>Increased the point value of the analytic parts of her assignments so students would recognize their importance. Was in the process of creating smaller units of learning within her complex assignments.</td>
</tr>
<tr>
<td>Peter</td>
<td>No change. Was rethinking the credit values of parts of his assignments.</td>
</tr>
<tr>
<td>Ross</td>
<td>No change. Was rethinking covering content in classes instead of teaching for depth of understanding in key areas.</td>
</tr>
</tbody>
</table>

The one-hour sessions additionally provided faculty with new ideas about ways to enhance the effectiveness of their critical thinking assignments. The following chart lists the ideas that faculty said they gained as a result of the workshops.
During the faculty interviews, the six participants identified eleven new ideas they had been exposed to after interacting with their peers for a total of 3.5 hours. Additionally, three faculty indicated that they had immediately implemented changes to their assignments based on the new ideas.

Some instructional ideas were new to several faculty: 1) teaching needed steps before assigning complex critical thinking and writing projects, 2) giving rewards for student efforts--critical thinking processes and peer review efforts. Not surprisingly,
these suggestions came from the teachers who had done more experimentation with critical thinking and writing projects with their students (Julie and Peter). With "trial and error" over a few years of instruction, they knew their students' shortcomings with analytic thinking and writing and had determined ways to aid them with the process. For example, Julie and Peter understood that students needed a knowledge base before they could be expected to evaluate professional articles in their field and that students needed regular practice, modeled by faculty, in preparing article critiques in ways acceptable in their disciplines. That understanding did not seem as clear to Elizabeth, Dale, Ross, or Joe. This could be an indication of a lack of knowledge about instructional practices and learning theory that most university faculty do not have unless they have studied pedagogy.

Four faculty found giving substantial credit for the thinking or learning process or peer review to be a new idea. This could be an indicator of how inbred grading the final product rather than the learning process is at the university and also the difficulty faced by faculty trying to give credit for something as messy as exploratory thinking and writing. Again Peter and Julie had devised alternative ways to evaluate student processes. For example, Peter used graded journals and Julie tried "breathing" with her students so she could continuously assess their learning. Both devices were set up to monitor and encourage students learning new processes or exploring difficult theories. The other faculty expressed interest in these techniques, but were concerned about the time they would take away from teaching content.
The three faculty who brought their “troublesome” assignment to the third workshop are the three participants who immediately implemented changes in their instructional strategies. Perhaps this can be attributed to their clear recognition of a problem, indicated by bringing the assignment to the group, and five minds working out solutions. This supports the research premise that faculty can collectively solve discipline specific instructional problems even if they come from differing disciplines. Implementing the changes also suggests a high degree of trust in each other’s opinions. Perhaps their shared interests and obvious dedication to student learning promoted confidence in their opinions. Motivation, openness, identification of problems and respect for peer’s opinions seem to contribute to faculty willingness to change.

Certainly, additional research would have to be conducted to determine to what extent the faculty actually implemented their planned changes. Since my investigation changed and didn’t include reviewing student papers and faculty comments, triangulation of data was not achieved. This information has been verified by only two observations: comparison of the data from interviews and the workshop tapes. However, during the interviews, this group of teachers enumerated numerous instructional changes that they had regularly implemented over the years to solve various learning problems. It would be expected that their proposed changes would be tried and assessed in some way in their upcoming classes.

A byproduct of the inter... was faculty awareness of the value of collaboration in a workshop setting. Faculty indicated the short workshops provided them a useful forum:
• To learn about the complexity of critical thinking and writing instruction—Dale, Elizabeth, Julie, Joe and Ross

• To fix assignments that were not achieving the desired learning outcomes—all instructors

• To clarify their thinking about practices—all instructors

• To validate their thinking and practices—Dale, Julie, Peter, Ross

• To exchange ideas with knowledgeable faculty in a comfortable environment—Elizabeth and Julie

These comments stress the value of regularly bringing teachers together to discuss teaching. Short-term workshops do impact faculty behavior.

Workshop Preferences

Although only two of the faculty (Julie and Elizabeth) preferred the one hour workshop format, all participants came away with new instructional ideas, knowledge about critical thinking and writing, and the knowledge that others at their university shared their interests and struggles. In the interviews, the participants noted which of the workshops best met their needs. Workshop One, “Identifying Evidence of Critical Thinking in Student Writing,” provided the opportunity for the group to review sample student papers and label thinking skills and attitudes. Workshop Two, “Responding to Inadequate Thinking in Student Writing,” focused the group’s attention on the disorganized presentation of ideas in two student papers. Workshop Three, “Creating/Improving Written Critical Thinking Assignments,” had the group analyze and offer suggestion to those who provided troublesome assignments.
In his interview, Dale reported that Workshop One was his favorite since he learned a new way to look at the depth and complexity of his assignments. This led him to re-consider his assignment requirements and to consider Peter’s suggestion to grade the critical thinking process, as well as the final product. He also enjoyed Workshop Three when the group helped him with a troublesome research paper assignment and suggested he give higher points to the peer reviewers for their effort. Dale indicated that he did implement the suggestion.

For Dale, the best way to learn was not in one hour workshops, but rather in two day sessions where he could get away to think deeply about the issues. Nevertheless, he did implement changes to his senior research project based on information gained in two, one-hour workshops. This suggests an impact of short-term workshops on faculty who do not enjoy the format.

Elizabeth preferred Workshop One because it helped her to label ideas and think about teaching critical thinking in different ways. Workshop Two and Three were also helpful since the group showed her elements of her students’ writing that she hadn’t noted before, and she was able to see that others shared her problems. She thought attending the workshops with the small group helped her to become more comfortable talking about instructional problems. Elizabeth had participated in various WAC sessions offered at the University, and found each to have value.

Joe enjoyed the interaction in Workshop One to determine instructional steps needed to think critically and the assistance he received in Workshop Three on his “lesson plan” assignment for senior pilots. He adapted Julie’s, Ross’ and Peter’s ideas to
require more independent learning from his students and to concentrate on key content without pushing to cover quantities of information superficially. He enjoyed the various length workshops that WAC made available and thought they suited the needs of most faculty, but he felt the one hour workshops were not long enough to delve into a topic.

For Julie, one hour workshops every other week would be the ideal. She likes to hear an instructional idea, try it with her students, and then determine if she'll keep it. She also reports enjoying having her ideas validated by others experimenting with their instructional methods. Workshop Three was her favorite since she was able to discuss her clinical research project with the group. She thought their comments about the complexity and grading system helped her to clarify her own thinking. Workshop Two was least useful to her since the group looked at comments on student papers to correct weak thinking. The discussion made her consider her own admittedly terse and non-productive comments, which she has stopped using. She now uses one-to-one conferences to discuss problems.

For Peter, opportunities to discuss pedagogical interests with his peers are a favorite activity. He enjoys workshops of differing lengths and has participated in many WAC activities at the university. He found Workshop Two to be the most useful for him because he heard other’s views about inaccurate student thinking and writing. He’s been working with his own students on these topics and felt his beliefs were validated by the group. Workshop One was least useful since it dealt with an aspect of critical thinking, differentiating between skills and attitudes, that he had already determined and moved beyond.
Ross enjoyed Workshop One since the group interacted to expand their knowledge of critical thinking that they teach in their own classes. He believed the two workshops he attended showed him that he should be doing more with WAC, since the sessions generated new ideas and reinforced some of his own practices. He enjoyed the one hour sessions but preferred half day explorations of specific practices where “expert” information could be briefly presented and instructional applications developed.

**Findings Related to Faculty Knowledge**

These instructors were committed to developing critical thinking abilities in their students, but had little knowledge of the academic debate over the definition of critical thinking, i.e., skills, or attitude, or a combination of both. Peter and Julie had each struggled with teaching critical attitudes and skills, but the others seemed surprised at the possible complexity of the learning they were attempting in their classes. They were also unaware of the other key issue in the literature, the generalizability of critical thinking abilities across disciplines. Since each instructor only taught critical in their own discipline, they were not overly concerned with the carry-over of critical thinking attitudes or skills although some of them suggested it in their practices and comments.

**Knowledge of the Critical Thinking Debate**

After reviewing one student paper, Dale reported his surprise at the number of thinking processes evident in the paper. “I never thought about it [the amount of critical thinking in the assignment] this way before.” In terms of the critical thinking definition debate in academia, Dale uses a combination skills/attitude approach, although prior to the workshop he admittedly had not created assignments the differentiated between
attitude and skill development. He certainly noted the different approaches to critical thinking his colleagues utilized in their courses, but he never suggested that thinking skills were domain specific, although he does believe content knowledge must precede effective thinking processes.

Elizabeth recognizes the need for both specific skills and critical attitudes for her students if they are to think and write like archeologists and anthropologists. In her classes she gave students repeated practice reading critically and often provided students with opportunities to question competing theories. She was surprised by the number of critical thinking skills needed to complete her article critique assignment, and the need for extensive pre-teaching of skills and content to adequately prepare students.

She recognizes the connection between student content knowledge and their success with professional article critiques, but never indicated if she believes critical thinking abilities are specifically tied to a domain or if they are transferable across disciplines and circumstances. However, in an interview she mentioned that the best class presentations and critical papers in one of her archeology classes were offered by a senior chemical engineering student and a student new to the discipline. She commented that each of them knew how to teach themselves (attitude), to select and evaluate material (judgement), and to synthesize information and present it in an organized and easy-to-follow format (skills). They came to her class with these abilities and out-performed archeology majors—suggesting that she acknowledges critical thinking abilities that are useful in multiple disciplines.
Julie’s assignments indicate her efforts to develop both critical thinking skills and attitudes in her students. Six years of experimentation helped her to develop assignments that emphasized the attainment of specific skills and attitudes. Although Julie never discusses critical thinking abilities as being domain specific, she repeatedly implied that students need a thorough understanding of the “material” if they are to assess or apply it. This suggests a view that one needs to have something to think specifically about, more than suggesting that critical thinking abilities are limited to specific domains. At the group workshops and also at WAC meetings she raised questions about critical thinking and writing activities used by instructors from other disciplines, and in an interview, stated that she often gets her ideas from other faculty and then adjusts them to her curriculum. This suggests a belief that at least some critical thinking skills and abilities can be generalized across disciplines.

Joe attempts to develop analytic skills and attitudes in his students. Like Elizabeth, he underestimated the complexity of his critical thinking assignments. Although he hoped to develop both skills and attitudes, his instructional activities didn’t address the different strategies or assessment models needed to promote learning. Joe believes that critical thinking skills and attitudes carry across disciplines, as demonstrated in an aviation-composition linked courses he developed with a critical thinking emphasis.

Peter, perhaps more than any of the other workshop participants, uses a wide variety of the instructional tools to promote critical thinking skills and attitudes. Experience and a fine critical eye have helped him to develop processes that coordinate
adequate content development, effective instruction, and assessment. Peter seems clearly convinced that students need basic information in their discipline to develop related specific critical thinking skills and attitudes, but in discussions, seemed to believe that some analytic skills, such as reading for a main idea and identifying evidence, shared similarities across domains.

Like Dale, Peter, and Julie, Ross has been experimenting with instructional changes to promote critical thinking skills and attitudes in his students for a number of years. The inadequacy of student performance in industry drives him to improve student learning in this arena. Ross often adapts and uses ideas to promote student thinking that he acquires at WAC sessions from those in different disciplines. He believes strategies to promote critical thinking are transferable, as long as the actual skill development is grounded in his own content area.

Knowledge of Developmental Theory

Faculty seem to know little about developmental learning theories. For them, the lack of student analytic performance is related to inexperience with various critical thinking abilities or intelligence. Never did anyone suggest that students weren’t developmentally or philosophically ready to think in the needed ways to carry out the assignments. Peter came closest to noting developmental limitations when he complained about students who couldn’t take a stand on whether to put a nuclear power plant near St. Paul. They wanted him to tell them the “right” answer. He seemed exasperated at their response.
Dale notes the differences between grade level and ability to perform more complex thinking tasks, but he seems to have no knowledge of developmental theory. For example, he associates analytic ability with intelligence, but he never suggests any other cause for weak student analytic performance.

Elizabeth often differentiates between the analytic abilities of beginners in her discipline versus the skills of more experienced students, but she never links performance to developmental levels. She neither mentions student age or intelligence when discussing curriculum goals, but seems to believe all college students can perform critical thinking activities at some level if given practice.

Joe noted the differing critical thinking activities between his sophomore, junior and senior students, although he attributes the differences to lack of practice. He creates worksheets and study guides to support learning and believes that his structures have increased learning in his classes but, like the other instructors, finds that all students have trouble with assignments that require higher order analytic skills. He is not yet concerned with sequencing assignments.

Julie’s struggles with the poor student performance in some of her advanced critical thinking activities and clearly understands the need to build analytic skills in increasing complexity. She and her departmental peers are investigating sequencing curriculum based on Bloom’s taxonomy to improve student learning. Julie didn’t seem to be aware of a possible developmental limitation in her students’ abilities.

Peter seems puzzled by the difficulty his students have comparing, contrasting, taking a position, and presenting supportive evidence. Since each of these critical
abilities is related to students’ perception of their right to determine value (a level located in the middle of Perry’s developmental scale), these students’ ineffective performance may be directly related to a belief system that must be challenged before they can develop appropriate skills and attitudes.

Ross was already providing repeated practice of the same critical thinking assignments over time in his courses since he noted students inability to perform well. He also had sequenced increasingly more complex assignments within his department so that critical abilities increased throughout the three years, culminating in a Capstone course. He never spoke of developmental levels, but his activities suggest an application of Perry’s findings.

Faculty who attempt to develop a reflective/critical attitude in their students need to be aware of Perry’s theories and the research that continues to investigate developmental levels in teens and adults. Many of the difficulties faculty suggested students have with acquiring higher-order critical abilities (fear of taking a stand, trust in expert opinions, binary thinking) seem to be related to the behaviors sequenced in Perry’s development model. This information could significantly alter instructors’ approaches to critical thinking instruction and save them and their students needless frustration.

Developing analytic abilities is tough enough for faculty and students. Neither group wants inappropriate instruction.

Findings Related to Faculty Needs

In a small group or one-to-one discussions the participants in this study identified the types of training they believed would improve their critical thinking assignments and
They also indicated problems receiving assistance in two key areas: mentoring and departmental coordination. Because of their experimentation with analytic assignments faculty are aware of training that would assist them.

**Requested Training**

**Writing**

- Creating a grammar and usage review for faculty
- Responding to inadequate writing and thinking in student papers
- Developing alternative ways to improve student critical writing besides faculty comments on papers
- Developing alternative research paper structures

**Assessment and Grading**

- Evaluating complex critical thinking assignments
- Rewarding students for taking risks in assignments
- Grading discussions
- Teaching student self-assessment

**Critical Thinking Assignments**

- Developing in-depth critical thinking assignments in learnable segments
- Motivating departmental peers to sequence critical thinking assignments throughout program
- Promoting independent learning attitudes
- Developing critical thinking assignments for large classes
- Fostering comparison and contrast abilities

**General**

- Developing curriculum for distracted seniors
- Creating four to five hour monthly seminars for faculty dealing with their instructional problems
Needed Support

- **Mentors and Role Models** Julie was the only teacher who received on-going mentoring from two faculty in her department. She credits them with bringing her to her current level of instruction and understanding of student learning because of the motivation and information they provided. Elizabeth, Peter and Ross have had model teachers in their lives whom they have imitated and discussed issues with, but they are not peers in their departments and the support is not on-going. Dale and Joe did not mention either mentors or role models, although both sought out new ideas from WAC-type activities where innovation was modeled by other teachers. All mentioned enjoying working with other faculty who can help them with problems and give them suggestions.

- **Departmental Support** While all the teachers believe the university-wide programs from WAC and Faculty Development provide them with important instructional support, the degree of support they receive from their departments varies. Peter, Julie and Ross work in settings where the faculty meet to set instructional goals, develop program assessment measures, and coordinate curriculum. While Joe and Elizabeth report that their deans and department chairs verbally support their attempts to alter curriculum to improve student thinking and writing, there is no departmental discussion of ways to accomplish this. Declining numbers of students in Elizabeth's large introductory sections, attributed to her writing emphasis, is a concern in her
department. WAC has provided some support for these teachers as they alter their instructional practices, but the lack of department-wide critical thinking and writing instruction does seem to impact on the level of student success (as viewed by the teachers).

Issues

There were several recurring issues revealed by the six teachers during the workshops and interviews. They were especially eager to discuss things that interfere with critical thinking and writing instruction. Each issue relates to established university practices and will require attention from faculty groups and administrators to find resolution.

Barriers to Change

Large Lecture Sections This group recognizes that the lecture format is not appropriate to promoting student critical thinking. They work to develop activities, often using writing, that will promote student thoughtfulness. They all favored one-on-one, and one-to-small group interaction to promote learning since they believed that dialogue, between participants, facilitates a shared critiquing of ideas. Large lecture classes inhibit these practices and yet each instructor reports having at least one class with over 80 students. Class size and numbers of students to work with each semester limits interaction between teacher and student and student to student. Everyone but Peter asked for help promoting critical thinking and writing in large classes.

Grading Julie, Peter, and Ross believe that grading of design or “free thinking” activities needs to be different from the standard letter grade system generally accepted at
the university. Each of them has developed his/her own system to address this, but each is interested in learning other methods. The other faculty expressed concern about the time needed to appropriately assess student analytic performance and to develop alternate evaluation methods.

*Competing Agendas* Dale, Joe and Elizabeth each had problems finding the time to cover large blocks of required material, implement critical writing and thinking activities, and still keep up with research and publishing demands.

*Resistance to Active and Independent Learning* Each teacher gave examples of deep seated student resistance to critical thinking and writing activities. Students preferred lecture and objective tests to activities where they had to assume responsibility for their learning and produce a product either independently or in groups. Ross and Dale also noted initial resistance to group work where students were expected to learn from each other.

*Resistance to Polished Communication* The group reported students’ aversion to perfecting their written and verbal communication. The faculty found wide-spread resistance to content revision and final editing. They felt that students didn’t believe in the importance of these abilities for professionals.

*Reluctance to Act in Professional Ways* Dale, Joe, Julie, and Peter noted that students resisted taking on the role of a professional in their chosen field. They often resisted assuming responsibility for project completion and didn’t seek out appropriate and needed information to resolve problems. They expected solutions to be given to them.
Industry Pressure

A major issue for Dale, Julie, Peter and Ross was the pressure industry placed on them to graduate professionals with higher-order critical thinking abilities so they could function effectively on the job. The department’s reputation with industry was tied to graduate performance, and meeting corporate expectations was a major concern for these faculty.

All of the issues raised by this group of faculty suggest the need for more than improved professional development training so that the instructors become better teachers of critical thinking and writing. If university graduates are to perform as effective professionals with strong critical thinking abilities, a broader-based remedy to faculty-identified problems needs to be developed.

Recommendations

Improving and assessing students’ critical thinking performance in classroom assignments and in the workforce are challenges for educators at all levels. The days are gone of making assumptions that somehow over two or four years in higher education, by taking an assortment of liberal arts and major specific courses, students will have sufficient abilities to think and communicate effectively. State, and perhaps soon, federal regulations or standards are demanding that K-12 systems demonstrate student competency in critical thinking skills. Business and industry are often highly critical of the critical thinking and writing abilities of the university graduates they hire and are creating their own “corporate universities” to provide employee training that meets their standards. Some faculty groups and individuals, cognizant of the importance of these
skills for the future success of their graduates, are experimenting with instruction as these six teachers have. These are the key players in promoting change on campuses because of their commitment to improvement—but they can’t do it without support from faculty leadership and university administrators. Many of the barriers to change the project’s participants identified are aspects of university culture that need to be addressed by the university community as a whole if better student analytic abilities are to become widespread. These faculty have identified practices that not only inhibit their own instructional objectives, but also reveal inherent problems with an education system that does not always coordinate efforts and develop systems to achieve shared goals.

How should faculty groups and the university administrators help these six hardworking faculty improve student critical thinking and writing abilities? It seems to me there are three possible courses of action. They can do nothing. WAC and Professional Development Programs do offer faculty an opportunity to receive help with instructional design and implementation and faculty should be able to request specific training from program administrators. This research shows that they are not making these requests, but that is their choice. Obviously this approach would help the faculty involved in this study in limited ways, but do little to remove the university practices that prevent a more comprehensive attempt to improve student critical thinking and writing abilities.

Faculty groups and administrators could ask all current professional development groups on campus to improve the responsiveness and effectiveness of their training by assessing staff needs and the impact of new curriculum or instructional methods that
evolve. This would certainly target training to help the participants in this study get help where they most need it, hopefully improving their instruction and their students’ critical thinking and writing abilities. Those students lucky enough to take classes with these instructors would probably have an easier time developing higher-order critical thinking skills and attitudes.

The last course of action would be for faculty and administrators to take the difficult path of creating a university-wide initiative that promotes critical thinking and writing competencies in all graduates. Only a comprehensive approach will address the faculty needs and issues identified in this study. This would be no easy task if all university departments and their students were to be involved.

College leaders would need to take action in three areas in order to make these changes. First, they would need to assess current practices on campus that inhibit the success of faculty promoting instructional improvement and develop a strategic plan to modify barriers to change. Second, they would need to develop a comprehensive program, based on a university-wide curriculum plan, that regularly assesses and meets the specific professional development needs of faculty like these motivated participants. Third, they would need to reassign finances to support the initiatives.

**Overcoming Barriers**

Prevailing attitudes on campus about the importance of teaching, research, service, and publishing have been identified by this study’s participants as barriers to change. Although faculty report a slow shift in the prestige given to those actively involved in instructional interests, they confirm that research and publication are still
more highly valued at the university. College leaders need to determine ways to give faculty recognition for the pedagogical growth, as well as their research efforts. Inclusion of statements that grant equal status to teaching and research in the university’s mission statement might be a way to bring the issue to the community for debate. Obviously, promotion and pay increases would need to be a part of valuing the efforts of faculty working in curriculum and instructional initiatives.

College administrators must also look at class size and faculty-student ratios if they expect improvement in student critical thinking and writing abilities. Five of the six participants in this study had difficulty using critical thinking assignments in their large sections and complained of poor results when they tried. Two of them reported concerns from their department chairs about the decreasing enrollments in their thinking and writing intensive classes. Since departments are held accountable for generating income from the delivery of courses, and funding continues to be tight, the college leadership needs to collaborate with faculty to determine priorities and then develop a plan to fund smaller sections that promote critical thinking activities. This is going to be a highly controversial discussion since faculty teaching load and research time will need to be reviewed as a means of generating additional revenue to cover smaller class numbers. There needs to be a broad-based discussion of this issue, so that there is some consensus about how funding cuts and expenditures are made.

All faculty focusing on pedagogical changes need to feel safe pursuing their interests, and it is the faculty’s and administration’s responsibility to create an environment that supports new ventures in teaching and learning, and that tolerates the
mishaps that often accompany experiments. The faculty in this project all reported increases in student complaints because of the challenging assignments they required. Some of their department chairs had inquired about instructional problems because of the student complaints. Additionally, this group discussed instructional problems they were having with their peers and with WAC participants at the workshops they attended. They publicly admitted to being less than expert in the field of critical thinking and writing instruction, so they could receive help from others. The openness they exhibit could make them vulnerable to suggestions of incompetence if they are not protected.

Four of the faculty participants in this study had reached a point in their professional lives where they were comfortable taking risks and admitting errors and problems publicly. Stephen Brookfield, in *Becoming a Critically Reflective Teacher*, reports that this behavior is not wide-spread in education:

> This utopian vision of colleagues talking democratically, respectfully, and insightfully about their practice may seem far removed from the experience of many of us. Teacher talk is often obsessed with the failings of administrators, the obstructive nature of colleagues in other departments, or the annoying loutishness and intellectual limitations of students. Moreover, conversation groups are often formed within organizational cultures that punish public disclosure of private errors. If appearing less than perfect calls our competency into question, we are hardly likely to spring
enthusiastically into conversations with colleagues about how we have learned from experiments and mistakes (142).

If Brookfield is right, then faculty leadership in concert with the college administration need to support opportunities for the college community to regularly assess and improve their instructional experiments. He advocates the sponsorship of "critically reflective groups" on campuses, in which faculty work together to improve teaching and learning and overcome the reluctance to openly share instructional problems with peers (9,140). Brookfield has also developed practices that build trust so that collectively faculty can examine their own practices that may interfere with needed pedagogical changes. "Talking to colleagues helps us become aware of how much we take for granted in our own teaching and how much of our practice is judgmental. It often confirms the correctness of instincts that we felt privately but doubted because we thought they contradicted conventional wisdom" (141). Sanctioning and financially supporting these activities would go a long way to encourage other faculty to take the instructional risks needed to promote critical thinking and writing across the campus.

Finally, faculty and administrators should explore establishing measurable, university-wide critical thinking and communication competencies for all graduates. Students' lack of interest in developing critical skills would more likely be altered if their chosen department had an integrated program supported by all faculty. If repeatedly exposed to increasingly more difficult critical thinking and writing assignments, students would also be able to note their improvement and perhaps come to value the hard work. Smaller colleges have successfully instituted this model for improving student critical
thinking and writing and more recently for the achievement of pre-determined college-
wide core competencies. This type of initiative must be supported by the administration
both with words and with dollars.

**Professional Development Planning**

In order to create appropriate and timely professional development programs,
motivated faculty and instructional development coordinators need to develop college-
wide curriculum initiatives and then develop a plan to regularly create training and assess
its effectiveness. While improving student critical thinking and writing performance is
most important to the participants in this study, in time, other instructional and curricular
topics will emerge. A plan to monitor training results and the achievement of goals
should be implemented.

Professional development initiatives could address the specific problems
identified by faculty like those in this study. I support Writing Across the Curriculum and
Instructional Development programs’ generalized approach to curriculum reform that
offers broad-based training to maximize exposure of large numbers of faculty. However,
it seems to me that this approach fails to assess the needs of those faculty most likely to
carry out reform. If the goal of these campus initiatives is to foster more analytic learning
and enhance student communication skills on campus, then training must support those
individuals most likely to implement changes.

Professional development coordinators and the faculty they serve need to
establish a communication system so that faculty progress can be monitored and shared
with others. Attending a seminar, trying a new instructional strategy, and then having no
formalized way to share results will limit the impact of the training—for the experimenter and those who could learn from the results. A communication system could also provide the vehicle for faculty to report their evolving pedagogical needs, so that training is more responsive and appropriate.

Interestingly, none of the participants in this study ever reported going to the WAC or the professional development coordinators to ask for help with a particular problem, despite being concerned for the inadequacy of student critical thinking and writing performance. The group was grateful to participate in the generalized workshops and never asked to have their specific needs addressed. That is not to say that they couldn’t pursue their own interests during workshop discussions, but generally they reported picking and choosing sessions based on “topics” offered rather than requests they had initiated. An effective communication system could encourage participants to make their needs known to program coordinators.

If professional development coordinators developed a system to monitor the effectiveness and impact of their programs on individuals, they would readily identify, as I did in this study, expert faculty willing to share their knowledge, successes, and failures. If instructors like Peter and Julie have already determined that analytic performance is enhanced by one-to-one conferences or faculty-to-small-group discussions, rather than faculty comments on student papers, they need a forum to share this information. Currently, their expertise and best practices are not being utilized in any formalized way that would benefit others and prevent them making the same mistakes.
Finally, professional development programs should include not only assessment of faculty needs and accomplishments, but also assessment of student growth in critical thinking and writing. This could be part of a comprehensive student competency assessment program that identified specific benchmarks that individual departments used to develop performance indicators. Such an initiative would send additional messages to the university community about the value of promoting student thinking and writing, and bring status to college programs that could demonstrate the achievements of their graduates in these highly valued areas. Assessment specialists could help set up an ongoing process to determine the program’s structure and success. These professionals are readily available at most universities.

**Funding the Initiatives**

Public university administrators are constantly challenged to prove that state supported education is meeting society’s needs in this new century. Frequently, measurable outcomes are demanded, and achievement must be demonstrated to those holding the purse strings. Because of this, it behooves college administrators to support the efforts of faculty who seek to foster critical thinking and writing abilities in their students. Problem solving and effective communication are continuously cited by workforce development analysts as critical employment abilities. That’s the good news. The bad news is that demonstrating analytic growth is difficult and will require, as Peter and Julie reported, the development of different kinds of assignments and assessment procedures. Helping faculty learn to teach critical thinking and demonstrate student
growth is going to take time and money. These will be resources well spent if graduates excel as strong thinkers and communicators.

An important financial challenge for administrators will be convincing the university community to shift limited funding to support the development of a comprehensive plan that ensures that graduates have advanced critical thinking and writing abilities. While initial project funding may be achieved through grants for training and establishing assessment and measurement systems, long-term funding will be needed to support the activities. Reducing class size to promote the activity-based learning that analytic growth seems to demand is going to require adjustments to program funding plans. Some colleges have successfully managed this shift, but most need a gradual, collaborative approach that involves faculty like those in this research, department chairs, and other campus leaders.

Conclusion

The efforts of faculty like those in this study need to be applauded, rewarded, and broadcast throughout the university community. University administrators and faculty groups need to address barriers to improving student critical skills and attitudes identified by these faculty and support a comprehensive reform package that does more than provide Band-Aid solutions.

This small group of reformers have identified one of the most important academic needs for university graduates, and with minimal support are devoting mostly unrewarded time to make their students more thoughtful and articulate. They are working
this hard because they recognize the gap in student education and they are morally committed to closing it.

Short term workshops can impact on faculty instructional practices in the areas of critical thinking and writing, but far more needs to be done within the university community if the faculty’s goal to graduate successful critical thinkers and writers is to be met.
APPENDIX A

WORKSHOP ONE SUMMARY

Types of Critical Thinking Research Valued in Student Writing.

SELECTING IDEAS
CONNECTING/LINKING
QUESTIONING
IDENTIFYING NEED FOR MORE INFO
IDENTIFYING THEMES AND SUPPORT
EVALUATING/CRICITICIZING
DETERMINE USEFULNESS
ORGANIZING
SYNTHESIZING INFO
EXTENDING IDEAS
TRANSLATING INFO

Sub-Steps Needed to Extend an Idea

Student needs a base of knowledge:

Courses in the subject area
Research skills
Writing skills

INTERPRETING IDEAS
CONCLUDING
HYPOTHESIS
IDENTIFYING BIAS
ANALYZING
DEVELOP OWN REACTION
APPLYING INFO
DISCOVERING
APPLYING IMPRESSIONS
EXPLORING IDEAS
Practice extending ideas with teacher (modeling). Important to show "sloppiness" of initial extension process.

Student Needs to Apply Knowledge:

Understand idea and related ideas
Define the idea
Evaluate relationship of idea to subject material and/or concepts
Defend the extension of the idea

Issues Raised:

Time .... To write helpful responses and for students to think
Class size
Number of written assignments
Teacher review
Student self review
Student peer review

Assignment/Emphasis:

- Grading Thinking Only
  Instructor comments on content only.
  Instructor designates a section of the paper to show analysis, application, etc.
- Comprehensive Written Assignment
  Instructor comments on content, organization, usage, punctuation and spelling.
- Grading Possibilities
B RANGE
To encourage student effort.

C RANGE
To motivate students to do better.

RD (Re-do)
To get an improved draft.
Responding to Inadequate Thinking

The group reviewed two student papers for evidence of thinking and made suggestions for ways to help the students writers improve.

Topics/Comments

- Grading is usually binary – right or wrong
- Creativity can be reduced by right/wrong grades.
- Assignments that require creative thinking should consider other evaluation forms.
- How do we give credit for the “missed” idea?
- Use conferences for weak papers to save time and be more helpful to students.
- Interaction with students important if they are to model critical behavior.
APPENDIX C

INTERVIEW QUESTIONS

I'm going to begin with some general questions and then move into the area of using writing and evaluating the workshops you participated in last March.

1. When did you become interested in experimenting with your instructional methods?

2. Can you describe the changes in teaching approaches or students learning goals that you've made over the years?

3. Do you have goals now for your students than you originally had?

4. Do you feel you have been supported in your efforts in your department and at UND in general?

5. How do the students respond to your instructional methods? Do you think they support what you do in the classroom?

6. How and why did you become interested in WAC (Writing Across the Curriculum)?

7. How does writing fit into the curriculum changes that you have made? Can you give me some specific examples?

8. How do you use writing in your classes now as compared to earlier in your career?

9. Where did your ideas for changes in writing use originate?

10. Describe the impact of your instructional changes on student writing.

11. Describe the impact of your instructional changes on student thinking and learning.

12. How have the changes you've made impacted on your "teaching style?"
12. How have the changes you've made impacted on your "teaching style?"

13. Please describe for me your philosophy of student evaluation ... considering areas of
   1) how you use evaluation and 2) what is its purpose?

14. Can you describe the types of student evaluation that you actually use?

15. Please describe you written comments on student papers.

16. Are you satisfied with the comments you currently give?

17. If you were able to give direction to composition researchers, what information about
   responding to student papers would you ask them to investigate?

18. Describe the specific areas in your class assignments where students have difficulty
   thinking clearly?

19. Have be able to change the curriculum to improve student thinking?

20. Have you noticed evidence of improved thinking since you made the curriculum
   changes?

21. How useful to you are short term, one hour workshops like the ones you attended?

22. Which one of the 3 you attended was most useful and which one was least useful.
   Please explain why.

23. Do you want to continue receiving help from WAC and Instructional development?

24. What other delivery of information or activity formats might they use?

25. What didn’t I ask you about that I should know? - Something that you want to tell me
   about related to the topics we’ve covered.
APPENDIX D

INVITATION TO PARTICIPANTS

FROM Pat Wilber
TO Faculty Participants
SUBJECT Critical Writing/Thinking Workshop

WED Mar.2, Noon-1:00PM, Alumni room, Memorial Union

You’ll be happy to know that “free lunch” still exists. The WAC Committee has
graciously agreed to provide us with boxed lunches at the three workshop sessions that
are part of my dissertation project.

Workshop Agenda

Part I

So what is critical/analytical thinking? Biddle and Clark suggest the following
definition as a jumping-off point:

Thinking is the process by which the human mind manages
information to understand established ideas, to create new
ideas or to solve problems.

As we teach we tend to describe specific skills that evidence student thinking:

Selecting ideas (for summarizing or evaluation)

Connecting ideas (to increase understanding)
Extending ideas

Applying ideas

Interpreting data

Classifying data

Drawing conclusions

Creating hypotheses

Others?

Using the two student papers you’ve agreed to evaluate for the project as a basis, we’ll create a “master list” of the variety of critical /analytic thinking skills we routinely ask students to produce in their writing assignments.

Part II

From our master list we’ll select one or two thinking skills and discuss the sub-skills students need to learn before they can successfully--extend an idea or draw a conclusion. We’ll use our collective intelligence to diagnose this rather complex learning process.
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