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Critical Thinking Assessment: The Link Between Critical Thinking and Student Application in the Basic Course[1]

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Critical thinking is a skill that is highly valued in the educational enterprise. The term is used often in many contexts. But, what does it look like; how do we know it when we see it; and most importantly, how do we measure it? The intent of this study is to evaluate existing literature on the concept, the teaching, and the assessment of critical thinking. To reach this goal, critical thinking will be examined in terms of its multiple definitions, and its relationship to higher order thinking, critical teaching, and assessment. In addition, the study will introduce a practical basic course classroom activity that effectively assesses students' ability to apply critical thinking skills outside the classroom. In the end, it is hoped that the reader will come away with (a) a well-rounded knowledge of critical thinking, (b) acknowledgment of the link between critical thinking and higher order thinking, (c) an idea of the various

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[1] An earlier draft of the article was presented at the Annual Teaching Symposium at Illinois State University (October 1998) and the Central States Communication Association Convention at St. Louis, MO (April 1999).

assessment tools available, and (d) an understanding of the new assessment tool presented in this study.

The authors take the perspective that students are active agents in the learning process, as opposed to passive audience members absorbing only what the teacher deems appropriate. This perspective implies that students take responsibility for their own learning and have the skills necessary to provide the theoretical/ practical links between course content and real-life experiences. Therefore, this study uses the students' own words as support for the claim that certain aspects of critical thinking can be assessed by the qualitative data (i.e., the artifact assignment) introduced in this paper, which relies heavily on student involvement in learning. Once again, this places each student in the role of active participant in her or his learning process.

CRITICAL THINKING

Definition

Although most definitions of critical thinking contain common themes, they vary in some of their specific assertions and have evolved over time. According to Grant (1988), "[o]ne difficulty in discussing critical thinking stems from the lack of a common definition. In part, this difficulty is the result of a plethora of terms describing the cognitive activity. The process is variously referred to as reasoning, higher order thinking, intelligent behavior, creative thinking, and thinking, each with its own meaning" (p. 34). To establish a working definition for this paper, it is necessary to examine and evaluate a few of the well known definitions of critical thinking. McPeck (1981) offered a description to characterize some aspects associated with

critical thinking. He explained that skepticism is crucial to critical thinking, and that truth is established through evaluating "alternative hypotheses and possibilities" by learning how and when to question (p. 6). In addition, McPeck felt that logic is useful in critical thinking, but warned against relying too heavily on it. For instance, he believed that testing logic alone is not sufficient for assessing critical thinking. Finally, McPeck did not recognize critical thinking as a distinct subject, and goes so far as to say that one must have "knowledge of, and experience in, a specific field" (p. 8), in order to think critically about it.

Although skepticism is an integral part of critical thinking, and is used by our students in the practice of critical thinking, it may not be sufficient in encompassing all areas of critical thinking. Additionally, having experience in a subject may arm an individual with some of the skills to think critically, but the authors of this study believe that one must first think critically to gain the appropriate knowledge to become experienced in a particular field. McPeck, in seeking truth through alternative perspectives, provided an open-minded approach to evaluating ideas, actions, and beliefs in a critical manner.

Meyers (1986), who examined the teaching of critical thinking across disciplines, agreed with McPeck that logic, although important, is not sufficient for critical thinking. He also agreed that knowledge in a particular topic is instrumental in critical thinking. Although Meyers did not offer an official definition of critical thinking, he does provide some general attitudes towards the concept. He stated, "A specific perspective or framework for analyzing materials and issues in a discipline is an important cognitive element in critical thinking. But affective elements can be equally important. These include general attitudes related to the

raising of questions, temporary suspension of one's own judgments, and enjoyment of mysteries and complexities" (Meyers, 1986, p. 8).

Ennis (1993), a leading researcher in the field, defined critical thinking as "reasonable reflective thinking focused on deciding what to believe or do" (p. 180). Ennis, over the years, also developed numerous characteristics of critical thinking, including dispositions and abilities. One of his more recent articles (1993) offered ten independent critical thinking behaviors, including:

1) judge the credibility of sources;
2) identify conclusions, reasons, and assumptions;
3) judge the quality of an argument, including the acceptability of its reasons, assumptions, and evidence;
4) develop and defend a position on an issue;
5) ask appropriate clarifying questions;
6) plan experiments and judge experimental designs;
7) define terms in a way appropriate for the context;
8) be open-minded;
9) try to be well informed;
10) draw conclusions when warranted, but with caution. (p. 180)

Much of Ennis' work focuses on assessing critical thinking and will be discussed later in this manuscript. Ennis' list of behaviors successfully relates critical thinking to issues of argumentation. For the purpose of this study, however, the authors feel that a more

encompassing definition of critical thinking, including analysis, application, and conceptualization is warranted.

Critical thinking, as defined by some authors, incorporates ideas of transferability and self-evaluation of one's own thinking processes. For example, Elder and Paul (1996) define critical thinking as "the ability and disposition to improve one's thinking by systematically subjecting it to rigorous self-assessment. Persons are critical thinkers, in the fullest sense of the term only if they display this ability and disposition in all, or most, of the dimensions of their lives (e.g. as a parent, citizen, consumer, lover, friend, learner, and professional). We exclude from our concept of the critical thinker one who thinks well in only one dimension" (p. 34). This idea differs from other concepts of critical thinking because it implies that it is not necessary to be experienced in an area to think critically.

Another expert on critical thinking, Richard Paul (1995), cited a definition of critical thinking from the National Council for Excellence in Critical Thinking Instruction that stated, "[c]ritical thinking is the intellectually disciplined process of actively and skillfully conceptualizing, applying, analyzing, synthesizing, or evaluating information gathered from, or generated by, observation, experience, reflection, reasoning, or communication, as a guide to belief and action" (p. 110). Paul (1995) then paraphrased an addition to the Council's definition, stating:

> [Critical thinking] entails larger-scale abilities of integrating elementary skills in such a way as to be able to apply, synthesize, analyze, and evaluate complicated and multidimensional issues. These include such abilities as clarifying issues, transferring insights into new contexts, analyzing arguments, ques-

tioning deeply, developing criteria for evaluation, assessing solutions, refining generalizations, and evaluating the credibility of sources of information. Among the abilities are included also the central forms of communication: critical reading, writing, speaking, and listening. Each of them is a large-scaled mode of thinking which is successful to the extent that it is informed, disciplined, and guided by critical thought and reflection. (pp. 110-111)

Although a lengthy definition, the authors feel that it provides a comprehensive understanding of the subject and an excellent base for discussing critical thinking. Therefore, the above is offered as the working definition for this manuscript.

Higher Order Thinking

In various ways, many authors linked critical thinking to higher order thinking and Bloom's taxonomy. More specifically, Bloom's *Cognitive Domain of the Taxonomy of Educational Objectives,* offers several levels of thinking or learning, which when applied appropriately, can result in different levels of critical thinking. Cooper and Simonds (1999) offered a concise explanation of the levels, which included:

- *Knowledge*: Questions that require simple recall of previously learned material
- *Comprehension*: Questions that require students to restate or reorganize material in a literal manner to show that they understand the essential meaning

- *Application*: Questions that require students to use previously learned material to solve problems in new situations

- *Analysis*: Questions that require students to break an idea into its component parts for logical analysis

- *Synthesis*: Questions that require students to combine their ideas into a statement, plan, product, and so forth, that is new for them

- *Evaluation*: Questions that require students to judge something based on some criteria. (pp. 153-155)

As cited in Grant (1988), Doyle defined higher order processing skills as "those requiring critical thinking, as the cognitive processes of comprehension, interpretation, flexible application of knowledge and skills, and assembly of information and resources. These higher order thinking processes produce new knowledge or knowledge in new forms ..." (p. 35). It is clear that this definition coincides with our accepted definition (that of the National Council) of critical thinking which also focuses on comprehension, interpretation and application.

Although many authors articulate that critical thinking and higher order thinking skills are not one in the same, many of the skills associated with higher order thinking are crucial for thinking critically. For example, Ennis (1987) argued that "critical thinking is not equivalent to the higher order thinking skills, in part because the idea is so vague" (p. 10). However, he recognized that critical thinking does include many higher order thinking skills. He linked higher order thinking skills to the top three levels of Bloom's taxonomy, which include analysis, synthesis, and evaluation.

Ennis (1987) acknowledged that "some educators might supplement the top three levels with non-routine practice of the next two lower levels, comprehension and application" (p. 10). The implication is that many of the skills used in higher order thinking are also key skills to be used in critical thinking.

The comparison between higher order thinking and critical thinking is important to this study because when a student engages in higher order thinking, the outcome can manifest itself in critical thinking. However, it should be noted that the skills involved in higher order thinking and critical thinking are separate entities although, when combined, they can successfully compliment one another.

Critical Teaching

Now that a working definition of critical thinking has been proffered, and a link between critical thinking and higher order thinking has been established, it makes sense to discuss the concept of teaching critical thinking. A logical question to ask is: Is it possible to teach critical thinking? McPeck (1981) helped answer this question when he states that critical thinking is "teachable in much the same way that other skills are teachable, namely, through drills, exercises or problem solving in an area" (p. 18). We agree that critical thinking can be taught, but McPeck seems to imply that it is the sole responsibility of the teacher to control this process, rather than allowing the students to share in the learning of critical thinking. We believe that students should be responsible for making their own critical connections between real life experiences and course content.

Many authors agree that critical thinking can be taught, although there may be disagreement on how to teach these skills. McPeck believed that critical thinking can be taught through drills, exercises or problem solving. On the other hand, See (1996) cited Chaffee as saying that there are two approaches to teaching critical thinking: "the integrated approach, which involves students' daily and academic experiences, and the interactive approach, which involves readings, group exercises, and reflective writing assignments" (p. 26).

Other scholars suggest that using questioning (or Socratic questioning) is the best method for teaching critical thinking (Paul, 1995; Savage, 1998; Hannel & Hannel, 1998; and Elder & Paul, 1998). For instance, Savage (1998) stated that "it is common knowledge that the strategy that can have the greatest impact on student thinking is teacher questioning" (p. 291). Hannel and Hannel (1988) also support the practice of questioning when they offer their seven steps to critical thinking, which provide a framework for the types of questions to ask students during the learning process. Paul (1995) similarly believed that questioning (specifically Socratic questioning) is crucial to the teaching of critical thinking. He also explainsedthat questioning can be used for three different purposes: 1) to help students organize their thoughts for writing assignments, 2) to help students think more deeply about basic ideas, and 3) to help students think carefully about difficult social issues.

Finally, some authors feel that the transfer of critical thinking skills to other academic areas and to real life experiences is an important way to teach critical thinking. See (1996) stated that "[c]ritical thinking is presented to students as the process of evaluating what they see and hear, then judging what those ideas mean to them" (p. 27). To transfer ideas, students must be

able to evaluate and judge what they are experiencing. Ennis (1987) provided good support for the need for students to be capable of transferring their critical thinking skills to other areas when he states, "... there are many areas calling for critical thinking that are not subjects people are likely to have studied in school, thus requiring that we teach for transfer and that our efforts in school not be judged to have succeeded unless critical thinking instruction transfers to areas of practical concern" (p. 17).

Lee (1997) explained that having students relate their personal experiences to the classroom leads to a liberal education, which in turn, "influences behavior less by direct application to experience than by instilling a habit of routinely reflecting critically on our experience within the broader frames of reference acquired through such an education" (p. 1). She follows by explaining that teachers should provide in-class opportunities for students to apply concepts from the subject area to their own personal experiences. We recognize the value in the aforementioned methods of teaching critical thinking, and believe that all of these possible methods of teaching may assist in facilitating the learning of critical thinking. We also recognize that using a combination of these methods in the classroom may be the most effective manner of teaching the concept.

Assessment

If one agrees that it is possible to teach critical thinking, next, it is important to decide whether it is possible to assess it, and if so, how. A major theme of Ennis' (1993) work is that "given our current state of knowledge, critical thinking assessment, albeit difficult

to do well, is possible" (p. 179). The authors agree that critical assessment can be done, but also that it should vary with the purpose and the format of the assignment and the topic being taught.

Paul (1995) offered several objectives and criteria for assessing higher order thinking, which is linked to critical thinking. Of the 21 objectives, we selected those that are most appropriately related to this manuscript.

1) It should assess students' skills and abilities in analyzing, synthesizing, applying, and evaluating information.

2) It should make clear the inter-connectedness of our knowledge and abilities, and why expertise in one area cannot be divorced either from findings in other areas or from a sensitivity to the need for interdisciplinary integration.

3) It should account for the integration of communication skills, problem-solving, and critical thinking, and it should assess all of them without compromising essential features of any of them.

4) It should test for thinking that is empowering and that, when incorporated into instruction, promotes the active involvement of students of students in their own learning process.

5) It should be of a kind that will assess valuable skills applied to genuine problems as seen by a large body of the populace, both inside and outside of the educational community.

6) It should contain items that, as much as possible, are examples of the real-life problems and issues that people will have to think out and act upon. (pp. 107-109)

These objectives for assessment are extremely important in deciding how to evaluate critical thinking.

When it comes to actual critical thinking tests, there is a surprisingly large number and variety of tests already established. For example, Bloom's taxonomy of higher order thinking is often used as an assessment of critical thinking. Ennis (1987) noted that "in the elementary and secondary schools we find heavy current emphasis on the upper three levels ... of Bloom's taxonomy" (p. 9). Most tests, however, are more structured and objective than Bloom's taxonomy. Ennis (1993) and Norris and Ennis (1989) described several standardized tests with the following being a few of the more popular.

- *Watson-Glaser Critical Thinking Appraisal*: A multiple choice test, this assessment tool is geared towards high school and college students. It includes "sections on induction, assumption identification, deduction, judging whether a conclusion follows beyond a reasonable doubt, and argument evaluation" (Ennis, 1993, p. 183).

- *Cornell Critical Thinking Tests*: These tests have two levels, X and Z, which are geared towards different age groups. There are multiple-choice questions examining "induction, credibility, prediction and experimental planning, fallacies (especially equivocation), deduction, definition, and assumption identification" (Ennis, 1993, p. 183).

- *Ross Test of Higher Cognitive Processes*: Containing 105 multiple-choice questions, this test assesses the upper three levels of Bloom's Taxonomy, focusing on the "students' ability to analyze, synthesize, and evaluate" (Norris & Ennis, 1989, p. 68).

- *The Ennis-Weir Critical Thinking Essay Test*: This
  test is similar to the Cornell test, but is designed in
  essay format and aimed at high school students,
  college students, and other adults.

When using such tests, Ennis (1993) warned against
"traps for the unwary" one can easily fall into when
assessing critical thinking. He felt that "Test results
may be compared with norms, and the claim made that
the difference, or similarity, is the result of instruction"
(p. 181). He also raised the concern that "Most critical
thinking tests are not comprehensive, especially those
that are easiest to use, the multiple-choice tests" (p.
181), and significant results may be expected in too
short a time period" (p. 181). Other traps include pre-
testing and posttesting without a control group, differ-
ences in background beliefs when using multiple choice
tests, using the same test for the pretest and posttest,
test validity because of "high-stakes purposes" (p. 181),
and scarce resources. We also acknowledge the traps of
testing, and these traps which are taken into considera-
tion in the assessment tool presented here.

In contrast to the standardized tests just mentioned,
Ennis and Norris suggested that "a combination of a
standardized test and open-ended assessment tests
should be used to measure critical thinking" (Ennis &
Norris as cited in Spicer & Hanks, 1995). They also
offered the opinion that "Evaluations of critical thinking
are usually artificial in comparison to the life situations
in which we hope students will eventually be able and
disposed to think critically" (Norris & Ennis, 1989, p.
41). The authors agreed with this statement and with
Paul (1995) who said that "A true measure of critical
thinking, can be obtained only by including in the
assessment *generative* as well as *selective* dimensions"

(p. 144). In reality, however, most assessment comes in the form of standard multiple choice tests, open-ended questions, and an essay section, which asks the student to do something specific. Tests are not provided, however, to assess how a student can critically reflect on an event in her or his life and apply classroom concepts to that event, evaluating how the two (or more) elements fit together and allow them to make sense of what goes on outside the classroom. This manuscript supports the idea that having students generate their own ideas using critical thinking skills is a much more meaningful way to assess critical thinking as compared to circling answers on a multiple choice test. Having said all of this, it is time to introduce an alternative form of critical thinking assessment which the authors feel provides rich descriptions of critical thinking using actual testimonies and descriptions from students as data. It should be noted that this is one of several assessment approaches to measuring critical thinking. However, when viewing students as active agents in the learning process, this assessment tool allows for the analysis, synthesis, and evaluation of information gathered through observation and experience on the part of the student, in accordance to the author's accepted definition of critical thinking.

METHOD

Participants/Data Collection

This study was conducted using data collected from 51 students participating in one of three sections of a basic communication course at a large Midwestern university. The course uses a hybrid approach to teaching communication, focusing on public speaking, inter-

personal and small group communication. One topic, introduced at the beginning of the course, is critical thinking. After a thorough discussion of the concept, students are asked to apply critical thinking skills to various concepts during the term. Some of the topics linked to critical thinking are: ethical communication, cultural diversity, audience analysis, support material, persuasion, logic, and the communication process. To accomplish the goal of application, students are asked to complete several (6-8) "artifact" assignments. The assignments require the students to think critically by relating class concepts to their experiences outside the classroom. The artifact assignment reads as follows:

> *Artifacts may include any phenomenon outside of class that are effective examples of course concepts discussed in class. Artifacts might include television shows, movies, newspaper articles, comics, guest speakers, personal conversations, etc. In a brief (one page) paper, you are to describe the artifact, link it to a communication concept, and analyze how the artifact is related to the communication concept. The first paragraph should discuss and/or describe the artifact in detail (who, what, where, when, how) and the second paragraph should identify (reference class discussions or text material) and analyze the communication concept being discussed. When appropriate, include the artifact with your paper. Each artifact ... will be evaluated based on writing, format, description, link, and analysis.*

These artifacts are included in a working portfolio compiled by the students throughout the term.

At the end of the term, students are asked to complete an assignment reflecting on how their communication skills have changed over the semester and

identifying areas in which they improved the most (see "Synthesis Paper" assignment below).

SYNTHESIS PAPER

Description

Your goal in the final portfolio assignment is to evaluate how your communication has changed over the semester. Are you a better public speaker? (Why or why not?) Are you more comfortable and effective in small group settings? Are you better at handling conflict in groups and interpersonally? Are you better at critical thinking, identifying illogical arguments or constructing logical arguments to influence others? Are you more aware of your language choices and better able to select appropriate terms that are not sexist/racist or just stupid?

The items in the portfolio provide the evidence for the claims you are making. For example, if you claim you have improved in public speaking, point to something you did ineffectively in your first speech but improved in your second. You don't need to give exact location on outline, evaluation form, or tape, but you should "situate" the evidence (e.g., "I am now better at organizing my speeches. In my informative speech (see introduction), I did not give any indication of the three points I wanted to make. In my persuasive speech (see introduction), I very clearly stated that I was going to discuss the problem caused by _____ and offer a three-step solution to solve the problem. Also, my transitions improved. In my informative speech, I had no transition between the body of the speech and the

conclusion, but in my persuasive speech, I provided a very clear transition into my conclusion by using repetition (see the last two minutes of the tape)." Other portfolio items should be used in the same way. If you claim to be a better critical thinker you should provide editorial pages, ads, descriptions of commercials, summaries of conversations, etc. that illustrate some fallacy you have now begun to recognize. If you claim to be more aware of sexist or racist language, provide a cartoon, editorial, or summary of a conversation that illustrates this.

Format

Your paper should be 3-5 pages (typed and double spaced with no more than 1.25 inch margins and 12 point font). Your paper will contain 5 paragraphs including an introduction (with attention getter, thesis, and preview), 3 main points (which reflect the 3 improvement claims with evidence to support), and a conclusion (with summary and memorable close).

Evaluation

This paper is worth 20 points and is part of your total portfolio grade. The following is my criteria for evaluation: Format (4 pts), Writing (4 pts), Organization (4 pts), Support (4 pts), and Overall Impression (4 pts).

To collect the data for this study, students of one of the authors voluntarily gave their completed papers to the instructor. Each student was to write six to eight artifact assignments and one synthesis paper. Before using the artifacts and synthesis paper as data for this study, the authors obtained written permission from the students. We used the collected data to show that the artifact assignment is a viable form of assessing critical thinking. In the following analysis section, we use the student's own words to support this claim.

Data Analysis

Two of the researchers independently coded one half of the 273 artifact assignments and one half of the 46 synthesis papers. For the artifact assignments, the coders first indicated the topic of the artifact. To do this, the coders (who have both taught the basic communication course) read the artifact assignment and indicated the topic they thought the artifact covered. The researchers also coded whether the critical thinking used in the artifact was latent, manifest, or non-existent. The coders then added any additional comments that might help in refining categories. To establish intercoder reliability, the coders, using a systematic random sample, pulled 10% of the artifacts and 22% of the synthesis papers and coded them independently. For the artifact assignment, intercoder reliability was 88.9% for topic and 92.6% for latent/manifest. Coding for the synthesis papers involved indicating whether or not critical thinking was referenced. If critical thinking was referenced, the coders indicated whether it was latent or manifest, and added any comments needed for refining categories. For the synthesis papers, intercoder reliability for topic and for latent/manifest was 90%. After

differences were discussed, the coders came to 100% agreement for topic and latent/manifest for both the artifact assignment and the synthesis papers.

Based upon the analysis of the artifact assignments several categories emerged (see Table 1). Categories included: persuasion, ethical communication, speaker evaluations, listening, support materials, logic, small groups, the communication process, critical thinking, credibility, language, audience analysis, ethical communication, communication apprehension, organization, conflict, cultural diversity, university resources, public speaking, interpersonal communication, and speech delivery. Occasionally, no topic or no critical thinking was evident, or a concept was incorrectly analyzed. These instances were categorized as no topic/no critical thinking.

RESULTS

This section first presents the results for the artifact assignment, dividing the papers into the categories of latent and manifest critical thinking. The authors will summarize student responses and provide direct quotes from the artifact assignments to show that the artifact assignment helps students to consciously or unconsciously think critically. Part two of this section will contain similar support material for the claim that the artifact assignment is one form of critical thinking assessment. This support will come from the synthesis papers and will be structured under the latent and manifest categories as well.

Table 1
Numbers of Each Category for the Artifact Assignments

Category	Number
Persuasion	33
Logic	24
Communication Process	22
Audience Analysis	20
Ethical Communication	19
Listening	19
No Topic/No Critical Thinking	19
Small Group	16
Language	15
Speaker Evaluation (of self or other)	15
Delivery	13
Critical Thinking	10
Credibility	10
Conflict	9
Cultural Diversity	9
Communication Apprehension	8
Support Material	6
University Resources	5
Organization	4
Public Speaking	4
Interpersonal Communication	2

Examples from the student artifacts and the synthesis papers offer support for the idea that students learn critical thinking skills through the artifact assignment. Most of the students applied their critical thinking skills in completing the assignment. Some of the papers directly address the use of critical thinking during the assignment (manifest critical thinking). Others do not directly address the concept, but based upon the definition of critical thinking adopted for this study, it is clear that the students are engaging in critical thinking (latent critical thinking). Nineteen students did not reflect the process of critical thinking. The topic being analyzed was either not clearly articulated or there was no evidence of critical thinking.

Artifact Assignment

Manifest Critical Thinking. In completing the artifact assignments some students explicitly stated that they were engaging in critical thinking. In several of the examples of manifest critical thinking, students applied their critical thinking skills to analyzing and evaluating advertisements and commercials. They analyzed issues such as fallacies, the use of statistics in advertising, judging evidence or arguments, and distinguishing fact from opinion. For example, while incorporating the concepts of judging evidence and distinguishing fact from opinion, one student applied these concepts to a psychic network commercial. She begins by providing a quote from the textbook and then elaborates by saying, "When something sounds too good to be true (like this commercial) it is necessary to use critical thinking skills." Another student, in analyzing an add for a razor, stated that "[w]e ... have to be critical in our thinking and be skeptical in our interpretations." In one

artifact assignment, a student exposes poor statistical support for claims in an advertisement, stating that "[a]s a critical thinker I was able to identify the flaw in the advertisement."

Other examples of manifest critical thinking included group work, gender roles, and interpersonal interactions. Two students indicated that they used critical thinking while working in groups. One of the students indicated that work on difficult problems can be made easier because having a group think critically together helps solve the problem. While trying to organize a group speech, one student commented on using critical thinking skills during the process. She explained, "To do some critical thinking in this situation, what we did is establish the problem. The problem was: how are we going to get this to work the way we want it to? Critical thinking involves focused and organized thinking where you see the relationships between ideas and the way things are presented .... We used critical thinking to help us work as a group and come to a decision."

Analyzing gender roles was one topic that a student used to show critical thinking skills by explaining that "[h]ad it not been for my developing critical thinking skills, I may have never noticed any of this." As for applying critical thinking to interpersonal interactions, one student indicated that she used critical thinking to choose an apartment and convince her parents to let her move out of the house. She stated that "[b]y using critical thinking, I was able to choose the right apartment and persuade my parents at the same time."

Finally, one student commented on relating critical thinking to listening. She referred to a message in a fortune cookie that read: "By listening, one will learn truths. By hearing, one will only learn half-truths." The student analyzes the statement, saying:

The connection of *truth* to listening vs. hearing is actually a connection of *critical thinking* to listening vs. hearing. In order to make sense of what is heard, that is, in order to listen, one must *think*. The best way to discover truths is to engage in focused, organized thinking that allows one to see clearly the relationships among ideas, otherwise known as critical thinking. When one thinks critically, one spots weakness in arguments, distinguishes fact from opinion, judges the credibility of statements and assesses the soundness of evidence. This process allows lies to be filtered out of messages that the listener receives.

Latent Critical Thinking. Based upon the definition of critical thinking adopted for this study, the concept involves analyzing, applying, transferring ideas to new contexts, evaluating, etc. and can include critical reading, writing, speaking, and listening. We propose that even if students did not directly address critical thinking in their artifact assignment, much of what they engaged in when applying class concepts to phenomena outside of class is latent critical thinking. In the artifacts, the students clearly transfer ideas to new contexts, apply course concepts to events in their own lives, and evaluate circumstances they encounter.

First, many of the students (N = 33) referenced instances when they applied persuasion to situations outside the classroom or evaluated persuasive tactics. The subcategories of persuasion that were the most prevalent were related to advertising, fallacies, credibility/support, persuasive appeals, organizational patterns, and types of persuasion. Students often chose to use their critical thinking skills to recognize fallacies in advertisements and commercials, and to recognize persuasive appeals. For instance, one student pointed out situations when an advertisement relied on an

"appeal to authority, which incorporates the improper reliance on the expert and faulty comparison, which compares two ideas or things which should not be compared." Another student analyzed *Seventeen Magazine*, stating she was "looking for ads that contained persuasion tactics that I should 'watch for' as a critical consumer." She noted that "When advertising products, companies know that teenagers are the most gullible and the least critical consumers in the market. As a result, fallacies are abundant when youth is the target audience."

Other students observed a variety of persuasive techniques in advertisements. These involve the student critically thinking and evaluating the type of persuasive tactic used. Some of these include appealing "to the idea that everyone is doing, thinking, or buying something," making faulty comparisons, and attacking the person instead of the person's argument.

For one of the artifact assignments, students were provided the opportunity to solve a logical exercise. Twenty-four students successfully analyzed the "Four-Car Problem" to come to a well thought-out conclusion by using their critical thinking skills to question and evaluate information.

The communication process (N = 22), audience analysis (N = 20), ethical communication (N = 19), and listening (N = 19) were topics that arose regularly in the artifact assignments. For the communication process, the students applied concepts such as situation/context, message, miscommunication/misunderstanding, feedback, channels, barriers to effective communication, listening, language, and frames of reference to situations in their own lives. Some students evaluated conversations they had with their social networks, while others analyzed newspaper articles or cartoons.

A large portion of the students used critical thinking in audience analysis. Students writing about audience analysis discussed such topics as ethics, appropriate language (including the use of jargon), gender, open-mindedness, and demographic factors of the audience. For students to apply critical thinking to audience analysis, it is necessary for the student to evaluate the audience, to think critically, and to appropriately adapt to a speech situation. According to a student, "... we [the students] have to be aware of what is happening in our society and incorporate our surroundings into our speeches. We have to be open-minded and consider all types of audiences when presenting all topics." A student who just started attending the university explained a situation where she had to analyze her audience [i.e., her father and younger brother] by using critical thinking, and alter her language appropriately. A third student made a connection between audience analysis and situations outside the classroom. She stated "When giving any type of presentation, one must be sensitive toward his or her audience and their feelings .... This is found to be true when giving speeches, when participating in a job interview, or when teaching a class."

Students, when discussing ethical communication in their artifact assignments, chose topics such as racist/sexist language, biased language, showing respect, name-calling, plagiarism, cultural sensitivity, and stereotyping. In class, the students learn to analyze the use of appropriate/ethical language, such as biased or sexist language. In their artifact assignments, some of the students thought critically about advertisements where inappropriate language was an issue. When examining an article found in *Redbook Magazine* describing "bad teachers who exhibit inappropriate language in the classroom," one student noticed "a clear

representation of abusive, foul language, and name calling, diminishing personal dignity." Using critical thinking skills, the student made a clear link between the communication concept of using appropriate language and the article she read.

Another important category that the students identified in their artifacts was listening. The topics the students focused on when discussing listening included empathic listening, listening vs. hearing, the causes of poor listening, distractions/barriers to effective listening, active listening, and ethical listening. One student was clearly thinking critically when he applied what he had learned about barriers to critical thinking to a comic strip. The student noted that "Cathy's husband heard what she was saying but chose not to listen, or comprehend, because he was focusing on other issues. He had a personal agenda ...."

As mentioned earlier, many authors discussed the importance of credibility to the process of critical thinking. For instance, Ennis (1993) listed judging credibility as one of ten independent critical thinking behaviors. In addition, the National Council for Excellence in Critical Thinking Instruction (as paraphrased by Paul, 1995) included "evaluating the credibility of sources of information" (p. 110) as part of critical thinking. Some of the students (N = 10) also made the connection between critical thinking and credibility. One student made the comment that a company who is not credible in their commercial advertisements, may not be credible in their other business practices. Another student claimed that using an invalid analogy in a commercial causes the company to loose credibility. While analyzing an MCI ad, the student stated, "[r]ather than comparing AT&Ts lowest rate plan with their lowest rate plan, MCI chose to create an invalid analogy .... Though, in the beginning

they may help you gain support, once the analogy is shown to be invalid, you will lose support and credibility." It is evident that the students are evaluating the credibility of advertisements by utilizing their critical thinking skills.

Another example of students applying their critical thinking skills when analyzing a person's credibility occurred when one student pointed out that public speakers need experience in the topic area to be deemed credible. In another instance, a student referred to a conversation she had with two other students concerning the importance of looks in a relationship. She noted that one of the participants lost credibility when "she did not consider that other people may have different opinions. She did not take her audience into consideration. Also, she gave facts that have no proof to support her claims. Her credibility basically flew out the window within the first couple of sentences that she spoke." In a different situation, a student used her critical thinking skills while judging the credibility of her softball coaches. She stated:

> I evaluate the credibility of coaches, assistants and teammates when facing conflicting perspectives. I find each coach's competence (a speaker's intelligence, expertise and knowledge of the subject--softball) is greater than the assistants or players due to their experience and position on the team .... Character (a speaker's sincerity, trustworthiness, and concern for the well-being of the audience) also plays a part in determining whose swing approach to use or whose footwork to follow.

Synthesis Papers

When writing their final synthesis paper, which asks the students to reflect on what they improved upon most during the course, many students named critical thinking as one of their major areas of improvement, while others showed evidence of critical thinking. Of the 46 synthesis papers, 19 papers referenced critical thinking in some way (see Table 2). Thirteen students commented directly on an improvement in their critical thinking skills (manifest critical thinking) and six others showed evidence of critical thinking (latent critical thinking).

Table 2
Numbers of Each Category for the Synthesis Papers

Category	Number
Critical Thinking (Manifest)	12
Artifacts/Communication Application (Latent)	5
Cultural Diversity (Latent)	1
Listening (Manifest)	1

Manifest Critical Thinking. In their own words, students commented that completing the artifact assignments taught them to become critical thinkers. One example from a student is: "an area in which I noticed improvement was concerning critical thinking.

This improvement I found mostly to be rooted in the artifact assignments." A second student said "I know I have learned about critical thinking from doing my artifacts. In doing an artifact you have to find an idea and analyze it." In addition, another student commented "I learned to apply concepts to everyday life. This is made evident through the artifacts I did." Referring to the artifact assignment, she later stated "I was using critical thinking to apply class topics to situations I encountered. I noticed that when a certain situation would transpire, I would automatically think of some way I could relate it to speech class." Finally, according to one student, "The artifacts were a real challenge to me at first because they made me think critically about the class and how it relates to the world."

Latent Critical Thinking. Some students, although not making direct comments addressing critical thinking, made it clear that the artifacts helped them learn to think more critically by applying course concepts to personal experiences. This is evident from comments from the synthesis papers. One comment that links critical thinking to experiences outside the classroom says "another exciting development was my recognition of communication applications in everyday life. The artifacts contributed greatly to this new ability." Similarly, another student showed how she was able to transfer insights into new contexts commenting that "through having to write the artifacts I am more aware of communication outside of the class. I am able to attribute the material I learned in class to situations other than those that are in the classroom." Finally, one student stated: "I think that my artifacts are good evidence that I understand the issues that were presented in the textbook."

DISCUSSION

Based upon the working definition of this paper, which comes from the National Council for Excellence in Critical Thinking Instruction, critical thinking focuses on actively gathering information through observation, experience, reflection, reasoning, or communication, then using the information to conceptualize, apply, analyze, synthesize, or evaluate. These processes should lead to intellectually supported belief or action. The assessment tool provided here supports these criteria, and provides evidence that critical thinking is taking place. The artifact assignment requires that students engage in application, analysis, synthesis, and evaluation of real-life events which is consistent with the objectives and criteria for assessment proposed by Paul (1995). This paper used students' own words as evidence of the link that exists between the aspects of critical thinking and the application of class concepts to students' experiences outside the classroom, which is consistent with the notion that students are active agents in the learning process.

Higher Order Thinking

As discussed earlier, there is a distinct connection between critical thinking and higher order thinking. There is agreement among authors that the top three levels of Bloom's Taxonomy (analysis, synthesis and evaluation), and possibly the next two levels (comprehension and application) are skills that assist in the process of the critical thinking. The above definition of critical thinking includes many of Bloom's objectives,

and it is clear through the students' words that they are engaging in many of these activities.

Critical Teaching

Although this paper does not speak directly to critical teaching, it is related because the methods used to teach critical thinking influence the assessment of critical thinking. For instance, teaching critical thinking through drills or exercises might assess critical thinking with a multiple choice test. On the other hand, teachers who emphasize the transfer of critical thinking skills to other disciplines and to real life may assess critical thinking using more generative methods. The assessment tool provided in this study meets Paul's previously mentioned objectives by assessing "students' skills and abilities in analyzing, synthesizing, applying, and evaluating information" (1995, p. 107). In addition, the assignment provided here allows students to be actively engaged in their own learning. Finally, as Chaffee stated in See (1996), there are two approaches to teaching critical thinking: "the integrated approach, which involves students' daily and academic experiences, and the interactive approach, which involves readings, group exercises, and reflective writing assignments" (p. 26). The artifact assignment presented here uses both approaches in one assignment. First, the assignment uses the integrated approach by allowing students to relate what they have learned in class to their lived experiences. Second, the interactive approach is used because the artifact assignment is a writing assignment asking students to reflect on these lived experiences, using their critical thinking skills. In addition, students often incorporated content from the textbook and group exercises into their writing.

This evidence supports See (1996), Ennis (1987), and Lee's (1997) feelings that the transfer of critical thinking skills to other academic areas and to real life experiences is an important way to teach critical thinking. As stated earlier by Lee (1997), having students relate their personal experiences to the classroom leads to a liberal education, which in turn, "influences behavior less by direct application to experience by instilling as habit of routinely reflecting critically on our experience within the broader frames of reference acquired through such an education" (p. 1).

Assessment

One goal of this study has been to provide an assignment that can successfully assess critical thinking and student's understanding of the concept. Based upon the purpose and the format of the artifact assignment, and the subject area being taught, the authors believe the assessment tool presented here successfully accomplishes this goal. Using the student's own words, evidence of critical thinking is provided in the results. Once again, some of the papers directly address the use of critical thinking during the assignment (manifest critical thinking), and others do not directly address the concept, but based upon the definition of critical thinking adopted for this study, it is clear that the students are engaging in critical thinking (latent critical thinking). For example, one student displayed manifest critical thinking when stating "we have to be critical in our thinking and be skeptical in our interpretations." Another student exposed poor statistical support for claims in an advertisement, stating that "as a critical thinker, I was able to identify the flaw in the advertisement." When analyzing an MCI advertisement, one

student showed latent critical thinking by saying "rather than comparing AT&Ts lowest plan with their lowest rate plan, MCI chose to create an invalid analogy .... Though, in the beginning they may help you gain support, once the analogy is shown to be invalid, you will lose support and credibility."

These quotes from the artifact assignments, as well as the other quotes presented in the results section, provide evidence that the assignment is a viable tool for assessing critical thinking. In addition, however, quotes from the synthesis papers provide even further support for this new assessment tool. For example, one student displayed manifest critical thinking by stating: "The artifacts were a real challenge to me at first because they made me think critically about class and how it relates to the world." Another student showed latent critical thinking in the synthesis assignment by saying: "another exciting development was my recognition of communication applications in everyday life. The artifacts contributed greatly to this new ability."

In addition to providing support for the artifact assignment as a successful critical thinking assessment tool, several standardized assessment tests have been described including: the *Watson-Glaser Critical Thinking Appraisal*, the *Cornell Critical Thinking Tests*, the *Ross Test of Higher Cognitive Processes*, and *The Ennis-Weir Critical Thinking Essay Test.* As authors of some of these tests, Norris and Ennis (1989) stated, "Evaluations of critical thinking are usually artificial in comparison to the life situations in which we hope students will eventually be able and disposed to think critically" (p. 41). Agreeing with this statement, the we feel the three multiple-choice tests are limited because they prohibit students from taking an active role in learning and applying critical thinking. In addition, they fail to allow students to generate their own ideas,

which is part of the process of critical thinking. The Ennis-Weir Critical Thinking Essay does allow students to use their own words, however, it forces them to respond to an established scenario that leaves little room for true application through observation, experience and reflection.

In response to Paul's (1995) request for a more generative and creative way of assessing critical thinking, the authors offer the artifact assignment as a tool for allowing students to take an active role in learning to think critically. As supported by the students' own words, it is clear that these assignments allow students to apply critical thinking to their own experiences. In addition, the assignment allows teachers to assess each student's level of critical thinking by judging the description of the artifact, the link to the specified concept, and the analysis of each communication concept.

Again, even as an author of some of the standard critical thinking assessment tests, Ennis (1993) expressed a need for "general-content based tests to check for transfer of critical thinking instruction to everyday life" (p. 182). Unfortunately, he does not provide an assessment tool that allows for the transfer to real-life practices. The assessment tool presented in this paper is an excellent qualitative measure of this transferring process.

Limitations

Although the authors have made no attempt to generalize this concept to a larger audience, some may see this as a limitation. We are aware that the data collected was from a limited sample (three sections of one basic communication course). This was an attempt to qualitatively provide a rich description of student

experiences. This is an exploratory, preliminary study of assessing critical thinking through the artifact assignment. Future studies should take a representative sample of student papers and conduct a more thorough and rigorous content analysis to determine the usefulness of the artifact assignment as an authentic form of assessment. This assessment tool could also be effective if applied to other courses in other disciplines.

In addition, the wording of the synthesis assignment may also serve as a limitation as it asks questions of the students to help them analyze what they have learned throughout the term. One of these questions asks if the student has improved in the process of critical thinking. This may lead the student to reflect on the critical thinking process when they might not have otherwise. Also, when students claim that they have improved critical thinking skills, they must provide support for those claims, which is itself an exercise in critical thinking. Finally, as stated earlier, scholars define critical thinking in a variety of ways, which makes it a difficult concept to study. The assessment tool presented above follows the definition from the National Council, but would not be a good measure for a definition focusing mostly on logic or on developing arguments.

CONCLUSION

In sum, we believe that having students actively participate in their learning is imperative in the teaching and learning of critical thinking. This participation entails applying concepts learned in the classroom to the students' personal experiences. The evidence provided in this study supports the idea that students are using the artifact assignment to engage in this participation and are learning to think critically. As Lee

(1997-1998) stated, "By creating explicit opportunities for students to draw connections between their experience and course materials and then providing them with tools for reflection, instructors can help students internalize a habit of critical reflection" (p. 1).

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