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INTERDISCIPLINARY WRITING ASSESSMENT PROFILES

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Abstract: Relying upon current interdisciplinary theories, this article offers a newly created method for assessing interdisciplinary thinking, the Interdisciplinary Writing Assessment Profiles. The Profiles is a scoring rubric for the assessment of substantive undergraduate, expository, research-based interdisciplinary writing assignments, such as a senior thesis or major term paper. In this instrument, four dimensions of interdisciplinary writing are assessed: (1) drawing on disciplinary sources, (2) critical argumentation, (3) multidisciplinary perspectives, and (4) interdisciplinary integration. The first two dimensions focus primarily on elements that should occur in disciplinary as well as interdisciplinary expository writing. The final two dimensions are more pointedly focused on interdisciplinary writing. The instrument was developed and field-tested with disciplinary senior theses from the University Honors Program and interdisciplinary senior projects from the School of Interdisciplinary Studies at Miami University in Ohio. The article discusses the reliability and validity of the scoring procedures, offers some findings about how disciplinary and interdisciplinary projects compared in terms of the scoring, and provides concrete guidance on how to make specific scoring decisions.

Introduction

Despite growing demands for assessment of student learning, and a plethora of books and articles indicating various strategies and approaches for assessment, many seem to be at a loss as to how to measure success in undergraduate student learning and faculty teaching. The burgeoning field of interdisciplinary studies is no exception, and indeed, the assessment literature is quite small given the growth of scholarship and teaching in this area. Only a few good articles on the assessment of interdisciplinary learning have been pub-

lished (e.g., Field, Lee, & Field 1994; Field & Stowe 2002; Klein 2002; Newell 1998), and many of these devote more time discussing the paucity of interdisciplinary assessment efforts than providing specific methods of assessment or evidence of learning in interdisciplinary settings. Yet, the demand for effective assessment methods for interdisciplinary studies is keen. For example, Klein (1999) points out that, "If the case for interdisciplinary and integrative approaches is to be fully persuasive, however, claims of successful results must be matched by evidence" (p. 26).

The Interdisciplinary Writing Assessment Profiles provides one method for assessing interdisciplinary thinking: a scoring rubric for the assessment of expository, research-based interdisciplinary writing (see Field & Stowe 2002, for more about scoring rubrics; and Canavan 2001, for another approach to rubrics). Writing was selected as the venue for assessing interdisciplinary thinking for three major reasons. First, writing is greatly valued across the curriculum, and particularly in interdisciplinary contexts. Almost all fields and disciplines ask their scholars to conduct original research and to communicate those ideas through writing. Second, writing is generally one of the primary means of assessing learning in every discipline or major. Not only do faculty members across the curriculum assign writing to their students, but it is also a skill that is expected in virtually every professional interdisciplinary setting. Finally, writing produces a fixed, concrete record (i.e., the text) that can be used to assess indirectly more fluid, dynamic, and ephemeral mental processes such as synthesis and integration. This scoring rubric provides a means of reliably assessing a diverse range of interdisciplinary exposition, without committing to more quantitative approaches that some scholars may find inappropriate for interdisciplinary contexts (e.g., Wolfe, Wang, & Bergen 1999).

The theoretical starting points for the Interdisciplinary Writing Assessment Profiles are Newell's (2001) "A Theory of Interdisciplinary Studies," Klein and Newell's (1998) "Advancing Interdisciplinary Studies," and Haynes' (1996) plan for writing across an interdisciplinary curriculum. The focus of that theory and guide to practice is, appropriately, interdisciplinary *processes*. To illustrate, Klein and Newell (1998) state that "*interdisciplinary studies* may be defined as a process of answering a question, solving a problem or addressing a topic that is too broad or complex to be dealt with adequately by a single discipline or profession" (p. 3). However, this instrument is intended to be used with the *products* of those processes (i.e., static text) without direct access to the social and cognitive processes that produced them. In applying and operationalizing the theory to assessment, four dimensions of in-

terdisciplinary writing were identified: (1) drawing on disciplinary sources, (2) critical argumentation, (3) multidisciplinary perspectives, and (4) interdisciplinary integration.

The first two dimensions focus primarily on elements that should occur in disciplinary as well as interdisciplinary expository writing. However, drawing upon disciplinary sources and critical argumentation are by no means commonplace abilities. For example, according to the results of the Twelfth Grade Persuasive Writing Assessment (National Assessment of Educational Progress 1998), only 13% of the essays were judged “skillful” or “excellent” because they presented a clear claim supported by pertinent reasons and were judged to be well organized. The final two dimensions are more pointedly focused on interdisciplinary writing. Theoretically, employing multidisciplinary perspectives is considered a prerequisite for interdisciplinary integration, but, of course, the outcome of any particular study using the Profiles is an empirical issue. The reason for including all four dimensions is to clearly demarcate the traits that are indicative of interdisciplinary writing and to diagnose problems related to both disciplinary and interdisciplinary dimensions of writing.

It is assumed that those using the Profiles to assess interdisciplinary writing are themselves familiar with interdisciplinary theory and practice and have a general familiarity with the topic of the essays being assessed. The Profiles are designed to be used with substantial undergraduate essays such as senior capstone papers, senior projects, and significant term papers. The instrument was developed and field-tested primarily with year-long senior projects from the School of Interdisciplinary Studies (Western College Program) at Miami University in Ohio (see Newell 1992; Schilling n.d.), with projects typically about 60 pages in length. The Interdisciplinary Writing Assessment Profiles are not intended as a substitute for academic evaluation, one-on-one feedback to individual writers, or grading. Rather, this instrument is a means of assessing undergraduate interdisciplinary work for the purpose of improving teaching and learning. Indeed, we believe that it will be most useful for assessing whole programs, as when applied to a larger set of essays over time or, perhaps, across institutions. It may also serve as a useful set of guidelines for students and their faculty advisors to discuss before a student begins writing the thesis as a way to communicate clear expectations for interdisciplinary scholarly writing.

Those using the Interdisciplinary Writing Assessment Profiles should first thoroughly familiarize themselves with this article. It is important to understand both the rationale and the concrete operational definitions associated

with each judgment. If the Profiles are to be used in publishable research, we recommend that two or more professionals collaborate to understand the instrument and how it may be best applied to particular local circumstances. We also recommend that two individuals independently score each essay and then confer on each judgment, with differences to be resolved by consensus. This procedure can also be used to determine inter-rater reliability (defined, for these purposes, as the number of identical judgments divided by the total number of judgments), which is an expectation of many academic journals.

The general *modus operandi* for scoring an essay with the Interdisciplinary Writing Assessment Profiles is first to understand this instrument, then to read through the entire essay, and finally to re-read the essay looking for evidence for each particular judgment. Each judgment or source element should be supported by a specific reference to the text. One should be able to cite one or more lines of text for each judgment. Operational definitions should be followed conservatively and consistently. When in doubt, do not assign credit for a source element (positive or negative).

This article is divided into several sections. The next section discusses the reliability and validity of the scoring procedures as empirically determined by the authors. The section, "Profiles with Detailed Instructions," provides both the rationale for each judgment and concrete guidance on how to make specific scoring decisions and information to help researchers interpret their results. Those using this instrument to score an essay should study this section and refer to it in making specific judgments. The article concludes with a section, "Profiles in Brief," which summarizes the source elements associated with each judgment and the scoring criteria for each category of assessment.

Reliability and Validity of the Instrument

Reliability and validity are key concepts in the psychological literature on measurement, testing, and assessment. Conceptually, a reliable instrument produces a consistent, dependable result, and a valid instrument produces a result that assesses what the research claims it is assessing. To illustrate, suppose a person were to step onto a bathroom scale and read her weight as 110 lbs. Suppose further that she stepped off the scale and back onto it and read her weight as 160 lbs. She would be wise not to trust the scale, and in the parlance of measurement theory, the scale would be unreliable. Now suppose that another person, a child, stepped onto another bathroom scale and the needle pointed to 75. Suppose that the child took this reading as evidence

that he was 75 inches tall. In the language of measurement theory, one might say that the bathroom scale is not a valid way to measure height, even though it might be quite reliable in consistently pointing to 75 every time the child steps on the scale.

Needless to say, assessing interdisciplinary writing is not as straightforward as measuring height or weight. Nonetheless, we believe that if the field of interdisciplinary studies is to advance as an approach to teaching and a way of knowing, it is vital that we base our research on instruments that produce consistent results and that assess the constructs we choose. In short, it is important to develop and use instruments with demonstrably high levels of validity and reliability. Towards these ends, we conducted a small empirical research study to assess the validity and reliability of the Interdisciplinary Writing Assessment Profile (IWRAP).

In assessing the IWRAP, the most pertinent approach to addressing reliability is inter-rater reliability (IRR). Essentially, IRR is established by having two trained researchers independently use an instrument to measure the same thing. As in the case of the first bathroom scale, if the two researchers yield very different results, then the instrument lacks reliability. Conversely, high levels of agreement indicate that the instrument is reliable.

Validity is a more difficult issue. Our approach to assessing the validity of the IWRAP is to measure what has been labeled “concurrent validity” (Cronbach & Meehl 1955; Trochim 2003). In concurrent validity, we empirically assess the instrument’s ability to distinguish between groups that it should theoretically be able to view as distinct (Trochim 2003). Essentially, the idea is to start with two groups that have differences and to demonstrate whether or not the instrument is able to significantly measure those differences.

In our study of the reliability and validity of the IWRAP, we independently evaluated 20 expository senior undergraduate research projects that were completed by Miami University students over the past 10 years. Ten discipline-based senior honors projects and 10 School of Interdisciplinary Studies (SIS) interdisciplinary senior projects were arbitrarily selected from the archives. Honors students were used as a comparison group because their projects can be presumed to be well written, thus reducing the chance of confusing good writing with interdisciplinary writing. Good expository scholarship—whether discipline-based or interdisciplinary—requires writers to draw upon disciplinary sources and engage in critical argumentation. Thus, we reasoned that on the dimensions, “drawing on disciplinary sources” and “critical argumentation,” Honors projects would score higher than or equal to SIS projects. However, unlike discipline-based scholarship, interdisciplinary

scholarship requires the writer to draw upon many disciplinary perspectives and engage in interdisciplinary integration. Thus, on the dimensions, “multidisciplinary perspectives” and “interdisciplinary integration,” we predicted that SIS projects would score significantly higher than Honors projects. Each project (with a mean of 55 pages in length) was scored independently by the two authors to determine IRR. Discrepancies were resolved by consensus.

There are several ways to measure IRR, and we will address these from most global to most specific. The IWrAP requires 55 separate judgments (with an earlier version used for 2 projects requiring 53). In over 20 projects, the authors independently agreed on 1062 of 1096 judgments for a global IRR of .97. This breaks down by dimension as follows: for “drawing on disciplinary sources,” we agreed on 251 of 256 judgments for an IRR of .98; for “critical argumentation,” we agreed on 387 of 400 judgments for an IRR of .97; for “multidisciplinary perspectives,” we agreed on 116 of 120 judgments for an IRR of .97; and for “interdisciplinary integration,” we agreed on 308 of 320 judgments for an IRR of .96.

Specific scores on four seven-point scales were derived from those judgments as outlined later in this article. Agreement on those scores can be measured by the correlation between the two raters and by the number of agreements over the total number of judgments. For “drawing on disciplinary sources,” the correlation between the two raters was .79, and we agreed on 16 of 20 judgments for an IRR of .80. For “critical argumentation,” the correlation between the two raters was .90, and we agreed on 17 of 20 judgments for an IRR of .85. For “multidisciplinary perspectives,” the correlation between the two raters was .98, and we agreed on 17 of 20 judgments for an IRR of .85. Finally, for “interdisciplinary integration,” the correlation between the two raters was .95, and we agreed on 16 of 20 judgments for an IRR of .80. Over the 20 projects, we had complete agreement on 66 of 80 dimension scores for an IRR of .83. We characterize this as a solid level of inter-rater reliability.

We used the final consensus ratings for the validity portion of our study. On the first two dimensions, we predicted no differences between the honors and interdisciplinary (SIS) projects. As predicted, there were no significant differences between SIS and honors projects on the dimension, “drawing on disciplinary sources,” $F(1,18) = 1.604, p = .222$, with a mean of 5.7 for honors, and 6.3 for SIS projects. As predicted, there were no significant differences between SIS and honors projects on the dimension “critical argumentation,” $F < 1$, with a mean of 4.9 for honors, and 5.3 for SIS. For the

“multidisciplinary” and “interdisciplinary” dimensions, we predicted that SIS projects would score significantly higher. As predicted, there was a statistically significant effect for SIS projects to score higher on “multidisciplinary perspectives” than discipline-based honors projects, $F(1,18) = 5.554$, $p = .030$ with a mean of 2.2 for honors projects and a mean of 4.1 for SIS projects. As predicted, there was also a statistically significant effect for SIS projects to score higher on “interdisciplinary integration” than discipline-based honors projects, $F(1,18) = 5.504$, $p = .032$ with a mean of 1.5 for honors projects and a mean of 3.8 for SIS projects. These data provide empirical evidence that the IWRAP is a valid way to assess interdisciplinary writing.

The Profiles with Detailed Instructions

For each judgment, cite a specific portion of text that exemplifies each positive and negative source element. You should be able to reference a particular text passage for each judgment. Assign the lowest score possible.

Drawing on Disciplinary Sources

Positive Source Elements:

Interdisciplinary theorists Julie Thompson Klein and William H. Newell have convincingly argued that “interdisciplinary study is not a simple supplement but is complementary to and corrective of the disciplines” (Klein & Newell 1998, p. 3). Thus, disciplines form the foundation of interdisciplinarity; in order to engage in interdisciplinary study, one must have a clear understanding of disciplines.

According to Newell and Green (1998), a discipline is “a socio-political organization which concentrates on a historically linked set of problems. . . . Disciplines are also distinguished from one another by the questions they ask about the world, by their perspective or world view, by the set of assumptions they employ, and by the methods which they use to build up a body of knowledge (facts, concepts, theories) and a certain subject matter” (p. 25). When assessing writing, it is important that scorers find evidence that the author understands the discipline being used (e.g., the relevant questions, perspectives, assumptions, methods and knowledge). Below are some ways scholars do this.

1. Primary sources are included.

Scholars within a discipline or sub-discipline typically share a set of readings or primary sources which are seen as seminal or significant. Primary sources offer direct evidence or testimony of a topic or subject matter, while secondary sources are indirect. Thus, the phrase “primary sources” refers to original professional literature, whereas secondary references refer to commentaries, critiques, and digested versions of primary sources. Examples of primary sources include journal articles in scientific and social science journals, original works of fiction and poetry, and government reports such as the US Census. Secondary sources include newspaper stories (for example, about the Census), textbook chapters, and literary criticism (when literature is considered the primary source). Of course, in cases where journalism or criticism is the primary topic, then newspaper articles and essays of literary criticism may be considered primary sources.

2. Sources include more than 25% recent publications, dated within the last five years of the project's completion.

Given that the body of primary sources related to a specific topic is always growing, effective scholars keep themselves abreast of developments in their professional literature and incorporate recent sources in order to ensure that their study is current and relevant to scholars in their field. To score this category, look at the date when the paper was written and subtract five years. More than one quarter (25%) of the references in the reference section should be published in this or subsequent years to receive credit for this positive source element.

3. A range of perspectives from within the discipline is included.

Because what constitutes a discipline changes over time and from context to context, disciplines are necessarily malleable. As a result, not everyone practicing a discipline within a given moment of history agrees with one another or thinks alike. In short, differing schools of thought or perspectives almost always exist within each discipline. Successful scholars demonstrate an awareness of the conflicting or varying disciplinary perspectives on the subject matter at hand. Perspectives include theories, schools of thought, and paradigms. Examples include behaviorism and ecological psychology in the discipline of psychology, conflict perspective and symbolic interactionism in sociology, punctuated equilibrium and gradualism in evolutionary biology, and feminism and New Criticism in English.

To earn credit for this positive source element, at least two perspectives from the same discipline must receive significant attention (i.e., more than just a passing reference). For the purposes of this instrument, each perspective must be the topic of more than one paragraph of text to be considered more than a “passing reference.” Bibliographical references to sources embodying different perspectives are good evidence, but neither necessary nor sufficient to earn credit for this criterion.

Major Negative Source Elements

Using primary sources within a given field or discipline requires considerable knowledge of the field. Inexperienced writers may misuse sources in the following major ways.

1. Inappropriate types of sources are used.

Writers should display an ability to discern which sources are credible. Inexperienced writers may unwittingly incorporate non-credible sources into their study. Sources lacking credibility tend to advance claims that are unsubstantiated, use fallacious logic or overly biased reasoning, or include fabricated or flawed evidence. At times, the authors of these sources are not knowledgeable or respected in the field.

Inappropriate sources may also be those well outside the range of accepted scholarly discourse. Personal home pages on the web, entertainment media stories, and rumors are all examples of inappropriate sources. The World Wide Web and popular periodicals often (but not always) include sources that are inappropriate for scholarly writing. Newer academic journals—including those presenting controversial or cutting-edge materials—however, would not be considered inappropriate for these purposes.

2. Sources are used inappropriately (e.g., misinterpretation, overextending).

Writers sometimes use sources in inappropriate ways. Examples of inappropriate use of sources include: failing to distinguish between major and minor claims or between major or minor sources of information; citing a side comment or a counterargument as the major claim or as fact; or failing to take into account a source’s tone (e.g., interpreting a figurative or ironic comment as a literal or factual statement).

This category should be used for flagrant or obvious misinterpretations of texts. Interpretations which are within the range of accepted scholarly discourse but with which the scorer might not agree should not be considered

inappropriate uses of sources for these purposes. For example, published feminist criticisms of Freudian theory would not be considered “inappropriate use of sources,” even though some Freudians claim that these criticisms are based on misunderstandings.

3. There is an over-reliance on one or two sources.

Writers sometimes “lean too heavily” on a single source, causing their voices to be overwhelmed by those of the sources they draw upon. For example, a student may be particularly taken by a particular book or author and “shadow” that author’s viewpoint rather than providing an original perspective. When this happens, the writer’s viewpoint becomes indistinguishable from that of the source (or worse, merely a pale reflection).

This category is justified when the author includes too many quotations, paraphrases, or concepts from one or two sources. If removing some quotations, paraphrases, or concepts from one source and replacing them with quotations, paraphrases, or concepts from another source, or with original ideas, would improve the paper, then the category is warranted.

4. Sources are misquoted or quoted out of context.

This category is warranted when the writer includes a quotation that is not literally accurate in the sense that it does not match what was actually written or said. This problem can occur when writers omit key words in a quotation or include words that distort the quotation’s original meaning. At times, writers may attribute quotations to the wrong author or even invent quotations altogether. Minor typos and spelling mistakes should not be treated as misquotations.

A more subtle but nevertheless problematic error occurs when a writer uses a quotation, but fails to put it in its proper context, thereby distorting the quotation’s meaning. To be included in this category, an understanding of the original context should do more than clarify or refine the understanding of the quotation—it should change the fundamental understanding of the meaning of the quotation.

5. Perspectives essential to the case being made are missing.

In order for writers to present new findings in a field, they must be familiar with existing viewpoints and perspectives. In short, good writing entails effective research. Good research does not mean that writers must read every source relating to their topic that exists, but they should be acquainted with all of the major schools of thought or perspectives on the topic at hand.

This category is warranted when a reasonable reader from the intended target audience could readily identify a theory, school of thought, paradigm, or perspective that the author should have included in the paper. However, this category should not be applied if the author makes a convincing case for defining the scope of the problem in such a way as to justify the exclusion of the perspective. Of course, if the author seems ignorant of essential perspectives, then the category is justified.

Minor Negative Source Elements:

In addition to the major problems with sources discussed above, writers also can engage in relatively minor ones.

1. Inappropriate quotations are included.

Inappropriate quotations are those that do not advance or bolster the author's argument. If deleting a quotation would strengthen the paper, then it is inappropriate. However, the deletion should clearly make the paper stronger (i.e., if removing the quotation neither strengthens nor weakens the paper, then it should not be considered inappropriate for these purposes).

2. Sources are paraphrased inappropriately.

If a paraphrase misstates the original author's intent, then it is inappropriate. However, paraphrasings based on interpretations that are within the range of accepted scholarly discourse should not be considered inappropriate for these purposes.

3. There is an over-reliance on quotations.

In this case, writers tend to include so many quotations that their own argument or ideas seem to be overwhelmed by the thoughts of others. Writers who over-quote often do not have clear control over the argument or are having trouble advancing an original thesis.

If the paper has so many quotations that deleting one or more of them would strengthen the paper, then the author is guilty of over-reliance on quotations. However, the deletion of one or more quotations should clearly make the paper stronger (i.e., if removing one or more quoted passages neither strengthens nor weakens the paper, then, for these purposes, it should not be considered an over-reliance on quotations).

4. Key contexts identified in the literature(s) are missing.

When exploring a topic, writers need to be able to think about it in as

full a context as possible. Without thinking about the various implications and viewpoints related to the topic at hand, the writer risks launching a simplistic, naïve, or superficial argument. For example, if the writer is analyzing a specific U.S. immigration policy, he or she probably needs to consider the varying causes and consequences of it in order to evaluate it fairly.

This category is warranted when a reasonable reader from the intended target audience could readily identify a major context that the author should have included in the paper. However, this category should not be applied if the author has defined the scope of the problem in such a way as to justify the exclusion of the context.

5. Not enough sources are included.

It is difficult to determine when a writer has read and referenced a sufficient number of sources. Factors such as the conventions of the field of study, the state of the literature, and the length of the essay are just a few of the many considerations in assessing the number of sources. For the purposes of this instrument, the category “not enough sources are included” is considered in and of itself a minor negative source element. It may or may not be accompanied by major issues such as “perspectives essential to the case being made are missing” or “over-reliance on one or two sources,” or other minor issues such as missing contexts.

A study of 54 passing expository senior projects written over 12 years in the School of Interdisciplinary Studies at Miami University (overseen by the first author) found that students referenced an average of 31.17 sources ($SD = 14.1$) for essays averaging 79 pages in length ($SD = 23.3$). This normalizes to about 44 references per 100 pages of text ($SD \sim 20$). This category is warranted if a reasonable member of the intended target audience would likely believe that there are too few sources for an undergraduate essay of its length. However, the essay should only be scored as not having enough sources if the deviation is flagrant. As a rule of thumb, the category should not be assigned if the author has referenced more than 17 sources in an essay of this length (or more than 24 sources for an essay of 100 pages). Using this criterion, 7 of the 54 essays in the sample (about 13%) would be categorized as having not enough sources.

Scoring and Interpretation for Drawing on Disciplinary Sources

In our study of the reliability and validity of the instrument, SIS projects

scored a mean of 6.3 (SD = 1.06) on a seven-point scale for “drawing on disciplinary sources.”

Disciplinary Sources: Score of 1

Contains one or more major negative source elements, regardless of the number of positive elements. A score of 1 indicates a major problem with the use of disciplinary sources that completely overwhelms any positive characteristics of the paper with respect to drawing on disciplinary sources. In our research on the reliability and validity of this instrument, none of the SIS projects, and none of the honors projects received a score of 1 on drawing on disciplinary sources. A score of 1 should be rare for a college paper.

Disciplinary Sources: Score of 2

Contains two or more minor negative source elements, regardless of the number of positive elements, or contains none of the three positive source elements. In our research on the reliability and validity of this instrument, none of the SIS projects, and none of the honors projects received a score of 2 on drawing on disciplinary sources. When a paper receives a score of 2, the writer lacks awareness of the relevant professional literature, or the writer has persistent and pervasive problems using sources appropriately.

Disciplinary Sources: Score of 3

Contains one of the three positive source elements, and one of the minor negative source elements. A score of 3 indicates the presence of a relatively minor problem with the use of disciplinary sources, and only one of the positive characteristics of drawing upon disciplinary sources. In our research on the reliability and validity of this instrument, none of the SIS projects, and none of the honors projects received a score of 3 on drawing on disciplinary sources. The writer of a paper with a score of 3 has a very limited awareness of disciplinary sources and has difficulty using sources appropriate and effectively.

Disciplinary Sources: Score of 4

Contains one of the three positive source elements and none of the negative source elements, or contains two of the three positive source elements and one of the minor negative source elements. A score of 4 suggests the presence of a relatively minor problem with drawing on disciplinary sources. In general, the writer of a paper receiving a score of 4 engages only in a minor way with the professional literature or engages moderately but does

not do so effectively or appropriately. In our research on the reliability and validity of this instrument, 10% of the SIS projects, and 20% of honors projects received a score of 4 on drawing on disciplinary sources.

Disciplinary Sources: Score of 5

Contains three positive source elements and one of the minor negative source elements. A score of 5 suggests an adequate undergraduate paper with respect to drawing upon disciplinary sources. Papers that receive a score of 5 show an awareness of the relevant professional literature (primary and recent sources) as well as an awareness of differing viewpoints on the topic within the discipline(s) used. In our research on the reliability and validity of this instrument, 10% of SIS projects, and 10% of honors projects received a score of 5 on drawing on disciplinary sources. Eighty percent (80%) of the SIS projects had a score greater than 5.

Disciplinary Sources: Score of 6

Contains two of the three positive source elements and none of the minor or major negative source elements. A score of 6 suggests a good undergraduate paper with respect to drawing upon disciplinary sources. It indicates that there were no major or minor problems with the use of disciplinary sources. It is entirely possible for an excellent paper to earn a score of 6. In our research on the reliability and validity of this instrument, 20% of SIS projects and 50% of honors projects received a score of 6 on drawing on disciplinary sources. Forty percent of the SIS projects had a score of 6 or less.

Disciplinary Sources: Score of 7

Contains all three of the three positive source elements and none of the negative source elements. A score of 7 suggests a very good undergraduate paper with respect to drawing upon disciplinary sources. Not only has this writer conducted thorough and pertinent research on the topic, but she or he has made thoughtful and appropriate use of the sources. In our research on the reliability and validity of this instrument, 60% of SIS projects and 20% of honors projects received a score of 7 on drawing on disciplinary sources.

Critical Argumentation

Contrary to conventional wisdom, expository writing is not simply a set of grammatical and mechanical skills. It is also about constructing knowledge or advancing an argument in one's field, which depends upon a host of higher

order thinking skills (e.g., defining the problem, supporting major assertions, reflecting self-consciously on one's process, analyzing data and ideas).

Before presenting the new findings, writers must be sure that the readers understand the issue, problem, or topic. Thus, defining the problem is a crucial first step in any piece of writing. It is not enough to put forth interesting claims; claims must also be supported with evidence of one kind or another. Effective essays are also reflective in that they take into consideration their limitations as well as strengths. The self-reflective dimension of critical argumentation includes meta-level analyses where the author "steps back" from the immediate argument to consider its broader context and implications. Hence, in order to assess any piece of writing, it is important to consider some of the key components of argumentation.

Positive Elements:

1. The problem is defined.

The purpose of scholarly writing is to present new findings on the issue, problem, or idea at hand. Before presenting the new findings, writers must be sure that their readers understand the issue, problem, or topic selected. Thus, defining the problem is a crucial first step in any piece of writing, and it entails several components. Not only must writers state the problem, they also need to establish the background or existence of the topic as well as its seriousness.

a. The problem or issue under investigation has been clearly stated.

The writer should offer a clear statement of what is being explored, analyzed, interpreted, investigated, or studied in their paper. Generally, the thesis statement will be only a few sentences long, and then sometimes the author will elaborate further upon that basic statement.

To earn credit for this category, the reader should be able to readily understand what the paper is about and why this topic is worthy of attention. If a reasonable reader from the intended target audience could credibly be confused about the issue or problem, then the paper should not earn credit for this category.

b. The scope of the problem is clearly defined.

The scope refers to the boundary conditions of what is included and excluded from consideration. In other words, how much of this topic will be investigated? What are the limits of the investigation? For example, if the

problem being addressed is drug abuse, which specific perspective or angle will be pursued in this paper (e.g., causes of drug abuse, prevention or treatment options, types of drug abuse)?

To earn credit for this category, the thesis statement should not leave the reader with major questions about the range of phenomena under investigation. If a reasonable reader from the intended target audience could credibly be confused about the scope of the problem, then the paper should not earn credit for this category. However, the scorer should recognize that the scope of even a good paper is ambiguous at the margins.

2. Each major assertion is supported.

a. Empirical evidence is cited to support major assertions.

Empirical evidence is considered any systematically collected qualitative or quantitative information. Empirical evidence can be information gained from interviews, surveys, behavioral observations, publicly available statistics, and scientific experiments. The evidence must actually support the assertion for credit to be given for this category.

b. “Textual” evidence is cited to support major assertions.

Most humanities and fine arts scholars, as well as many social scientists, rely on text-based evidence to support their arguments. In this category, “text” is used loosely to mean original manuscripts, letters, current interpretations, or criticisms about the topic of study or information gleaned from artwork, artifacts, or musical compositions. In short, textual evidence is evidence taken directly from the “text” where “text” includes words, music, dance, film, and other forms of expression.

Thus, the definition of text can be quite broad (as exemplified by postmodern scholars). However, to earn credit for this category, the citation of the textual evidence should be quite specific (e.g., quotation, concrete description of a visual image, reference to a musical passage, special film technique, or choreographic sequence). The evidence must actually support an assertion for credit to be given for this category.

c. Theory or theoretical principles are used to support major assertions.

Some writers offer a theoretical argument, or they support assertions with other writers’ theoretical claims—that is, statements that are generally true across many different situations. Theoretical arguments can be developed in a purely abstract way, independent of any observations of the world, or they can be developed as generalizations from many specific empirical findings.

In general, theoretical writing follows a logical sequence of ideas or uses others' theoretical statements to bolster claims.

To earn credit for this category, scholarly or scientific theories or principles must be specifically cited as supporting an assertion. The relationship between the theory or principle and assertion should be explicit to earn credit for this category.

d. Direct experience and observation are used to support major assertions.

Direct experience and observation refer to the author's lived experience. Although most scholarly writing relies upon empirical data gained through impersonal systematic collection, occasions do arise when personal experience and knowledge can be used to support an argument. Generally, personal experience is used when the writer has had considerable experience with the topic at hand or when their observations or experiences help to lend credibility to another expert's assertions.

To earn credit for this category, the author should make specific autobiographical references to support an assertion. Examples include references to clinical judgment or professional experience. To illustrate, consider the statement, "These cases are very rare. In 23 years of practicing medicine I have never seen a case like this." In this example, "23 years of practicing medicine....," is used to support the assertion that "these cases are very rare."

3. Author reflects on his or her approach to research.

a. Author reflects self-consciously on the limitations of his or her approach.

One way that writers can deepen their own learning and continue to improve as thinkers and writers is to take time to reflect on their own writing, methods, and perspectives. By reflection, we have in mind the explicit assessment of one's own process, perspectives, and methodology.

To earn credit for this category, the writer should demonstrate an awareness of the limits of his or her own approach and findings. This may include self-criticisms of the theory, methodology, or interpretation. These reflections need not be lengthy; however, they must be more than passing references to shortcomings of the author's approach (i.e., the discussion of limitations should be the primary topic of at least one full paragraph).

b. Author reflects self-consciously on the merits of his or her approach.

Equally important to grasping one's own limitations is a realization of what works well so that these approaches and strategies can be used again in ap-

propriate contexts. To receive credit for this element, the author must explicitly discuss the strengths of the paper. This may include meta-level reflections on the theory, methodology, or interpretations. These reflections do not need to be lengthy; however, they must be more than passing references to strengths of the author's approach (i.e., the discussion of merits should be the primary topic of at least one full paragraph).

4. Author engages in meta-level analysis.

By meta-level analysis, we mean the conscious reflection and evaluation of the topic, including the exploration of the assets and shortcomings of the various disciplinary approaches used.

a. Author identifies shortcomings and limitations of at least one theory, school of thought, or disciplinary approach.

The author explicitly discusses limitations of a paradigm, school of thought, theory, or disciplinary approach. To earn credit for this category, the author must “step back” and critique the limitations of an approach. These reflections do not need to be lengthy, but they must be more than passing references to the shortcomings and limitations of an approach (i.e., the discussion of limitations should be the primary topic of at least one full paragraph).

b. Author identifies some insights or merits of at least one theory, school of thought, or disciplinary approach.

The author explicitly discusses the strengths or value of a paradigm, school of thought, theory, or disciplinary approach. To earn credit for this category, the author must critically examine the utility of an approach. These reflections do not need to be lengthy, but they must be more than passing references to insights or merits of an approach (i.e., the discussion of insights should be the primary topic of at least one full paragraph).

c. The explanatory power of theories is addressed –what the theory ‘buys you’ vis-à-vis other theories.

To earn credit for this category, the author must explicitly compare and/or contrast two or more theories, schools of thought, or disciplinary approaches with one another as “lenses” through which to study the issue or problem under investigation. These reflections do not need to be lengthy, but they must be more than passing references to insights or merits of an approach (i.e., the discussion of the explanatory power of theories should be the primary topic of at least one full paragraph).

Negative Elements

1. There is evidence of a misunderstanding of key concepts.

In order to write well, writers must also be strong readers. Reading involves comprehending and interpreting what you read, recognizing the writer's intentions, perceiving implications, making connections between the author's ideas and others' ideas, and drawing conclusions. This category addresses the writer's ability to comprehend key concepts from his or her sources.

To be categorized in this way, there must be specific textual evidence of a misunderstanding of a significant point or concept. The misunderstanding should be beyond the typical range of scholarly discourse.

2. The thesis is superficial or obvious.

The purpose of the thesis statement is to let the reader know the main point or central idea of the paper. Good thesis statements generally do the following: focus on one main point and are clearly written and specific. But they also must make an original assertion about the subject (i.e., not represent a summary of what someone else said or make a statement with which everyone in the field would agree). In other words, the thesis must be debatable and insightful.

The central issue here is the banality of the thesis in the context of work by undergraduate students. If a thesis is obvious to the intended and informed readers of this paper (i.e., not really debatable even for undergraduate students), then the paper should be negatively evaluated for this category.

3. Irrelevant facts or arguments are presented.

It is important that writers not waste the reader's time by presenting information that is not related to the argument at hand. The controlling idea of the paper—or the thesis statement—should be connected to everything else in the paper. Extraneous points and irrelevant arguments should be eliminated.

If the essay could be significantly improved by deleting facts, arguments, or other text passages, then this category is warranted. However, if deleting the irrelevant passages would neither strengthen nor weaken the paper, then they should not be considered irrelevant for these purposes.

4. Assertions are presented in an illogical order.

Good writers not only gather important information and points to communicate, they also must determine a plan for how to present the information so

that it best advances the thesis. In other words, they must decide the organizational structure of their argument. What comes first, in the middle, and at the end can be critically important in informing and persuading readers.

If the essay could be significantly improved by presenting the same set of assertions in a different order, then this category is warranted. However, if rearranging the order of assertions would neither strengthen nor weaken the paper, then the order of arguments should not be considered to be illogical for these purposes.

5. Writing is marred by significant grammatical and mechanical errors.

Writing involves many stages, including brainstorming, drafting, revising and editing. Before a paper is submitted to readers, it should also be carefully proofread for grammatical and mechanical problems. Grammatical errors refer to problems with the ways that words are put together to form sentences (e.g., subject-verb agreement, word usage, sentence fragments, fused sentences). Mechanical errors refer to problems related to capitalization, spelling, and punctuation as well as other deviations from the conventions of the target audience (e.g., misusing APA conventions in a psychology paper).

This category is warranted when a paper includes such a large number of errors, or one or two serious errors, that the reader becomes distracted, loses faith in the author, or is confused about the author's points.

6. Ideas are presented in an inappropriate context.

Good writers must be well acquainted with their intended audience and readers. Writers must consider what their readers already know about the topic as well as what their concerns will be relating to the topic and to the thesis at hand. In addition, they must be familiar with and take into consideration the typical topics, tone, organizational conventions, format, and vocabulary that their intended readers are generally accustomed to seeing and then plan accordingly. In short, they must understand the context in which they are writing.

To fall into this category, the author's ideas are presented in a context that a reasonable reader from the intended target audience would find objectionable. For example, if a writer is addressing a set of readers with special technical knowledge, he or she should appropriately use the technical terms with which that audience is familiar. However, papers should not earn this category if their approach is only objectionable from a certain faction of the discipline or field and accepted by another (e.g., applying critical literary theory to "reading" a Donald Duck cartoon as a "text" would not be consid-

ered an inappropriate context for these purposes because cultural studies critics would find this approach acceptable).

7. *Fallacious reasoning misses subtle but important points.*

In order to be convincing, writers must engage in careful reasoning and not fall prey to logical fallacies. “Fallacious reasoning” is that which exemplifies faulty logic. Examples include: *ad hominem* attacks on another thinker, “begging the question” (assuming something to be true without proving it), half-truths (minimizing or ignoring counter-evidence), oversimplifying or exaggerating another’s argument, *non sequiturs* (where the conclusion doesn’t follow from the argument), false analogy (overlooking significant differences in comparison), *post hoc* causal reasoning (asserting that one event caused another merely because the first preceded the second), or presenting red herrings (dodging the real issue by drawing attention to an irrelevant one). To be categorized in this way, there must be specific textual evidence of fallacious reasoning.

8. *Analysis is underdeveloped or insufficient.*

Whereas a summary represents the ideas of another writer or thinker, an analysis represents the writer’s own thoughts about the topic at hand. It can come in a variety of forms: (1) textual analysis in which the writer examines the components of a text (e.g., its purpose, tone, structure); (2) evaluation in which the writer assesses a text or subject using a set of criteria; (3) comparison and contrast in which the writer assesses similarities and differences between two texts or topics; (4) cause-effect in which the author examines the causes and effects of a certain phenomenon; (5) problem-solution in which the author offers and assesses a possible solution to a given problem; and (6) position in which the author explores an issue in depth and takes a stand on it. Good analyses go beyond considering the obvious or superficial points. They attempt to offer a new angle on the topic, and they include evidence for their assertions.

This category is warranted when a reasonable reader from the intended target audience would have to “fill in major gaps” in the author’s analysis, when analysis remains on a superficial level, or where there are significant “missing pieces” between assertions and conclusions. However, it is important to remember that the context for this category is a typical undergraduate essay, and not the professional literature.

9. *The scope of the problem is too broad or too narrow.*

The scope of the problem is considered as a positive source element above when it is clearly defined and appropriate. It is considered as a negative source

element when the scope of the problem is obviously defined inappropriately. The scope of the problem should be considered too broad if the author could not possibly do justice to the topic with the space and resources at hand (e.g., medical practices in every culture). The scope of the problem should be considered too narrow if the author's definition trivializes the problem, if the argument ends up being too short, or if the author resorts to excessive "padding" or repetition in order to meet the expected project length. Generally, student papers suffer from defining problems too broadly rather than too narrowly. Judgments of scope should be made based on the typical range of scholarly discourse.

Scoring and Interpretation for Critical Argumentation

In our study of the reliability and validity of the instrument, SIS projects scored a mean of 5.3 ($SD = 2.31$) on a seven-point scale for critical argumentation.

Critical Argumentation: Score of 1

Contains none or one element of the four categories of positive source elements, regardless of the negative source elements; or it contains three or more of the negative source elements, regardless of the positive source elements. A score of 1 suggests an essay with very serious problems of critical argumentation. Papers with a score of 1 in critical argumentation should be rare for college-level writers. The writer lacks some of the most basic writing skills. In our research on the reliability and validity of this instrument, none of the SIS projects, and none of the honors projects received a score of 1 on critical argumentation.

Critical Argumentation: Score of 2

Contains at least one element from two of the four categories of positive source elements, and one negative element; or it contains two negative source elements. A score of 2 suggests an essay with serious problems of critical argumentation. In our research on the reliability and validity of this instrument, 30% of the SIS projects, and 20% of honors projects received a score of 2 on critical argumentation.

Critical Argumentation: Score of 3

Contains at least one element from two of the four categories of positive source elements and none of the negative source elements. A score of 3 suggests an essay that is not strong with respect to critical argumentation. How-

ever, it also suggests the absence of problems that typically mar undergraduate writing. Generally, “3” papers have defined the problem and provided support for major claims, but they often lack the major critical reflection components (e.g., reflection on the author’s own approach and the disciplines or theories addressed). In short, the writer seems to take for granted his or her own approach and disciplinary assumptions, methods, and concepts. In our research on the reliability and validity of this instrument, none of the SIS projects, and 10% of honors projects received a score of 3 on critical argumentation. Thirty percent of the SIS projects had a score of 3 or lower.

Critical Argumentation: Score of 4

Contains at least one from three of four categories of positive source elements and one of the negative source elements. In our research on the reliability and validity of this instrument, none of the SIS projects, and 10% of honors projects received a score of 4 on critical argumentation. Thirty percent of the SIS projects had a score of 4 or lower.

Critical Argumentation: Score of 5

Contains at least one from all four categories of positive source elements and one of the negative source elements. A score of 5 suggests an undergraduate essay that is good with respect to critical argumentation. Writers whose papers receive this score are generally critically reflective thinkers who can launch persuasive arguments. In our research on the reliability and validity of this instrument, none of the SIS projects, and none of the honors projects received a score of 5 on critical argumentation. Thirty percent of the SIS projects had a score of 5 or lower.

Critical Argumentation: Score of 6

Contains at least one from three of four categories of positive source elements and none of the negative source elements. A score of 6 suggests an undergraduate essay that is very good with respect to critical argumentation. It also suggests the absence of problems that typically hinder undergraduate writing. In our research on the reliability and validity of this instrument, 20% of SIS projects, and 40% of honors projects received a score of 6 on critical argumentation. Fifty percent of the SIS projects received a score higher than 6.

Critical Argumentation: Score of 7

Contains at least one from all four categories of positive source elements and none of the negative source elements. A score of 7 suggests an undergraduate essay that is excellent with respect to critical argumentation. It con-

tains clear evidence of each of the key components of argumentation and is free of problems that typically hamper undergraduate writing. In our research on the reliability and validity of this instrument, 50% of SIS projects, and 20% of honors projects received a score of 7 on critical argumentation.

Multidisciplinary Perspectives

Multidisciplinarity and interdisciplinarity are terms that are often used interchangeably. However, in the professional literature for interdisciplinarians, they have different meanings. According to Newell and Green (1998), *multidisciplinarity* occurs when scholars explore a topic from different disciplinary perspectives but fail to integrate or combine them. Often, multidisciplinary scholars will consider each discipline's contribution to the topic at hand in a serial fashion. *Interdisciplinarians*, by contrast, accept the importance of disciplines and conduct inquiries that "critically draw upon two or more disciplines and which lead to an integration of disciplinary insights" (p. 24).

Multidisciplinarity (the consideration of various disciplines on a given topic) is not antithetical to interdisciplinarity. In some cases, it may even represent a step toward interdisciplinary integration or synthesis. Below are positive source categories that identify the multidisciplinary of a given paper.

1. Author identifies aspects of the object of study as being addressed by more than one disciplinary perspective.

A writer needs to select a problem, issue or topic that is broad enough to be addressed by more than one discipline (Klein & Newell 1998). Does the writer demonstrate an awareness of the need for more than one discipline to address the topic at hand?

Credit is given for this category if the paper explicitly states that a specific issue, problem, or phenomena can be studied by theories, schools of thought, paradigms, or perspectives in two or more disciplines. Credit should be given only if the perspectives that are identified arise in different disciplines.

2. Author demonstrates an understanding of how each discipline would approach the object of study.

Marilyn Stember (1998) has noted that "different disciplines have different cognitive maps" (p. 345). These maps include "basic concepts, modes of inquiry, what counts as a problem, representation techniques, standards of proof, types of explanation, and general ideals of what constitutes the discipline" (p. 345). Does the writer display an awareness of the different

cognitive maps or approaches of each of the disciplines included in the study? In other words, how does each discipline benefit the study differently?

Credit for this category is warranted if a reasonable reader from the target audience would find the explanation of each disciplinary approach adequate for an undergraduate student within each discipline. For example, if an author were to describe how sociologists and psychologists (from particular schools of thought) approach the topic of juvenile delinquency, then the description of the sociological perspective should be adequate for a sociology student, and the description of the psychological perspective should be adequate for a psychology student.

3. Author considers the object of study from more than one disciplinary perspective.

It is not enough for a writer to simply discuss the benefits and shortcomings of each disciplinary perspective; he or she should also use the different disciplinary approaches or perspectives to investigate the topic at hand.

Whereas the previous two categories were fairly general, this category is specific. To earn credit for this category, the author should apply more than one theory, paradigm, or perspective to the specific problem or issue under investigation. Credit should be given only if the theory, paradigm, or perspectives arises in different disciplines, and a reasonable reader from the target audience would find the application of each disciplinary approach adequate for an undergraduate student within each discipline. However, it is not necessary for the approach to be integrative. For example, a paper on a musical composition might include a psychoanalytic analysis of the lyrics as well as a mathematical model of the chord progressions.

4. Author identifies how at least one term is used differently in different disciplines within the context of the problem.

Does the writer demonstrate an awareness of the differences in how the disciplines at hand define key concepts? The key issue here is terminology. To earn credit for this category, the author should explicitly discuss how jargon—specific words and phrases—convey different meanings in different disciplinary contexts. For example, the word “old” conveys different time spans in gerontology, history, and geology. Similarly, “insanity” has a different meaning for criminal attorneys than for clinical psychologists.

5. Author identifies how different disciplinary terms are used to describe similar concepts.

When appropriate, does the author show an awareness of how different disciplinary terms actually connote the same meaning? The key issue here is again terminology. To earn credit for this category, the author should explicitly discuss how different terms convey similar meanings in different disciplinary contexts. For example, the word “agency” as used by some feminist literary scholars covers some of the same conceptual ground as the phrase “self-efficacy” as used by some clinical psychologists. The terms need not have the same identical meaning (they rarely, if ever do), and indeed the author should show an appreciation for differences as well as similarities.

6. Sources are drawn from 2 or more disciplines.

Because disciplines are constantly evolving, they sometimes come to overlap with another discipline or absorb concepts and approaches from another discipline. Thus, it becomes difficult to determine whether a writer is actually engaging deeply with and drawing from two distinct disciplines. One way to determine this is to note whether disciplinary scholars would generally call upon the range of sources found in the work. For example, it would not be rare for an educational psychologist to draw upon literature from psychology and educational theory, and this would not be considered drawing from two or more disciplines for these purposes. Conversely, an educational psychologist who incorporated literary criticism and psychology into her scholarship would be said to draw upon two or more disciplinary sources.

To earn credit for this category, the literature cited in the reference section or bibliography should clearly be taken from at least two academic disciplines. There should be at least one reference each from two or more disciplines excluding general reference materials (e.g., newspapers, encyclopedias, dictionaries).

Scoring and Interpretation for Multidisciplinary Perspectives

In our small study of the reliability and validity of the instrument, SIS projects scored a mean of 4.1 (SD = 1.85) on a seven-point scale for multidisciplinary perspectives.

Multidisciplinary Perspectives: Score of 1

Contains none of the six source elements listed above. A score of 1 suggests an essay that does not consider more than one disciplinary perspective.

This score would not be uncommon for disciplinary projects. However, interdisciplinary projects that receive this score are weak papers in which the writer seems to have no self-consciousness about the disciplines being used and their applicability to the project's topic of study. In our research on the reliability and validity of this instrument, 10% of SIS projects, and 60% of honors projects received a score of 1 on multidisciplinary perspectives.

Multidisciplinary Perspectives: Score of 2

Contains one of the six source elements. A score of 2 suggests an essay that only superficially considers more than one disciplinary perspective. In our research on the reliability and validity of this instrument, 10% of SIS projects, and none of the honors projects received a score of 2 on multidisciplinary perspectives. Eighty percent of the SIS projects received a score greater than 2.

Multidisciplinary Perspectives: Score of 3

Contains two of the six positive source elements. A score of 3 suggests an essay that considers more than one disciplinary perspective. It is entirely possible for a good disciplinary paper to earn a score of 3 on multidisciplinary perspectives if the author considers other disciplinary approaches, at least briefly. In our research on the reliability and validity of this instrument, 20% of SIS projects, and 20% of honors projects received a score of 3 on multidisciplinary perspectives. Forty percent of the SIS projects received a score of 3 or less.

Multidisciplinary Perspectives: Score of 4

Contains three of the six source elements. A score of 4 is at the middle of the scale with respect to employing multidisciplinary perspectives. In our research on the reliability and validity of this instrument, 10% of SIS projects, and 10% of honors projects received a score of 4 on multidisciplinary perspectives. Fifty percent of the SIS projects received a score of 4 or less.

Multidisciplinary Perspectives: Score of 5

Contains four of the six positive source elements. A score of 5 is indicative of an undergraduate essay that is good with respect to employing multidisciplinary perspectives. In our research on the reliability and validity of this instrument, 30% of SIS projects, and none of the honors projects received a score of 5 on multidisciplinary perspectives. Only 20% of the SIS projects scored higher than 5.

Multidisciplinary Perspectives: Score of 6

Contains five of the six positive source elements. A score of 6 is indicative of an undergraduate essay that is very good with respect to employing multidisciplinary perspectives. Papers with this score show an excellent self-conscious use of multiple disciplines and awareness of how they contribute to the topic at hand. It is entirely possible for an excellent essay to earn a score of 6 on multidisciplinary perspectives. In our research on the reliability and validity of this instrument, 10% of SIS projects, and 10% of honors projects received a score of 6 on multidisciplinary perspectives. Ten percent of the SIS projects received a score greater than 6.

Multidisciplinary Perspectives: Score of 7

Contains all six of the source elements. A score of 7 is indicative of an undergraduate essay that is outstanding with respect to employing multidisciplinary perspectives. In our research on the reliability and validity of this instrument, 10% of SIS projects, and none of the honors projects received a score of 7 on Multidisciplinary Perspectives.

Interdisciplinary Integration

Interdisciplinarity has been defined as a study that “draws on disciplinary perspectives and integrates their insights through construction of a more comprehensive perspective” (Klein & Newell 1998, p. 3). Thus, integration is typically seen as the litmus test of interdisciplinarity. Yet, as Field and Stowe (2002) have pointed out, “consensus on the meaning of synthesis or integration does not exist” (p. 263). How does one know when a writer has achieved interdisciplinary integration? The source elements below offer a variety of possible ways of assessing interdisciplinary integration.

Creating Common Ground

Joseph J. Kockelmans (1998) has pointed out that interdisciplinary researchers “share the view that the search for a common ground is the fundamental element of all [interdisciplinary] investigation. Without such a common ground . . . genuine communication between those who participate in the discussion would be impossible” (p. 82).

1. Author presents a clear rationale for taking an interdisciplinary approach.

When identifying the topic at hand, interdisciplinary writers must explain

and justify why a problem, issue, or topic needs multiple disciplines to address or solve it. To earn credit for this category, the author explicitly indicates that an interdisciplinary approach is being taken and presents a clear and credible justification for that approach. The rationale should be understandable to a reasonable reader from the intended target audience.

2. Assumptions from more than one discipline are made explicit and compared

One of the ways that interdisciplinary writers create a common ground is by laying bare the principal assumptions, suppositions, and “givens” of each discipline employed. For example, an assumption underlying mainstream microeconomics is that human beings are rational. As Newell (1998) has noted, “every field has its assumptions, which shape its activities to a considerable extent” (p. 560). Disciplines have differing assumptions about what constitutes truth, what counts as evidence or proof, how problems should be formulated, and what are the general ideals of the discipline. In many fields, those assumptions may be implicit or even unexamined. Does the writer explicitly discuss some of the assumptions or conventions of the disciplines involved in the study? Does he or she offer some comparison or contrast between these different disciplinary assumptions?

Credit should be given for this category only if at least one assumption from each of two or more disciplinary perspectives is explicitly considered in relation to another.

3. Author compares and/or contrasts disciplinary perspectives.

How do the disciplines being explored approach or perceive the subject matter at hand? What questions does each investigate or explore? What does each find important? What counts as evidence? Interdisciplinary writers should explore these questions and spend time comparing and/or contrasting the different “takes” of each discipline on the subject matter at hand.

To earn credit for this category, two or more theories, schools of thought, paradigms, or perspectives from two or more distinct disciplines should be explicitly “placed side by side” to examine similarities and differences or relative strengths and weaknesses.

4. The problem is explicitly defined in neutral terms that encourage contributions from more than one discipline.

Newell and Green (1998) note that “many if not most questions in everyday language are properly interdisciplinary, while questions phrased in the

technical language of a discipline are typically limited to treatment by a single discipline” (p. 26). In other words, by phrasing the question, problem, or issue at hand in neutral language, the writer opens up the possibility of incorporating multiple disciplinary perspectives.

Words and phrases generally not associated with any of the disciplinary perspectives under consideration are explicitly used and defined (at least for the purposes of the author’s project) in ways that facilitate the application of two or more disciplinary perspectives to the issue or problem under investigation. If the disciplines involved are so closely related that there is no need for a neutral vocabulary, then credit should be given for this category. However, if the use of jargon tacitly favors one approach at the expense of another, then credit should not be given for this category. The category is also unwarranted when the author uses vague, imprecise, colloquial, or inappropriate language that just so happens not to favor one discipline over others; the use of neutral terms must be deliberate.

5. Author creates a common vocabulary that can be applied to the object of study.

At times, different disciplines will use very specialized vocabulary to describe or address the subject matter. In some situations, the language can become especially esoteric which makes it “difficult for persons in one branch of a discipline to communicate with others in his [or her] own discipline, much less with members of the lay public” or other disciplines (Armstrong 1998, p. 173). As a result, it is important for interdisciplinary writers to create a common vocabulary that does not fall into disciplinary jargon but still communicates ideas in a sophisticated and specific manner.

Specific terms are explicitly defined (at least for the purposes of the project or thesis) in ways that facilitate the application of two or more disciplinary perspectives to the issue or problem under investigation. If the use of terminology tacitly favors one approach at the expense of another, then credit should not be given for this category. If the author uses a “common” vocabulary that is mundane, unsophisticated, or otherwise superficial, then credit should not be given for this category.

New Holistic Understanding

Recognizing and explicating the different disciplinary differences constitute one challenge for interdisciplinarians, but perhaps even more challenging is finding some means of resolving or reconciling those differences.

Stember (1998) has argued that interdisciplinarians may use a number of techniques for achieving a new holistic or reconciled understanding of the topic at hand: (1) dialectical reasoning in which the different disciplinary paradigms are given equal status and the two seemingly contradictory views are reconciled, (2) new metaphors are created that offer an understanding of the disciplines' interrelationship, (3) a new theoretical integration, and (4) new models that reconcile the two perspectives (p. 347).

1. One or more novel metaphors are presented.

Barbara Carlisle (1998) writes, "When a phenomenon presents itself to us, our best way of understanding it is to compare it to something we already know." (p. 391). In short, metaphoric transfer enables us to see connections. For example, by comparing a certain monument to a piece of music, one envisions that monument in a new way. Conversely, the musical composition may take on new dimensions through the comparison. Because interdisciplinarity entails the integration of insights from varying disciplinary paradigms, theories, concepts, and approaches, interdisciplinary scholars must constantly find ways to connect them. Metaphor is one useful approach to making disciplinary connections.

To earn credit for this category, the issue, problem, or phenomena under investigation is described with a new analogy, metaphor, or simile that is designed to help the reader think about the problem in a new way and that encourages an interdisciplinary approach.

2. A preexisting metaphor is used or applied in a novel way.

Sometimes, writers use unusual or "fresh" metaphors to explain a connection (e.g., comparing global warming to a coffee pot), but other times, they draw upon more established metaphors (e.g., the use of the desktop metaphor for a computer Graphical User Interface) and use it in a new way (e.g., applied to a new situation, given a new interpretation) in order to help readers rethink the topic at hand (see Wolfe 2001).

To receive credit for this category, the issue, problem, or phenomenon under investigation is described with an established analogy, metaphor, or simile that is presented in an original manner to help the reader think about the problem in a new way.

3. One or more novel models are presented.

A model is a small object, formula, visual, or conceptual plan that represents in detail, another larger object, event, or concept. According to van

Dusseldorp and Wigboldus (1998), models come in three types: conceptual (in which all components of a system are indicated but no attention is given to relations among these components), relational (in which the components and their interrelationships are indicated); and mathematical (in which relationships are expressed in mathematical formulae) (p. 318).

To receive credit for this category, the author presents a model that provides a more full and integrated understanding of the subject matter than is available from any of the contributing disciplines. In other words, the issue, problem, or phenomena under investigation is described with a new model, simulation, formula, or concept map that is designed to help the reader think about the problem in a new way that encourages an interdisciplinary approach.

4. A preexisting model is used or applied in a novel way.

The issue, problem, or phenomenon under investigation is described with an established model, simulation, formula, or concept map that is presented in an original manner (e.g., using a model from one discipline or context and applying it to an interdisciplinary context) to help the reader think about the problem in a new way that encourages an interdisciplinary approach.

5. A new theoretical interpretation or understanding is presented which explicitly draws on more than one discipline.

Has the writer found ways (e.g., through dialectical, both/and, analogical, or synergistic reasoning) to combine the conflicting and complementary disciplinary perspectives into a new theoretical or structural interpretation or understanding of the topic?

To earn credit for this category, the theoretical interpretation must be novel, and it must explicitly incorporate two or more theories, paradigms, or perspectives from at least two academic disciplines. Credit should not be given if an existing interdisciplinary approach is being discussed.

Application of the New Holistic Understanding

Note: If credit was not given for any elements in the preceding category on new holistic understanding, then credit is possible only for the last element in this category on application of new holistic understanding.

Some scholarly inquiries begin with the practical case, situation, or object at hand and then through analysis, move to more abstract, conceptual, or theoretical reasoning. Other inquiries begin with the conceptual and move

into the practical implications of the concepts explored. In rare circumstances, some projects remain mostly on the conceptual level, and the application is implied. The source elements below describe those projects that involve application (or that move between the abstract and the concrete).

1. The new metaphor, interpretation, or model is applied to a new situation or phenomenon.

Does the author demonstrate how the new metaphor, model or interpretation can be used to understand a concrete situation? The new metaphor, interpretation, or model (as defined above in the category on new holistic understanding) is explicitly applied to a novel issue, problem, or phenomena under investigation. To earn credit for this category the metaphor, interpretation, or model must not only be presented, but the ramifications of that metaphor, interpretation, or model must be deliberately explored.

2. The new metaphor, interpretation or model is applied in a novel way to an established “text,” situation or phenomenon.

The new metaphor, interpretation, or model is explicitly applied to an established issue, problem, or phenomena under investigation in an original way. To earn credit for this category, the metaphor, interpretation, or model must not only be presented, but the ramifications of that metaphor, interpretation, or model must be deliberately explored.

3. The new metaphor, interpretation, or model is explicitly tested through observation, data collection, or lived experience and reflection.

At times, writers might generate a new model, metaphor, or theory at the beginning of their project and then subject that model, metaphor, or structural interpretation to empirical testing. The new metaphor, interpretation, or model is explicitly examined in light of observation, data collection, or lived experience (as defined above in the section on critical argumentation). To earn credit for this category, the relative strengths and/or weaknesses of the metaphor, model, or interpretation must be considered in light of the empirical evidence.

4. The new metaphor, interpretation, or model is used in a significant way to guide inquiry.

The new metaphor, interpretation, or model is used as the basis of investigation. The metaphor, model or interpretation may be the source of, or inspiration for, hypotheses, methods, or interpretation of data (as broadly con-

ceived in the section on critical argumentation). To earn credit for this category, the relationship between the metaphor (etc.) and the inquiry should be apparent to a reasonable reader from the intended target audience for the paper.

5. The new metaphor, interpretation, or model is tested by using it to solve a problem.

The new metaphor, interpretation, or model is explicitly used to solve a problem or resolve an issue. To earn credit for this category, the application of the new holistic understanding must be deliberately applied to a well-described problem to obtain a defensible solution.

6. Interdisciplinary theory is used to assess the approach taken.

Is the study grounded in the professional interdisciplinary literature? Does it extend emerging concepts, practices, and theories within the field of interdisciplinary studies? Does the author use this theoretical insight to assess his or her own inquiry or study?

Unlike the other items in this section, this item makes specific reference to established interdisciplinary theory. To earn credit for this category, one or more existing interdisciplinary theories must be used to determine the strengths and weaknesses of primary approach taken in the paper. For these purposes, theories should be considered interdisciplinary if a reasonable member of an interdisciplinary organization such as the Association for Integrative Studies would likely recognize it as an established interdisciplinary theory. Credit should only be given if the theory is explicitly used to examine the merits and limitations of the author's approach.

Scoring and Interpretation for Interdisciplinary Integration

Interdisciplinary integration is conceived as a process of creating common ground, developing a new holistic understanding, and applying that holistic understanding to the topic at hand.

Recognizing disciplinary differences is a challenge for interdisciplinarians, and an even greater challenge is finding some means of resolving those differences. Interdisciplinary inquiries often conclude with applying the new holistic understanding to concrete situations, considering the practical implications interdisciplinary insights. In our study of the reliability and validity of the instrument, interdisciplinary studies projects scored a mean of 3.8 (SD = 2.70) on a seven-point scale for interdisciplinary integration.

Interdisciplinary Integration: Score of 1

Contains no elements from any of the three categories of creating common ground, new holistic understanding or application of new holistic understanding. A score of 1 indicates a project that provides no evidence of interdisciplinary integration or the critical, self-conscious synthesis of two or more disciplines. In our research on the reliability and validity of this instrument, 30% of SIS projects and 90% of honors projects received a score of 1 on interdisciplinary integration.

Interdisciplinary Integration: Score of 2

Contains elements from only one of the three categories of creating common ground, new holistic understanding, and application of new holistic understanding. A score of 2 indicates a project that is weak with respect to interdisciplinary integration. Writers with a paper receiving a “2” have made an initial but small step toward interdisciplinary integration. In our research on the reliability and validity of this instrument, 20% of SIS projects, and none of the honors projects received a score of 2 on interdisciplinary integration. Fifty percent of the SIS projects scored higher than 2.

Interdisciplinary Integration: Score of 3

Contains elements from only two of the three categories of creating common ground, new holistic understanding, and application of new holistic understanding. In our research on the reliability and validity of this instrument, none of the SIS projects, and none of the honors projects received a score of 3 on interdisciplinary integration. Fifty percent of the SIS projects scored 3 or less on interdisciplinary integration.

Interdisciplinary Integration: Score of 4

Contains one of five elements from the category of creating common ground and at least one element from the category of new holistic understanding and at least one from the category of application of new holistic understanding. In our research on the reliability and validity of this instrument, 10% of SIS projects, and none of the honors projects received a score of 4 on Interdisciplinary Integration. Sixty percent of the SIS projects scored 4 or lower on this dimension. Sometimes writers whose papers receive this score are “big” holistic thinkers, but they neglect to take the time to demonstrate how they came to this larger synthetic understanding of the topic by fully “creating common ground.”

Interdisciplinary Integration: Score of 5

Contains two of five elements of the category on creating common ground and at least one element from the category on new holistic understanding and at least one from the category on application of new holistic understanding. A score of 5 indicates a project that is very good with respect to interdisciplinary integration. A project earning a score of 5 clearly demonstrates the creation of a new holistic understanding and the application of that new holistic understanding to the topic at hand. It is possible for a very good interdisciplinary paper to earn a 5 on interdisciplinary integration. In our research on the reliability and validity of this instrument, none of the SIS projects, and none of the honors projects received a score of 5 on interdisciplinary integration. Forty percent of the Interdisciplinary Studies projects had a score of 5 or higher. Papers with this score demonstrate a good ability to think through the ways the disciplines addressed do and do not intersect.

Interdisciplinary Integration: Score of 6

Contains three of the five elements of the category on creating common ground, and at least one element from the category on new holistic understanding, and at least one from the category on application of new holistic understanding. A score of 6 indicates a project that is excellent with respect to interdisciplinary integration. In addition, a project earning a score of 6 clearly demonstrates the creation of a new holistic understanding and the application of that new holistic understanding to the topic at hand. It is entirely possible for an excellent interdisciplinary paper to earn a 6 on interdisciplinary integration. In our research on the reliability and validity of this instrument, 10% of SIS projects, and 10% of honors projects received a score of 6 on interdisciplinary integration. Sixty percent of the SIS projects had a score lower than 6. A paper with this score demonstrates a very sophisticated ability to compare and contrast and then integrate disciplinary knowledge and to apply that new integrative thinking to new situations.

Interdisciplinary Integration: Score of 7

Contains four or five of the elements of the category on creating common ground and at least one element from the category on new holistic understanding, and at least one from the category on application of new holistic understanding. A score of 7 indicates a project that is truly outstanding with respect to interdisciplinary integration. In addition, a project earning a score of 7 clearly demonstrates the creation of a new holistic understanding and the application of that new holistic understanding to the topic at hand. In our

research on the reliability and validity of this instrument, 30% of SIS projects, and none of the honors projects received a score of 7 on interdisciplinary integration. Papers with a score of 7 demonstrate an exceptionally sophisticated ability to integrate disciplinary knowledge to explore a topic and to apply the new integrative understanding of the topic to a new setting.

Summary: The Profiles in Brief

Below is an abbreviated version of the Profiles. For each judgment, cite a specific portion of text that exemplifies each positive and negative source element. Assign the lowest score possible.

I. Drawing on Disciplinary Sources

A. Positive Source Elements:

1. Primary sources are included.
2. Sources include more than 25% recent publications, dated within the last five years of the project's completion.
3. A range of (more than one) perspectives from within the (at least one) discipline are included.

B. Major Negative Source Elements:

1. Inappropriate types of sources are used.
2. Sources are used inappropriately (e.g. misinterpretation, overextending).
3. There is over-reliance on one or two sources.
4. Sources are misquoted or quoted out of context.
5. Perspectives essential to the case being made are missing.

C. Minor Negative Source Elements:

1. Inappropriate quotations are included.
2. Sources are paraphrased inappropriately.
3. There is over-reliance on quotations.
4. Key contexts identified in the literature(s) are missing.
5. Not enough sources are included.

D. Scoring System for Drawing on Disciplinary Sources

- Score of 1: Contains 1 or more major negative source elements regardless of the number of positive elements.
- Score of 2: Contains 2 or more minor negative source elements regardless of the number of positive elements or

- Contains 0 of the 3 positive source elements.
- Score of 3: Contains 1 of the 3 positive source elements and 1 of the minor negative source elements.
 - Score of 4: Contains 1 of the 3 positive source elements and none of the negative source elements or Contains 2 of the 3 positive source elements and 1 of the minor negative source elements.
 - Score of 5: Contains 3 positive source elements and 1 of the minor negative source elements.
 - Score of 6: Contains 2 of the 3 positive source elements and none of the negative source elements.
 - Score of 7: Contains all 3 of the 3 positive source elements and none of the negative source elements.

II. Critical Argumentation

A. Positive Elements:

1. The problem is defined.
 - a. The problem or issue under investigation has been clearly stated.
 - b. The scope of the problem is clearly defined.
2. Each major assertion is supported.
 - a. Empirical evidence is cited to support major assertions.
 - b. “Textual” evidence is cited to support major assertions.
 - c. Theory or theoretical principles are used to support major assertions.
 - d. Direct experience and observation are used to support major assertions.
3. Reflection
 - a. Author reflects self-consciously on the limitations of his or her approach.
 - b. Author reflects self-consciously on the merits of his or her approach.
4. Meta-level Analysis
 - a. Author identifies shortcomings and limitations of at least one theory, school of thought, or disciplinary approach.
 - b. Author identifies some insights or merits of at

least one theory, school of thought, or disciplinary approach.

- c. The explanatory power of theories is addressed (e.g., what the theory ‘buys you’ vis à vis other theories).

B. Negative Elements

1. There is evidence of a misunderstanding of key concepts.
2. The thesis is superficial or obvious.
3. Irrelevant facts or arguments are presented.
4. Assertions are presented in an illogical order.
5. Writing is marred by significant grammatical and mechanical errors.
6. Ideas are presented in an inappropriate context.
7. Fallacious reasoning misses subtle but important points.
8. Analysis is underdeveloped or insufficient.
9. The scope of the problem is too broad or too narrow.

C. Scoring System for Critical Argumentation

- Score of 1: Contains elements from 0 or 1 of the 4 categories of positive source elements regardless of the negative source elements, or 3 or more of the negative source elements regardless of the positive source elements.
- Score of 2: Contains at least one from 2 of the 4 categories of positive source elements and 1 negative element, or 2 negative source elements.
- Score of 3: Contains at least one from 2 of 4 categories of positive source elements and none of the negative source elements.
- Score of 4: Contains at least one from 3 of 4 categories of positive source elements and 1 of the negative source elements.
- Score of 5: Contains at least one from all 4 categories of positive source elements and 1 of the negative source elements.
- Score of 6: Contains at least one from 3 of 4 categories of positive source elements and none of the negative source elements.
- Score of 7: Contains at least one from all 4 categories of positive source elements and none of the negative source elements.

III. Multidisciplinary Perspectives

1. Identifies aspects of the object of study as being addressed by more than one disciplinary perspective.
2. Demonstrates an understanding of how each discipline would approach the object of study.
3. Considers the object of study from more than one disciplinary perspective.
4. Identifies how at least one term is used differently in different disciplines within the context of the problem.
5. Identifies how different disciplinary terms are used to describe similar concepts.
6. Sources are drawn from two or more disciplines.

Scoring System for Multidisciplinary Perspectives

- Score of 1: Contains none of the source elements.
- Score of 2: Contains 1 of the 6 source elements.
- Score of 3: Contains 2 of the 6 source elements.
- Score of 4: Contains 3 of the 6 source elements.
- Score of 5: Contains 4 of the 6 source elements.
- Score of 6: Contains 5 of the 6 source elements.
- Score of 7: Contains all 6 of the source elements.

IV. Interdisciplinary Integration

A. Creating Common Ground

1. Author presents a clear rationale for taking an interdisciplinary approach.
2. Assumptions from more than one discipline are made explicit and compared.
3. Author compares and/or contrasts disciplinary perspectives.
4. The problem is explicitly defined in neutral terms that encourage contributions from more than one discipline.
5. Author creates a common vocabulary that can be applied to the object of study.

B. New Holistic Understanding

1. One or more novel metaphors are presented.
2. A preexisting metaphor is used or applied in a novel way.
3. One or more novel models are presented.
4. A preexisting model is used or applied in a novel way.
5. A new theoretical interpretation or understanding is presented which explicitly draws on more than one discipline.

C. Application of the New Holistic Understanding

Note: If credit was not given for any category D II items, then credit is possible only for the last point (Interdisciplinary Theory).

1. The new metaphor, interpretation, or model is applied to a new situation or phenomenon.
2. The new metaphor, interpretation, or model is applied in a novel way to an established “text,” situation, or phenomenon.
3. The new metaphor, interpretation, or model is explicitly tested through observation, data collection, or lived experience and reflection.
4. The new metaphor, interpretation, or model is used in a significant way to guide inquiry.
5. The new metaphor, interpretation, or model is tested by using it to solve a problem.
6. Interdisciplinary theory is used to assess the approach taken.

D. Scoring System for Interdisciplinary Integration

- Score of 1: Contains elements from none the 3 categories of the source elements.
- Score of 2: Contains elements from only 1 of the 3 categories (creating common ground, new holistic understanding, and application of new holistic understanding).
- Score of 3: Contains elements from only 2 of the 3 categories (creating common ground, new holistic understanding, and application of new holistic understanding).
- Score of 4: Contains 1 of 5 elements of category DI (creating common ground), and at least one element from category DII (new holistic understanding), and at least one from category DIII (application of new holistic understanding).
- Score of 5: Contains 2 of 5 elements of category DI (creating common ground), and at least one element from category DII (new holistic understanding), and at least one from category DIII (application of new holistic understanding).
- Score of 6: Contains 3 of 5 elements of category DI (creating common ground), and at least one element from category DII (new holistic understanding), and at least one from category DIII (application of new holistic understanding).
- Score of 7: Contains 4 or 5 of 5 elements of category I (creating common ground), and at least one element from

category DII (new holistic understanding), and at least one from category DIII (application of new holistic understanding).

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