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Research and Rhetorical Purpose: Using Genre Analysis to Understand Source Use in Technical and Professional Writing

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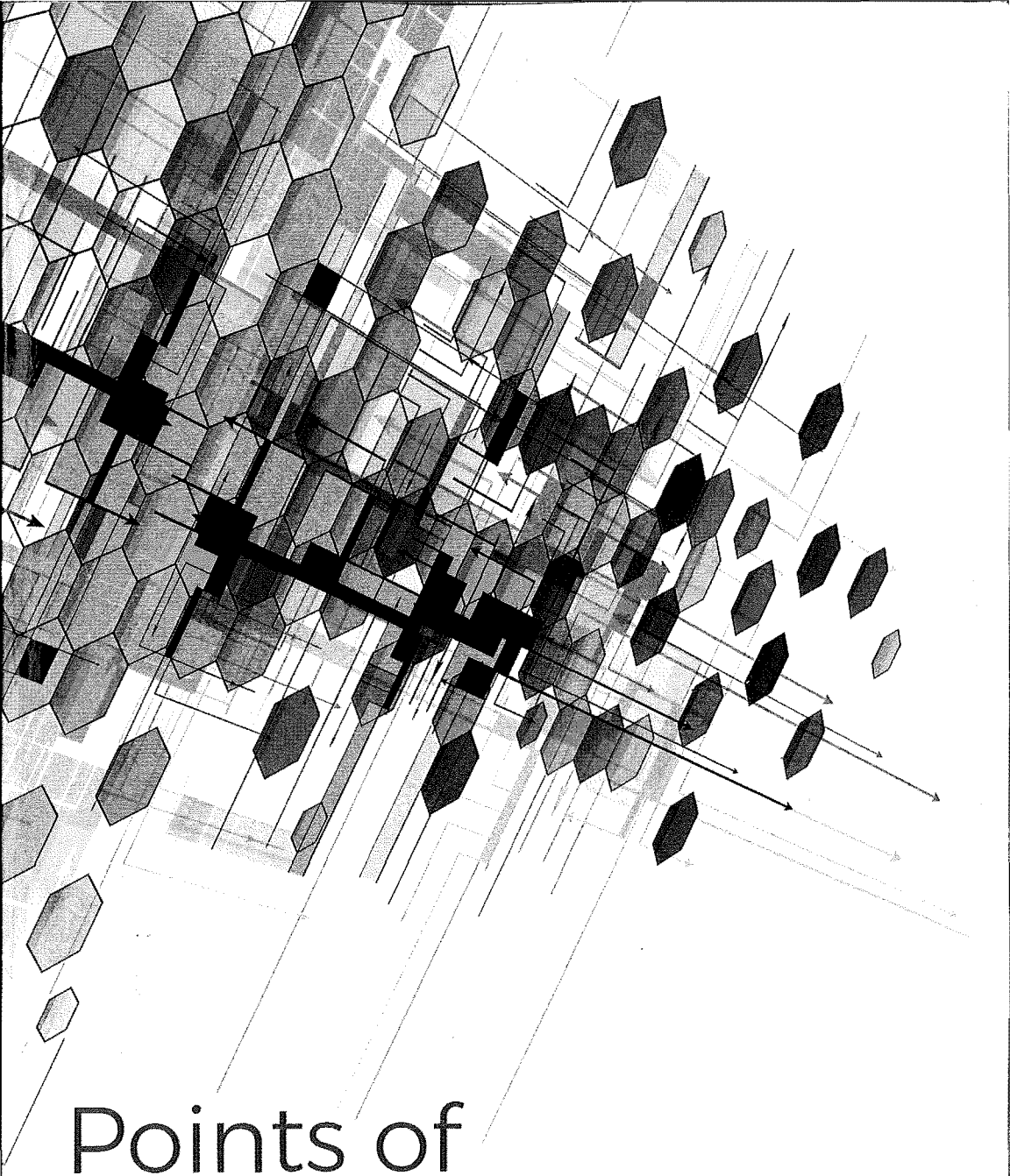

Points of DEPARTURE

RETHINKING STUDENT SOURCE USE AND WRITING STUDIES RESEARCH METHODS

EDITED BY
Tricia Serviss AND **Sandra Jamieson**

Chapter 6

RESEARCH AND RHETORICAL PURPOSE

Using Genre Analysis to Understand Source Use in Technical and Professional Writing

Lee-Ann Kastman Breuch and Brian N. Larson

ABSTRACT

This chapter describes a pilot study of student research-based writing in a technical and professional writing course designed for college-level juniors and seniors across the curriculum; fifteen analytical research papers are coded based on the rhetorical move John Swales (1990) calls "reference to previous research" to increase our understanding of how students use sources to introduce, support, or compare/contrast ideas and previous research. Student papers in this study overwhelmingly used sources to support main ideas, occasionally used sources to introduce ideas, often in the form of topic sentences, but rarely used sources to compare/contrast ideas. The frequency of support instances and the infrequency of compare/contrast instances may suggest students had difficulty using sources to position their research, whereas they had no trouble using source excerpts to support main ideas in their writing. Local impacts of this study included several discussions among instructors about the purpose of the analytical-report assignment in our technical and professional writing course as well as suggestions for pedagogical intervention and ongoing programmatic assessment as a result of the pilot study.

INTRODUCTION AND FRAMEWORK

In this chapter, we address student research writing in the context of a technical and professional writing course at a large public university.

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Specifically, we examine how students situate references to previous research in analytical reports. Our study addresses the question, *for what rhetorical purposes do students integrate sources into research reports?* This inquiry was inspired in part by recent work in the Citation Project regarding the ways students integrate sources into research writing. When Howard, Serviss, and Rodrigue (2010) examined eighteen student texts for instances of paraphrases, patchwriting, summary, and direct quotes, their analysis supported the hypothesis that students frequently "patchwrite" and that student papers often fail to summarize research (182). They propose a further research agenda, one to explore use of research by students in advanced writing courses, writing within their majors, and writing in specific genres (189). Our study responds to this call by examining writing in an advanced technical and professional writing course that reaches students in several disciplines across our university.

Our inquiry also responds to a call for research in technical-communication pedagogy from some scholars who have criticized technical-communication textbooks and curricula for failing to adequately address research methods and writing. For example, Joanna Wolfe (2009) argues that instructional textbooks in technical communication include ample material on formats or genres but rarely address techniques and strategies to communicate research results. She suggests that instructors must do a better job preparing students to use the IMRAD (introduction, method, results, and discussion) superstructure, illustrate data more clearly, discuss surprising results, and acknowledge errors and limitations of their studies (368–69). In a similar vein, Rachel Spilka (2009) points out the lack of research activities in technical-communication curricula. In a nation-wide survey of 114 technical-communication programs, Spilka found that only 35 percent of the programs surveyed included courses or activities involving research (527). While the assertions made by Spilka and Wolfe about technical-communication textbooks and curricula are on point, we note that neither Wolfe nor Spilka examined student research writing. Our research, then, is designed to extend theirs and focus on the writing produced by students in technical and professional writing courses rather than the pedagogy that led to that writing.

While some scholars have questioned generic application of the IMRAD superstructure to decision-making reports (see Rude 1995), IMRAD has a long history in technical communication and is commonly advocated in textbooks and curricula. It is associated with science writing and the scientific research article (see Bazerman 1988; Berkenkotter

and Huckin 1995; Swales 1990), and as John Swales (1990) argues, the IMRAD superstructure, or what he refers to as the "Research Article" (RA), reaches across disciplines and therefore plays a powerful role in published research writing. Swales devotes attention to how disciplinary differences emerge in published research and the *rhetorical moves* common in RAs. Such opportunity for genre analysis also inspired our study.

We were specifically interested in Swales's description of rhetorical moves in the results-and-discussion sections of research articles. Swales (1990, 172–73) identifies eight rhetorical moves within results sections: background information, statement of results, (un)expected outcome, reference to previous research, explanation, exemplification, deduction and hypothesis, and recommendation. Many scholars have used this framework to analyze rhetorical moves in the results sections of published articles or professional-writing samples (see Dudley-Evans 1993; Hafner 2010; Holmes 1997; Rude 1995; Swales 2004); however, few studies have analyzed student research writing for these moves. Vijay Bhatia (1993, 93) includes a helpful comparison of professionals' and students' writing of research articles (RA) and discusses the extent to which student writing (such as a lab report assignment) might represent a "subgenre" of the professional RA. However, he focuses on the introduction sections and not results and discussion, where students often synthesize their findings.

While Swales examines rhetorical moves in results sections of published research, we wanted to apply the model to student research writing. By using genre analysis, we extend the findings of Howard, Serviss, and Rodrigue (2010) in several ways. First, where that study and the expanded study by Jamieson and Howard (2013) describe the *manner* in which students integrate research sources into their writing (through direct quotes, paraphrases, patchwriting, or summary), our project examines the *purpose* of source integration. Second, our study looks at an upper-level professional and technical writing course rather than first-year writing. This leads to a third extension: the connection with professional and technical communication pedagogy and student research writing.

In the balance of this chapter, we describe the technical-communication class where we collected our data and the methods of data collection and analysis we applied. We then review how students positioned the rhetorical move Swales calls "reference to previous research," which in this case involved three purposes: introducing new ideas or topics, supporting ideas or claims, and comparing/contrasting references. We review the results of our coding in these three subcategories, discuss our

findings with reference to examples of student writing, and conclude with recommendations for further study.

METHODS

To investigate the use of reference-to-previous-research moves in student research papers, we collected a sample of student writing from the University of Minnesota's WRIT 3562W Technical and Professional Writing course in spring semester 2011. This course enrolls junior and senior undergraduate students and is required by several academic majors across the university. We typically offer between fifteen and twenty sections of the course each semester, each enrolling twenty-four students.

The analytical report generally accounts for 20 percent or more of the semester's grade. It can best be described as a problem-solving report in which students articulate a research question, gather primary (interview or survey) research and secondary (popular or scholarly) research, and articulate findings and recommendations using a variation of the standard IMRAD superstructure of a scientific report (introduction, methods, results, and discussion). The assignment is the culmination of several smaller assignments, including a formal progress report, and in preparation, students also read a chapter about analytical reports from the required textbook, *Technical Communication Today* by Richard Johnson-Sheehan (2010), in which Johnson-Sheehan notes that "the [IMRAD superstructure] is a common one, but the sections of analytical reports can be arranged and combined in a variety of ways" (271). (A typical version of the assignment description appears as Appendix 6.A.)

In the spring 2011 semester, we arranged with instructors of the course to obtain eighty randomly selected papers from sixteen sections, each of which had between twenty and twenty-four students, giving us five papers randomly selected from each section. We also collected from each instructor the assignment description for the analytical report or proposal assignment. The University of Minnesota IRB Human Subjects Committee determined that this study was exempt from review under federal guidelines (IRB Study 1009E90112).

In a larger analysis of these samples, we analyzed the results, discussion, and conclusion sections of thirty student papers for evidence of eight rhetorical moves based on Swales (1990) and Bhatia (1993). Of these thirty student papers, only fifteen papers employed the IMRAD superstructure. Thus, while this chapter describes the method used for the complete study (all thirty papers), we report only on one part of that analysis: the single rhetorical move reference to previous research

as it occurred in the fifteen papers that employed the IMRAD superstructure. Coders analyzed the thirty student papers at three levels: (1) IMRAD superstructure, (2) rhetorical moves in results section, and (3) reference-to-previous-research moves. First, four coders holistically assessed each student paper's conformity to the IMRAD superstructure (*Y* for yes and *N* for no). Observed agreement was 0.83; coders initially disagreed on five of the thirty papers. Disagreements were resolved during conferences among the coders to establish consensus codes on all the papers. (The coding guide for this phase appears as Appendix 6.B.)

Second, the same four coders performed an atomistic assessment of 2,943 units/sentences in thirty student papers for membership in categories based on the rhetorical moves we adapted from Swales (1990) and Holmes (1997). Table 6.1 illustrates the final rhetorical-moves coding scheme. Coders had two training sessions to prepare for coding; however, agreement among coders was difficult to establish. The coding scheme was adjusted after training sessions and the resulting observed agreement was 0.57. Coders met to resolve any remaining disagreements and established consensus for all codes.

The third analysis involved a close examination of the reference-to-previous-research rhetorical move in the papers coders had identified as conforming to the IMRAD structural convention—fifteen papers total. We did this coding without the assistance of our graduate-student coders. See table 6.5 for an overview of these papers. Given these fifteen papers, we began an examination of the units previously coded as Move 4: reference to previous research. We first coded the placement of each Move 4 within its respective paragraph, noting whether it occurred in the beginning, middle, or end of the paragraph. Then we coded each Move 4 for purpose. Swales's description of the reference-to-previous-research move involves the subcategories comparison, or comparing previous research with the focus of the student's research project, and support, or using references to support the student's research project (Swales 1990, 173). To these, we added a third subcategory of introduce, or using a reference to previous research to introduce a new idea or topic. Through these subcategories we wanted to learn more about how students were positioning references to previous research. Table 6.2 shows the coding scheme for reference to previous research.

We made no effort to judge interrater reliability at this stage, partly because we allowed for multiple subcategory codes per unit and partly because we found during our discussions that we were regularly agreeing on the subcategories.

Table 6.1. Rhetorical move coding scheme

Move 1: Background Information Information that strengthens the main discussion by articulating the purpose of the study, reiterating information from previous sections, highlighting theoretical information, asserting importance of the subject matter at hand, or reminding the reader of technical information.
Move 2: Statement of Results A statement about the subject matter of the student's study that articulates the main idea(s) and contribution(s) of the student's analytical report, that presents a claim of the student, or that represents an interpretation by the student of such a claim or of a Move 3 or Move 4 unit. A statement in this category is not reporting findings of primary or secondary research completed by the student but rather is an assertion about the subject matter of the study.
Move 3: Statement of Findings from Primary Research A statement that articulates a discovery or finding based on primary research completed by the student, such as surveys, polls, or interviews.
Move 4: Reference to Previous Research A statement that refers to any secondary source, such as journal articles, books, or Internet sources. (See discussion of subcategories below.)
Move 5: Explanation and Examples A statement that offers any reasons for results, including any surprising or unexpected results. Explanatory statements may also demonstrate analysis or argument that connects findings from primary or secondary research to statements of results. Examples reflect instances (rather than summaries) that support explanations, including anecdotal information, stories, or other illustrations that support explanations.
Move 6: Generalization and Limitation A statement that addresses generalizability of results of the study the student is conducting or addresses limits on its validity or generalizability. Statements in this category can include references to limitations in the present study the author is conducting, or it can include references to limitations in a secondary study the author reviews.
Move 7: Recommendation A statement that addresses the need and directions for future research, specifically future research studies on the same or similar topic. Statements in this category may also address future actions that can be taken as a result of findings, or calls to action.
Move 0: None of the Above Statements that do not reflect any of the previous categories. This includes rhetorical signposts or metatext, transition sentences between paragraphs or sections, rhetorical questions, and headers (unless headers exhibit characteristics of a particular move). This category includes sentences that have characteristics of more than one Move.

DISCUSSION OF METHODS

Adaptations to the Coding Scheme

Close textual analysis yielded many insights about student writing; the process was tedious, however, and we experienced several challenges.

Table 6.2. Coding scheme for subcategories of Move 4, reference to previous research

Code	*Description*
Compare or Contrast	Comment on how source information is similar or different from other information
Support	Comment on how source strengthens, explains, develops, or illustrates idea at hand.
Introduce	Use of source to introduce a new topic or idea in the paper
Other	Anything other than the three previous categories

First, the rhetorical moves we adapted from Swales (1990) are closely associated with the IMRAD superstructure in ways that did not always map easily onto student writing. For example, half our initial thirty-paper sample did not use the IMRAD superstructure, presenting a conflict between the collective rhetorical moves Swales found in published research and what we found in student writing and necessitating adaptations of the coding scheme to better suit the purposes of student writing.

UNITS OF ANALYSIS

A second challenge of our textual analysis involved determining the unit of analysis for coding. Swales (1990) identifies a series of eight rhetorical moves in the results sections of research articles, but these moves could be multisentence spans of text (see for example, the "sample move-step analysis" from Swales 1990, 139). If a coder had to select a span of text as a rhetorical move and then code the span for the move, interrater reliability would require an assessment of whether two coders selected the same spans and then an assessment of whether the span was coded as the same move. There are techniques for assessing the former, and they can address questions about what to do with partial matches or overlapping selections. For example, the span selections could be compared using pairwise F-scores with either a strict or lenient assessment of partial overlaps (see Cunningham, Maynard, and Bontcheva 2011; Larson 2015, 248). We chose to avoid those difficulties by using the approach of Richard Holmes (1997), who used sentences as coding units and applied a modified version of Swales's list of moves.

Coder Training and Interrater Reliability

A third challenge was coder training and interrater reliability. After Lee-Ann collected a random sample of eighty final projects from the

course in question in spring 2011, the second author joined the project as a research assistant. Thanks to grant funding, two other graduate students were available to assist with the coding, resulting in four coders. We assessed interrater (or intercoder) reliability with regard to the coding, as we considered that effort important in establishing transparency (Breuch, Olson, and Frantz 2002). We based the coding for the atomistic sentence/unit analysis closely on the moves described by Swales for results sections: background information, statement of results, (un)expected outcomes, reference to previous research, explanation, exemplification, deduction and hypothesis, recommendations. This list is complex, and we directed coders to assign one, and only one, code for a move to each sentence/unit. To prepare for the training, all four coders read excerpts of chapter 7 of Swales (1990), all of Holmes (1997) and Wolfe (2009), and the then-current version of the coding guide (Appendix 6.C). All four coders then completed a training session on ten sample papers using the draft coding guide.

The observed agreement between our two graduate-student coders on the training papers was 0.53. (Because we had already examined the training papers, agreement during training was calculated only for the two additional coders.) Because we were dissatisfied with that level of agreement, we wanted to examine where problems appeared, and an excellent tool for that is a "confusion matrix" or "contingency table" (Jurafsky and Martin 2009). Table 6.3 presents the confusion matrix displaying the graduate students' codes. A confusion matrix can be created automatically from data records using the pivot-table function of popular spreadsheet software. To interpret it, recognize that the first row represents those units coder 1 identified as Move 0, and each column represents the move categories to which coder 2 assigned the same units. The shaded cell represents those units on which the coders agreed, sixty-one times in the case of Move 0. The second cell indicates the number of cases in which coder 1 assigned the unit to Move 0 but coder 2 assigned it to Move 1, four times in this instance. Using the ratios of category agreement described in the confusion matrix, we calculated the Kappa statistic for our graduate-student training at 0.42, which means they obtained only 42 percent of the possible nonchance agreement (Carletta 1996).

The confusion matrix in table 6.3 provided insights into those categories that were proving most difficult for our coders. For example, of the 208 units coder 1 identified as Move 4, coder 3 put 33 in Move 2, suggesting that the coding guide was unclear on some point(s) that would aid in choosing between these two categories.

Table 6.3. Confusion matrix from coding training

	Coder 2 Codes										
Coder 1 Codes	*0*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*Totals*
0	61	4	43		5		15	3	1	13	145
1	12	12	5				6				35
2	12	8	103		8		39	5		9	184
3				12	1					1	14
4	6	8	33	1	147	2	8			3	208
5	6	1	11	2	7			1			28
6	1	1					1				3
7	4	1	31		13			4		6	59
8									10	1	11
9	1		8		1			1		37	48
Totals	103	35	234	15	182	2	69	14	11	70	735

Regarding Move 4: reference to previous research (the subject of this chapter's analysis), we found that there was sometimes disagreement between Move 4: reference to previous research and Move 2: statement of results. While these were the most frequently coded moves, we noticed that student writers used them in different ways, thus making the coding difficult. One of the complexities arose from what we meant by Move 2: statement of results. Was it about stating a claim or assertion or simply stating a finding from primary or secondary research? For example, when students summarized sources, were those summaries considered a result of their research or simply a citation? Our final interpretation of this category was to agree with Swales's description of statement of results as a claim or assertion of findings, and with Swales's description of references to previous research as ways to compare, contrast, or support a study (Move 4). However, students used sources in many cases as part of their findings—"so and so found this" and "this author suggested this." Students rarely used language to position the work of previous authors against or for their current study. They simply reported it, often summarizing the work. In addition to this complexity, we noticed the inadequacy of the student summaries of previous work. Sometimes students failed to include citations, leading us to suspect plagiarism. In some cases, students included long paraphrases of several sentences with a parenthetical citation only at the end of the paragraph,

making our sentence-level coding difficult. In short, students demonstrated varying levels of sophistication regarding the ways they summarized or shared previous research in their reports. Each of these factors complicated our coding.

We revised the coding guide again, based on the discussions and complexities we experienced in coder training. The final coding guide reflects the categories as stated in table 6.1. We were dissatisfied with the level of agreement in our second round of coding; agreement had slightly but not significantly improved. We recognized several causes for the problem: first, we had a large number of categories, which makes agreement less probable as a statistical matter. Second, rhetorical function is a complex thing, and different readers see a given sentence as serving different functions. Third, we required that units be assigned to single categories, and it seems quite likely that units can serve more than one function on our list.

To overcome these difficulties, we held coder conferences. We scheduled meetings of each pair of coders and required them to reach consensus on a single move code for each unit. Each coder spent four to six hours in such meetings, but the result was the assignment of a single move for each unit in our data set. Despite the relatively low interrater reliability on the original coding, the coders reached consensus codes. Once we had established agreement on codes, we focused attention on Move 4: reference to previous research and created subcategories that related to Swales's (1990) original descriptions of compare, contrast, or support. As mentioned earlier, we added introduce as a subcategory, as we often found citations used to begin a paragraph or new idea. Assigning these Move 4 subcategories was relatively straightforward and yielded consistent intercoder agreement.

Advice for Those Who Might Build on our Research

We learned much from our textual analysis and offer several suggestions for anyone conducting similar research, including the following:

- Create a coding guide and revise it to reflect any changes.
- Select individual rhetorical moves rather than the collective set to allow for more flexibility.
- Ask students about rhetorical purpose regarding how they referenced previous research.

First, we learned that the coding guide is an essential tool and that it is most effective when it clearly reflects relevant and concrete examples.

We revised our coding guide multiple times: our first version reflected Swales's rhetorical moves in brief form; our second version included adaptations to the categories that better fit the student papers (see table 6.1); our third version expanded the second version to include clear category descriptions and four to five concrete examples per category. (This final coding guide appears as Appendix 6.D.)

Second, we would not recommend applying Swales's (1990) collective rhetorical moves to student papers, as the set was intended for published research and not student writing. Applying all moves also introduced the potential for greater coder disagreement. Yet, specific rhetorical moves such as Move 4: reference to previous research were highly relevant to student writing, and close examination of that move allowed us to learn about the ways students were citing research. Thus, we recommend selecting specific moves rather than replicating Swales's collective set of rhetorical moves. To provide more context for using rhetorical moves in academic texts, we recommend reading Swales (1990), Holmes (1997), and Howard, Serviss, and Rodrigue (2010) as essential starting points.

Finally, we learned that our textual analysis could have been enhanced by asking students about their intentions as writers. In hindsight, student reflection about their own writing would have provided valuable information about the ways students were citing research, and it would have provided an important perspective. For example, using discourse-based interviews modeled on Odell, Goswami, and Herrington's (1983) work, we could have asked students to explain the choices we found so predominant. Doing so before our coding might have provided different categories for coding the references to research. Doing so after our coding might have provided insights into students' choices and purposes when referencing research.

FINDINGS

The results and discussion sections of the papers were segmented into units generally consisting of one sentence per unit, though a unit could consist of an image or an item in a numbered or unnumbered list instead. There were 1,405 units in the fifteen IMRAD papers. As table 6.4 shows, Move 4: reference to previous research was the second most common category, at 20.3 percent. This percentage reflects the overall frequency of this move across all samples—each sample varied significantly in the frequency and use of references to previous research.

A closer look at the subcategories of Move 4: reference to previous research shows that references were used most often to *support* a topic

Table 6.4. Frequency of coding categories in IMRAD papers

Category Number and Name	*Raw Frequency*	*Relative Frequency (%)*
Move 1: background information	40	2.8
Move 2: statement of results	218	15.5
Move 3: statement of findings from primary research	284	20.2
Move 4: reference to previous research	286	20.3
Move 5: explanation and examples	144	10.2
Move 6: generalization and limitation	17	1.2
Move 7: recommendation	97	6.9
Move 0: none of the above	319	22.7
Total	1,405	99.9

or idea expressed in the paper (n = 252) as opposed to using the reference to *compare/contrast* (n = 21) or to *introduce* an idea (n = 54). See table 6.5 for an overview of the fifteen IMRAD papers and the distribution of these Move 4 subcategories in them. These frequencies speak in part to rhetorical purpose, or how students were using references in their papers.

An analysis of how Move 4 was placed in paragraphs provides further insight. Units found in the middle and end of paragraphs (middle sentence and last sentence) were more likely to be instances of support or comparison. Units found in the first sentence were more likely to be instances of introduction to a topic or idea. Figure 6.1 shows the distribution of Move 4 sentences within paragraphs for each paper. (Note the absence of papers 013, 074, and 079, which had no Move 4 units.) While placement was not identical across authors, there was a pattern of more frequent uses of Move 4 in the middle sentences of paragraphs, which matched the frequency data of instances of support' for Move 4. Below we discuss some patterns of individual writers, such as using references to previous research to introduce, support, or compare/contrast ideas.

In the papers in which students used a significant number of Move 4 units to begin paragraphs, they usually did so to introduce a topic and sometimes also to provide some support for the claim in the paragraph. Here is an example of a paragraph in which the student used this approach:

> In November 2010, the *Marshall Independent*, as well as Minnesota Public Radio, reported on a new study being done by MNSCU to gauge the alignment of courses between Minnesota West Community and Technical

Table 6.5. Overview of IMRAD papers and presence of Move 4 and its subcategories

	Units	*Move 4*	*Subcategories of Move 4 (#/% of total)*			
Paper # and topic	*Coded*	*(#/% total)*	*Support*	*Compare*	*Intro*	*Other*
5. Marketing university campus as transfer destination	59	7 (12%)	4 (57%)	2 (29%)	3 (43%)	0 (0%)
6. Fluctuating milk prices	103	49 (47%)	43 (88%)	1 (2%)	10 (20%)	2 (4%)
11. Title IX	65	25 (38%)	21 (84%)	1 (4%)	4 (16%)	0 (0%)
13. Management style and employee satisfaction	71	0 (0%)				
16. Effect of thin models on teen eating disorders	54	14 (26%)	13 (93%)	3 (21%)	3 (21%)	2 (14%)
27. Effect of music listening on exercise	93	28 (30%)	23 (82%)	0 (0%)	9 (32%)	0 (0%)
31. Choice of dogs as pets	82	42 (51%)	36 (86%)	4 (10%)	9 (21%)	5 (12%)
35. Effect of listening to music on student grades	59	6 (10%)	5 (83%)	1 (17%)	0 (0%)	0 (0%)
38. Website usability	192	16 (8%)	13 (81%)	0 (0%)	3 (19%)	2 (13%)
52. Dangers of tanning	166	57 (34%)	57 (100%)	9 (16%)	5 (9%)	0 (0%)
55. Raw-milk-related illness	103	33 (32%)	29 (88%)	0 (0%)	7 (21%)	0 (0%)
73. Evaluation of non-profit event	109	4 (4%)	3 (75%)	0 (0%)	1 (25%)	0 (0%)
74. Curriculum changes in computer science	163	0 (0%)				
78. Alcohol sales at university stadium	57	5 (9%)	5 (100%)	0 (0%)	0 (0%)	0 (0%)
79. Effect of stress and procrastination on student performance	29	0 (0%)				
Totals	1,405	286	252	25	54	11

> College and SMSU [Move 4/introduce]. This was consistent with Dr. Onyeaghala's statements as well as what I was beginning to believe about the appeal of SMSU to community college students [Move 5].
>
> Paper 05/units 0084–0085

As this example demonstrates, Move 4/introduce units could occur at the beginning of a paragraph as a kind of topic sentence. And more often than not, these moves consisted of a source paraphrase. We noted

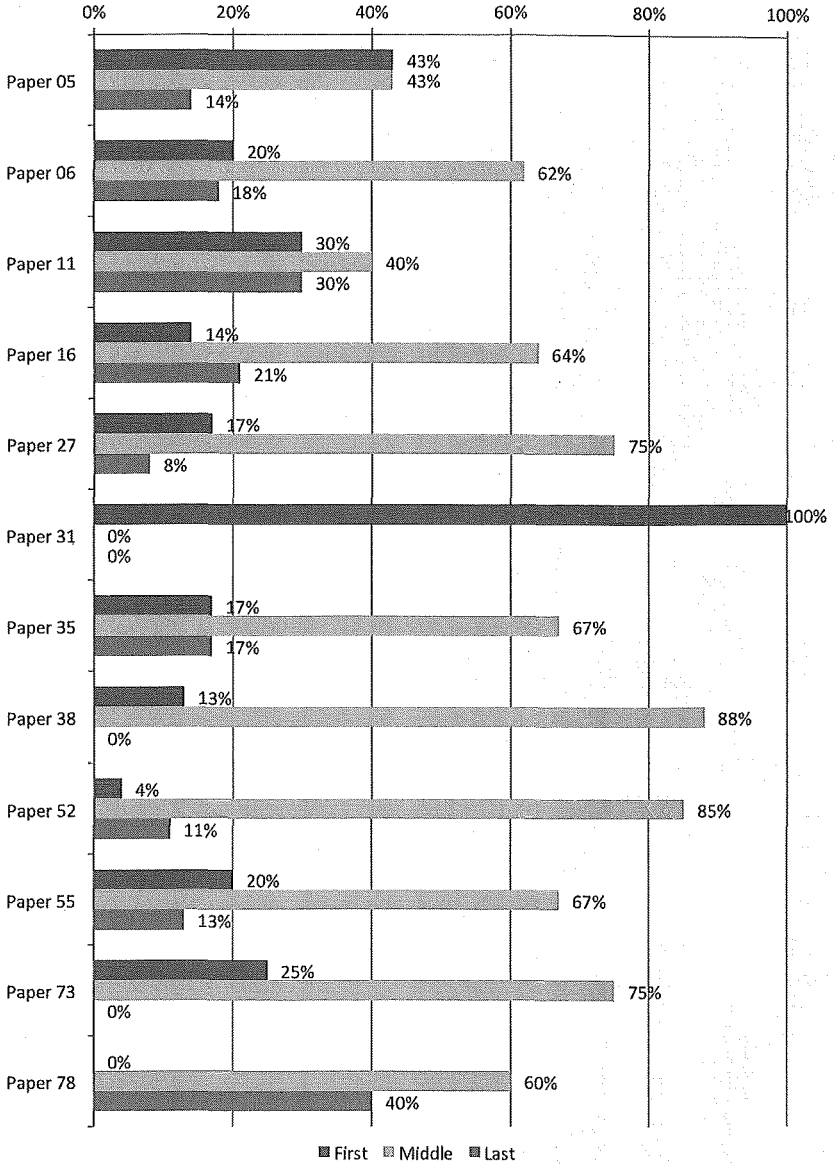

Figure 6.1 Distribution of Move 4 units

that in these instances, the paraphrase substituted for the student's voice in introducing a new topic through a topic sentence.

As we noted above, Move 4 was most frequently made to support ideas or topics in a paper. We began to notice common patterns among

frequent "support" users. The simplest of these consisted of paragraphs entirely made up of references to secondary sources and paragraphs in which all the units were secondary sources except that the first or last sentence was in the student's voice. This excerpt comes from paper 06, whose author frequently had complete paragraphs made up of nothing but Move 4 units:

> The Federal Milk Marketing Orders were established in 1937 to help market milk from the producer to the processor [Move 4/introduce/support]. FMMOs are used to set a minimum price in which processors pay producers for raw fluid (Grade A) milk [Move 4/support]. The price that is established is a uniform "blend" price that is a weighted average of the class prices [Move 4/support]. The price also varies by a schedule based on the traditional supply and demand of dairy products. The Federal Milk Marketing Orders help to regulate about 75% of the milk produced in the United States (Dairy Fluid, 26) [Move 4/support].
>
> Paper 06/units 0174–0178

This is the most common pattern of all for the use of Move 4 units, and the authors of papers 27, 31, and 55 all practiced it regularly. A second pattern similar to the first consisted of a topic sentence in the student's voice (usually Move 0 or Move 2) followed by the balance of the paragraph consisting entirely of Move 4 units. The authors of papers 06 and 16 used this practice frequently. It was less common to find Move 4/support units at the ends of paragraphs, although papers 11 and 78 frequently used them in this way.

The least common use of Move 4 was compare/contrast, or placing references to previous research in conversation with other research or observations made by the author. The author using this move steps back and comments critically on research as it compares to previous studies or other evidence. This move was rarely practiced in our samples; however, a few students used one or two more sophisticated approaches for integrating the voices of others with the students' own. First, the authors of papers 05, 35, and 52 interspersed references to secondary sources with interpretive comments and claims of their own. This excerpt is from paper 35:

> Comparing the results of the background research and the empirical survey, there are many similarities and potential for new research projects to develop beyond this research report [Move 0]. First, every single participant regardless of student status, gender, and GPA listened to music during designated homework times (though the amount of time varied) [Move 1 (repeating previously presented results)]. This is comparable to what society is reflecting through the creation of headphones and portable music devices in addition to designing stores that music can overtake the

> entire space (Lincoln, 2005) [Move 4/compare]. Second, it was found in the empirical survey that while there was a most preferred and least preferred music genre, there was not a significant difference between response numbers of the music genres [Move 2]. This is another reflection of societal changes of preferred music genres due to rises of technology [Move 0]. Technology makes music accessible, so humans are able to explore and develop personal musical tastes [Move 0]. Lastly, it is not surprising that college students are listening to music during designated homework times because music has been proven to influence behavior in previous studies and has current research interest for the Department of Homeland Security (Department of Homeland Security, 2009) [Move 4/support]. While it is speculative to conclude that listening to music may increase concentration levels during designated homework times, it would not be entirely surprising if a reputable study concluded it as fact [Move 0].
>
> Paper 35/units 956–963

The Move 4/compare statement above demonstrates how this student author placed sources in conversation with one another. In this case, the author compared her primary survey research on the topic of music listening to a secondary source (Lincoln) on the prevalence of music devices. This kind of connection reflected an analysis useful to the remainder of her argument. Again, this move was rarely visible among our samples.

DISCUSSION OF FINDINGS

As we digest these findings, we return to our research question, *for what rhetorical purposes do students integrate sources in research reports?* Using genre analysis as described by Swales (1990), we structured our study around his rhetorical moves for results sections, focusing on Move 4: reference to previous research. We divided this move into three subcategories: introduce, support, and compare/contrast. Our findings suggest that of these subcategories, references were most frequently used to support a main idea or topic in student writing (252 instances), whereas references used to introduce an idea (54 instances) or compare/contrast (21 instances) were far less frequent. These findings, and our textual-analysis method, have generated several observations and questions about student use of citations among our samples.

First, we observe that the frequent use of citations to support main ideas (Move 4/support) corresponds well to Swales's finding that using sources for support is a standard and expected rhetorical move in academic writing. In fact, of the eight moves Swales outlines, Move 4 was the second most frequent rhetorical move we coded in our student samples. In addition, among the subcategories of introduce, support, and

compare/contrast, support was by far the most frequent. The samples we reviewed for this study consistently demonstrated an awareness of and effort from students to incorporate secondary sources in support of a main idea or argument. We consider the frequency of Move 4/support statements encouraging, for it demonstrates student awareness of integrating sources to build written arguments. But this frequency does not necessarily reflect sophistication. For example, we did not examine the Move 4/support statements for correctness of citation format or accuracy of content; our results suggest only that students frequently made efforts to integrate sources for support.

However, the same observation cannot be made about instances of Move 4/compare statements and Move 4/introduce statements. The infrequency of the former suggests that students rarely place sources in conversation with one another, possibly because they do not know how to integrate sources in this way, or perhaps because they do not consider it important to their analytical research paper. Students did not often mingle their own interpretations with source findings and rarely articulated themes or trends among their sources. Students also rarely used sources to present alternative or opposing viewpoints; they used them to support main points rather than rebut them. Students' use of Move 4/introduce statements to introduce main points further illustrated the use of sources to develop a main point; however, they also illustrated how students constructed topic sentences using source references rather than articulating their own topic statements. We hypothesize that using sources to introduce topics in this way may dilute the student's authorial voice in research papers.

To better understand these findings, we reviewed the directions students in the Technical and Professional Writing course were given in the assignment description and grading criteria for the analytical report. (A commonly used assignment description appears as Appendix 6.A.) What we found was disappointing: the common assignment description notes students will analyze their data and sources, but it says nothing about what that effort entails. One implication is that instructors should provide further detail and explanation about this work in the assignment sheet (see also Head and Eisenberg 2010; Kleinfeld, this volume).

IMPLICATIONS AND FUTURE RESEARCH

We set out to discover what rhetorical purpose references to sources served in our students' analytical reports. We found that Move 4: reference to previous research was the second most common rhetorical move

in our students' papers and that the great majority of those references to previous research served the purpose of supporting the claims or arguments the student was making. In fact, our finding that compare/contrast moves were rarely seen among student papers suggests that, in terms of rhetorical purpose, these undergraduate writers think of citations primarily in terms of supporting a position they have stated in their writing. Student writers in our sample rarely discussed themes or patterns evident in previous research. This almost unvarying purpose for references to previous research suggests students in this study may have had difficulty positioning their work in the context of previous scholarship. Or, as we learned from reflecting on our own assignment, students may have simply done exactly as we asked and found sources that aligned directly with their arguments.

These findings, we believe, suggest a greater need to help students develop a stronger authorial voice based on an overall perspective of the research they are citing. We are reminded of Wolfe's (2009) critique of technical-communication textbooks and her suggestions that students need more help discussing and integrating data in research papers. The same argument could be made regarding research papers that rely heavily on secondary sources—students need more help discussing and integrating sources in a way that demonstrates critical thinking.

On this point, we shared our data analysis with our local instructor community, which resulted in several discussions about how to better help students critically analyze sources in the contexts of their arguments. Many instructors noted the importance of students having stronger familiarity with their sources. One change we discussed was to strengthen an existing proposal assignment (meant to precede the analytical report) to include an annotated bibliography of sources that would be used for the analytical report. Another suggestion was to incorporate a stronger literature review section in the analytical report assignment. We reasoned that these additions might give students the opportunity to engage more deeply with sources and to observe patterns, themes, and disagreements among sources. We felt it was important that students engage with their sources early and often so they could more completely enter the conversation of scholarship. In addition to a more robust proposal assignment, instructors also articulated ideas for smaller, low-stakes assignments that would ask students to reflect on sources or share their findings with other students. If such changes are introduced, a follow-up study could analyze their impact in comparison with this data.

Our conversations with instructors yielded other helpful insights. For example, we discussed strategies to help students talk about their

sources beyond a single paraphrase or quote to support a main point. Could students question the sources? Could they compare and/or contrast opposing views from sources? Could they explain the cited reference more deeply? Such strategies could potentially help students "unpack" their sources by encouraging them not only to *articulate* main points but also to *illustrate* and *explain* how those sources contribute to the overall argument at hand. One instructor noted that he'd like to share Swales's rhetorical moves along with examples so students could see what rhetorical moves might accomplish. We considered sharing our coding guide for this purpose because it includes explanations and examples of the rhetorical moves. Another idea was to have students analyze their own writing using Move 4: reference to previous research to further understand the ways they are using references in their writing. Each of these ideas offered great direction for strengthening attention on how students use research references.

In addition to local impacts of this research, our pilot study opened directions for future research. The pilot study involved tedious steps regarding coding, but we believe any second attempt could run more smoothly, especially if coding for specific rhetorical moves rather than trying to apply them all. We imagine future studies revisiting Move 4: reference to previous research using a new data set, perhaps as part of an ongoing assessment of student writing in this advanced writing course. We imagine inviting students to participate in an analysis of their own writing, perhaps by sharing with them the rhetorical moves and asking them to comment on their own purposes and choices for using references. Finally, we imagine how this research might be more fully integrated into our technical-communication programs, in terms of both undergraduate writing and graduate-student research. In sum, we found our study an important first step for building a more robust assessment program of student writing in our undergraduate program, and we look forward to exploring these new avenues.

APPENDIX 6.A
Assignment Description

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> You have chosen a topic and have reported on the progress of your project in a progress report/activity report. In this assignment you will demonstrate your ability to follow the necessary steps for research: define

a research question, develop a research methodology, gather information using that methodology, and analyze the information (see Figure 23.3 and Chapter 7). You will then demonstrate your ability to write an analytical report based on that research. Your report will follow the general analytical report structure—Introduction, Methodology, Results, Discussion, Conclusions and/or recommendations—the IMRAD structure. (Chapter and figure references are to Johnson-Sheehan 2010)

APPENDIX 6.B
Final Coding Guide for Holistic Assessment of Student Papers' Conformity with IMRAD Structure

Examine each of your student texts for the existence of IMRAD structure. An Excel spreadsheet will be provided for you to record your results. Please provide a "yes" or "no" indicating whether the IMRAD structure is present. The IMRAD structure resembles Introduction, Method, Results and Discussion. The Results and Discussion section may be labeled different things such as "Findings," "Results," "Results and Discussion," "Conclusion." More important than the headings used in the paper, the "Results" and "Discussion" must do two things: (1) make a statement of results, which may be interpreted as a claim or finding (or multiple claims or findings) and (2) provide an explanation of the statement of results, no matter how short or long that explanation is.

- For a "yes" code, the document must have evidence of all IMRAD sections. For example, there must be an introduction with background information, an explanation of methods, sharing of results and some kind of discussion of those results. The prose is more important than the headings/titles. For example, if sections of text indicate introduction, methods, results, and discussion, but are not labeled as such in headings or are labeled differently, the paper would still receive a "yes" code.
- For a "no" code, the document will have left out one or more of the IMRAD sections. For example, if an introduction is provided as well as results and discussion, but the methods section is absent, the document gets a coding of "no." If results are shared, but discussion of those results is absent, the document would receive a "no" code.

APPENDIX 6.C
First Draft Coding Guide for Atomistic Assessment of Sentences/Units

(Note that references are incomplete, as that is how they appeared in the draft.)

- **Move 1. Background information.** Information that strengthens the main discussion by restating main points, highlighting theoretical information, or reminding reader of technical information. Reference: See Swales, p. 172.
- **Move 2. Statement of results.** Statement of claim and findings. This statement may occur more than once. Reference: Swales p. 172, and Wolfe p. 368 "Interpret data and draw conclusions" p. 368.
- **Move 3. (Un)expected outcome.** Address any surprising results. Reference: Swales, p. 173, and Wolfe, p. 369, "Acknowledge errors, flaws, and unexpected or unfortunate results."
- **Move 4. Reference to previous research.** Swales describes this as the most common move after Move 2. Sub-types include comparison with present research or support for present research. Reference: Swales p. 173.
- **Move 5. Explanation.** Offer reasons for results, including any surprising or unexpected results that may differ from literature; acknowledge error something different from literature. Wolfe suggests that the writer should "present data in a way that leads reader to conclusion" (368). Swales suggests that this category overlaps somewhat with Move 3. Reference: Swales p. 173, and Wolfe p. 368.
- **Move 6. Exemplification.** Swales suggests that "Examples are most often used to support an explanation" (173).
- **Move 7. Deduction and hypothesis.** Claim about generalizability of results. Reference: Swales, p. 173.
- **Move 8. Recommendation.** Statements about need and directions for future research. Swales' comment that this section is often missing because US scientists don't want to tip their hat about their future directions. Reference: Swales, p. 173.

APPENDIX 6.D
Final Coding Guide for Atomistic Assessment of Sentences/Units

References to three-digit numbers are to the unique identifiers of the papers we used for developing the coding guide training coders; page numbers refer to pages in those documents.

MOVE 1. BACKGROUND INFORMATION.

Information that strengthens the main discussion by articulating the purpose of the study, reiterating information from previous sections, highlighting theoretical information, asserting importance of the subject matter at hand, or reminding reader of technical information.

EXAMPLES:

- "The purpose of this study was to find if caffeine had any effect. . . ." 002 p. 11

- "The effects of caffeine on academic performance are an important concept." 002 p. 11

MOVE 2. STATEMENT OF RESULTS.

A statement about the subject matter of the student's study that articulates the main idea(s) and contribution(s) of the student's analytical report, that presents a claim of the student, or that represents an interpretation by the student of a such a claim, or of a Move 3 or Move 4 unit. A statement in this category is not reporting findings of primary or secondary research completed by the student, but rather is an assertion about the subject matter of the study.

EXAMPLES:

- "However the limited evidence shows that caffeine has a negative impact on academic performance." 002
- "Relating to my question of what the effects are in pregnant women if they consume artificial sugars, we can conclude that it there will most likely not be any effects by consuming the sugar. Although it is suggested to not consume the artificial sugars during pregnancy to be sure that there will not be any bad effects." 018 (both coded as Move 2)

MOVE 3. STATEMENT OF FINDINGS FROM PRIMARY RESEARCH.

A statement that articulates a discovery or finding based on primary research completed by the student such as surveys, polls, or interviews.

EXAMPLES:

- "Sense of privacy in a workplace . . . is important to every generation that was interviewed." (Referring to interviews the student conducted.) 017 p. 8
- "[1] <LBimage imagetype="chart" > figure 1: Cumulative GPA of all Participants < /LBimage > [2] As you can see from the pie chart the majority of the participants have a 3.0 to 3.4 GPA. [3] A 3.0 grade point average is equivalent to a B average. [4] Participants with a 3.5 to 4.0 GPA make up 30% of the date." 002 ([2] and [4] report the results of the student's survey; those results are presented in a pie chart in [1]; all three are thus coded Move 3. [3] is coded Move 0, because it's unclear where the student came by this information.
- "In my interview with <redact></redact>, she explained to me that there are not any recommendations to not use artificial sugars during pregnancy." 018 (the student reports the comments of an informant the student interviewed; the information gleaned from this interview is thus coded Move 3)

MOVE 4. REFERENCE TO PREVIOUS RESEARCH.

This category includes statements that refer to any secondary source, such as journal articles, books, or internet sources. Statements in this category can manifest in a variety of ways:

- Reference that summarizes, paraphrases, or quotes previous research from a secondary source.
- Reference that compares and/or contrasts previous research with the study presently conducted by the student.
- Reference that articulates the way in which a previous article supports the study presently conducted by the student.

EXAMPLES:

- "The article *Encouraging Healthy diet is elementary in Lansdownw,* by Brain Conlin, looks at how foods are laid out in the lunchroom." 020 p. 7 (source attributed sentence)
- "Many studies have investigated the research of caffeine intake on academics and the results show that caffeine as negative impacts . . ." 002 p. 11
- "Also, brain science studies have shown that social interaction accelerates learning, decision making and long term memory (Williams 2009)." 003 p. 6 (cited source)
- "'There is no universal experience of childhood, experiences are rather social constructs which are the result of a complex interplay of historical, social and cultural factors' (Jha, 207)." 023 p. 7 (quoted source)

"Unfortunately. . . . the results [from secondary research] were extremely minimal regarding apparel design job listings." 009 p. 10–11 (though this sentence does not report specific secondary source results, it reflects the student's review of such sources)

MOVE 5. EXPLANATION AND EXAMPLES.

Statements in this category offer any reasons for results, including any surprising or unexpected results. Explanatory statements may also demonstrate analysis or argument that connects findings from primary or secondary research to statements of results. Examples reflect instances (rather than summaries) that support explanations, including anecdotal information, stories, or other illustrations that support explanations.

EXAMPLES:

- "[1]According to my survey, one of the most popular perceptions of child labor was the lack of implementation of current laws already in place . . . . [2] As discussed in the introduction, India has a long history of passing laws and taking a proactive stance on this issue. [3]

However, the government is not able to fully implement these laws as the issue is not getting any better. [4] This could be a results of lack of national funds to punish employers or rather the large amount of bribery and corrupt throughout the government."(Sentence [1] is Move 3, Sentence [2] is move 1, but sentences [3]-[4] are Move 5.) 023 p. 7

- "To me this seemed strange." (Referring to a result of the student's primary research.) 020 p. 7
- "Surprisingly, of everyone I surveyed, no one believes financial support was a contributor to the child issue problem." 023 p. 8
- "As I was reading this article I remember a conversation with an elementary teacher that I had." 020 p. 7
- "Because they cause snow to melt quicker, it reduces the amount of chloride dispersed in the environment." 041 p. 11

MOVE 6. GENERALIZATION AND LIMITATION.

Statements in this category address generalizability of results of the study the student is conducting or address limits on its validity or generalizability. Statements in this category can include references to limitations in the present study the author is conducting, or it can include references to limitations in a secondary study the author reviews. A statement explaining why some state of affairs is a limitation should be coded as Move 6 (rather than Move 5).

EXAMPLES:

- "This problem also affects external validity because since the scores did not measure what they were supposed to it cannot be applied to the population." 002 p. 11
- "Because I focused most of my research in Minnesota, I was not able to compare/contrast as I would if I looked fully at the whole US." 020 p. 6
- "A major problem of the study was that the experimenter used a questionnaire in order to collect data." 002, p.11 (referring to the student's primary research)
- "Effects from a rat could end up being slightly different in a human being." 018 p. 7 (referring to secondary research)
- "[1] A major problem of the study was that the experimenter used a questionnaire in order to collect data. [2] There was minimal demographic data collected on the subjects. [3] Detailed information was not obtained." 002 (though [2] and [3] don't overtly criticize the study, they *explain* the criticism in [1])

NOTE: "These are clear examples of the benefits social networking can have on specifically workers but could definitely be applied to the productivity of students." 003 p. 6 (this is the student's claim and thus

Move 2; here she generalizes from workers to students, but does not comment on generalizability)

MOVE 7. RECOMMENDATION.

Statements in this category address need and directions for future research, specifically future research studies on the same or similar topic. Statements in this category may also address future actions that can be taken as a result of findings, or "calls to action."

EXAMPLES:

- "In the future, the experimenter should use a more detailed questionnaire in order to properly assess the relationship between caffeine consumption and academic performance." 002 p. 11
- "Further research needs to begin at the core of this issue and alleviating the burden children have at supporting their families as such a young age." 023 p. 8
- "The Career Center should become more active in social media and include GoldPass in this process as a way of increasing advertisement to employers and businesses." 009 p. 13
- "My recommendations to other businesses and CEOs, keep the energy of your company, keep creating and if there is some difficulties looks like unsolved." 012 p. 11

MOVE 0. NONE OF THE ABOVE.

Statements that do not reflect any of the previous categories. This includes rhetorical signposts or 'metatext,' transition sentences between paragraphs or sections, rhetorical questions, and headers (unless headers exhibit characteristics of a particular move). Statements in this category will vary, and often may have some similarity to a particular category, but not enough to code it cleanly as that category. For example, statements of personal reflections or beliefs about the study might fall into this category, rather than Move 2 "statement of results." This category includes sentences that have characteristics of more than one Move. If a sentence firmly reflects one move, but has hints of a second, please code the first move and describe the second move in the "notes" space.

EXAMPLES:

- "Thank you for your interest on this issue and if you have any further questions or comments regarding this report please do not hesitate to call me . . . ." 023 p. 8
- Photograph in 012 p. 7.

- "I edit it into Excel form for clearly view." 012
- "What are the reasons for child labor: The poor economic status of India? The lack of implementation of current laws? Western greed for lower prices? Or just the simple difference in childhood definition between cultures." 023 p. 6

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POINTS OF DEPARTURE

Rethinking Student Source Use and Writing Studies Research Methods

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