A Mathematician Learns the Basics of Writing Instruction: An Immersion Experience with Long-Term Benefits

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A Mathematician Learns the Basics of Writing Instruction: An Immersion Experience with Long-Term Benefits

Lynne L. Doty

Abstract: Initially designed to be an interdisciplinary experiment that would change attitudes about mathematics, the semester-long collaboration between a writing instructor and a mathematics instructor yielded unexpected long-term results. The collaboration served as an immersion in methods and techniques used by writing instructors. Description of jointly supervised assignments demonstrates how this experience enhanced a mathematician's ability to use formal writing assignments in other mathematics classes.

Keywords: Interdisciplinary, writing assignments, collaborative teaching.

1. INTRODUCTION

Writing to learn about mathematics: You have read several articles on the topic. You have attended conferences or workshops presenting pedagogical strategies. You are ready to try integrating writing assignments into your mathematics classes. What should you do next? According to Meier and Rishel, you should "stroll over to the writing department" [7, p. xiii]. My own experience illustrates the outcome of one such stroll and articulates specific benefits that occur when the journey transforms itself into a guided tour. I was motivated, initially, by a desire to create a one-semester general education mathematics course that would teach mathematical thinking and underline the importance of mathematics in human culture. I expected that, in addition to creating an interesting and rewarding interdisciplinary experience for students, the result would be a profitable exercise in collaborative teaching. The most significant long-term benefit of the enterprise for me, however, and one that was wholly unanticipated at

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the outset, extended well beyond that one-semester experiment. The intensive one-on-one interaction with a writing instructor, jointly designing, guiding, and grading formal writing, taught me concepts and techniques with lasting value: they enabled me to become more confident and effective thereafter at using writing projects in major and non-major mathematics courses.

2. BACKGROUND

At Marist College, a small liberal arts institution, we had been experimenting with the idea of enrolling the same cohort of incoming freshmen in pairs of courses in an attempt to achieve intellectual coherence in our general education program. So a mechanism to facilitate my original goal of situating mathematics in the mainstream of the liberal arts was in place. I simply needed to pair my mathematics course with another course in which content was flexible enough to accommodate the integration of some mathematical ideas within its objectives and its structure. A course like College Writing, which emphasizes the teaching of skills rather than mastery of specific topic areas, seemed to be a good choice. I found a colleague in the English department who was willing to design a significant number of her course assignments so that they would illuminate the historical-cultural locus of mathematics.

Our College Writing II, typically a first-semester course for well-prepared incoming students, is intended to present students with increasingly sophisticated writing tasks. It familiarizes them with a variety of rhetorical strategies, emphasizing awareness of audience and tone, and it offers them practice in selecting and employing different types of writing, e.g., descriptive, expository, evaluative, and comparing and contrasting. The course focuses particularly on writing that demands analysis and synthesis of information. A major course objective is that students master fair and accurate use of sources, including principles and methods of documentation. Within the parameters of these generally articulated course goals, instructors are free to choose readings and devise their own assignments. It is easy, therefore, to link a section of the writing class with a course in another subject area, and to focus readings and written assignments on the content area of that second course, without sacrificing any of the goals of College Writing. Insofar as the College Writing readings and assignments help students to understand materials or reinforce skills essential for success in the paired course, those readings and assignments become doubly valuable to students.¹

In many ways, the content of our general education mathematics course at Marist is as open to modification as is the content of the writing course.

¹A different and intriguing implementation of the Marist paired-course structure, also involving college writing and a general education mathematics course, is described in [6].
Our goal is not to teach particular topics, but to teach students a full range of mathematical thinking skills, including methods of coming to grips with problems. Within some broad guidelines, the area of mathematics that will serve as the vehicle for instruction is left to the choice of individual instructors. Most of the full-time faculty select one area of mathematics and spend the entire semester on it. By taking this approach, we can study a topic in sufficient depth to provide realistic examples of its uses and to allow students enough time to experience the intellectual satisfaction that comes from mastering at least one or two of the more complex and fundamentally important ideas in mathematics.

For several years I have used graph theory to accomplish the goals of our general education mathematics course. Many topics in this area can form the basis of class work and assignments that develop a full range of mathematical thinking skills, helping students master at least a few of the more complex ideas that underlie much of mathematics: counting arguments, recursion, multiple methods of solution, and multiple correct solutions. Most of the ideas are best explained in prose, and understanding them requires almost no algebraic background. Thus graph theory enables the design of an in-depth experience well within the grasp of freshmen, regardless of their mathematical backgrounds. With some care, moreover, it is possible to find results discovered during the last half century that can be presented in such a way as to give students at least a glimpse of what it is like to do mathematical research.

3. DESCRIPTION OF WRITING ASSIGNMENTS

Illustrating fully the interplay between mathematics and other areas of human experience served as a common purpose in both courses, and provided a framework for the development of some assignments in each. Two writing assignments were common to both courses, i.e., they were jointly assigned and supervised, and they counted toward the final grade in both courses. A joint research paper project assumed central importance. Each student focused on the personal and professional life of one mathematician, attempting to situate his or her life and work in a larger social, cultural, and historical framework. Since most people have never heard of any mathematicians, with the possible exception of Euclid and Newton, the first part of the project was designed to provide brief biographies of about 20 mathematicians to everyone in the class. I prepared a list of about 25 prominent men and women mathematicians who represent a wide range of time periods and civilizations. Each student literally pulled a name out of a hat and gave a brief oral report on the life and accomplishments of the designated mathematician.

Having heard reports on approximately 20 mathematicians, each student selected one and prepared a research paper designed, supervised, and graded jointly by the two instructors. Since we were sure that none of the students
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had ever done a research paper like this before, we provided detailed instructions describing the elements the paper was expected to address. Students were supposed to indicate how the mathematician’s major achievements fit into the history of ideas in a large sense: How did these ideas change either theory or practice in some branch of mathematics? What applications or implications affected other fields such as engineering, architecture, astronomy, commerce, philosophy, or art? To help students position a mathematician’s work in a cultural and social context, we asked them to identify significant political, artistic, intellectual, and religious movements in the relevant time period, and to identify contemporaries prominent in other fields. To underline the point that mathematicians are living, breathing human beings, we directed the students to provide a coherent overview of each mathematician’s life, including any unusual or intriguing aspects of the life story, e.g., education, struggles, setbacks, competing vocational or avocational interests. (Complete directions for this assignment are in Appendix A.)

A second jointly conceived and executed writing assignment was designed to give students the opportunity to think carefully about one of the generally accepted working definitions that mathematicians use today when trying to explain to non-specialists what mathematics is. A standard assignment that is given early in College Writing II is that of writing a summary. In our paired courses, we used this assignment (which again was graded by both instructors, and counted in the final grade for each course) early in the semester to help students enlarge their ideas about the scope of mathematical thought. Keith Devlin’s essay, “What Is Mathematics?” presents a succinct, yet well developed, argument that mathematics is best understood as “the science of patterns” [3]. In the course of articulating his ideas about mathematical thinking, he traces in bold strokes the expansion of mathematics through several historical stages. He provides specific examples of the growth of mathematics from the science of numbers, through the science of position and the science of movement, to its current state as the science of patterns. Neatly woven into the essay is a subordinate thesis that any complete understanding of mathematics must include the recognition of the creative and artistic (i.e., the aesthetic) values of mathematics. Hence this assignment directly served several of the goals of the mathematical component of our interdisciplinary experiment. Moreover, it gave me an opportunity to design, monitor, and grade a different type of writing task. (Complete directions for the assignment are in Appendix B.)

4. DETAILS OF COLLABORATIVE WORK

An extensive amount of joint work was required of both instructors to design the common writing assignments, to construct a detailed description of the expectations for the assignments, to read first drafts and offer constructive
feedback, to guide the development of the research project through conferences, and to grade the finished projects. These tasks provided me with training and guided practice, under the watchful eye of my collaborator. Although there is much to be gained from reading about how to use writing to help teach mathematics, there is nothing quite like the active learning that is required when a mathematics instructor actually uses writing assignments with continuously available help from an instructor in the field. In the long term, all the understanding gained and all techniques learned while participating in this immersion experience allowed me to be much more successful at implementing writing assignments, especially formal ones, in a variety of mathematics courses.

Creating and describing the expectations for a term or research project in any mathematics course is a complex undertaking. As Kenney has observed, instructors often have almost no training in how to create an effective writing assignment [5, p. 20]. Meier and Rishel offer guidelines and examples of how to determine mathematical topics for a good major project [7, pp. 69–71]. Establishing the basic goals and ideas of a project, however, is only a small part of the overall design of a good writing assignment. Deciding, for example, that for our collaborative project a student should “investigate the life of a prominent mathematician,” in order to situate mathematics in the larger cultural context of the mathematician’s era, was only the first part of creating an assignment. In general, determining how much detail the instructions for the assignment should include depends on a host of factors (e.g., level of course, course objectives, and student academic engagement and preparation) that vary from course to course. Discussing the design of the project with a writing instructor who has years of experience in crafting all types of writing assignments supplies the mathematics instructor with valuable insights into the level of detail required by specific projects, courses, and students.

Once we had described the assignment for the students, our next task was to determine the steps (and a schedule of due dates for the steps) that would be required as preliminaries to the submission of a final draft. Given the just-in-time proclivity of many students, it was crucial to break the research paper into components, each of which was due at a specific date, was graded, and earned points. As both Rishel [9, p. 32] and Sibley [10, p. 53] have noted, requiring the early submission of a thesis statement, introductory paragraph, and some sources allows instructors to encourage students who are doing well but, just as important, provides an opportunity to help students reformulate flawed proposals early in the process. About two weeks after completing the early review of thesis statements and sources, we required submission of a first draft. The benefits of incorporating review of a first draft as part of a major project, and in a variety of mathematics courses, have been described by others (see, for example, [2, p. 131; 7, p. 67; 8, p. 134; 10, p. 53]).

In the paired-course structure, we first read and commented on each draft independently. We then combined our comments so that the students received
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a coherent message about the strengths and weaknesses of their first drafts. In creating the schedule of submission dates for the project we needed to allow enough time 1) for us to complete the independent review and reconciliation process, and 2) for the students to make meaningful use of our suggestions. Working with a writing instructor, who knows how much time will be required to review students’ work and guide them through revisions, helped me understand all the factors that must be considered when determining a workable schedule that allows enough time for each stage of the process. Further, the writing instructor helped me think about how to design an allotment of points, for each phase of the project, that rewarded students according to criteria I wanted to use. Since our paired-course students were supposed to be learning how to write a proper research paper, our criteria and point structure also reflected many of the goals appropriate to a freshman writing project. (See Appendix A for details.) Other courses that assume students already know how to approach a research paper may use different project designs, but a writing instructor’s suggestions for devising both schedule and point distribution can help the mathematics instructor create a calendar and grading rubric to match specified goals.

Having participated in creating a good writing assignment, I faced another task for which many mathematicians have little or no training or experience—guiding students through the various stages of their projects. Reviewing students’ theses, proposed sources, and first drafts requires a lot of time and a deft touch, as does crafting comments that help them improve their work. It is much easier just to tell students how to fix their errors than it is to find ways to help them identify and address these errors independently. During the paired-course experience, for example, I came to appreciate just how difficult it is for many of our students to construct proper thesis statements. Finding topics is part of designing a good project. Criteria for choosing appropriate topics, as well as examples of topics, are presented in several sources (e.g., [7, pp. 69–71; 4, 9]), and so mathematics instructors generally have little trouble locating appropriate subject matter. Crafting a workable thesis, however, is much more than simply deciding on a topic. While we did not see any proposed thesis statements that simply identified the mathematician, i.e., that merely specified the subject of the paper, we did get many that were at best embryonic. A typical first attempt was this: “Although best remembered for his philosophical studies, René Descartes was also an influential figure in mathematics during the 17th century.” This is essentially a statement of fact and so not really a thesis. It does contain the beginnings of a possible thesis, however. After some judicious questioning by the instructor, the student stated that he planned to write about how Descartes’ mathematical contribution is linked to his philosophy. With a bit of encouragement, the student was able to craft this revised thesis statement: “Although best remembered for his philosophical studies, René Descartes was also an influential figure in mathematics during the seventeenth century whose mathematical work was intertwined with his
philosophy." Explaining the connection between Descartes’ mathematical and philosophical work provided a focus for a paper that otherwise easily could have degenerated into a prose version of a two-column list.

Guiding students through the process of moving from a general topic to a sufficiently precise thesis is a real art, best learned with practice, guided by an experienced writing instructor. As the writing instructor and I reviewed, evaluated, and discussed thesis statements, I learned how to articulate my responses to proposed theses, so that the students themselves could modify their initial attempts and transform them into acceptable statements. In fact, the second time we ran the paired courses, I led the in-class discussion of proposed thesis statements during the mathematics class, thereby modeling interdisciplinary engagement.

When we reviewed thesis statements, we also checked each student’s proposed list of sources for the project. In an electronic age, it is not surprising that many of their sources were Internet sites. What was discouraging was the students’ lack of sophistication in evaluating the credibility of an Internet source. As both Rishel and Sibley have pointed out, early review of proposed sources by the instructor is another opportunity to redirect students’ efforts toward finding materials that are authoritative and contain information appropriate to the student’s mathematical background [9, p. 32; 10, p. 53]. The ease with which electronic documents can be copied or printed, either whole or in part, presents another problem: It invites students simply to highlight large chunks of prose they intend to use without trying to sift the information for ideas that are relevant and useful for their project. Requiring source and note cards (for details see Appendix B), although it may seem old-fashioned, forces students to analyze and digest source material, to extract information from multiple sources, and then to synthesize that information in support of a thesis.

After having formulated proper thesis statements and collected authoritative source material, students next submitted first drafts. In addition to describing the usefulness of reviewing first drafts, Millman has noted specifically that “the most common difficulty with the initial draft [is] organization” [8, p. 135]. While our students had the expected problems with mechanics (grammar, syntax, word usage, punctuation, spelling), we found that the most serious problems centered on organizational issues that can be referred to collectively as large features of an essay. Students needed to be reminded, for example, to think about logical progression of the thesis development, to notice (and eliminate) repetition of ideas and extraneous information, to make sure they provide sufficient examples and evidence, and to check for adequate transition between and within paragraphs.

By working with the writing instructor after we had independently reviewed and tentatively evaluated the first drafts, I learned to avoid focusing solely on the small issues (errors in syntax, grammar, and punctuation)—which
are certainly easier to identify—and to concentrate instead on the overall organization of the paper. As we reconciled our evaluations of each draft, I learned how to articulate accurately my reactions, both positive and negative, to the students’ papers. We divided the individual student conferences between us so that each student would meet with one of us to review the combined comments on his or her draft. Preparing for these follow-up conferences required us to discuss how best to convey our comments to each student in useful and constructive ways. Haver and Hoef identify mathematicians’ inexperience with giving feedback on writing assignments as one stumbling block to using writing assignments in mathematics classes [4, pp. 194–195]. Preparing for the conferences gave me the “professional guidance on commenting constructively” that Stehney advises mathematics instructors to seek [11, p. 28]. Not only did I learn how to make comments that would help the students to understand and then correct the problems in their work, I also came to appreciate the importance of highlighting the problems most in need of correction, thus steering students toward the most effective revisions.

For both the smaller essay assignment and the research paper, the instructors evaluated the writing assignments independently at each stage and then met to discuss these evaluations and arrive at a common grade. Grading writing assignments is another part of the process that often perplexes mathematics instructors, as others have noted [4, pp. 194–195; 6, p. 19]. Assigning grades to writing assignments is highly dependent on an individual instructor’s pedagogical ideas. There is, moreover, a continuum of methods that have been used successfully. Some instructors “grade papers in a somewhat impressionistic manner” [9, p. 32]. Others have developed checklists, especially when they must grade hundreds of papers [4, pp. 201, 202; 7, p. 34]. Whatever the grading method, the instructor eventually has to determine the relative importance of the evaluative criteria. Which paper gets a better grade? One that has an interesting thesis and a reasonably well-organized development of that thesis but is riddled with mechanical and stylistic errors? Or another that is mechanically and stylistically clean but manifests poorly organized development of a mediocre thesis? Having to articulate to a colleague in the English department the reasons for assigning a grade of B rather than A or C to a piece of formal writing forced me to understand and make explicit the grading criteria appropriate to a particular assignment. This in turn helped me articulate the criteria and principles of evaluation to students. These intense sessions with an experienced writing instructor, devoted to grading a set of actual papers, introduced specific ideas and techniques that theoretical discussions never would generate.

5. LONG-TERM BENEFITS

Of course, all this joint work in designing, guiding, and grading writing assignments consumes huge blocks of time. So why would anyone do it? Writing
faculty typically welcome the opportunity to strengthen the attention paid to composition in classes offered outside an English department. The instructor of the College Writing course reaped specific benefits from our pairing, because students were compelled to recognize that good writing skills were integral to their success in another subject area, one they do not ordinarily associate with writing at all. The writing-mathematics pairing effectively counters students’ tendency to compartmentalize their learning. For my part, in the years since the paired-course experience I have come to appreciate the long-term effect of my immersion experience in writing instruction, particularly when I have wanted to assign major projects in upper-level mathematics courses.

While the details of the entire project may be different, the basic structure of a major project assignment is almost identical. Thus everything I learned about designing a good writing assignment in the freshman course carries over to major courses. The skills required to evaluate theses and to formulate comments that help students improve first drafts also are quite similar. Focusing on large issues of organization while commenting on first drafts or evaluating final projects is much harder than fixing mechanical errors and stylistic problems. Having had so much practice in grading writing assignments with a writing instructor, I am now much better at focusing my attention on big issues. As a result, I do a more effective job helping students identify and correct the larger organizational and editorial faults in first drafts, enabling them to revise their drafts and create substantially improved final projects.

Much of what I learned in the paired-course experience also has helped me when I teach our Mathematical Reasoning course. This is our “bridge” from lower-division to upper-division mathematics courses. Many people refer to it as our “proofs course.” One of its goals is to train mathematics majors in the proper and precise use of mathematical terminology. The more important goal is to teach them to write correct proofs in conventional forms. While some aspects of proof writing are formulaic—when you want to prove $A \subseteq B$, the first line should be “Let $a \in A$”—most of the skills needed to write a good proof are exactly those needed to craft an effective essay. Just as students in the paired course had to be discouraged from concentrating on mechanics instead of overall structure, students writing proofs have to be constantly reminded to focus first on organizational issues (e.g., logical structure, transition, tone, evidence) and only later on mechanical details.

Guided by my experiences in the paired courses, I use graded first drafts followed by revisions of individual proofs. Mathematics students must become competent evaluators of the effectiveness of their own proofs, and one of the best ways to help them learn this is to require them to read my comments and make their own revisions. Because I had thought about relative weights for grading during the collaboration, I now can easily determine a good method for assigning points to each draft. A “good method” ensures
that students will make a reasonable effort on the first draft and still have an incentive for thinking about my comments in determining how to correct their proofs. The process of writing the comments is as difficult in this context as it is in the paired courses because it is just so much simpler to re-do students’ work than to write comments that help them think about how to address the problems on their own. Because of all the practice in the paired courses in writing helpful comments, I know that I need to be careful to guide students—not just correct their errors. Based on my experiences with the safety net of a writing instructor at my side in the paired courses, I spend much less time pondering exactly what to write in my comments on students’ proof attempts, in upper-level courses as well as in the proofs course. Although I have not yet saved as much time as I invested in the paired-course experience, the deficit is more than balanced by the improvement in the ease and confidence with which I approach a variety of writing assignments in mathematics courses.

Guided, hands-on practice of the myriad skills needed to use writing assignments confidently and effectively is similar to the immersion method of learning a foreign language: it moves the instructor from passive understanding, acquired by reading about ideas and techniques, to active use of newly mastered knowledge and skills. Clearly, the paired-course model is not the only way to achieve an immersion experience. A single, team-taught course, in which a mathematics instructor and a writing instructor work together, creates a similar collaborative experience [1], [4]. If an institution has any resources to support intensive writing courses across the curriculum, or other Writing Across the Curriculum-based pedagogical enterprises, it may be possible to create an intense collaborative experience. The rewards will extend well beyond the semester spent working together. The design and execution of formal writing assignments in a mathematics class forces both instructors to confront ideas neither has thought much about before, reaping benefits of various kinds, as others have observed and I have described here [4, p. 201; 6, pp. 23–24].

Because the immersion experience works both ways, the mathematician realizes unanticipated secondary gains: the writing instructor, as well as students enrolled in the paired, or team-taught, courses, emerges from the interdisciplinary collaboration with new knowledge and new appreciation for the contributions of mathematicians to human culture. The mathematician now has an ally in the Humanities, who understands that mathematics is an integral part of the history of ideas, that mathematical discoveries are interwoven closely with developments in politics, economics, philosophy, and aesthetics. The re-examination of content and the rethinking of pedagogical strategies in an interdisciplinary context give each instructor new insights, extending beyond the two courses directly involved, to enrich and reinvigorate the whole sphere of each instructor’s academic life.
ACKNOWLEDGMENTS

The author wishes to acknowledge the time and unstinting energy contributed to the paired-course immersion experience by the writing instructor, Dr. Judith Saunders, Professor of English at Marist College.

APPENDIX A: RESEARCH PROJECT ASSIGNMENT

College Writing II/Excursions in Mathematics

Guidelines for Research Paper Project

Each student will investigate the life of a prominent mathematician (to be selected from the attached list1). The final product of this investigation will be a properly documented research paper, to be graded jointly by the two instructors. This paper is to be written and submitted in stages, which are described in detail on the following pages. Compliance with the process and intermediate due dates established for the project is essential and will count in final evaluation of the paper (see section on grading). The project will comprise 25% of the final course grade in College Writing II and 20% of the final course grade in Excursions in Mathematics.

Elements to be included

1. Major mathematical achievements
   Explain in terms accessible to an educated non-specialist the mathematician's most significant contributions to the field. a) Suggest how these fit with other kinds of interests, accomplishments, and events in the life of the individual mathematician. b) Indicate how these contributions fit into the overall history of mathematics and into the history of ideas in the largest sense: What makes these contributions significant? How did they change either theory or practice of some branch of mathematics? What applications and/or implications have affected other fields, e.g., engineering, architecture, economics, music, astronomy, chemistry, operations research, philosophy, art?

2. Location of the mathematician in history
   Where and when did the mathematician live? Identify significant political, artistic, intellectual, and religious movements in the relevant culture and time period. Name significant contemporaries in a variety of fields of endeavor. Give a full and balanced view of the times in which the mathematician lived, noting any instances of influence, collaboration, or contact with important contemporaries.

1The actual list is not relevant to this article and so is omitted.
3. Personal history
   Provide a coherent overview of the mathematician’s life, emphasizing his or her career in the field of mathematics and presenting any unusual or intriguing aspects of the life story, e.g., education, struggles, set backs, or competing vocational or avocational interests.

GENERAL DIRECTIONS

1. Your paper must be organized around a thesis illuminating the mathematician’s life and accomplishments as part of the ongoing history of mathematics, and as part of human intellectual history in general. DO NOT organize your paper around chronology (So—and—so was born in 1613 . . . published his magnum opus in 1636 . . . died in 1694). Chronology must be subordinate to a clearly formulated thesis addressing the significance of the subject’s mathematical career.

2. The paper must include all elements described above, but not necessarily in this 1-2-3 order. It’s up to you to choose an organizational scheme that best serves your thesis.

3. The paper is to be properly documented, using the Modern Language Association (MLA) parenthetical style of citation. An acceptable minimum number of sources cannot be determined precisely; the guiding principle is that a paper must make use of sufficiently appropriate sources to support a persuasive and meaningful thesis. An absolute minimum of six different sources will be enforced (not including general reference tools such as Collier’s Encyclopedia). A number of useful materials have been placed on reserve in the Marist library, and both instructors will be available for consultation during the research process.

Research Method: Recording Information from Sources

For this assignment students will be required to record and organize source materials using source cards and note cards. The cards will be reviewed once (as part of the evaluation process for the project); students should retain them until the final draft has been returned, and must produce all cards at any point if asked to do so.

Source Card: On a 3 × 5 or 4 × 6 index card, record the author, title, and publishing information for one source (one book, one article, one film, one interview . . . ). Record the information exactly as will be required for your Works Cited page (MLA method of documentation). Take no notes on this card.
Note Card: On a 3 \times 5 or 4 \times 6 index card, record information from a source that you intend to use in writing your paper. In the upper left corner of the card, note in abbreviated form the author and/or title of the source, so that you will know which source card it goes with. Decide whether to paraphrase, summarize, or quote the information you record on the card, and indicate clearly which method you choose, so that you will not be confused later about whose language the card contains—yours or the author’s. Use as many note cards as you need to collect useable information from a source; for a given source card, you might take as many as ten or more note cards. The sources on each card should belong together; don’t jumble together a series of facts that have no relationship to one another just because the card is not full. The advantages of forcing yourself to select information as you read and to collect it on a series of individual cards (as opposed to a long, uninterrupted sequence on big sheets of paper) are important:

1. Making decisions as you read about significant information and illuminating quotations means that when you sift through your materials and begin writing, you will not be overwhelmed with masses of excess material. You will have a stack of cards containing information you already have decided is pertinent (rather than 50 pages of photocopied, highlighted pages, all to be re-read and digested once again).
2. Separate note and source cards are labor-saving: you take down publication information only once; simple abbreviations tell you which source any given note card comes from.
3. Typing up the Works Cited page presents no problems because the source cards already contain the necessary information in exactly the required format.
4. Keeping information in coherent, manageable units (a related group of facts on a single card) means that when you organize your paper you can sort and reshuffle your note cards in many different ways. You can arrange them on the surface of a table or floor, trying out different structural possibilities. You can also interweave information from several sources without confusing them.
5. Being scrupulous and indicating how information has been recorded (summary, direct quote, paraphrase) means that you can write your first draft without needing to go back to check sources again.

Grading

<table>
<thead>
<tr>
<th>Component</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Note and source cards:</td>
<td>3</td>
</tr>
<tr>
<td>Outline (with thesis statement):</td>
<td>4</td>
</tr>
<tr>
<td>Works Cited draft:</td>
<td>3</td>
</tr>
<tr>
<td>First draft:</td>
<td>20</td>
</tr>
<tr>
<td>Final draft:</td>
<td>70</td>
</tr>
</tbody>
</table>
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This method of grading rewards conscientious completion of the process. A student who submits acceptable, on-time preliminary materials can accumulate up to 30 points toward the total project grade. By the same token, an excellent final draft will not guarantee an above-average grade if it is preceded by incomplete, late, or deficient preliminary materials.

Calendar of Due Dates for Research Project

1. **Thursday, October 9**
   Both instructors present guidelines for project in CW II class.

2. **Thursday, October 30**
   Due: a minimum of 4 source cards and accompanying note cards (at least 5 cards per source). Bring to class and present for review.

3. **Thursday, November 13**
   Outline (with thesis statement) and first draft of Works Cited page due: bring to class and present for review (two copies of each).

4. **Tuesday, November 25**
   Due: complete draft of paper—two copies. This must be word-processed, but typing may be rough, and handwritten editing is acceptable. Documentation must be accurate and complete.

5. **Week of December 2–5**
   Conferences: no CW class on either Tuesday, December 2 or Thursday, December 4. Individual scheduled conferences will replace regular College Writing class meetings. Drafts will be discussed and plans made for revisions.

6. **Thursday, December 11**
   Due: Final draft of paper—two copies.
   Format: word-processed in dark, legible ink, double-spaced, one-inch margins. Include a cover sheet, number pages, staple upper left corner (no binders). Length: approximately 2,500 words. Documentation style: MLA. Students must resubmit both copies of their first drafts at this time.

APPENDIX B: SUMMARY ASSIGNMENT

This is Written Assignment #1 for Excursions in Mathematics and Written Assignment #2 for College Writing II.

Summary

Write a summary of Keith Devlin's essay, "What Is Mathematics?" Indicate the author's purposes in writing and his intended audience. Identify the principal ideas in the essay, and indicate relationships among these.
General Directions

1. Documentation: You need not provide any apparatus for citation beyond naming the title and author of the essay that you are summarizing, somewhere in your opening sentence(s). Remember not to take over the author’s language; your summary should restate his ideas in different terms. Do not employ direct quotation except in the case of a crucial phrase that cannot be restated without loss of meaning.

2. Audience: Assume that you are writing for an audience of non-specialists who have not read Devlin’s essay. Your purpose is to communicate his main points clearly, accurately, and concisely.

3. Objectivity: Remember not to offer an opinion or judgment of any kind.

Length: approximately 250–300 words (i.e., one substantial paragraph or two shorter ones)

Due: September 18. Submit two copies

REFERENCES


BIOGRAPHICAL SKETCH

Lynne L. Doty is Professor of Mathematics at Marist College. Her mathematical research interest is in graph theory, with a particular focus on connectivity measures. She continues to be interested in interdisciplinary ventures; her most recent project argued that E. A. Poe’s depictions of mathematicians are most properly understood within the historical context of the emergence of non-Euclidean geometries.