

Teaching Mathematics Majors How to Write Mathematics

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Need for Mathematical Writing

It is no good being able to reason and compute if you are unable to communicate your work effectively. Very few if any of our students have solitary career paths; whether in academia or the private sector, if they use mathematics, they will need to be able to communicate. This presentation will focus on written communication.

Availability of Presentation

This talk is available from my web-site:

`http://frodo.elon.edu`

under the link **Presentations**.

Reasons for Writing

As stated in the MAA's Committee on the Undergraduate Program in Mathematics Curriculum Guide (2004), Part II.C.1,

Communicating mathematical ideas with understanding and clarity is not only evidence of comprehension, it is essential for learning and using mathematics after graduation, whether in the workforce or in a graduate program.

Beginning of the Major

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- ▶ At Elon, we have worked in our Calculus sequence to raise our expectations for problem sets, focusing our students on the need to explain their solutions as if for someone who does not have a Solutions Key in front of them.

Middle of the Major

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- ▶ At Elon our students gain this experience mainly in our Mathematical Reasoning and Linear Algebra courses.

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- ▶ At Elon our students reach this level in our research Seminar.

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- ▶ Require that units be included where relevant.

Mathematical Lab Reports

In my calculus classes, I give monthly projects that apply the course content to some tangible problem, such as comparing the Bisection Method with Newton's method or determining the centroid of a dorm room. The assignments require a good introduction, detailed steps in the computation, and a summary of the result. The assignments are modeled on comparable assignments in introductory science lab courses.

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- ▶ It is also helpful to pair off the students and have them critique each others proofs. Writing for an audience of peers requires more thought and effort than writing for an instructor.

Intermediate Proofs

Students need to learn how to structure proofs of moderate length. It is at this point that spending time on critiquing, revising, critiquing, revising, etc. can really pay off, depending on the number of students in your class and the number of hours in your day.

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- ▶ Weekly meetings

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- ▶ For introductory assignments it is relatively easy to give characteristics for below average, average, and above average grades.
- ▶ For longer assignments I make a point of commenting all papers before assigning grades; it makes it far easier to pick up patterns that need addressing in class as well as helping maintain consistency in my grading.

Conclusion

There are a number of ways to give our majors more experience in writing. By giving them experience appropriate to their stage in their progress through their major, we can help them to be great mathematical writers by the time they graduate.