

Method Development Project

What is it?

The method development project is a 10-week independent project in which you will go through many of the standard steps that are part of developing and validating an analytical method. Because time is limited, you will use an established procedure from the literature as your starting point and work to determine the procedure's performance characteristics.

How do I select a project?

A suitable project must involve a quantitative analysis for one or more analytes and may use any of the department's instrumentation, including the equipment available in the Chem 260 lab. In our lab room, you will find a small collection of analytical chemistry lab manuals, analytical chemistry textbooks that include experiments, and a small sampling of papers from the literature, which you may use to develop ideas. You also may wish to search in the *Journal of Chemical Education* (<http://pubs.acs.org/journal/jceda8>) for ideas, or peruse the list of experiments included in the Additional Resources section of *Analytical Chemistry 2.1*. Finally, there are some useful handbooks of analytical methods available in the library, such as *Standard Methods for the Examination of Water and Wastewater* (REF QD142.A5) and *Dean's Analytical Chemistry Handbook* (REF QD78.P37).

When do I need to finalize my project?

The topic of your project must be approved by no later than Friday, February 17th. I encourage you to start early and to consult with me as you consider possibilities to ensure that the project is suitable.

What performance characteristics should I explore?

Although this may vary slightly from project-to-project, typically validating an analytical method involves characterizing its accuracy, precision (both repeatability and reproducibility), sensitivity, selectivity (also called specificity), limits of detection, limits of quantitation, linearity and range, ruggedness, and robustness.

How should I manage the project?

It is difficult to predict in advance the best pathway through your project; indeed, the choice of what to do each week will depend upon what worked or did not work during the preceding week. A good first step, however, is to simply run through the established procedure at least once so that you can see how it works.

How do I get help in solving problems?

Each week in lab we will review your completed work and your plans for the current lab period. In addition, I encourage you to consult with me at other times as you work on your data outside of class and lab.

How much time should I devote to this project each week?

According to the University's suggested guidelines for courses, you should expect to spend at least 6 hrs/wk on a 0.5-credit course. For those weeks set aside for the project, this means that you should be in lab working on your project for 3–4 hrs, with the additional 2–3 hrs divided between time in class and work completed outside of class and lab. Although our lab is scheduled for Tuesday mornings, you may, with advanced planning and with permission, work at other times between the hours of 8 and 4 on M-F. Evening and weekend hours generally are not possible.

What requirements are there for reporting final results on my project?

You will report your final results in three ways. First, during the last week of class you will present your results to your classmates in the form of a standard oral presentation similar to that used at national meetings. Second, you will maintain a laboratory notebook during your project that documents your work in lab, your analysis of that data, and any research you conduct using library or internet resources. Third, and finally, you will submit a written report that summarizes your characterization of your method's performance characteristics.

How is my work on the project evaluated?

The method development project counts for 80% of your final grade; as such, you should expect to expend considerable effort on your project. Among the factors influencing your final grade are:

- *Your sustained and productive use of laboratory time.* This includes both logging an appropriate amount of time in lab and making good use of that time. The latter is particularly important and benefits from good preparation. Using lab time to complete calculations that should be done before lab is one example of not using lab time productively, as is spending an entire lab period preparing solutions for a single calibration curve.
- *The quality and thoroughness of your laboratory work and data analysis.* This part of your evaluation relies on the work you share during our weekly conversations in lab, on the data you present during your two oral reports, on your written report, and on the information you include in your laboratory notebook. Note that the last item is particularly important. You should, therefore, endeavor to maintain a neat and thoroughly documented notebook.
- *How you handle difficulties as they arise.* Problems are inevitable in any independent project. How you handle such problems speaks volumes to your ownership of the project.
- *The quality of your two oral presentation.* This includes both the quality of your slides, the quality of your remarks, and your responses to questions raised by me or your classmates.

Obviously this evaluation is subjective and holistic. I am looking for evidence that you are fully and actively engaged in your project, that you are investing time in your project and that, at the end, you have taken ownership of your project. It is not possible to assign individual percentages to the various facets of this evaluation, nor is it feasible to estimate an approximate grade as you are working on the project. I will, however, provide you with ample warning if I believe that you are in danger of receiving less than a C for the project.