

## Designing Your Dream Course, and Making it a Reality

Discussion leader: Dr. Nancy Pfenning, Statistics, Pitt.

During this lunch, Dr. Pfenning discussed two honors courses she has developed – one for [Applied Statistical methods](#) and an interdisciplinary 1 credit course she co-developed with a faculty member who teaches journalism.

Dr. Pfenning also had lunch participants discuss with each other what kinds of honors courses they would be interested in developing in their own discipline and what kinds of interdisciplinary courses they would want to develop with faculty in other departments.

It is important to keep in mind that Pitt is very interested in increasing the number of courses in the Honors College and in general, imbue Pitt's educational ideals exemplified by the Honors College throughout the university. If you are interested in developing an honors course, or adding an honors component to an existing course, the Honors College can provide support (e.g., overtime pay).

### [Applied Statistical Methods](#)

The idea for this course came from an Undergraduate Honors seminar course Dr. Kaufmann has sat in. Students in that course read and discussed research articles and Dr. Pfenning was very impressed with the students, in particular, their discussions about various papers they read indicated that they had the ability to delve deeply and understand complex statistical concepts. Dr. Pfenning wanted to give the opportunity to introductory students to explore topics of interest which is why she created this honors course. There were also informal conversations with faculty in the statistics department which indicated that there was interest in developing an honors course.

Dr. Pfenning has taught this course nearly 10 times since she developed it.

For detailed information on the course, including lecture slides, seminar topics, homework assignments etc. visit the [webpage Dr. Pfenning has made for this course](#).

### Course overview

- Meets 4 days a week for 50 minutes
- 1 day reserved for a recitation
  - Usually, students ask homework questions and the TA may explain some concepts and work out problems
  - Instead, Dr. Kaufmann decided to require students to give presentations related to the concepts they are learning in the course.
- Student presentations
  - Students were tasked with finding an article of personal interest that uses a statistical method discussed in class and give a presentation about the article in class.
    - Students send Dr. Pfenning the article they want to make a presentation about for approval.

- One important focus of the presentations is the statistical methods discussed in the article.
- Each student had to do two presentations during the semester.
- All students read the articles, not just the students who presented on them.
- The presentation is always followed by a general discussion about the article.
- Students were also incentivized via grades to make constructive comments or ask questions during the presentations.

Dr. Pfenning gave several examples of what students presented on. The main theme is that they often had very insightful comments that indicated they really understood various statistical methods and could critique the studies' methodologies.

For example, in the "consensus among economists" article, the researchers' null hypothesis was that there was an even distribution of answers (no consensus). The student making the presentation commented that rejecting this hypothesis isn't necessarily evidence of consensus – a rather insightful comment which indicates that he/she really understands what the *t*-test in statistics investigates. In addition, his/her comment about the answer choices not having a middle ground indicates a careful reading of the article.

Also, students select articles that are of interest to them, which can often help motivate them to learn and understand the statistics in those articles. The next student Dr. Pfenning talked about selected an article about the effects of bullying on adolescents. This student was bullied in school and the article is very relevant to the student – he/she is therefore motivated to understand what the article is trying to say and what evidence it presents to make its point.

Some students actually engaged with the class in their presentations and used on-the-spot statistical software to use the class data to carry out an investigation. For example, one student presented made the claim that there was a moderate to weak correlation between the ability to carry out a non-verbal numerical approximation (as measured by a [simple test of numerical approximation](#)) and math ability (as measured by math SAT scores).

- The student presenting this article asked students in the class to carry out the numerical approximation test on their own outside of class (simple task that takes only 5 minutes) and report their scores to him. He/she also asked students to report their SAT math scores.
- During the presentation, he/she carried out a regression analysis to see if the same correlation is there for the students in the statistics course and did not find it.
- The student then came up with a plausible explanation.

This illustrates how engaged the student (and class) was about this study, and also that the student presenting really understood the statistical technique being used because he/she had to come up with an explanation on the spot for the results found in the statistics class (which contradicted those of the study) and the explanation was pretty good.

Dr. Pfenning did not want to hand out the articles to students, and instead they were required to find them. Students sometimes found articles with very bad statistics in them. For example, in the article investigating the stroop effect, there is a paragraph which indicates that the authors have little idea how

to carry out a student's  $t$ -test (to anybody who knows even the most elementary statistics, the paragraph makes no sense).

- The good thing about this is that students get to recognize bad statistics, and this can improve their own confidence in interpreting statistics.

One of the main results of introducing these presentations in the course is that it really created a sense of community. Students' ratings on the question regarding getting to know classmates were much higher than usual.

Dr. Pfenning then asked the participants at the lunch to discuss the following question:

"If you had all the time and resources you needed, what would be the most stimulating course(s) you could imagine teaching undergrads in your discipline".

#### Discussion summaries:

- Physics: Physics faculty were very interested in developing a course that discusses problems facing the world today (e.g., energy crisis, climate change).
  - There is already a course like this that is taught to non-science majors, which means that a lot of the technical details and the physics are often discussed very superficially if not skipped altogether. The physics faculty were interested in developing a course for physics majors which would discuss all the details and physics and create a learning environment in which students really grasp the relevance of physics content to the real world.
- Psychology: Psychology faculty discussed developing an integrated research methods and statistics course. At the moment students have to take statistics first and then research methods, and often, they don't necessarily understand how to apply the statistical methods they learned in the statistics course to research in psychology. Because of this, there is often a need to discuss statistics in a research methods course anyway, and therefore, an integrated course would be beneficial.
- Biology: Biology faculty discussed developing a course for non-majors in which students learn biology by doing experiments. Students come to "class" and work with either an experiment or are given data and they have to identify certain patterns and discover rules governing them. They would be discovering biological concepts by doing hands-on activities, which are guided to help them get to the desired understanding in a reasonable amount of time.

#### [Honors Stats in journalism](#)

#### Note:

- There are many private foundations that are very interested in funding initiatives to develop interdisciplinary courses. If you are interested in learning more about these foundations, contact the dB-SERC director, Dr. Chandralekha Singh.

Dr. Pfenning co-taught this course with Cindy Skrzycki from the English department who teaches journalism courses (among others). For detailed information on the course, visit the [webpage Dr. Pfenning has made for this course](#).

Also, Dr. Pfenning and Dr. Skrzycki wrote an article about the course in Chronicle of Higher Education: [“Just the facts?”](#)

- The article got an overwhelming positive reaction from other instructors, e.g., “this course should be a requirement for all students”

After the article was published in 2013, and after more people heard about it, there were requests from many people to teach some of the stuff in this course to other audiences:

- A high-school teacher who teaches a research methods class asked Dr. Pfenning to come to her course to discuss writing of science and how important statistics is to accurate science reporting.
- Nutritionist majors and graduate students in an epidemiology seminar were interested in learning about how statistics can be misused in reporting scientific results.

The main objective was to help students reason critically about research presented in popular media articles and be able to critique how to research studies arrive at those results.

- Students explored articles they found interesting – help with motivation.
- There were many issues students identified which made them more careful in accepting scientific results reported in popular media.

The course took a lot of work because both instructors were present at all the classes, and also developing the course took a significant amount of time.

- This course counted as overload and Dr. Pfenning was paid for teaching it through the Honors College

Dr. Pfenning then asked the participants at the lunch to discuss the following question:

“If you were to team up with someone from another department (represented by others in attendance) and create a cross-disciplinary course (or club), what would it be, ideally?”

Unfortunately, there was no time at the lunch to have a general discussion and share ideas, but overall, participants had informative discussions with one another and some ideas which emerged during those discussions may be pursued in the future (e.g., a Biology-Chemistry interdisciplinary course that would follow the research-based introductory labs taught in the Biology department).