

Mathematical and Statistical Consulting at Wheaton College

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Background on Wheaton

- Liberal arts college in Norton, Massachusetts
 - Between Boston and Providence
- 1600 undergraduates
 - Math & Computer Science department
 - 4 tenure-track pure mathematicians
 - 1 tenure-track statistician
 - 1.5 non-tenure track continuing math faculty
 - 3 tenure-track computer scientists
 - 6 to 12 math majors graduate each year
- No applied math major or track
 - Statistics minor approved in spring 2006

Origins of course

- Dept recognized lack of applied opportunities for students
- Articulated as programatic need during external review in 2005
- Mike Kahn experienced with Math Practicum course at St. Olaf
- Spring 2007 funded as part of grant from Teagle Foundation
 - Meals with clients
 - Computing equipment
 - Summer support for faculty
 - Course release

Student travel to MathFest



Goals of course

- Provide real-world applied experience
- Focus on educational experience for students
 - Cannot promise solution to clients
 - Project cannot be mission critical
 - Ideally open-ended project
Client interested in results but has not have time to tackle
- Secondary goal to build relationships between Wheaton and community

Structure of class

- Team-taught course by MK (statistics) and TR (pure math)
- Two teams of four students each
 - 3 seniors, 4 juniors, 1 sophomore
- Teams worked independently from each other
- Team meetings with clients once-per-month
- Substantial final products for each team
 - Formal, hour-long presentation at clients' location
 - White paper with results for clients

Structure of teams

- One scheduled meeting with both faculty per week
- At least one scheduled meeting of students without faculty
- Designated Team Leader and Note Taker each week
 - Roles rotated among group members
- Email reports from Note Taker after each meeting

Structure of email reports

Leader:

Date of Meeting:

Time of Meeting:

Report(s) on assignment(s) from last meeting:

(What was done? How was it done? What did/does it lead to?)

Brainstorming:

Assignments for next meeting:

For each item,

- Member(s) responsible
- If two or more, date and time for meeting
- Agenda items for next mtg

(Prioritize items, try to approximately budget time to items)

National Weather Service project

- **Goal:** Make long-range forecasts in New England with level of statistical significance
- **Hypothesis:** Four oceanic & atmospheric indices will predict temperature and precipitation. El Niño especially important
- **Data:** 30 years of monthly averages of indices
30 years of monthly averages temp and precip at six New England stations
- **Student approach:** Built regression and time series models
- **Conclusion:** No statistical significance between indices and temps in non-winter months

El Niño never statistically significant

Battelle project

- **Goal:** Statistical analysis of thresholds used to close estuaries in Long Island to shellfishing
Slightly less well-defined than NWS project
- **Data:** 15+ years of measurements of coliform levels for 24 locations
- **Student approach:** Cleaned up data sets
Need to build background knowledge
Built confidence intervals for a lognormal distribution
- **Conclusion:** Many more subtleties involved in evaluating contamination
Potential to affect policy for threshold for closure

Challenges in finding projects

- Identifying firms with problems that match goals of course
- Exploratory phone conversations with 7-8 firms
- One potential client could not get clearance from corporate
- Recognize that essentially community outreach for clients
 - Must be very sensitive to clients' time commitment
- Helpful to offer lunch meetings near client

General thoughts on first experience

- Benefits to semester-long experience
- Challenges to semester-long experience
 - Potential for student conflicts over 3+ months
Both scheduling and personality

These teams worked very well together

- Tremendous amount of work at end of semester
- Non-traditional class structure
 - Faculty must be willing to give up control
 - Incredibly rewarding to see what students can accomplish

In the future

- More structure for interaction between teams
 - Give updates at various points of the semester
 - Critique final presentations
- Use current students as resource for future students
- Each faculty take primary responsibility for one project
- Include non-math majors and faculty

Conclusions

- Very happy with first experience
- Expensive course since team-taught for 8 students
 - Department committed to offering every spring
- Valuable addition to departmental offerings
 - For *both* students and faculty

Thank You