Incorporating Service Learning into an Undergraduate Statistical Consulting Course

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The Statistical Consulting Center

- Staffed by statistics faculty and valued as service for promotion & tenure.
- Provides free advice to on-campus individuals and local NPOs.
- Typically 30 clients per year with most in fall or late spring.
Statistical Consulting Course

- 3-credit hour with pre/co-requisites:
  - calculus based intro. to probability & statistics (prereq),
  - experimental design (prereq),
  - applied linear regression (pre or coreq),
  - at least junior standing.

- Required for statistics major.

- Anticipate increase from 5 to 12-15 students within next 3 years.
Required Topics & Readings

- History of consulting,
- roles of consultant and client,
- ethics,
- strategies for dealing with difficult situations,
- effective verbal and non-verbal communication,
- identifying available resources,
- effective written communication techniques, and
- review of statistical terms and techniques.

Institutional & Departmental Context

- Master’s level with 19,000 undergraduates.
- Strategic plan incorporates service learning.
  
  “Service learning is a method of teaching where students learn and develop through active participation in thoughtfully organized community service. The service experience is integrated into and enhances the academic curriculum of the student.”
  (Modified from the Corporation for National Service definition)

- 1,500 students do community service placements per year.
- No graduate programs in math or statistics.

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A Service Learning Project

- Students worked with a local non-profit medical center. The center had observed unacceptably high rates of no-shows for appointments in their eligibility, dietetics, lab and clinic areas.
- Client wished to know whether a new late fee had been effective in reducing the no-show rates, if there were any days of the week with particularly high no-show rates in some area, and whether no-show rates remained lower after the center ceased to enforce the late fee.
Role-Plays

- 8 role-plays (adapted from Tanner 2003 & 2007) provided practice in asking questions and selecting appropriate analysis methods.
  - Generally served as lead-in to a review of a statistical topic e.g. regression, nonparametric methods. Data from role-play possibly used throughout the subsequent discussion.
  - Each student paired with instructor at least once; students always the consultant in these pairings.
Case Studies

Instructor acted as client in 2 in-class mock consulting sessions based on case studies from Cabrera & McDougall (2002). Provided practice at asking questions and managing session but primary goal was to **improve writing skills**.

- **Suggestion for larger classes:**
  - Give students basic analysis (output only) with in-class discussion based on the limitations of this and other options for analysis.
  - Homework consists of replication and perhaps a small subset of additional analysis.

This should produce greater uniformity in analyses students perform and thus increase the time available to provide feedback on writing.

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## Timing

<table>
<thead>
<tr>
<th>Weeks</th>
<th>Supporting Activities</th>
<th>Service-Learning Activity</th>
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<tbody>
<tr>
<td>1-7</td>
<td>5 role-plays</td>
<td>Met with client off-campus In-class debrief</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>Bi-weekly 15 min. in-class debriefs</td>
</tr>
<tr>
<td>9-14</td>
<td>2 case studies 4 role-plays</td>
<td>Draft team written report</td>
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<tr>
<td>14</td>
<td></td>
<td>Team written report Individual oral presentation</td>
</tr>
<tr>
<td>15</td>
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- Instructor passively observed meeting in week 8 but met with client privately immediately after to obtain additional information. Students received this information only after realizing they needed it in approximately week 12.
Assessment

▶ Service-learning activity comprised approx. 35% of course grade.
  ▶ 20% from team’s final written report (scaled by peer-evaluation),
  ▶ 10% from individual oral presentation to instructor,
  ▶ 5% from effect of peer-evaluation on class participation grade.
▶ The peer evaluation is essential in preventing slackers from receiving high grades.
Ethics Discussion

- Students required, in homework, to
  - pass Institutional Review Board (IRB) training,
  - identify guidelines within ASA’s *Ethical Guidelines for Statistical Practice* that align with each of JMU’s “8 Key Questions”.
  - Focus on ethical reasoning in action and the 8 values: fairness, outcomes, character, liberty, empathy, responsibilities, authority and rights.
  - In absence of (or in addition) an institutional ethics program, the ASA’s Committee on Professional Ethics case studies could be used.
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- In-class panel of IRB members and research office staff discussed protocol application process, good practices, and common mistakes.
Discussion

- Students were required to observe at least two real consulting sessions conducted by other consultants.
  - Suggest videotaping some sessions to use as back-ups in case of low client numbers. Students reported the video session to be no less “real” than the live ones.
An effective weekly assignment centered on 2-3 terms or concepts such as effect size, p-value, or interaction effect. Students came to class with draft explanations of these terms. Class discussion revealed misconceptions and difficulties in explaining the terms without jargon or in the context of the client’s problem. Subsequent homework asked for rewrites.

“The Explaining Terms assignment was probably the most useful assignment I have ever received.”
Student comments suggest the role-plays and case studies helped them learn how to:

- speak to a client including how to effectively ask questions, what to ask, and how to best explain both methods and their choices,
- manage a meeting,
- multitask,
- develop a strategy to solve a question,
- put statistical models in the client’s context.

One student noted that
- “it was great to combine previous courses into one practical experience. Discerning the best methodology to tackle real problems with flawed data was quite the change of pace from doing in-class examples with perfect scenarios.”
References