Experienced Users Work Group: Analyzing and Interpreting NSSE Data

Spring 2009 Regional NSSE Users Workshop
April 2009
Bob Gonyea
Allison BrckaLorenz
National Survey of Student Engagement

Overview
1. Data Quality
2. Linking to School Records
3. Collapsing Response Categories
4. Combining Questions into Scales
5. Statistical Comparisons Against Norms
6. Interaction Effects
7. Additional Analyses

Data Quality
- Generally, the more respondents you have, the better your data will be
- Data quality measures to consider
  - Response rate
  - Sampling error
  - Proportional representation

Data Quality: Response Rate
- Response rate: Percentage of a sample that completes the questionnaire
  - "Complete" → viewed the demographics page
- NSSE 2008 average response rate was 37%, with a large majority of institutions ranging from 20% to 60%
- Low response rates do not necessarily produce nonresponse bias
  - Nonresponse bias is the extent to which responders and nonresponders differ on key variables
  - Nonresponse bias is minimal in overall NSSE results

Data Quality: Sampling Error
- Sampling error: How much respondents could differ from the population
  - Based on number of respondents (n) relative to total population (N)
  - Preferred sampling errors around ±3% or 5%
  - Sampling errors greater than ±10% need not be dismissed entirely, but should be interpreted with caution

Data Quality: Proportional Representation
- Determine the extent to which respondent demographics match those of your population
  - Weighting may help counter bias
  - NSSE weights data by gender and enrollment status (because women and full-time students respond at higher rates)
Linking to School Records
- NSSE returns data with student identifiers provided in the population file
  - studid, lastname, surveyID, Bsurvid
- Using multiple sources of data can expand the number and type of questions that institutional researchers can answer for campus assessment
  - Particularly useful for program-level decisions

Collapsing Response Categories
- Collapsing response categories for individual items into fewer categories can make results more approachable
  - Very often + Often = Frequently
  - Very much + Quite a bit = Substantial
- Only report one category of interest
  - Never
  - Done
- Collapse benchmarks and scales into quartiles or above- and below-average groups

Combining Questions into Scales
- Scales reduce the number of variables in analytical models, may have better reliability, and may convey more meaningful information than individual questions
  - The NSSE syntax library provides syntax for a variety of scales
    - www.nsse.iub.edu

Linking to School Records
- Link NSSE data to high school grades, standardized test scores, or financial aid information
- Analyze retention
- Evaluate program effectiveness of academic departments and student affairs activities

Linking to School Records
- Other records that could link to NSSE:
  - Admissions
  - Financial aid
  - Orientation or other first-year experiences
  - Registrar
  - Academic support centers
  - Athletics programs
  - Academic departments
  - Student affairs

Example: Examine first-year engagement of students who reenroll as sophomores.
- You find that working more than twenty-five hours per week off campus had a negative association with persistence
- Reexamine the number of work-study positions available on campus, review how scholarship dollars are distributed, and speak to students about working too many hours while enrolled at first-year orientation sessions
Combining Questions into Scales

- Deep Approaches to Learning
- Higher Order Thinking subscale
- Integrative Learning subscale
- Reflective Learning subscale
- Self-reported Gains
  - Gains in Personal & Social Development
  - Gains in Practical Competence
  - Gains in General Education
- Satisfaction

Statistical Comparisons Against Norms

- NSSE’s published norms
  - By Carnegie classification and class
  - By gender and class
  - By major and class
- Future web-query tool to create your own norms groups

Combining Questions into Scales

- Compute your own scale
  - For items with the same response sets
    - Sum the response values for individual items
    - Compute the mean score for these items
  - For items with different response sets
    - Standardize the items first
    - Recode individual response values into a common scale range (this is how NSSE creates the benchmarks and scale scores)
- Make sure scales in the same statistical models or equations do not share a common item!

Statistical Comparisons Against Norms

- t-tests determine whether the means of two groups are statistically different.
  - The NSSE Benchmark and Mean Comparisons reports use t-tests to compare institution and peer group scores
  - t-tests can be quickly calculated by dividing the mean difference by your institution’s standard error of the mean.
  - Standard errors of the mean are included in the comparison reports
- t-scores greater than 2 are p<.05, greater than 2.6 are p<.01, and greater than 3.3 are p<.001.

Statistical Comparisons Against Norms

- t-test Calculation

\[
\frac{M_1 - M_2}{SEM_1} = t
\]

\[
\frac{64.8 - 60.4}{.89} = 4.9
\]

(p<.001)

Effect size: A measure of the strength of the relationship between two variables; practical significance

- Cohen’s d: Divide the mean difference by the standard deviation of the norm group (or by the pooled standard deviation).
- See Contextualizing NSSE Effect Sizes. For benchmarks, consider:
  - |d| >.1 = small
  - |d| >.3 = medium
  - |d| >.5 = large
Effect Size Calculation

\[
\frac{M_1 - M_2}{SD} = d
\]

\[
\frac{64.8 - 60.4}{13.9} = .32
\]

(medium)

Interaction Effects

- An interaction effect is present when the association between two variables (X and Y) depends on changes in a third variable (Z).

Interaction Effects

- An ANOVA can test for interaction effects among categorical variables.

- Entering cross-product terms into regression models can test for interaction effects among continuous variables.

Interaction Effects

Student-Faculty Interaction by Gender and Discipline

![Bar chart showing interaction effects between gender and discipline.]

Race Variations in the Effect of Serious Conversations on Supportive Campus Environment

![Graph showing race variations in the effect of serious conversations.]

Additional Analyses

- t-tests and regressions can help you to test the effect of a particular activity on a selected outcome.

- Path analysis or structural equation modeling can estimate direct and indirect relationships among variables by running multiple simultaneous linear regression equations.
Additional Analyses: Regression

- Example: Determine whether a relationship exists between senior culminating experiences and self-reported gains while controlling for various student characteristics.
- Independent variable: Having "done" a culminating senior experience (Q7h)
- Covariates: gender, enrollment, parental education, major, transfer status, grades, adult
- Dependent variables: Gains scales

<table>
<thead>
<tr>
<th></th>
<th>Gains in General Education</th>
<th>Gains in Personal &amp; Social Development</th>
<th>Gains in Practical Competence</th>
</tr>
</thead>
<tbody>
<tr>
<td>male</td>
<td>-.14</td>
<td>-.08</td>
<td>-.04</td>
</tr>
<tr>
<td>fulltime</td>
<td>-.07</td>
<td>-.23</td>
<td>-.04</td>
</tr>
<tr>
<td>parent ed.</td>
<td>-.10 *</td>
<td>-.11 **</td>
<td>-.13 **</td>
</tr>
<tr>
<td>transfer</td>
<td>-.27 *</td>
<td>-.17</td>
<td>-.12</td>
</tr>
<tr>
<td>grades</td>
<td>.08</td>
<td>.08 **</td>
<td>.09 **</td>
</tr>
<tr>
<td>adult (&gt;24)</td>
<td>.16</td>
<td>-.26</td>
<td>-.08</td>
</tr>
<tr>
<td>major</td>
<td>-.44 *</td>
<td>-.17</td>
<td>-.14</td>
</tr>
<tr>
<td>bio</td>
<td>-.08</td>
<td>.20</td>
<td>.60 ****</td>
</tr>
<tr>
<td>edu</td>
<td>-.17</td>
<td>.06</td>
<td>.15</td>
</tr>
<tr>
<td>eng</td>
<td>-.06</td>
<td>-.11</td>
<td>.57 **</td>
</tr>
<tr>
<td>phy</td>
<td>-.08</td>
<td>-.04</td>
<td>.06</td>
</tr>
<tr>
<td>pro</td>
<td>-.30</td>
<td>-.12</td>
<td>.27</td>
</tr>
<tr>
<td>soc</td>
<td>-.10</td>
<td>-.05</td>
<td>-.28</td>
</tr>
<tr>
<td>oth</td>
<td>-.24</td>
<td>-.17</td>
<td>-.04</td>
</tr>
<tr>
<td></td>
<td>**</td>
<td>**</td>
<td>**</td>
</tr>
</tbody>
</table>

Culminating Senior Experience: .26 ** .27 ** .26 **

Additional Analyses: Regression

- Dependent variables: Gains scales
- Self-reported gains in
  - Practical Competence (working with others, job skills, problem solving, using technology, etc.)
  - General Education (writing, speaking, critical thinking, etc.)
  - Personal and Social Development (values and ethics, citizenship, understanding yourself and others, etc.)

Additional Analyses: Path Analysis

- Example: Estimate the direct and indirect effects of writing amount on self-reported gains in general education.
- Independent variable: Average amount of written pages
- Mediator: Deep Learning
- Outcome: Gains in General Education

- Deep Learning: a latent construct indicated by three subscales
  - Higher Order Thinking
  - Integrative Learning
  - Reflective Learning
- Gains in General Education: self-reported progress made in
  - Acquiring a broad general education
  - Writing clearly and effectively
  - Speaking clearly and effectively
  - Thinking critically and analytically

Additional Analyses: Path Analysis

Standardized Solution:

```
<table>
<thead>
<tr>
<th>Amount of Writing</th>
<th>Deep Learning</th>
<th>Gains in Gen Ed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>.08</td>
<td>.64</td>
</tr>
</tbody>
</table>
```

Total Effect = .08 + (.31)(.64) = .27
Questions?

Robert Gonyea
rgonyea@indiana.edu

Allison BrckaLorenz
abrckalo@indiana.edu

www.nsse.iub.edu