CHAPTER 2

Indicators and Other Experimental Design Tips

Both quantitative and qualitative data should be collected in evaluation studies of STEM graduate school programs. Quantitative data, numerical information that can be collected and compiled into tables, charts, or graphs, are very useful in determining what is happening, especially over time, but are less useful in determining why things are (or are not) happening.

Qualitative data, information collected through surveys, interviews, and focus groups, rely on individual responses of program participants. As a result, this information is more likely to include responses to meaningful questions related to the graduate school or departmental experiences of both students enrolled in a particular institution and those who chose to leave. Through periodic surveys, interviews, or focus groups, evaluators can collect information about whether students were satisfied or dissatisfied with a variety of practices and activities, including: recruitment; admissions; financial aid; academic support workshops, activities, and resources; and faculty behavior and attitudes, as well as students' attitudes toward these activities.

But the down side is that qualitative data are often more difficult and time consuming to collect and to analyze. Therefore, it is important to determine how high-quality qualitative data can be collected and analyzed without adding too great a burden to faculty and staff.

For both the qualitative and the quantitative data to be of value, they need to be collected at multiple time points and include a comparison group; how to assign comparison groups is discussed later in this chapter. In addition, appropriate administrators and/or faculty members need to have some discussion about the time periods for data collection, particularly for studies related to leavers and degree completers and those examining institutional and departmental culture and climate.

Using Quantitative Data to Examine Trends

For studies on student entry into a STEM graduate program to Ph.D. degree completion, disaggregated data can be collected for multiple years to examine changes in number and percentage of:

- Applicants;
- Admits;
- New or first time enrollees;
- New or first time enrollees in master's programs;
- New or first time enrollees in Ph.D. programs;
- Overall enrollment;
- All master's enrollees;

- All Ph.D. enrollees;
- Students advancing to doctoral candidacy; and
- Students completing master's or Ph.D. degrees.

In addition, post-Ph.D. employment information can be collected, particularly as related to employment in academic, government, business, and other sectors. When possible, these data should be disaggregated by race/ethnicity, sex within race/ethnicity, disability, citizenship, and STEM fields.

As part of an NSF evaluation capacity building project with colleges and universities funded by the NSF AGEP Program, AAAS and Campbell-Kibler Associates, Inc, collected longitudinal disaggregated data, as described above. Data were collected and compiled for 73 institutions. In many cases, graduate schools were already collecting disaggregated data for:

- New or first time enrollees;
- Overall enrollment; and
- Students completing master's or Ph.D. degrees.

However, only 11 institutions could provide disaggregated data on post-Ph.D. employment for some of the years between 2000 and 2009.

The data collected from the AGEP institutions were compiled into a format for use by the individual institutions and aggregated to report on the overall progress of AGEP institutions. Appendices B and C include sample reports of how the data were compiled and reported. Appendix C also contains information on how the data were collected and analyzed. More AGEP Info Briefs are posted on the NSF AGEP website: http://www.nsfagep.org/publications/info-briefs/.

Other Quantitative Indicators for Evaluation Studies

In addition to examining data disaggregated by race/ethnicity, sex within race/ethnicity, disability, citizenship, and STEM fields, data for students and faculty can be disaggregated in a variety of other ways. A good source of information about graduate school indicators for evaluation studies is the NSF Survey of Earned Doctorates (SED): http://www.nsf.gov/statistics/srvydoctorates/.

A sampling of indicators often used to disaggregate graduate student data are listed below:

- Age.
- Marital or partnership status and number of dependents.
- Type of undergraduate institution where the baccalaureate degree was earned. These data can be grouped using the Carnegie Classification of Higher Education Institutions (http://classifications.carnegiefoundation.org/) or by Historically Black Colleges and Universities (HBCUs), Hispanic-serving Institution (HSIs), women's colleges, or colleges with a high enrollment of students with disabilities.

- Academic background, including: overall undergraduate GPA; graduate school GPA; and verbal, analytical, and/or quantitative scores on the GRE.
- Participation in extracurricular programs during the undergraduate years, including participations in undergraduate research programs or in minority STEM undergraduate programs.
- Sources of graduate school financial support, including fellowships, scholarships, dissertation grants, teaching assistantships, research assistantships, traineeships, internships, loans, personal savings, family savings, and employer reimbursement.
- Duration and continuity of financial support.
- Amount of education and non-education debt at time of bachelor's degree completion.
- Amount of education and non-education debt at time of Ph.D. completion.
- Highest educational attainment of mother and/or father, including less than high school/secondary school, high school/secondary graduate, bachelor's degree, master's degree, professional degree, or doctoral degree.
- Time-to-Ph.D. degree.

Information about classification on colleges and universities can also be located at the following websites:

- Historically Black Colleges and Universities (HBCUs): http://www2.ed.gov/about/inits/list/whhbcu/edlite-list.html.
- Hispanic-Serving Institutions (HSIs): http://www.molis.org/hsis.asp.
- Tribal colleges: http://www.aihec.org/.
- Women's colleges: http://www.womenscolleges.org/.
- Colleges and universities with high enrollment of disabled students: Gallaudet University (http://www.gallaudet.edu/) or the National Technical Institute for the Deaf at Rochester Institute of Technology (http://www.ntid.rit.edu/).

The U.S. Department of Education also has a list of minority postsecondary institutions: http://www2.ed.gov/about/offices/list/ocr/edlite-minorityinst.html.

Comparison Groups

In order to make a strong case that programs, practices, or interventions are having a positive effect or resulting in positive outcomes for participants, it is important to identify an evaluation design that includes comparison groups. It is also important to ensure that sufficient data can be collected to permit appropriate and convincing comparisons.

In general, comparison groups are usually made up of members who are (a) similar to participants and/or (b) have not participated in the program or activity. For an educational study, depending on its objectives, it is generally important that the two groups be matched on characteristics that are correlated with: