Selecting Research Methods

Selecting your research methods means choosing the type of data you will collect, how you will collect your data, from whom you will collect your data, and how you will analyze your data.

Methodology
Your choice of specific research methods may be guided by an overarching research methodology. ***Quantitative methodologies*** involve using numbers or statistics to describe, correlate, or compare variables and the relationships between them. ***Qualitative methodologies*** involve observing or describing phenomena using non-numerical data, such as human language or interactions.

There are many different types of both quantitative and qualitative research methods. At TLL, our R&E experts can help you identify the methodological approach that is most aligned with your research purpose(s).

Data sources
You can collect many different types of data in educational contexts. Researchers have historically relied on surveys (often student self-report surveys), interviews, and focus groups to assess the processes and outcomes of educational programs. But, depending on the context you are assessing, you might also consider some of the following data sources:

- Observations and field notes
- Student work (e.g., exams, final projects, reflections)
- Administrative data (e.g., student enrollment, grades, demographics) collected by MIT Institutional Research, the Registrar, or departments, labs, and centers (DLCs)
- Institute-wide surveys conducted by MIT Institutional Research

Each of these data sources have strengths and weaknesses, some of which are summarized in the chart below.

Data Source	**Benefits**	**Concerns and considerations**
Surveys	Time- and resource-efficient Tailored to study objectives Allow students to provide direct feedback	May create survey fatigue Less in-depth than interviews Indirect measure of outcomes
Interviews and focus groups	Allow students to provide direct feedback Ability to collect in-depth information about context and experiences Ability to ask follow-up questions	Resource-intensive to collect and analyze Requires deep engagement and time from students

Observations and field notes	Reduce burden on students to complete extra assessments Ability to collect in-depth information about context	Time-intensive for researcher May not represent student perspective and experience
Student work (e.g., exams, final projects, reflections)	Direct measure of outcomes Can be qualitatively or quantitatively analyzed Reduce burden on students to complete extra assessments	May not always be available, practical, or ethical to use May require scoring with a rubric (time-intensive)
Administrative data (e.g., enrollment, grades) from the Registrar, Institutional Research, or MIT DLCs	Readily available (with permission to use) Reduce burden on students to complete extra assessment Can be more reliable	Not tailored to study objectives May require permission and/or training to use
Institute-wide surveys conducted by MIT Institutional Research	Reduce burden on students to complete extra assessments Allow students to provide direct feedback	Not tailored to study objectives Requires Human Subjects training to access

It is important to carefully consider which data source(s) are best to achieve the purpose(s) of your assessment, evaluation, or research project, given the resources and time available to you. The R&E team at TLL can assist you with identifying and weighing the strengths and weaknesses of different data sources.

Sampling participants

The **statistical *population*** refers to the entire group of people in whom you are interested. The population of interest for one study might be all undergraduate students entering MIT in a given academic term, whereas in another study the population might be doctoral stuents in STEM programs. Defining the population, and understanding the characteristics of that population, is essential for ensuring that your study allows you to address your research objectives.

Sampling refers to collecting data from a subset of the population. We sample participants when we are not able to collect data from the entire population, often because that population is too large or complex.

There are many different ways to sample participants. You can randomly sample, develop a stratified sample, or engage in purposeful sampling based on characteristics of interest. Some things that you will want to consider when determining how to sample participants include:

- Will this sample be *representative* of the larger population of interest? That is, will it match the population on important characteristics, including demographics (e.g., racial and ethnic identification, citizenship, gender identity, age) and academics (e.g., major, year in school)?

- If you would like to draw *comparisons* between important subsets of the population, will you have sufficient numbers of students in these subgroups to draw meaningful comparisons without asking a very small number of students to represent a larger, more diverse group?
- Which potential participants do you have access to, and what resources do you have for encouraging participation?

How you engage in sampling will depend on your research objectives and your answers to the above questions. Often, researchers choose to sample based primarily on their access to a particular group of students (e.g., undergraduate research pools). This *convenience sampling* allows researchers to collect data more efficiently, but can limit representativeness.

In addition to defining who you would like to study, you will also need to consider how your data collection procedures might influence the characteristics of those who ultimately respond. *Sampling bias* occurs when data are collected in a way that makes some members in the population of interest less likely to participate than others.

Data collection procedures

There are several important considerations to weigh when deciding how you will collect your data. These include:

- Sampling bias
- Inclusiveness and accessibility
- Ethics and informed consent
- Privacy and confidentiality
- Practicality

Sampling bias

Sampling bias occurs when the sample of individuals who participate in your study differ systematically from the population of interest because of how you have collected your data. For example, if your population of interest is all undergraduate students at MIT and you collect data by asking students to take a survey on an iPad as they exit a class, you may have sampling bias because your data will only reflect the experiences of students enrolled in that class.

Nonresponse bias is a specific type of sampling bias in which participants' decision to participate in the study may be influenced by factors of interest. For example, you may find that female students were more likely to respond to your study invitation than male students. This would make your sample less representative of the overall population.

To address sampling bias and nonresponse bias, it is important to carefully consider how you are recruiting participants and collecting data, and to encourage broad participation among individuals in your chosen sample.

Inclusiveness and accessibility

You will want to ensure that the ways in which you collect data do not inadvertently exclude individuals from participating. A common mistake is collecting demographic data in a way that excludes underrepresented and marginalized groups. Researchers should structure demographic items such that participants can accurately record their identities.

In addition, researchers should ensure that their data collection methods are accessible to students with disabilities. If you are collecting data online (e.g., with an online survey), make sure that your data collection adheres to standards for digital accessibility (link to DAS: https://studentlife.mit.edu/das/accessibility/digital-accessibility). MIT's Disability and Access Services can review and consult with researchers and instructors on digital accessibility. If you are collecting data in person, you will want to consider physical accessibility (link to DAS: https://studentlife.mit.edu/das/accessibility/physical-accessibility).

Ethics and informed consent
There are important ethical and legal issues to consider when you are collecting data. Depending on the parameters of your study and the intended use of the data, you may need to get approval from the Committee on the Use of Humans as Experimental Subjects (COUHES). Always check whether you need COUHES approval before collecting any data.

Whether or not you need approval from COUHES, you will generally want to request students' informed consent before using their data for research purposes. This means that students should be informed of the intended use of their data and given the opportunity to provide consent or decline, without any coercion from the researcher(s). Special considerations apply when data are being collected by instructors or other people in positions of authority or power over the potential participants.

Privacy and confidentiality
When you collect and present data on humans in general–especially students–it is important to be mindful of privacy law. For example, the Family Educational Rights and Privacy Act (FERPA) places limitations on the use of student's educational information for research without the informed consent of students or their parents. You may need to obtain consent from the students before using their educational information for research, even if you are able to access this information for other purposes.

In addition, you will want to ensure that you collect and store data using secure methods that decrease the likelihood of data breaches. To learn more, see COUHES' guidance on data protection (link: https://couhes.mit.edu/guidelines/data-protection).

Practicality
Researchers never have unlimited time and resources and, as such, practicality is an important factor to consider. Some methods of data collection take less time and resources than others. However, practicality should never supercede ethical considerations. Ultimately, your goal as a researcher is to find the most practical methods that allow you to achieve your objectives in a reliable and valid manner.

If you aren't sure how to weigh the various factors involved in data collection, or if you would like help identifying practical ways to achieve your study objectives, contact the R&E team at TLL for a consultation.

Data analysis and interpretation

Once you have collected and organized your data, you will want to have a plan for analyzing it, interpreting the results, and ultimately using your data for its intended purpose(s). Just as there are many ways to collect data, there are a multitude of data analysis procedures and tools available to you.

How you analyze your data will depend heavily on the research questions you have asked, the type of data you have collected, and your overall methodological approach (qualitative and quantitative).