Researching Teaching and Student Outcomes in Postsecondary Education:

A Guide

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STLHE SAPES

Society for Teaching and Learning in Higher Education
La société pour l'avancement de la pédagogie dans l'enseignement supérieur

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I am delighted to support HEQCO's collaboration with the Centre for Leadership in Learning at McMaster University in producing the first edition of *Researching Teaching and Student Outcomes in Postsecondary Education: A Guide*. This publication is a valuable introductory tool designed to foster inquiry into teaching and learning and to support newer researchers commencing such work.

Inquiry into teaching and learning under the broader umbrella of the Scholarship of Teaching and Learning (SoTL) continues to break disciplinary and geographic boundaries. SoTL's prominence is reflected in STLHE's signature *Canadian Journal for the Scholarship of Teaching and Learning*.

As a first edition, this Guidebook is a work in progress and several STLHE members have already suggested areas worthy of further elaboration, including an augmented discussion of qualitative methodologies and increased attention to the place of theory in teaching and learning research.

I want to congratulate HEQCO on how it has incorporated feedback and on its willingness to continue refining the Guidebook. Already, I'm hopeful that this resource will serve as a catalyst for generative discussion and will encourage others to consider additional ways to build on and around this work in future.

More broadly, I look forward to the further development and proliferation of Canadian SoTL work!

Sincerely,

Arshad Ahmad, President, Society for Teaching and Learning in Higher Education 3M National Teaching Fellow

CACUSS / ASEUCC

On behalf of the Canadian Association of College and University Student Services, we are pleased to endorse this guide to "Researching Teaching and Student Outcomes in Postsecondary Education". The guide has been reviewed by some of the leaders in assessment in Student Affairs in Canada who are members of CACUSS. We believe the guide will be a good resource and starting point for student affairs staff who are considering a research project to measure student outcomes in their departments, programs, or on their campus.

CACUSS is a professional bilingual association representing and serving those individuals who work in Canadian postsecondary institutions in Student Affairs and Services.

www.cacuss.ca

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Introduction

Over the past decade there has been an upsurge of interest in the quality of postsecondary education, with a particular focus on learning, engagement, and other student outcomes. Instructors, administrators, and other staff across the postsecondary sector have been investigating innovative approaches and services, while many institutions, faculties, departments, and professional associations have established teaching and learning centres or offices to help enhance student success. Governments and governmental organizations have provided support for new approaches and for research projects evaluating them.

This guide, co-sponsored by the McMaster Centre for Leadership in Learning (CLL) and the Higher Education Quality Council of Ontario (HEQCO), and endorsed by the Society for Teaching and Learning in Higher Education (STLHE) and the Canadian Association of College and University Student Services (CACUSS), is intended to assist researchers and evaluators of postsecondary educational outcomes. The intended audiences for this document include, but are by no means restricted to, the following:

- faculty members and educational developers investigating innovative approaches or technologies designed to enhance learning in postsecondary contexts;
- faculty members and administrators leading initiatives for students enrolled in programs or courses that are considered particularly challenging;
- anyone involved in professional development initiatives for faculty, graduate students, and others intended to enhance teaching and learning effectiveness;
- student service providers at postsecondary institutions; and
- students and student associations focusing on effective teaching, learning and student success.

The origin of this publication was a guidebook published in 2010 by CLL at McMaster University in Hamilton.[1] The Centre for Leadership in Learning has actively supported the Scholarship of Teaching and Learning (SoTL) and the purpose of its guide was to support faculty, staff, and graduate students who wanted to engage in this work.

The Scholarship of Teaching and Learning, described in more detail in Appendix A, has developed to explore specific questions about teaching and learning by engaging with the literature, conducting research, and making public the research results. Support of SoTL by teaching and learning centres may take place in several ways:

- offering modest grants for SoTL research;
- providing faculty fellowships to engage in SoTL work;
- hosting symposia and conferences for sharing SoTL research; and
- employing educational consultants to support work in SoTL.

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[1] Fenton, N. E., & Szala-Meneok, K. (2010). *Research on teaching and learning guidebook*. Hamilton: Centre for Leadership in Learning, McMaster University.

The Higher Education Quality Council of Ontario (HEQCO) was founded in 2005. It is an arm's-length agency of the Government of Ontario that funds and undertakes research to provide recommendations for evidence-based improvements to the postsecondary education system in Ontario. Over the past three years, HEQCO has funded evaluations of a wide range of interventions and initiatives designed to promote student success, and has disseminated those findings to as broad an audience as possible.

The pages that follow are informed by the original McMaster guidebook, and the recent experiences of researchers at Ontario colleges and universities. The objective of this guide is to encourage all those involved in postsecondary education to continue to be innovative in their practices to improve student success, and to engage in research on and evaluation of those practices.

The authors are grateful for the suggestions and support of the many scholars who have been consulted during our review process and elsewhere, and who have made suggestions about this publication—we could not have done it without you! In addition, we would like to acknowledge the support and input of HEQCO and of CLL.

Note to Readers: This guide provides an accessible introduction to methods and techniques used in research on student outcomes of postsecondary education. The guide is informal in style and is meant as an entry point to the literature. Readers will need more specialized information once the outlines of their projects begin to clarify. In Appendix B, there is a list of suggested readings, many of which are also referenced in the text.

The document is structured so as to follow the course of a research project: from forming the question, though planning, ethics, implementation and analysis, finishing with writing and dissemination.

This is the first edition of the guide, and we plan to collect feedback for revisions to future editions. Please send suggestions to researchguide@heqco.ca.

Section 1:
Initiating a Research Study

Research on student success in postsecondary education may look different in different disciplines and areas because we look at issues within professional frameworks, contexts, and experiences. Nonetheless, the broad research processes are the same, regardless of where they are carried out.

Finding a Researchable Question

The 'big questions' we choose to pursue in research on postsecondary education often come from situations we encounter while teaching, offering student services or directly interacting with students. They can also spring from institutional issues such as allocation of scarce resources, pressures for accountability, adopting technical innovations, and increasing diversity of the student body. Here are a few situations that may prompt research ideas:

Personal Encounters
What are the students excited about? Wondering about? What kinds of problems do students bring to you? What are your colleagues talking about?

Attaining Goals
How can you determine whether your methods have succeeded or failed in achieving goals you or students have set? Is there a need to compare different methods or approaches to determine a best practice? What is the learning process involved in promoting better student performance? For example, might changing the order in which you present the material make a difference to student learning, and how would you find out if it did?

Student Performance
Are there aspects of institutional policies, program requirements or curriculum that are helping or causing difficulty? Which students are doing well? Are there consistent errors that students make or challenges that they encounter? Can you design your research to clarify your perceptions?

Student Comments
Students often make comments about issues that you didn't expect. It is a great experience when a student asks a question you can't answer. Can student comments lead you to pursue a research topic? Try to figure out the reasons behind what students are saying and embed them in your research design.

Student Accommodation Needs

The student body is becoming increasingly diverse in a variety of ways, including learning needs and abilities. If an accommodation to meet a need is not obvious or practical for your situation, a research idea is born. Sometimes the 'received wisdom' regarding the appropriate approach is debatable. You are ripe to test alternative approaches: go for it!

The Literature

The literature provides many ideas about learning, teaching, student engagement, and motivation. You may wish to locate your enquiry within a specific theoretical framework. Reading broadly provides a wealth of ideas to pursue in your research. Try to map what you are seeing onto a theoretical approach--maybe attribution or cognitive theory?

Accountability

Increasingly, internal and external stakeholders are looking for evidence of the outcomes of a program or innovation in terms of student success. Well-designed research can bring enhanced credibility to support educational innovations.

Identifying the 'Big Issue'

Although in many scientific arenas the justification for a research proposal is drawn from theory or previous research findings, teaching and learning research is grounded in the classroom and student services. Proposals and research ideas can be drawn from practical experiences, as well as from models and research evidence. The important thing is that the research proposal provides the logic to uncover evidence that a particular method or tool can show added value and/or be considered a best practice.

> **The research proposal must provide the logic to uncover evidence that a particular method or tool can show added value and/or be considered a best practice.**

Theoretical Models

While there has been a recent rebirth of interest in teaching and learning at the university/college level, we must not forget the many decades of cognitive and adult learning research that already exist in disciplines such as psychology, education, and sociology. Bransford, Brown and Cocking (2000) and Svinicki (2010) provide helpful overviews of theoretical frameworks from psychology. There are many studies on the processes involved in adult learning and thinking, as well as a large literature on social and motivational aspects of learning. You may wish to use these sources to provide a theoretical framework for your study.

> A current HEQCO-funded project examines the problem of competition versus co-operation among students working on small group projects. What are the small group dynamics that determine whether group members will work well together to achieve the group's goal versus the individual student's goal? This project was justified by earlier research using a social evolutionary theoretical model. The model and supporting research translated to the classroom situation.

Use what is available: read broadly across disciplines.

Educational Needs

We must constantly be questioning why we seem to be succeeding in some educational goals in the postsecondary sector while doing less well in others. How can we do better?

> Some interesting HEQCO-funded projects were based on the observation that despite efforts to engage youth in apprenticeships, where they can gain qualifications in skills badly needed in the province, the drop-out rate is unacceptably high. We need research to address why this is happening: what are the barriers to completion? How can we better support student completion?

Innovative Tools

We are in an age of technological advances. New tools are being offered that are intended to enhance learning. Instructors are encouraged to use new technologies. But do we know that these new tools (or new technologies) actually achieve better engagement or learning outcomes for students?

> A number of ongoing HEQCO-funded projects are evaluating the success of innovations, including assignment planners, e-portfolios, iclickers, and domain-specific software. Some current HEQCO projects are looking at ways in which these technologies can best be used, and how their impact compares with methods previously used to teach the same materials.

Drawing From What's Already Out There

There are many sources to draw from to justify your 'big question.' Sample freely from them; find out what's already been done or is currently being done from colleagues, professional websites, listservs, conference presentations or elsewhere. Google Scholar is a great source of ideas. You may wish to consult your library, and peruse the references in Appendix B. You may be able to locate a helpful review of the literature. The ERIC collection of resources at www.eric.gov.ed has extensive holdings. In many cases the information that you are looking for may not be formally published but may become available through search and collaborative enquiry.

We have just advised you to read and consult broadly to find support and justification for pursuing your research ideas: now a caution about the use of literature and other evidence.

Search broadly at first, and then trim your review of the evidence to focus only on issues directly relevant to your research idea. The broad evidence search is for your education, so that you are conversant in all of the relevant knowledge resources. However, the review you will need to develop as the basis of your study should be more focused and concise.

Your thinking about the evidence should be structured as an argument, so that it leads to the study you intend to do: begin with the logic of the big question, and then draw from your review of the evidence to find support for the particular intervention or techniques, the approaches you will take, and the methodology you have selected. What exactly do you want to find out? Don't be tempted to test a null question (e.g., new tool X does not improve student learning). Also, avoid vague questions (e.g., students will learn if they use new tool X; the answer is surely 'yes'; students learn using almost anything!). If you can, phrase the questions as a comparison: students learn more with X than with Y.

> **What exactly do you want to find out?**

Formulating Research Questions

The broad question gets you going, but in practice you need to be able to operationalize it so that specific research questions are tested. This is the first step of research design. How can you reduce the question to specifics that grab the main idea you want to pursue?

The research questions are the main questions that you want to answer by conducting your research (not the specific questions that you will ask on a survey or during an interview). Usually there is one main research question and a few sub-questions. The questions determine the research design or how you will conduct your study (e.g., data that you need to collect and the analysis you will use).

This is a very important step because research questions drive the entire research process. They must be specific (not too broad or too narrow), focused and researchable.

Defining an overall purpose for your study will help you get started. Is it one of these?

Exploratory ⟶	To gain insight into a phenomenon in order to study it further
Descriptive ⟶	To describe a situation, group, sample or population
Relational ⟶	To find out how two or more variables or themes are related
Explanatory ⟶	To derive casual assertions or interferences

Based on your objective, think about whether you should begin your question with: How, What, Why …. Think about what might be happening in the situation you are investigating, and draw a picture of the processes if you can. Decide on the data that need to be collected in order to answer your question. Given the type and range of information required to answer the question, ask yourself—is your question too broad? Is it too narrow? Is it specific enough?

In other words, is your question 'researchable'?

Some Advice

Don't hesitate to ask for help
Among your immediate colleagues and elsewhere throughout your own college or university and within the teaching and learning centre, there are people with the experience and expertise to assist you.

Address only one or two specific research questions
It is so tempting to throw in a multitude of questions - don't! The data set quickly becomes large and complex making it difficult to manage.

Keep the research questions simple and clear
The research questions must specify tightly how you are operationalizing the 'big idea'. If you can, phrase the question as a comparison: do students score higher on test A using method X than method Y? If you are trying to understand a social process such as student engagement, the question might be: Do students ask more questions using social media or in the classroom? Other kinds of questions benefit from broadening the scope. Rather than asking 'why are students not accessing our service?' try 'what do students do when they want that kind of help?'

Remember this will not be the last study
Don't feel tempted to pursue questions that are vague or complex. Break the issue into small bits. You can always plan future projects that go further into the issue once you understand it better.

Initiating a research project is exciting; it requires careful preparatory work while providing opportunities for fruitful collaborations. This work pays off with a well-designed study that yields clear and useful results.

> **Initiating a research project is exciting!**

Section 2:
Study Design

Credible research asks an important question, has specific objectives, is carried out using robust methods and analysis, and provides evidence that can be used as a basis for modifying practice, adopting innovations or extending theory. Study design is the foundation of research credibility. The design must fit the nature of the question and forms the logical link between the research questions and possible conclusions.

Even before the formation of research questions is complete, attention must turn to methodology, ethics, and analysis. The process of designing a study involves a series of iterative steps. Researchers may consider the kind of answers they are seeking, and then work backward, bending their efforts toward a plan to collect and analyse data that will enable them to find these answers.

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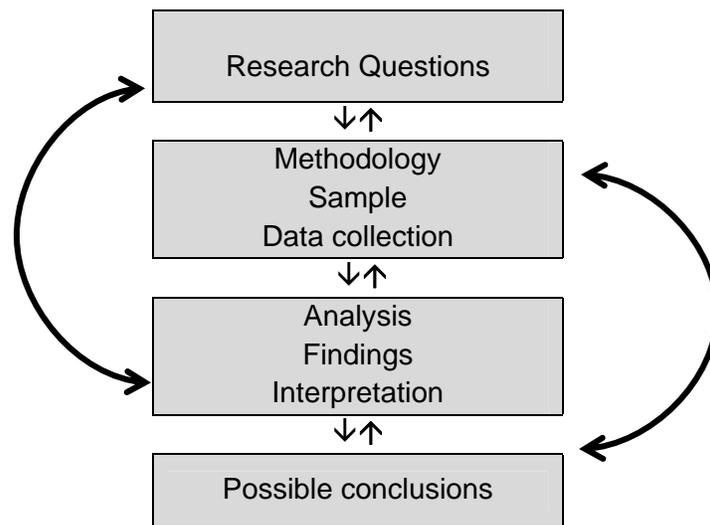
There are many authoritative sources on applied educational research. Of the suggested readings in Appendix B, Creswell (2009), Gray and Guppy (2007), and Mertens and McLaughlin (2004) are especially relevant to this section, in which the focus is on data sources, major methodological approaches, and choice of participants.

Data Sources

Student and Institutional Records
One of the most common sources of data for studies of student outcomes is existing administrative records.

Institutions hold a wealth of information on:
- Admissions
- Grades
- Finances
- Internships
- Users of student services
- Work experience

Instructors have access to student work, attendance, and academic performance, at least in their own classes. In addition there is information elsewhere, such as application centres, high schools, school boards, and the census.

Be aware that permission must usually be obtained from your ethics board to access these data. Many of the problems in using these data occur because the data were not collected originally for research purposes. They often:

- pose ethical issues for access and use;
- do not contain all the variables desired (research objectives may have to be altered to reflect the information that is available);
- are maintained in several offices with fields and coding that are not easily reconcilable;
- contain incomplete data records; and
- are not formatted in a way that is readily available for analysis.

However, these are data that often involve the 'bottom line' of postsecondary outcomes research. Simply be aware that considerable time may be needed to merge, clean, and develop the data so that there is sufficient quality to answer your question. You may need administrative permission, ethics approval, and even help from institutional administrators to access and use these data.

> **Considerable time may be needed to merge, clean, and develop the data.**

Data Collection
Students, instructors or staff can collect data from:
- Surveys
- Interviews
- Focus groups
- Observation
- Standardized tests
- Attitude surveys
- Assessment of learning or leaderships styles

There are challenges in choosing and developing instruments and data collection methods. Perhaps the biggest is to be sure that they measure what you want to find out! A thorough read

of the technical literature on standardized tests and/or careful consideration about constructs or concepts underlying researcher-developed instruments will help to ensure the fit of instruments to study objectives. It is important that data collection methods and instruments be both of high quality and suitable to the research purpose.

Researchers are often tempted, when not sure of the measurement quality of their instruments, to administer several in hopes of capturing what they want. However, administering too many instruments causes respondent fatigue and complicates analysis. Plan to collect only data that relate directly to the research questions.

> **It is important that data collection methods and instruments be both of high quality and suited to the research purpose.**

Methodology in Brief

The term methodology applies to the totality of a research approach, including all phases of the research and extending to underlying beliefs about the nature of knowledge. Sometimes the choice of methodology is easy, as the nature of the research question determines the basic approach; other times researchers have a choice. Criteria such as the background and comfort of the investigator, the nature of the question, and acceptance by stakeholders of the approach should be taken into account when deciding. A brief overview of the qualitative, quantitative and mixed methods methodologies follows.

Methodology vs. Method
The word 'methodology' refers to the major research approach. The term 'method' is used to refer to data collection or analysis methods, of which there are a multitude: survey, interview, tests, inventories, focus groups, textual analysis, hierarchical linear modeling, and so on. Because of the way the field developed, the methodology of mixed methods confusingly contains in its name the word 'method.'

Methods are combined in many ways to become research approaches. We have chosen to highlight just two, action and case study research, because of their frequent use in postsecondary research.

No matter which methodology is chosen and how data are collected, assuring the reliability (robustness or trustworthiness), the validity (whether the methods support the interpretations that will be made of the results), and the fit of the methods to the research questions must be primary concerns to researchers. Ethical issues, about which further information is presented in

Section 3, also need attention from all researchers.

Does the methodology fit the question?

Do we have the resources & expertise needed?

Will the results be convincing?
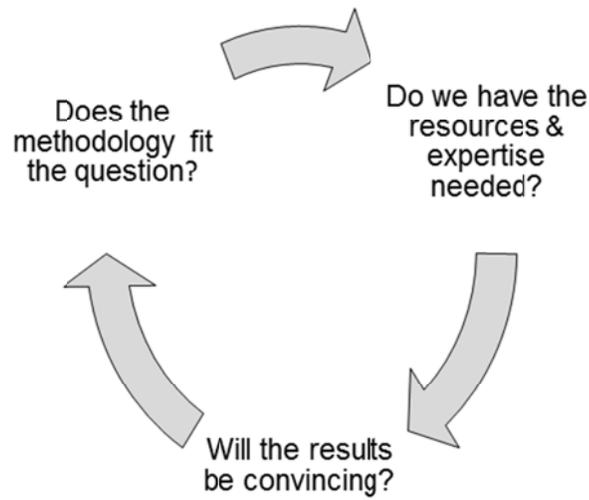
Methodology: the major research approach.
Method: data collection or analysis methods.

Qualitative Methodology

Data from interviews and focus groups, observations, and documents are typically in the form of text, although they may take the form of audio and video recordings, photographs, and other data formats. Qualitative methodology has been developed to analyse data like these. There are many qualitative research models; central to them is the interpretive search for meaning. Researchers strive to understand the meanings the study participants have constructed – how they make sense of their experiences in a particular social setting and how they act on their understandings. Researchers bring their own experiences and knowledge to the work, and need also to remain as open as possible to whatever they see and sense in the early stages of the research. Part of the research process is for researchers to be reflexive or to scrutinize their research experience, decisions, and interpretations in ways that bring themselves into the process and allow the reader to assess how and to what extent the researcher's interests, positions, and assumptions influenced inquiry. It is important to note that there are many recognized qualitative approaches; researchers should identify and learn about the essential elements of the approach they are using (for example, grounded theory, phenomenology, ethnography, narrative enquiry).

Analysis of qualitative data begins with the beginning of the project; understandings, and themes that emerge with analysis dictate the nature and process of subsequent project activities. Many projects involve video- or audio-recorded data that are transcribed prior to analysis. Typically, data segments are 'coded' or categorized according to a scheme that develops as the study proceeds. Through coding, you define what is happening in the data and

begin to grapple with what it means. The qualitative data analysis process is lengthy, involving many encounters with the data. The outcome of analysis is the description of themes in the data, and how themes are related to each other and the context. Some qualitative studies stem from a theoretical stance, but most often the focus is on deriving meaning from the data in an inductive way. Detailed, rich description is essential to qualitative enquiry.

For more information about qualitative methodology, the following references will be helpful: Creswell (2012), Merriam and Associates (2002), and Miles and Huberman (1994). Please see Appendix B for bibliographic details.

Quantitative Methodology

Data from tests, surveys, records, and attitude inventories are usually in numeric format; that is, they are collected, analyzed, and interpreted using quantitative methodology. The large literature on experimental and quasi-experimental design and specific quantitative methods has developed to guide quantitative study designs. Quantitative studies are more often deductive (that is, derive results from applying previously developed theory) than inductive (results are drawn from the data). The following sources focus on quantitative methodology: Murname and Willett (2011), Tabachnick and Fidell (2007), and Trochim (2006); details in Appendix B..

Once assembled, quantitative data must be checked and cleaned. Careful project planning includes deciding on the analysis approach. Hiring a statistician for a few hours of consulting at the beginning of the project will help ensure that the data collected are appropriate for the planned analyses and study objectives.

Things to consider:
- Have expertise using the measures. Make sure measurement tools are available and that you or your collaborators have expertise in using them.
- Make sure that institutional data (if you plan to use them) will be available to you in a form and timeframe that can be used in your research.
- Choose outcomes to measure. There is a tendency in 'what works' research to measure only outcomes directly related to the specific strategy under review. For example, if one were teaching speed reading, a measure of words read per minute would be important; however, it might also be important to measure more distant constructs such as comprehension, subsequent applications of the content, and reading enjoyment.

> **Deductive: results are derived from applying previously developed theory.**
> **Inductive: results are derived from the data.**

Mixed Methods

There is a growing literature on mixed methods research, which combines qualitative and quantitative approaches. The texts by Creswell and Plano Clark (2007), and Teddlie and Tashakkori (2009) would be good places to start reading; bibliographic details can be found in

Appendix B. Key to mixed methods research is careful connection of the qualitative and quantitative portions of the study. Sometimes data of one kind are central to the study, while data of the other kind are secondary; sometimes both kinds are equal. Sometimes the two kinds of data are collected simultaneously, sometimes sequentially. If collection and analysis of one kind of data comes first, the results can inform the collection and analysis of the other kind. It is important that researchers identify how the two types of data inform each other during the design, data collection, analysis and reporting stages. Mixed methods research is not simply research that employs both qualitative and quantitative data; the two kinds of data must be mixed and must complement each other.

> **Key to mixed methods research is careful connection of the qualitative and quantitative portions of the study. Mixed methods research is not simply research that employs both qualitative and quantitative data; the two kinds of data must be mixed and must complement each other.**

Research Approaches

Two research approaches well-suited to and frequently used in postsecondary projects are case study and action research.

The case study approach has the objective of achieving a comprehensive understanding of a single case. Case study is a method used in many disciplines. In postsecondary education research the case is almost always a social entity such as a study group, a class, a department or an institution. Case study is often thought of as a qualitative approach; however, quantitative and mixed methods case studies are also possible. The defining characteristic of a case study is that just one unit is studied in depth.

Action research stems directly from teaching practice. It starts from the needs and problems of classroom participants. Usually the action researcher is the instructor, who uses reflective self-inquiry along with data collection and analysis to study teaching techniques as they are implemented in his or her class(es). The processes of intervention, observation, data collection, analysis, and reflection are carried out by the same person and have the objective of direct improvements in personal practice. Results of action research are more often shared with colleagues or a community of practice than published in academic journals.

Research Quality

All researchers surely have the intent of carrying out "good" research. How we discern and describe good research varies, though, according to the research area and methodology used. Quantitative researchers often use the term 'validity' as a way to talk about whether results of measures used tap into the intended constructs and 'reliability' to talk about the consistency of measurement. Many qualitative researchers also refer to 'trustworthiness' and 'credibility' of research processes and studies. To increase the likelihood of carrying out a study of high quality, researchers should delve into the literature associated with the methodology and their field, and apply suggested research procedures rigorously.

Perspectives on Sampling

Whatever the methodology, research requires selection, whether of sites, classes, students, or exemplars of student work. What constitutes an adequate sample depends on study methodology. In quantitative studies, the statistical power of the design, that is, the likelihood of having significant findings and thus the persuasiveness or generalizability of the results, depends on the size and nature of the sample. The contribution of 'sampling' (though few qualitative researchers would use this term) to the credibility of qualitative research lies more in a good match between research question and participants than in the number of participants. Of course, projects collecting more than one kind of data will most likely have more than one sampling plan. Unplanned bias in choice of participants detracts from the quality of any research model. Most of the references listed in Appendix B have sections on sampling. Mertens and McLauglin (2004) provide an overview of both qualitative and quantitative approaches.

As well as thinking about sampling, researchers must specify the criteria for inclusion in the study. Sometimes criteria are simple, such as being a student in a certain course. Other times, criteria will be more difficult to develop, for example when one is planning research on students with very specific characteristics. In that case, the exact inclusion criteria, perhaps test scores or age in months, must be specified with cut-off points.

Purposive Sampling

Most often, researchers with a qualitative perspective use purposive sampling. Once the research question is clear, the issue is to choose a site or situation which will yield the most information. Sampling may be done purposively in order to increase the diversity of the sample. The goal in this case is not to find a truly "representative" sample that reflects certain attributes (gender, age, grade point average distribution) in the population, but rather to collect data on as many different points of view as possible. (Simply identifying perspectives of interest may take quite some preparatory time in the field.)

Random Sampling

Researchers from a quantitative perspective, on the other hand, usually wish to select a random sample from whatever population is of interest. If done appropriately, random choice typically results in a sample representative of the population; importantly, statistical significance testing assumes random sampling.

Stratified Random Sampling

One way of looking at stratified random sampling is that it is a combination of purposive and random methods whereby random samples are chosen from subpopulations (for example, students with and without physical disabilities). This method is often used to ensure a credible sample or to study a low-incidence group. For example, students with physical disabilities might be over-sampled to ensure the robustness of the data collected from them.

Sampling for qualitative research may seem simpler than for quantitative, since qualitative design evolves with data collection and sampling continues until data 'saturation' is reached

(though saturation is a debated concept). Both quantitative and qualitative researchers need to pay attention, though, to selectivity in participation and dropout and how that may affect results. Careful records of contacts with potential participants should form part of the research journal that you will keep.

Sampling for mixed methods studies will be different and perhaps separate for qualitative and quantitative data. It is important when planning the sampling to reflect on how you plan to integrate the two kinds of data; you may well wish to create a particular relationship between the samples, for example that the qualitative sample is a subsample of the quantitative.

Sampling for a case study may be the most challenging of all, since a poor choice could result in little to report.

> **Stratified random sample: a combination of purposive and random methods whereby random samples are chosen from subpopulations.**

> **Sampling for mixed methods studies will be different and perhaps separate for qualitative and quantitative data.**

Random Assignment

Random assignment is not a sampling method, but does involve selection for treatment(s). It is very important in quasi-experimental design, that a class or other group is randomly assigned (say by a coin toss) to either the program/intervention or to a comparison group that has similar characteristics but does not receive the treatment in question.

Research as Evidence

Most researchers on postsecondary education are interested in applied questions concerning the improvement of student outcomes in and out of the classroom. Convincing research on outcomes of programs or innovations is usually comparative. Data may be collected from participants who were or were not part of the program or from the same participants when treatment is phased in and out. As long as the flow of logic from question to conclusion is clear, other research designs can also convince!

The evidential quality of research goes hand-in-hand with the perception of research quality. It is important to bear in mind beliefs about evidential quality that may be held by administrators, practitioners, and other consumers of the research.

Section 3:
Ethics of Conducting Research within Postsecondary Institutions

This section contains information about ethical issues that education researchers may encounter. It is important that you consider ethical implications throughout your project, particularly during the planning and implementation stages. We encourage you to contact your institution's research ethics board to learn more about local requirements and processes.

Conducting Human Participant Research

Institutions of higher learning throughout Canada have adopted the Tri-Council Policy Statement: *Ethical Conduct for Research Involving Humans* (TCPS2) as the core human research ethics guideline. The three councils who developed the policy were: the Canadian Institutes of Health Research (CIHR), the Natural Sciences and Engineering Research Council of Canada (NSERC), and the Social Sciences and Humanities Research Council of Canada (SSHRC). The Tri-Council Policy covers the ethical conduct of all faculty, post-doctoral fellows, graduate students, undergraduate students, and staff who conduct research with humans, including research on teaching, learning, and student outcomes. The Tri-Council Policy is easily accessed online: http://www.pre.ethics.gc.ca/pdf/eng/tcps2/TCPS_2_FINAL_Web.pdf. The associated website provides considerable support materials, including an online tutorial.

Under the Tri-Council Policy, any Canadian university or college receiving Tri-Council funding is required to establish a Research Ethics Board (REB) to review the ethical acceptability of all research involving humans conducted within their jurisdiction. Though these boards all adhere to the Tri-Council policy, there may be variations among boards in terms of ethics education opportunities for researchers, application forms, submission deadlines, requirements, and procedures.

The Boards review the research with respect to the three core Tri-Council ethics principles:
- Respect for person
- Welfare of the participants
- Justice

Research Ethics Boards assess how the intended research may impact the participants and help researchers to make adjustments to the research so they can protect their participants and reach their research goals.

It is important to familiarize yourself with your Research Ethics Board and its procedures in advance of preparing your materials: visit their website!

> **Tri-Council Policy Statement: *Ethical Conduct for Research Involving Humans (TCPS2)* as the core human research guideline. The three councils who developed the policy were CIHR, NSERC, and SSHRC.**

Instructional Practice

It is standard practice for professors or student service providers to evaluate regularly the effectiveness of their practices, and these assessments do not ordinarily require ethics approval. However, it is specified in the Tri-Council Policy that when these data collection activities move past a basic assessment of in-course class activities with the purpose of expanding knowledge, and are generalizable beyond the institution, then ethics review and clearance are required. Generally, if the results are intended to be published or disseminated in any form, ethics approval is required.

> **If the results are intended to be published or disseminated in any form, ethics approval is required.**

Length of the Review

When the Research Ethics Board receives your application, a pre-assessment is made of the level of risks and benefits that your research poses to prospective participants. According to the Tri-Council Policy, the level of scrutiny should be proportionate to the level of risk to participants. Typically, delegated (sometimes referred to as "expedited") reviews are conducted with studies of low risk, while full board reviews (which occur less frequently) are required for higher risk research. A number of elements influence how long the review process takes, but submitting a well prepared and complete application form with the required supporting documents goes a long way in reducing the review time. High volume periods can increase the review time, as most members of the Research Ethics Board are also active researchers and professors.

Key Ethical Issues

The following are issues that may arise in research on postsecondary outcomes. Contact your institution's Research Ethics Board for assistance in identifying and resolving ethical questions that affect your planned research.

Power Differentials

A key issue stems from the dual role of instructor (or service provider) who is also the researcher. Those who conduct research in classes or student service settings should think through the power differentials in the relationships they have with students and teaching

assistants. Power-over relationships can influence how comfortable participants feel in declining invitations to participate in research or expressing their opinions about course activities. This issue is especially of concern when the students' behaviour in a course, their involvement in course activities, and their overall performance are the focus of the research.

Vulnerability

According to Tri-Council Policy, if potential participants are considered to be vulnerable, risks associated with the research project are higher. Individuals or groups in vulnerable circumstances have historically included children, the elderly, women, prisoners, those with mental health issues, and those with diminished capacity for self-determination. Researchers of groups or individuals whose circumstances make them vulnerable should ensure their safety in the context of a planned research project.

Participant Burden

Students enroll in courses and programs for the purpose of gaining knowledge and mastery of a topic or to assist in their overall postsecondary success rather than to be participants in research projects. When planning a study, researchers might think of ways to conduct their research so that it does not intrude into the primary purpose of learning, and, indeed may wish the research to complement the learning experience.

Lost Time to Participate in Instructors' Research

The researcher/instructor needs to ensure that their students are not losing time from the regular course hours to participate in the instructor's pedagogical or other research. If students in a course are recruited to participate in a research project, an effort should be made to use time just before or just after class to talk about the study. If your institution has an online learning management system (LMS) or a virtual learning environment (VLE), your flyer and the letter of information or brochure can be posted there so students can access those documents easily. Recruitment pathways and the consent process are, of course, subject to institutional policies and Research Ethics Board clearance.

Equitable Distribution of Research Benefits

Researchers should consider ways to ensure the equitable distribution of any benefits of participation in research. This core Tri-Council principle may be challenging to fulfill in projects involving a comparison group. Aim to design your research study so that the comparison group's experience is intense as, but different from, that of the experimental treatment group and the benefits are distributed, as well as the risks minimized.

Confidentiality of Student Consent

Due to the dual instructor or service provider/researcher role, students might be concerned that their professor or teaching assistant (who might actually have more contact with the student) will know whether they took part in the research. Protective measures need to be developed to protect not only the participants but also those who choose not to participate. It is important to specify to project staff and to students how study documents such as consent forms and data will be collected and stored, who will have access to this material, and at what time. Some

researchers find a colleague or other person, who is at arm's length from the course, program or intervention, to serve as a consent aide or monitor.

Secondary Use of a Student/Participant's Academic Data
Some researchers wish to study outcomes such as students' performance on a course task, their class performance, and possibly their overall grade point average in other courses. Because information on students' academic performance at an institution is produced to evaluate the student's mastery of their program of study, the researcher must obtain permission from student participants to use these data for a secondary purpose (that is, for a purpose other than that for which it was initially intended). In addition, bear in mind that obtaining Research Ethics Board clearance to use students' data doesn't compel the holder of data such as the registrar, to provide you with the data requested.

Timing the Researcher's Access to and Analysis of the Data
It is required by many Research Ethics Boards that the instructor/researcher as well as teaching assistants with grading responsibilities not have access to data including consent forms until after the final grades have been posted. It is best to lay out this plan very clearly for the student participants in the letter of information/consent form and other study related documents.

Data Security
Instructors already have a duty to ensure that their students' grades, assignments, and accommodation needs remain confidential. When in the dual role, the service provider or instructor/researcher must also demonstrate to the participants and to the Research Ethics Board that care is being exercised to protect the privacy of the student participants and the confidentiality of their data when it is collected and used and when the results are disseminated. At a minimum, data that is in paper form should be kept in a locked filing cabinet in the researcher's office and electronic data should be held on a password protected computer. Data moved through email or on data keys should be encrypted. Data sources, which may include identifying information, should be distinguished from data sets, which should be cleaned of markers. Non-identifying data sets are often kept indefinitely; however data sources with identifiers ought to be securely stored for a defined period of time and subsequently destroyed.

Roles in the Research Project
Many researchers find it useful to approach a colleague, another researcher or a research assistant who has no connection at all with the course, program or project to serve as an intermediary who can inform students about the study, assist with recruitment' receive or collect the consent forms, surveys or other instruments or exercises that research participants are going to be invited to complete. This person might also strip any personal identifiers from the raw data and could also create and hold securely a copy of the data key that links data to the participant if identifiers are being removed. In addition, if participants decided to withdraw from a research project, they would simply contact that intermediary to withdraw.

Importantly, focus groups and interviews should be carried out by someone other than the person responsible for teaching the course, marking, or assigning grades.

Care should be taken in courses where graduate students serve as teaching assistants and will have regular and sometimes even more direct contact with student participants than the instructor. It is important that teaching assistants' roles (e.g., teaching and grading) and any research study roles that might be given to them are carefully delineated to ensure participant voluntariness and confidentiality and comply with institutional policies regarding research tasks.

> **Focus groups and interviews should be carried out by someone other than the person responsible for teaching the course, marking, or assigning grades.**

Advice for Facilitating the Ethics Review Process

Create a timeline for your research so that your ethics application and supporting documents are submitted with enough time for a proper review to take place and for you to meet your research objectives. For example, you might want to conduct a pre-test in the early weeks of the term. You need to calculate in advance how much time it will take for your application to go through the review process and for you to address any queries the committee might have. You will want to factor this into your overall schedule so that you can begin data collection early in the term. The research ethics application process, relative to other research tasks, is usually of short duration! Creating a timeline by working backwards from the date you want to begin collecting data and leaving enough time for the ethics review process are two simple but very effective ways to make the process easier for you. If your project will have co-investigators at other institutions, they should contact their Research Ethics Boards early to determine their own requirements and timelines for ethics clearance.

Research Ethics Board application forms are designed so that the consent forms, scripts, and other accompanying material are informed by your answers to the application questions. You might find it helpful to complete a rough draft of the application, of supporting documents such as the participant letter of information and consent form, and of your questionnaire or other data collection instruments. It may also be useful to set up an appointment with a member of the research ethics staff to go over drafted material to ensure that your application is complete. Many experienced researchers as well as those new to human participant research take advantage of this service. You can even use the application form as a device for helping you prepare the content of a research proposal since most of the sections of the application mirror the standard format of a research proposal. That way you would incorporate the protection of your study participants right from the start.

You could also ask your ethics office if they are planning any ethics education events. Some Boards have monthly drop-in clinics or other education activities for researchers. Many post sample supporting documents (e.g., letters of information and consent forms, interview guides,

posters, consent checklists) on their websites to make your job easier. If they don't have these materials posted yet, they might have samples they can send to you if you ask.

> **Create a timeline for your research so that your ethics application and supporting documents are submitted with enough time for proper review to take place and for you to meet your research objectives.**

Section 4:
Carrying Out the Study

The reality is that even before planning is complete you need to start implementing. This section discusses project collaborators, stakeholders, staff, proposal writing, and other practicalities of research.

People and Organizations

Colleagues and students

If you are new to postsecondary outcomes research, you might want early on in your project, to approach a colleague who is more experienced in research to act as a mentor, or visit your Teaching and Learning Centre. Some researchers form a research group with whom to discuss ongoing project activities.

Collaborations are important to work out before the study is fully developed. No doubt, you have colleagues and students who can help to work out the design and proposed analyses of the data. Bring these people into the project discussions early on. In the case of undergraduate and graduate student collaborators, the research project might be designed to include honours, thesis or dissertation projects. Plan these as the design is being completed, so that each collaborator knows his/her role and what use of the data set each participant will have access to for specific purposes. You might also have collaborators from other institutions or from within your own institution willing to provide either expertise or even study participants. Again, get these commitments early and include the controls that will ensure that all parties will receive the same research protocol, even though they may be in different classes or institutions. This is the early foot work needed to make sure your project is really doable within a proposed schedule.

> **Choose an experienced researcher to act as mentor.**
> **Choose collaborators from your own or other institutions.**

Stakeholders

Think as well about other project stakeholders and how they can help you with refining and developing your conceptualization and/or carrying out the study.

Possible supportive stakeholders:

- Colleagues
- Students
- Teaching assistants
- Administrators
- Government organizations

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- Librarians
- Educational research consultants
- Publishers

Supportive stakeholders can provide you with:

- access to the field,
- specialized knowledge,
- 'real life' perspectives,
- funding,
- assistance with research tasks,
- a sounding board, and/or
- a way to carry on the work past the project's end.

It is best to establish relationships with stakeholders close to the beginning of the project—that way the project will be collaborative throughout its history. Informed, committed stakeholders can make huge contributions to research, providing expertise or funding, or refining the project orientation so that it is much more applicable to real-life situations. In addition, early involvement of stakeholders creates a foundation for knowledge diffusion.

Research Proposals

Research proposals vary in length and purpose. Some are written to obtain funding, others to seek ethics approval, to solicit institutional permission for the research or to interest stakeholders.

If the project will require funding, other stakeholders, research partners or your professional network may be able to assist you with ideas or funds. Many institutions provide research funding for internal projects. Some institutional research offices and professional associations provide lists of funding sources. You may apply for an award from federal research funding through the Social Sciences and Humanities Research Council (SSHRC), the Natural Sciences and Engineering Research Council (NSERC), the Canada Institutes of Health Research (CIHR) or other sources. Provincial or federal government ministries and agencies (such as the Higher Education Quality Council of Ontario (HEQCO) in Ontario) might consider funding your research. Sometimes agencies issue Requests for Proposals (RFPs) when they are interested in a specific research area. In any case, you will in all likelihood need to write a proposal in order to obtain funding.

The proposals for services contracts (e.g., in response to a Request for Proposal) and those for regular research funding are somewhat different. Proposals responding to an RFP must respond to the specific request—these funders will have little interest in your general research ideas. In this case the number one priority is to address the research concern expressed in the RFP. This type of research project is usually undertaken as a contract for services with specified expectations for deadlines and deliverables.

A typical proposal must contain

☑ An introduction that states the research plan

☑ An overview of the literature

☑ Specific research questions

☑ A description of specific data collection methods

☑ Planned sampling methods

☑ Planned analysis strategies

☑ Anticipated findings and contributions to the field

☑ A timeline and budget

☑ Description of the research team

For more detail, please see the suggested outline for the final report later in this document. Recall that the proposal should be brief but comprehensive. For example, the literature review should cite supporting literature for each major step of your argument, but does not need to be an exhaustive review of the topic. A well-written proposal is a foreshadowing of the final report or manuscript! Be sure that each section is clearly linked to the previous sections. It is particularly important to explain how the data that you plan to collect will be used to answer the research questions. Write clearly and use short sentences to get your ideas across.

> **Proposals responding to a Request for Proposal must respond to the specific request – these funders will have little interest in your general research ideas.**

Getting Organized

When your proposal has been accepted, you will then begin the next phase of your project.

Issues that will need attention:

- Finalizing the research team
- Refining the details of data collection methods
- Obtaining ethics clearance
- Scheduling

Campus Resources

Take time early on to connect with the teaching and learning centre, research office, library, and ethics office: your institution doubtless has many resources and services that will make your tasks easier.

Research Team

You will already have sounded out colleagues, stakeholders, and perhaps graduate students as potential contributors to the research project. Now is the time to formalize these arrangements. Do not hesitate to include people who differ from one another (in roles, background, training, dispositions) – often this makes for a good team.

If you receive funding, think carefully about the hiring of assistants. Research takes a lot of time and an added person can complement the time and expertise of people already on the team. You may have sufficient resources to engage a project manager. Be sure of the specifications of collective bargaining agreements that may bear on your situation. For example, at some institutions it is against union rules to ask teaching assistants to carry out research tasks.

Work Plan

An early task should be the development of a work plan, preferably in tabular format. There should be column headings for major tasks, sub-tasks, completion dates and who is responsible, and a row for each task. Reporting dates (if applicable) should be included in the work plan, as well as a data collection schedule, interim report preparation and so on, as needed by the project. Take a look every few weeks to check that the work plan is up to date and that completed tasks are marked off. A good time to do this would be during regular team meetings. If you have a project manager, maintaining the work plan would be one of their tasks.

Here is a sample work plan

TASK	Why	Who	When
DEVELOP QUESTIONS FOR INTERVIEWS			
Interview protocol for Program Directors	Questions for phone interviews to prepare for focus group. Should cover goals, process, satisfaction, dissatisfaction, adequacy of resources.	Whole team	First week May
Interview protocol for Coordinators &/or administrative staff	Really the same. We need to understand what the Coordinators actually do. Need to follow up re interview with Assistant Director	PI will follow up.	May 21 week MUST FINISH
Interview protocol for students	(a) for students taking course (b) for students through their association	Research Assistant	Mid May
Interview questions for organization X	This should be an exploratory interview. Outline only is needed.	PI	Late May
Focus group questions for Program Directors	Detailed list of questions and who will ask them.	RA, then PI	June 4th week MUST DO
Focus group questions for students	This needs to be done AFTER a couple of exploratory interviews are done	Whole team	June
SCHEDULE INTERVIEWS			
Interview contact Y again	We need to understand the XL database. Whoever does this will do the XL analysis	THIS IS ON HOLD!!	
Contact XX to interview one or	It turns out that this has to be organized through XX and PI has	PI	IN PROGRESS

Methods and Instruments

You will need to make final decisions on research methods and instruments. Plans may need to be adjusted because of changes that occurred during the proposal and funding process. If instruments developed elsewhere are to be used, double-check the cost, availability, and suitability of these tools to your purpose. If you need to use non-standardized tests, make sure you know how to construct them effectively. You may find the book by Kember and Ginns (2012) helpful in locating instruments.

If the instruments are to be administered online, be sure that the links are properly specified and that the bandwidth is adequate. If you plan to collect data using interviews, surveys or focus groups, now is the time to start developing questions and protocols and if needed to identify the appropriate expertise. The instruments must be complete before the ethics submission.

Take a look at the literature or the test manual to double-check on the reliability of measures developed elsewhere. Make sure that the instruments really measure what you want to measure and that interview or focus group scripts tap constructs you wish to explore—you want your data collection methods to be both valid and reliable. No matter whether the instruments you choose were developed elsewhere, are widely used or are in the process of development, be sure to schedule time to pilot test them. Your time, and the time of respondents and study staff is too precious to waste!

> **Make sure that the instruments really measure what you want to measure and that interview or focus group scripts tap constructs you wish to explore – you want your data collection methods to be both valid and reliable.**

Training and Expertise

Whether your assistance is from students or staff, you may need to arrange specialized training for them. Use of some standardized tests and inventories, including the National Survey of Student Engagement (NSSE) and many ability tests and inventories requires trained testers. Information about training should be available from distributors. Check to see if there is a schedule of research methods workshops offered at your college or university.

If the project plans involve research methods, instruments or analysis with which you or your research team colleagues are not expert, why not consult a research methods specialist at these initial stages of study implementation? Many universities and colleges have centres such as Research 'Methodology' or 'Methods' Centres or Services with staff that can help.

> **Some standardized tests and inventories (like NSSE and ability tests) require trained testers.**

Purchases and Budgeting

The research plan may require specialized software or other purchases. Enlist help, if needed, to source these purchases economically. The vendor's website is speedy but often not the best place to buy. You will also need to set up a budget so that you can pay for your purchases. Most researchers have administrative support to help with such tasks, but the researcher should also keep supplemental records of hours worked and purchases, just to double-check. Use of spreadsheet software should do the trick. Keep in mind that this information can also be useful to future teams planning to carry out similar or follow-up research on the same or similar topics.

The Research Journal

A very important point comes last. Please keep a research journal. This is where you will make notes of important decisions and why you made them, explain developing ideas and concerns to yourself, and jot down those important ideas that come to you when you should be doing something else. Keeping a journal is central to the process of research and analysis in the qualitative field in particular, but all researchers benefit from keeping one.

Data Collection

Many researchers find data collection to be the best part of a research project. It is interesting, intriguing, even exciting, and sometimes can be too exciting! We all hear tales about broken appointments, cancelled programs, snowstorms, labour disputes, unexpected visitations and — you name it! The following are a few suggestions to facilitate orderly progress.

Selection of Participants

For qualitative research, selection of participants is partly dictated by the choice of study location. Once the location is chosen and inclusion criteria are developed, choosing the participants should be relatively easy. As described in the section on study planning, qualitative sampling is usually done with a view to obtaining a variety of perspectives. Sometimes it is appropriate to use 'snowball' sampling, whereby study participants identify others who may participate.

Sampling for quantitative studies can be more challenging; usually a randomly selected sample is desirable. Before sampling, you need to decide how many participants you need, perhaps in consultation with a statistician.

In concrete terms, a way to draw a sample when the population is small is to write IDs or names on pieces of paper, place them in a hat or bowl, mix them up carefully and choose the number needed. Usually this procedure, so easily understood, is not practical. Rather, a population list is drawn up in a computer spreadsheet, and sorted systematically, for example by increasing ID number or alphabetically by name. The next step is important: in some random way, a particular case is chosen as the first to be sampled. Before selecting the sample, you need to calculate the fraction or percentage of the total that is needed, so that every "nth" case can be chosen. For example, if you want 100 students from a class of 400, the percentage is 25% and one

chooses every 4th case. You can also use software to select random numbers; see www.random.org for one example.

Selecting possible participants is only the beginning, however. Refusal to participate and study dropout are huge challenges to postsecondary researchers. It is reasonable to plan for a participation rate of only 33%, and for a dropout of 20% from that. These percentages suggest that if you contact 360 students, you will collect data from 95. Analysis requirements may result in a further loss of cases. Sample many more than you think you need!

> **Before selecting the sample, you need to calculate the fraction or percentage of the total that is needed, so that every "nth" can be chosen.**

> **Refusal to participate and study dropout are huge challenges to postsecondary researchers.**

Recruitment of participants

Recruitment of participants is sometimes challenging for researchers working in postsecondary education and requires careful planning. A tip sheet on strategies suggested by current researchers appears on the following page. Bear in mind that it is typically a biased rather than representative sample of students who agree to participate in and who remain part of a research project. Accordingly you will want to tailor recruitment activities to attract those students who are least likely to participate. Of course, recruitment strategies should be considered by your ethics office.

Scheduling data collection around participants' and institutional schedules, while simultaneously meeting research needs, can be tricky. If it is a pre-test/post-test design, it is important to administer the pre-test at the very beginning of term since changes in knowledge and attitudes may happen very quickly. The post-test can be administered close to the end of term or academic year, but try to avoid the very end of term when students have so much on their minds. If you can, schedule a third testing occasion during the following term.

Tips to Encourage Student Participation in Research

Incentives
- Food   - Draw for prizes   - Small education-related item, e.g., pen, pencil, school t-shirt   - Gift certificate or small honorarium
Mode of Communication
- Make personal visits to classes   - If email: - Personalize the email   - Avoid use of terms like survey or context that may be picked up by spam detection software   - Use an engaging subject line   - Phone call in addition   - Use social media like Facebook, Twitter or a Smartphone app   - Imbed the consent form in several media: e.g., flyer, website, email
Content of Communication
- Appeal to their pride in their program/university   - Explain possible benefits of the project/program/initiative   - Ensure confidentiality   - Let participants know that you will share main findings with them via a website or similar means   - Ask student team members to ensure wording is current
Networking
- Engage other faculty and staff to encourage participation   - Enlist students or former students as part of the team   - Arrange for a VIP, maybe a future employer, to speak to the class and encourage participation
Design
- Keep the data collection short – few questions on few occasions   - Consider giving participants their results with feedback   - Use paper rather than online survey
Scheduling
- Avoid the end of term and the time of midterm evaluation   - Try to find time for project activities just before or after class

Data capture

Data that are collected need to be stored and formatted for analysis. Online surveys and tests are usually already formatted in a way suitable for computer analysis. Try to develop paper surveys or tests in formats that allow the results to be scanned. Some researchers use Scantron sheets; however, respondents may find the sheets of bubbles off-putting. More flexible scannable forms with embedded text can be created with software such as Teleform. Some quantitative data, such as results of experiments or tests or observation sheets, will need to be entered by hand into a spreadsheet or online survey tool (such as SurveyMonkey or LimeSurvey) prior to analysis.

Audio or video recordings present some special challenges. With current technology, it is quite possible to code and analyse recordings directly. However, revisiting the data requires as much time as the original data collection, and as a result the majority of researchers transcribe the data. Transcription has other advantages such as helping researchers with recorded voices that are difficult to hear or understand and enabling the use of text searches and qualitative data analysis software (e.g., NVivo or MaxQDA). Transcription itself is time consuming and can be costly—estimates range from three to six times the length of the recording. Selective transcription (of just the apparently interesting parts) may save time and money, but researchers are dependent on the judgement of the transcribers for filtering the data. Some researchers listen to the complete recording and note, perhaps by minute, which parts of the recording to transcribe. The use of voice recognition software (e.g., Dragon Naturally Speaking) sometimes helps, but is not successful in focus group or other noisy settings.

Data Storage

Plan ahead for data storage needs, including a password protected computer in a locked office to which research team members have access. Someone should keep track as data come in, via a table or spreadsheet. Check to make sure that there is an orderly procedure for transferring data from the collection point (digital recorder, online survey software, tally sheets, etc.) into computer files. Arrange that someone is checking the quality of incoming data – it would be unfortunate to continue using a malfunctioning recorder. Recommended also is use of a systematic file naming and directory system to facilitate easy data retrieval. Use a special section of your research journal to record details.

> **Keep track as data come in. Check the quality of incoming data. Use a systematic file naming and directory system to facilitate easy data retrieval.**

Data Analysis

Data analyses are fascinating, demanding, exciting, time consuming, and usually very interesting! As data analysis progresses, you will want to schedule time to talk about the issues with a colleague, mentor or your research group.

Careful work on development of the study plan will help you immeasurably at this stage of the research process. Before data analysis can begin, you will probably need to organize, and sometimes to merge data files, perhaps using specialized software such as NVivo or MaxQDA for qualitative studies, SPSS or SAS for quantitative studies.

For quantitative data analyses, data cleaning is the next important step. For example, duplicate records need to be removed, while missing data points can sometimes be estimated from elsewhere (for example, if gender information is collected in two places) or through use of recently developed estimation techniques. Descriptive statistics and graphs should be

produced, so as to look for anomalies in the data and guide the choice of subsequent statistical analysis procedures. Some instruments contain items or detailed observations that will subsequently be combined (for example, items on a scale). In this situation, estimates of reliability should be calculated. Once data preparation is complete, you are ready to proceed with statistical procedures that respond to the research questions. If this process is new to you, consult one of the references suggested in Appendix B, such as Gray and Guppy (2007) or Trochim (2006). For assistance with the somewhat technical tasks, you may wish to engage a statistical consultant to plan for and/or complete the analysis

For qualitative data, the analysis processes are quite different, as inductive rather than deductive analysis methods are typically used. Often segments of data are coded or categorized so as to identify and aggregate data from themes. Researchers often develop coding schemes (called rubrics by some) to facilitate accurate and consistent data coding. Identifying themes that emerge from the data and understanding how they are related require repeated encounters with the data and considerable contemplation time away from the data. Some qualitative researchers, however, use a 'top-down' theory-driven analysis whereby texts are analyzed for their consistency with a framework.

Researchers in teams will benefit from regular meetings to review coding—perhaps arranged so that each team member has coded the same data in advance. It may be desirable to quantify qualitative data, by computing counts of the number of times a code arises for different participants or in different situations. Quantitative analysis methods can be used subsequently, an approach more attractive to some decision makers. In this situation, inter-rater reliability might be assessed by computing the percentage agreement of two coders. Qualitative data analysis software may help to speed up the process of coding, but does not really help with the contemplation. Some researchers use textual analysis programs that parse texts linguistically to uncover underlying themes.

Understanding the results of analyses usually takes time, whether they are quantitative or qualitative. Use graphs or diagrams to represent relationships among variables or themes if you can.

The analysis usually will include not just description, but also an outline of relationships among themes or variables. Whatever the methodological approach, forming premature conclusions is both a temptation and a trap for researchers, so keep working until you are really sure it is finished. The end step of this research stage is called the 'Findings' or 'Results' section of the write-up, and consists simply of a summary of the results.

Section 5:
Project Completion

Completing the project includes interpreting the findings, forming conclusions, and sharing them. Often, a report or manuscript must be written. Sharing the work with others can be a very enjoyable and helpful component of this stage.

Interpretation

Writing the summary of the findings may feel like it should be the last thing you do on the study. By then, you've been at it for a while! However, even more important is the interpretation of research results. Interpretation begins, inevitably, as data start to come in. It is a process that should usually be guided by the literature and is much helped by conversations with some or all of your:

- Team members
- Colleagues
- Stakeholders
- Administrators
- Other researchers

Writing down emerging understandings and perceptions of the data in your research journal is a great way to start interpretation—making sure important things are not forgotten and initiating the process of writing and reporting.

As a researcher, you may not understand the underlying processes that influenced your results. Often though, your understanding of the results can be deepened by thinking through what might have brought about what you found. Drawing a diagram may help in maintaining a logical flow to your thoughts.

You need to understand your results, as well as to communicate them. Consider:
- How each finding fits with the others, during and after the analysis process. Is there triangulation of results – are the findings from different sources or methods consistent?
- How your findings fit with:
    o Your expectations and research questions.
    o Relevant theory.
    o The literature. Are they consistent with those of other researchers? If not why not?
- How your findings might influence personal practice, and the practice of others.
- The limitations of your design and analysis, and how the limitations affected the outcomes.
- How your findings form the basis of recommendations for future research.

Reporting

Not all research projects require a final report, but many do. Completion of a final report is included in most research contracts; in addition, service contracts often require interim reports on data collection and analysis progress at specified intervals. Even if your project is not bound by a service project, you will doubtless wish to report your results, for example as an academic paper, presentation or posting on a website. The structure, style, and outline of research reporting are approximately the same no matter what the format. The following section is focussed on reporting on service projects. However, the suggestions are pertinent no matter what the purpose of the writing.

Audience

Bear in mind that this final report to the sponsor or funder should be written to that audience; subsequent professional or academic reporting may be quite different. Funders vary in the amount of technical detail that has to be included in final reports. Some prefer the body of the report to be an overview with graphs and diagrams but few technical details such as statistical tables. Others prefer the technical details in the body of the report. Before writing, seek out the preferred style of the funder. You may wish to share in advance an outline of the report, along with a little text, to facilitate mutual expectations. Request details as to special formatting, including the style guide. For example, will the report be published online? Printed? Translated? It is always good to read a few of the reports already published by the funder to get a better idea of the acceptable style. In what format will you provide a summary of your results to the study participants?

Readability

A number one complaint of applied researchers is that people do not read their reports or articles. You can help increase readership by using a reporting structure familiar to readers. Try to make the report as readable as possible. One way to do this is to keep the focus on the research questions as you write about the different parts of the study. Always use the same name for variables, themes or technical terms. Try to avoid unnecessary specialized language and acronyms, and if this is impossible, include a glossary.

Collaboration with your team, colleagues, and stakeholders during the report production period will increase interest in your work. Ask others for input on wording and graphics. Do make the report as visually attractive as possible, using an interesting layout, graphs, diagrams, and possibly art. Try to schedule a meeting (with light refreshments!) to present the report to interested stakeholders. That way you can share the real 'nuggets' and draw people to read the entire report.

Structure

The structure of the report should correspond to the proposal. The report should include an introduction that describes the problem it addresses, a review of the literature, research questions, information about methods and data collection, findings, discussion, and conclusion. The following table contains a suggested outline.

Conclusions

Be careful when you formulate your conclusions. We are all tempted, after months of hard work, to get caught up in our enthusiasm when reporting results. Do not over-generalize your findings. If a finding is small, report it that way. It is an addition to knowledge. If there are negative findings, it is quite interesting to imagine why and important to report. Good research, in fact, often results in ambiguous findings. And sometimes the main finding may well be that more and even better research needs to be done. If you used a theoretical framework, be sure to draw out the theoretical implications of your findings. Your conclusions may have policy implications; if so be sure to explain them and to make appropriate recommendations.

Executive Summary

Reports on contracted research should begin with an executive summary. This section should be written last, often in consultation with the sponsor. It should summarize the main findings and show how they are trustworthy. It should emphasize the applications of the findings to the sponsor and the field.

The final report should not be the final product of the research—more on that in the next section. However, it is a place to explore and explain your research, to document your procedures and to suggest future directions. Writing a clear, logical report sets in place future publication and research for you and others in your field. The report or manuscript is a way to honour the contributions of the participants, study sponsor, and other stakeholders.

Suggested Outline for Research Write-up

Executive Summary
• Needed for contract research
Introduction
• Reasons why the study is important, topic, location in the literature
• Background on the institution and the intervention, if applicable
Review of the Literature
• Identification and explanation of two or three related strands of literature
• Gaps, ambiguities, and inconsistencies in the literature
• Support for the proposed questions and approach
List of Research Questions or Explanation of the Problem
• Clearly articulate the research or define the problem
Methodology and Data Collection
• Discussion of the major methodology
• Data collection methods, instruments, and analytic strategy
• Description of the study setting
• Inclusion criteria for participants
• Sampling scheme
• Description of the obtained sample
• Reliability and Validity measures
• Participation and attrition rates
• Summaries of any screening or pre-test data
Findings
For quantitative data:
• Tables of results—percentages, means, standard deviations, sometimes correlations among variables
• Written accounts or tables showing the results of statistical analyses
• A summary of the findings
For qualitative data, sometimes the findings and discussion sections are merged:
• Identification of the major themes in the data
• Supporting quotes and examples
• Written summaries, often accompanied by diagrams, of the relationships among themes
Discussion
• Internal coherence of the findings
• Consistency with other reports and the literature—how the findings are similar or different from those of other studies
• Implications for practice
• Limitations
• Suggestions for future research
Conclusion

Application and Dissemination of Findings

Evidence-based practice is at the core of many professional and institutional improvement philosophies. You now have some evidence. Perhaps you have already put the ideas derived from your research into effect in your personal practice. If not, now is the time.

Try to maintain the researcher's eye as you do this. If you can, vary the intensity and/or context in which you apply the innovation or change in procedure. If you continue to maintain a journal, document the results in your day to day practice. Now would be a great time to form or join a community of practice, often referred to as a COP, if you have not already. In a community of practice you will meet with and be able to present your ideas to colleagues with similar interests. You will be able to share and refine your insights and begin dissemination of your research findings.

In the preceding sections, the focus has been on how to do research about practices and innovations designed to enhance student success. How can you systematically collect evidence of an innovation's effect on students' learning, engagement with the topics or attitudes toward the field of study? How can you tell if the effects are consistent across students and what conditions are needed? How generalizable are the results?

Generalizability is critically important when encouraging others to use the results. This is particularly true when we think beyond publishing a study in traditional academic journals to consider other modes of knowledge mobilization or knowledge translation and other audiences. Some authorities distinguish between (1) "pushing" information to potential users and (2) responding to "pull" from potential users (for example, practitioners' suggestions of problems that should be researched).

The push approach may include traditional publishing, but can also involve developing products, working with media and social media and/or hosting events. For written products, the Canadian Health Services Research Foundation (CHSRF, 2010) recommends a "1:3:25 rule": create a one-page summary of the main messages (no findings, just the implications) in bulleted form; write a three-page executive summary in plain language, starting with the implications and ending with some of the details; and write a 25-page report (with appendices, if needed) describing clearly and succinctly the context, implications, approach, results, and further research.

For help with academic publishing, researchers turn to colleagues, perhaps in their research group or in the teaching and learning centre. For assistance with other forms of knowledge diffusion, researchers can also turn to their institution's communications staff who will assist in placing news about research in campus and external vehicles, facilitate media connections and help out with social media applications. Before using social media, researchers should check institutional policy and guidelines. Many institutions are developing formal knowledge mobilization programs to connect researchers with research users so as to maximize research impact.

Events may include seminars, workshops, roundtables, conference talks or presentations to administrators. Your professional association doubtless has sessions on pedagogy and/or student services. Some associations specialize in and hold conferences on research on postsecondary education, such as the International Society for the Scholarship of Teaching & Learning (ISSOTL) and the Society for Teaching and Learning in Higher Education (STHLE). The 25-page report you prepare may form the basis for a journal article—go for it! Journals continue to be an important mode of communication among postsecondary educators. A list of journals that publish research on postsecondary outcomes is maintained by Virginia Tech: http://www.cideronline.org/jihe/.

Push and pull approaches are not mutually exclusive. Forming partnerships with potential users may facilitate the ongoing exchange of suggestions and results. Even when such partnerships are not practical or where the needs of potential users were not known before the study was completed, it may be possible to present the results in a way that responds to potential users' needs. For example, do others in your field report student inattention during lectures or find that students struggle with a particular concept? If your study's findings suggest that your teaching approach addresses one of these challenges, you could frame your findings as a response — with an appropriate discussion of the limits of the study's generalizability, of course.

> **Generalizability is critically important when encouraging others to use the results.**

Concluding Thoughts

If you have read this far, thank you! We hope your study thrives and your ideas reach fruition — that you enjoy yourself as you share your findings with others.

As we developed this guide, we were able to reflect on our own experiences of conducting applied social research. We've found it to be interesting, exciting, difficult, somewhat addictive, and extremely rewarding.

We leave you with a little advice:

- be logical,
- be open,
- be true to yourself and the data, and
- have fun!

Appendix A:
Brief Introduction to the Scholarship of Teaching & Learning

Note: This appendix was prepared by Beth Marquis, McMaster Centre for Leadership in Learning

Much of the research this guidebook is designed to support could be understood to fall under the umbrella of the Scholarship of Teaching and Learning (SoTL). The SoTL movement, which continues to grow and develop within higher education settings (Hutchings, Huber & Ciccone, 2011), is often traced back to Ernest Boyer's *Scholarship Reconsidered* (1990), an important text that attempts to address the traditional valorization of research and the concomitant undervaluing of teaching in many postsecondary educational institutions (Healey, 2000; Trigwell & Shale, 2004). In response to this problematic hierarchy, Boyer proposes that the work of higher education professionals in fact involves four distinct but overlapping forms of scholarship: the scholarship of discovery; the scholarship of integration; the scholarship of application; and, the scholarship of teaching (more recently renamed the scholarship of teaching and learning). Each of these scholarships, Boyer argues, must be seen as serious and valuable academic work.

- **Scholarship of Discovery**: inquiry or 'research' in which new discoveries are made through original investigation.
- **Scholarship of Integration:** work that synthesizes and gives meaning and perspective to isolated facts.
- **Scholarship of Application:** work that examines how knowledge can be responsibly applied to consequential problems.
- **Scholarship of Teaching and Learning:** work that examines teaching and learning in a scholarly fashion.

In the wake of Boyer's reformulation, the concept of the scholarship of teaching and learning has been elaborated and refined (Glassick, Huber, & Maeroff, 1997; Trigwell, Martin, Benjamin, & Prosser, 2000). One common strategy has been to define SoTL by distinguishing it from the related concepts of good teaching and scholarly teaching (Dewar, 2008; Vajoczki, Savage, Martin, Borin, & Kustra, 2011). While many argue there are distinct overlaps between these aspects of teaching and learning (McKinney, 2007; Thompson, 2001), the terms nonetheless retain their utility as descriptive categories that can help us to understand what the scholarship of teaching and learning is all about.

Good Teaching

Good teachers are those who are able to foster learning effectively in their students (Kreber, 2002; McKinney, 2007). These individuals demonstrate and exemplify several sound pedagogical practices that have been described in the literature, such as respecting and responding to diverse approaches to learning, providing prompt and effective feedback, setting high but attainable expectations for students, and encouraging cooperation and collaboration between learners (Chickering & Gamson, 1987). While good teachers often engage in institutional teaching development activities and evaluate purposefully their own teaching to make improvements, at this stage SoTL does not usually inform them directly.

Scholarly Teaching

Scholarly teachers are informed not only by feedback on and reflections about their own teaching, but also by research investigating pedagogical approaches and methods of fostering and evaluating student learning in their fields (Allen & Field, 2005; Dewar, 2008; Richlin, 2001). Individuals who are scholarly teachers engage with the scholarly contributions of others, integrate the results of the literature into their own teaching practices, and reflect on the results.

The Scholarship of Teaching & Learning

The teacher engaged in the scholarship of teaching and learning considers a teaching problem as an opportunity for scholarly investigation (Bass, 1999). The teaching and learning environment, broadly defined, is positioned as "a site of inquiry" (Huber & Hutchings, 2005), and questions about students' learning are posed and explored in order to improve one's own practice and to advance the knowledge base. Teachers engaged in SoTL projects frame research questions, systematically gather and explore evidence, reflect on and refine new ideas, and craft the results in a form that is suitable for public presentation and peer review (Cambridge, 2001; Christensen Hughes, 2005). This final step of 'going public' is crucial, as it makes the results of individual inquiries available for others to build upon and to learn from, enhancing the wider profession of teaching in the process (Huber & Hutchings, 2005; Hutchings & Shulman, 1999).

The scholarship of teaching and learning may look different in different disciplines because most instructors think about pedagogical issues within the framework of their own fields. Thus, work in this area can take many forms. Likewise, SoTL work can also involve research questions and/or designs that extend beyond a single classroom, program or discipline (Hutchings, Huber & Ciccone, 2011; Hubball & Clarke, 2010). In all its forms, however, SoTL involves inquiry into teaching and learning in order to improve practice, to enhance student outcomes, and to make findings available to peers. In this respect, it has the potential, if done well, to transform

academic cultures and to make compelling contributions to the field of higher education as a whole (Bernstein 2012; Brew, 2011).

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Glassick, C. E., Huber, M. T., & Maeroff, G. I. (1997). *Scholarship assessed: Evaluation of the professoriate*. San Francisco, CA: Jossey-Bass.

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Hubball, H., & Clarke, A. (2010). Diverse methodological approaches and considerations for SOTL in higher education. *The Canadian Journal for the Scholarship of Teaching and Learning*, *1*(1). Retrieved from http://ir.lib.uwo.ca/cjsotl_rcacea/vol1/iss1/2

Huber, M. T., & Hutchings, P. (2005). *The advancement of learning : Building the teaching*

commons. San Francisco, CA: Jossey-Bass.

Hutchings, P., Huber, M. T., & Ciccone, A. (2011). *The scholarship of teaching and learning reconsidered: Institutional integration and impact.* San Francisco: Jossey Bass.

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Trigwell, K., & Shale, S. (2004). Student learning and the scholarship of university teaching. *Studies in Higher Education*, *29*(4), 523-525.

Trigwell, K., Martin, E., Benjamin, J., & Prosser, M. (2000). Scholarship of teaching: A model. *Higher Education Research and Development*, *19*, 155-168.

Vajoczki, S., Savage, P., Martin, L., Borin, P., & Kustra, E. D. H. (2011). Good teachers, scholarly teachers and teachers engaged in scholarship of teaching and learning: A case study from McMaster University, Hamilton, Canada. *The Canadian Journal for the Scholarship of Teaching and Learning*, *2*(1). Retrieved from http://ir.lib.uwo.ca/cjsotl_rcacea/vol2/iss1/2

In addition to the references above, please see the following SoTL bibliographies, which list much of the key literature in this field.

Healey, M. (2011) The scholarship of teaching and learning: A selected bibliography. Retrieved from http://www.mickhealey.co.uk/wp-content/uploads/2010/10/SoTL-Bibliography2.doc

Hutchings, P., Bjork, C., & Babb, M. (2002). An annotated bibliography of the scholarship of teaching and learning in higher education. Retrieved from http://www.carnegiefoundation.org/sites/default/files/CASTL_bibliography.pdf

McKinney, K. (2010). SoTL bibliography. Retrieved from http://sotl.illinoisstate.edu/resLinks/selBibl.shtml

Appendix B:
Annotated List of Suggested Readings

Theoretical Frameworks for Educational Research

Bransford, J. D., Brown, A. L. & Cocking R.R. (eds); Committee on Developments in the Science of Learning and Committee on Learning Research and Educational Practice, Commission on Behavioral and Social Sciences and Education, National Research Council. (2000). *How people learn: Brain, mind, experience, and school*, expanded ed. Washington, DC: National Academy Press. Available as a download from   http://www.nap.edu/catalog.php?record_id=9853

This publication provides an approachable introduction to cognitive psychology as it applies to teaching and learning.

Svinicki, M. D. (2010). *A guidebook on conceptual frameworks for research in engineering education.* Retrieved May 2012 from http://cleerhub.org/resources/116/download/Conceptual_Frameworks_Revised_2010.pdf

Svinicki provides a detailed and structured summary of the major current theoretical approaches to research in education. Particularly helpful are the questions provided as examples of how to apply theory to educational contexts.

Overviews of Research Methodology

Creswell, J. W. (2009). *Research design: Qualitative, quantitative, and mixed methods approaches* (3rd ed.). Thousand Oaks, CA: Sage.

This book is friendly, accessible, and wise. Creswell is an experienced author and teacher who provides a guide to all phases of social research, from theory of knowledge to writing. Excellent use of checklists and graphics. Probably all social researchers would benefit from reading this book annually!

Gray, G. & Guppy, N. (2007). *Successful surveys: Research methods and practice* (4th ed.). Toronto: Harcourt Canada.

The title belies the breadth of content of this excellent, small, Canadian-authored book. It provides guidance on many aspects of survey (and other) research from purposes, to phrasing threatening questions, to analysis, to writing an executive summary, and more.

Kember, D. & Ginns, P. (2012). *Evaluating Teaching and Learning: A practical handbook for colleges, universities and the scholarship of teaching.* New York: Routledge.

This excellent recent book includes many instruments In their entirety as well as a large item bank.

Mertens, D. M. & McLaughlin, J. A. (2004). *Research and evaluation methods in special education.* Thousand Oaks, CA: Corwin Press.

As the title indicates, this volume is intended for researchers on special education. The authors discuss a broad range of models, and include practical information on research processes.

Ethics

Canadian Institutes of Health Research, Natural Sciences and Engineering Research Council of Canada, & Social Sciences and Humanities Research Council of Canada. (2010). Tri-Council policy statement: Ethical conduct for research involving humans. Ottawa: Authors.

Supporting materials including possible revisions, interpretations, and a tutorial are available at http://www.pre.ethics.gc.ca.

Qualitative Methodology

Creswell, J. W. (2012). *Qualitative inquiry and research design: Choosing among five traditions* (3rd ed.). Thousand Oaks, CA: Sage.

Yes, it's the same Creswell! This classic book dates from the 90s. There are many strengths to this volume—there is special insight into the effects of differing theoretical perspectives on the formulation of research problems. Creswell includes examples of papers from the traditions he identifies. In this new edition, he discusses online data collection and qualitative data analysis (QDA) software.

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Merriam, S. B., & Associates. (2002). *Qualitative research in practice: Examples for discussion and analysis.* San Francisco: Jossey Bass.

Merriam's volume is particularly helpful to those new to qualitative research because of the clear definitions. Merriam includes a model she calls Basic Interpretive Qualitative Research, helpful for applied researchers. A particularly valuable part of this volume is the inclusion of entire papers from the research traditions presented.

Miles, M. B., & Huberman, A. M. (1994). Qualitative data analysis: An expanded sourcebook (2nd ed.). Thousand Oaks, CA: Sage.

This book provides an introduction to qualitative research, and most especially to qualitative data management and analysis. The matrix-based approach to analyzing and displaying data is accessible and has been helpful to many applied researchers. Although published in the '90s the book's age is evident only in recommendations concerning computer software.

Quantitative Methodology

Murname, R. J., & Willett, J. B. (2011). *Methods matter: Improving causal inference in educational and social science research.* New York: Oxford University Press.

This recent volume provides a thoughtful and accessible presentation of theory and practice in designing educational research. It is particularly oriented to providing the evidence for evidence-based decision making.

Tabachnick, B. G., & Fidell, L. S. (2007). *Using multivariate statistics* (5th ed.). Boston: Allyn & Bacon.

Tabachnick and Fidell provide a friendly, yet thorough introduction to multivariate statistical methods. There are many examples that include sample computer output, graphs, and results write-ups. There are a few equations that are explained relatively clearly—understanding them is not necessary in order to follow the text.

Trochim, W. M. K. (2006). *Research methods knowledge base.* Retrieved from http://www.socialresearchmethods.net/kb

This website contains a wealth of information on quantitative research, organized very clearly. A great resource, it is quick to check and accurate. Some information about statistical analysis is included.

Mixed Methods

Creswell, J. W., & Plano Clark, V. L. (2007). *Designing and conducting mixed methods research*. Thousand Oaks, CA: Sage.

Creswell and Plano Clark have written a clear and detailed book on mixed methods research. It contains diagrams and charts to explain various ways of combining the data, along with practical suggestions and checklists.   There is a discussion of quantifying qualitative data to facilitate mixing. Four exemplary studies are included in full.

Teddlie, C. & Tashakkori, A. (2009). *Foundations of mixed methods research: Integrating quantitative and qualitative approaches in the social and behavioral sciences*. Thousand Oaks, CA: Sage.

This thoughtful text includes an account of the history and philosophy behind the development of mixed methods research, as well as extensive 'how to' information and many references.

Case Study Research

Stake, R. E. (1995). *The art of case study research*. Thousand Oaks, CA: Sage.

This is a classic – brief, practical, attractive, interesting, well-written. It includes an example case.

Creswell (2012), and Merriam and Associates (2002) also provide information about case study research.

Action Research

McNiff, J., & Whitehead, J. (2002). *Action research: Principles and practice* (2nd ed.). London; Routledge Falmer.

This is a widely used resource.

Report Writing & Knowledge Diffusion

Canadian Health Services Research Foundation. (2010). *Communication notes: Reader-friendly writing – 1:3:25*. Ottawa: Author.
http://www.chsrf.ca/Migrated/PDF/CommunicationNotes/cn-1325_e.pdf

This brief publication provides helpful hints for clear presentation of research results.

Lavis J. N., Lomas J, Hamid M., & Sewankambo, N. (2006). Assessing country-level efforts to link research to action. *Bulletin of the World Health Organization, 84*(8), 620-628.

The push and pull approaches to knowledge diffusion are presented in this paper.

Appendix C:
Glossary

CIHR
Canada Institutes of Health Research
http://www.cihr-irsc.gc.ca/

CLL
Centre for Leadership in Learning,
McMaster University
http://cll.mcmaster.ca/

HEQCO
Higher Education Quality Council of Ontario
www.heqco.ca

ISSOTL
International Society for The Scholarship of
Teaching & Learning
http://www.issotl.org/

LMS
Learning Management System; Examples
are Blackboard, Moodle, and Desire2Learn

NSERC
Natural Sciences and Engineering
Research Council
http://www.nserc-crsng.gc.ca/

PSE
Postsecondary Education

REB
Research Ethics Board

RFP
Request for Proposal; RFPs are issued by
government and other organizations to
request plans and budgets for research and
other products

SoTL
Scholarship of Teaching and Learning; The
STLHE has recently launched a section of
their website with information on SoTL:
http://www.stlhe.ca/sotl/

SSHRC
Social Sciences & Humanities Research
Council of Canada
http://www.sshrc-crsh.gc.ca/Default.aspx

STLHE
The Society for Teaching and Learning in
Higher Education is a Canadian society
http://www.stlhe.ca

TCPS2
Tri-Council Policy Statement; The statement
regarding research ethics that governs
Canadian practice. The current edition was
released in 2010
http://www.pre.ethics.gc.ca/default.aspx

VLE
Virtual Learning Environment; A set of
technology tools which enable online
teaching and learning, by providing options
for displaying course material, assignments
and assessments, student evaluation, and
virtual discussion spaces