



RESEARCHING TEACHING & STUDENT OUTCOMES IN POSTSECONDARY EDUCATION: AN INTRODUCTION

SUSAN ELGIE



Published by:

The Higher Education Quality Council of Ontario

1 Yonge Street, Suite 2402 Toronto,
ON Canada, M5E 1E5

Phone: (416) 212-3893

Fax: (416) 212-3899

Web: www.heqco.ca

E-mail: info@heqco.ca

Cite this publication in the following format:

Elgie, S. (2014). *Researching Teaching and Student Outcomes in Postsecondary Education: An Introduction*. Second edition. Toronto: Higher Education Quality Council of Ontario.

© Queen's Printer for Ontario, 2014

In memory of

Professor Susan Vajoczki

The Higher Education Quality Council of Ontario (HEQCO) remembers gratefully the central role of Dr. Susan Vajoczki of McMaster University in the creation of the first edition of this guide. Recognizing the need for a resource that would provide an introduction to teaching and learning research for practitioners new to the field, Susan shared with HEQCO a guidebook created by the former Centre for Leadership in Learning at McMaster University. Furthermore, she was instrumental in facilitating collaboration between HEQCO, McMaster and the Society for Teaching and Learning in Higher Education (STLHE). Susan's dedication to enhancing teaching and learning in higher education was remarkable; this guide is evidence of her commitment and vision.



January 15, 2014

CACUSS is pleased to support the second edition of this guide to “Researching Teaching and Student Outcomes in Postsecondary Education.”

The first edition was a useful resource for our members in working collaboratively to understanding academic and co-curricular learning in postsecondary contexts. The guide offers an accessible introduction to the issues and techniques in conducting research and we believe that it is a good resource for student affairs staff who are considering a research project to measure outcomes in their departments, programs, or campus.

Student affairs professionals are involved in various research and assessment projects seeking to understand the student experience. We are asked more and more frequently to provide evidence of how our work impacts student learning, wellbeing, development and success rates. In addition, the need to refine programs, build outcomes-based plans and engage with faculty on academic initiatives to support student success also persists.

We congratulate the authors and collaborators on their work in updating this useful tool.

Founded in 1972, CACUSS is a professional association representing and serving individuals who work in Canadian postsecondary institutions in student affairs and services.

www.cacuss.ca

**Canadian Society
for the Study of
Higher Education**



**Société canadienne
pour l'étude de
l'enseignement supérieur**

November 13, 2013

On behalf of the Canadian Society for the Study of Higher Education I am pleased to endorse the new second edition of *Researching Teaching and Student Outcomes in Postsecondary Education: An Invitation*. The Board of Directors of our Society has reviewed a near-final draft of this new edition and agrees that it is a very logical, clearly written guide for teachers and others who want to conduct practice-oriented research that will ultimately contribute to the improvement of teaching in higher education.

We would like to congratulate Susan Elgie, as well as her collaborators Ruth Childs, Nancy E. Fenton, Betty Ann Levy, Valerie Lopes, Karen Szala-Meneok and Richard Dominic Wiggers, as well as HEQCO, for creating and publishing this valuable resource for practitioners of higher education.

Yours sincerely,

Walter Archer, President

Canadian Society for the Study of Higher Education



STLHE SAPES

Society for Teaching and Learning in Higher Education

La société pour l'avancement de la pédagogie dans l'enseignement supérieur

February, 2014

I am delighted to support HEQCO's collaboration with MIETL, McMaster Institute for Innovation and Excellence in Teaching and Learning, in producing *Researching Teaching and Student Outcomes in Postsecondary Education: An Introduction*. This publication is a valuable introduction that aims to foster inquiry into teaching and learning and to support new researchers interested in this line of scholarship.

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*.

This guidebook continues to be a work in progress, which we hope will be reflected in subsequent editions. We therefore look forward to feedback on areas worthy of further elaboration that would enrich this guide.

I want to congratulate HEQCO on its willingness to continue refining the guidebook. They are fantastic partners that enable our communities to push the boundaries of knowledge and dissemination.

I am confident that this resource will serve as a catalyst for generative discussion and will encourage others to add their contributions.

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

Sincerely,

Arshad Ahmad, President, STLHE
Associate Vice-President, Teaching & Learning, McMaster University
3M National Teaching Fellow

Contents

Preface	vii
Introduction	1
1. Initiating a Research Study	2
Finding a Researchable Question.....	2
Drawing From What’s Already out There	5
Formulating Research Questions.....	6
Some Advice.....	7
2. Study Design	8
Data Sources	9
Methodology in Brief	10
Perspectives on Sampling.....	16
Research as Evidence	18
3. The Ethics of Conducting Postsecondary Research	19
Conducting Human Participant Research	19
Key Ethical Issues.....	21
Advice for Facilitating the Ethics Review Process.....	24
4. Carrying out the Study	25
People and Organizations.....	25
Research Proposals.....	26
Getting Organized.....	28
Data Collection.....	31
Data Analysis	35
5. Project Completion	38
Interpretation.....	38
Reporting	39
Application and Dissemination of Findings	42
Concluding Thoughts.....	44
Appendix A: Brief Introduction to the Scholarship of Teaching & Learning	45
Appendix B: Annotated List of Suggested Readings	49
Appendix C: Glossary	54

Preface

Research on postsecondary education is not new, but there has been a recent upsurge of interest focussing on learning, engagement and other student outcomes. Instructors, administrators and other staff across the postsecondary sector have been investigating a variety of innovative approaches and services, while many institutions, faculties, departments and professional associations have established teaching and learning centres or offices and initiatives designed to help enhance student success. Governments and governmental organizations have provided support for new initiatives and for research projects to evaluate them.

This guide was inspired by an earlier publication from McMaster University, which was further developed by the Higher Education Quality Council of Ontario (HEQCO) and published in 2012 with endorsements from the Canadian Association of College and University Student Services (CACUSS) and the Society for Teaching and Learning in Higher Education (STLHE). This second (2014) edition of the guide is endorsed as well by the Canadian Society for the Study of Higher Education (CSSHE). It is intended to assist researchers and evaluators of postsecondary educational initiatives and outcomes. The objective 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 continuous research on and evaluation of those practices.

The intended audiences for this document include, but are by no means limited 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 focussing on effective teaching, learning and student success.


It is hoped that this document will be of value to those engaged in the Scholarship of Teaching and Learning (SoTL), a cross-disciplinary field of study that encourages the exploration and public discussion of issues and questions about teaching and learning in postsecondary education. SoTL is described in greater detail in Appendix A. Many teaching and learning centres, including McMaster's Institute for Innovation and Excellence in Teaching and Learning, support SoTL by offering modest grants for SoTL research; providing fellowships and other recognition to faculty members who engage in SoTL work; hosting symposia and conferences

for sharing SoTL research; and employing educational consultants and other research methods experts to support work in SoTL.

Encouraging broader use of effective research methods in the assessment and evaluation of student service and teaching and learning initiatives has been of particular interest to HEQCO. HEQCO is an 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 five years, HEQCO has funded nearly 120 evaluations of a wide range of interventions and initiatives designed to promote student learning and success at Ontario colleges and universities. HEQCO disseminates its findings to as broad an audience as possible, and encourages excellence in assessment and evaluation. The continued evolution of this guide is an important part of that effort.

The pages that follow are informed by the previous edition of the guide and recent experiences of researchers at Ontario colleges and universities. Special acknowledgements go to Nancy E. Fenton, Karen Szala-Meneok and Beth Marquis of McMaster; Ruth Childs, Betty Ann Levy and Valerie Lopes, all HEQCO research consultants; and Nicholas Dion and Richard Wiggers of HEQCO for substantial and insightful contributions to the text. Thanks to Amy McIntosh and Catherine Swanson of the McMaster Institute for Innovation and Excellence in Teaching and Learning for assistance with the design and production of this second edition.

The suggestions and support of the many scholars who have been consulted during our review process and at other times, and who have made suggestions about both editions of this publication, were invaluable. It could not have been done without you. In particular we acknowledge the support and input of colleagues from CACUSS, CSSHE, STLHE, HEQCO, the McMaster Institute for Innovation and Excellence in Teaching and Learning, and the University of Toronto's Centre for Teaching Support and Innovation.

 **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 become clear. Appendix B contains a list of suggested readings, many of which are also referenced in the text.

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

This is the second edition of the guide. Please send suggestions or comments for future revisions to researchguide@heqco.ca.

Introduction

If you are reading this publication, you are probably thinking about undertaking a research project on postsecondary student outcomes. You are in an interesting, exciting, and perhaps puzzling situation. With this guide, we invite and encourage you to continue exploring your ideas and vision.

Many situations can motivate a decision to undertake a research project. The impetus can be tiny or huge in scale; can ensue from interactions in a classroom, course or student service intervention; can be face-to-face or online; may be suggested by a theoretical problem; or can stem from departmental, institutional or even provincial policies. People often want to do research in order to collect evidence to support what they or their colleagues are doing in their daily practice. At the early stages of a project, it is sometimes difficult to zero in on an exact question. It is worth spending some time in reflection, playing with ideas, chatting with colleagues and students, and dipping into the literature before finalizing your plans.

This publication is intended to help in the process of conceptualizing, planning and implementing a research project. It is meant as a sort of companion, knowledgeable but not overbearing. For this reason, details of methods are not provided here, but suggestions are made and there are references to authorities on various aspects of research in each section and in the suggested readings in the appendices. As well, there is a fictional companion in Lisa, whose story starts just below and continues through the sections. Lisa's story is a reflection and condensation of the research experience.



In each section, one or two related references are highlighted – a place to look for additional information. Bibliographic details appear in Appendix B.

Lisa is a language instructor at an Ontario postsecondary institution. She has a PhD and research experience in her field, but is a novice when it comes to educational research. When our story begins, she had been following several online blogs about postsecondary teaching and learning to support her personal practice.

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 and for what purposes they are carried out.

Finding a Researchable Question

The questions we choose to pursue in research on postsecondary education often come from situations we encounter while teaching, offering student services, or talking directly with students in other ways. They can also spring from institutional issues such as the allocation of scarce resources, pressures for accountability, adopting innovations, and developments in academic fields. They may come from the general public, internet or the media. Listed below are a few situations that may prompt research ideas, along with a few ideas from our experiences.

Before we get started, keep in mind that there are many stimulating ideas about learning, teaching, student engagement and motivation already available in various publications and websites on postsecondary education and in the press. There is more about how to search through this information a little later in the guide.

Lisa was upset when her department switched from face-to-face to online advising. She worried about the students' well-being and felt out of touch with them. She had a hunch that the web advising interface was especially discouraging to those students who needed help.

Personal Encounters

Every day we interact with students, faculty and administrators. What are your colleagues talking about? What are the students excited about? Motivated by? Wondering about? What kinds of problems do students bring to you?

- For example, students often question the nature of assignments: "Why are you asking us to write a 20-page research paper, rather than three short five-page papers?" What skills are better developed by writing long rather than short research papers?

Students often make comments about issues that you did not expect. It can be a great experience when a student asks a question that you cannot answer.

- Can student comments lead you to a topic? Try to figure out the reasons behind what students are saying and embed them in your research design.

The student body is diverse in a variety of ways, including learning needs, motivations and abilities. If an accommodation to meet a need is not obvious or practical for your situation, a research idea can be born.

- Sometimes the policies regarding accommodations may not be well-grounded by evidence. If you have the opportunity to test alternative approaches, go for it!

Policies

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?

- For example, several HEQCO-funded projects were based on the observation that despite efforts by postsecondary institutions to engage youth in apprenticeships, where they can gain qualifications in skills needed in the workplace and the economy, the dropout rate in apprenticeships is unacceptably high. Research projects have asked: What are the barriers to completion? How can we better support student completion?

Are there aspects of institutional policies, program requirements or curriculum that are supporting students 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?

- For example, you might wonder why so few students access the writing centre, when so many could benefit from the service.

Postsecondary institutions have a myriad of policies. Can you provide evidence to support or disprove the value of one?

- One interesting example would be to question why certain prerequisite courses are required for courses in later years of a program. For example, why is a student required to take an introductory course in psychology before he/she can register in a third-year child psychology course? Would the student without the prerequisite perform worse than a student with it?

Lisa wanted to find out more about how students were responding to the online advising system. She chatted with a few students she knew well. She was unable to make contact with any students who were experiencing difficulties with their studies to ask them how they felt about the new system. She spoke informally to some colleagues and found that some shared her concerns, while others were quite satisfied with the new system.

Practice

How can you determine whether your methods have succeeded or failed in achieving goals that you, your colleagues 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 improving students' experiences?

- For example, might changing the order in which you present the material make a difference to student understanding and learning, and how would you find out if it did?

We are in an age of technological change and new developments in teaching practice.

- For example, a number of HEQCO-funded projects evaluated the success of assignment planners, e-portfolios and clickers. How can new technologies best be used and how does their impact compare with other more traditional methods used to teach the same materials?
- Another HEQCO project is evaluating the “flipped” classroom. Do students learn better when some materials are provided online ahead of class and meeting time is used for discussion?

Accountability

Increasingly, internal and external stakeholders are looking for evidence of successful outcomes of a program or innovation. Well-designed research can bring enhanced credibility to support educational innovations or investments of funds or resources.

Theoretical Models

We must not forget the many decades of cognitive and adult learning research that already exist in disciplines such as psychology, education and sociology. There are large literatures on the processes involved in youth and adult thinking and learning and on social and motivational aspects of learning. These sources can provide a theoretical framework for your study and a basis for hypotheses. Research experts stress the importance of theory in study development.

- For example, a recent HEQCO-funded project examined whether there would be a difference between the outcomes of students working on small group projects using co-operative and competitive frameworks. What are the small group dynamics that determine whether group members will work well together to achieve the group's goal rather than the individual student's goal?



Bransford, Brown and Cocking (2000) and Svinicki (2010) provide helpful overviews of theoretical frameworks from psychology that have been useful to postsecondary researchers.

Drawing From What's Already out There

There are many sources to draw from to justify and develop your question. Sample freely from them; find out from colleagues, professional websites, listservs, blogs, conference presentations or elsewhere about what has already been done or is currently being done. You will need to consult your library and perhaps review some of the references in Appendix B. The ERIC collection (www.eric.gov.ed) has extensive holdings and is easily searchable. Google Scholar (scholar.google.ca) is also useful. Locating a good review of the literature, if you can, is a wonderful way to start your project.

In many cases the information that you are looking for may not be formally published but may be available directly from other scholars or organizations as reports, white papers, or conference presentations. Informal sources such as blogs can be as helpful as published research at this stage.

We have just advised you to read and consult broadly to find support and justification for your research ideas. However, literature and other evidence must be used with care. Search broadly at first and then narrow the scope of 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 focussed and concise.

Lisa searched online and at her institutional library for information on online advising. She was impressed with the volume of results, although not much of the material was directly relevant. She spent quite some time reading a variety of evidence, including the website of the company that provided the online service. She started writing down her ideas in a few sentences, trying to sharpen them with each edit. She also made an appointment with her supervisor and shared her thoughts.

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 your question and then draw from your review of the evidence to find information about your topic, the approaches you will take and the methodology you have selected.



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 can be tested. This is the first step of research design. How can you sharpen the question to specifics that reflect 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). There is usually 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 approach you will use). It is important to phrase your questions in a positive and specific form. An effective project might investigate the effects of a new method or teaching tool in a certain context. For example, does the use of a class study organizer improve student learning outcomes compared with the same teacher presenting the same materials but without the use of the class study organizer? With a clearly stated comparison, either outcome (better or not) is interpretable.

Formulating good research questions is critical because these questions drive the entire research process. They must be specific, not too broad or too narrow, focussed 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 causal assertions or inferences

Based on your objective, think about whether you should begin your question with “how”, “what” or “why”. Think about what might be happening in the situation you are investigating. Take a piece of paper and draw a diagram of the processes you think may be active. 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?



What In other words, is your question “researchable”?

After considerable reflection, Lisa decided that the core issue was to gain a detailed understanding of how students reacted to the advising website. Her objectives were descriptive and also exploratory, since there seemed to be little relevant existing evidence. Her questions were: How do students access and use the advising website? What features enhance and what features detract from their successful use of it?

Some Advice

Don't hesitate to ask for help

Whether among your immediate colleagues, elsewhere throughout your institution, or within the teaching and learning or student services 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 how you are operationalizing your question. 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 or different kinds of questions using social media than 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 that this will not be the last study

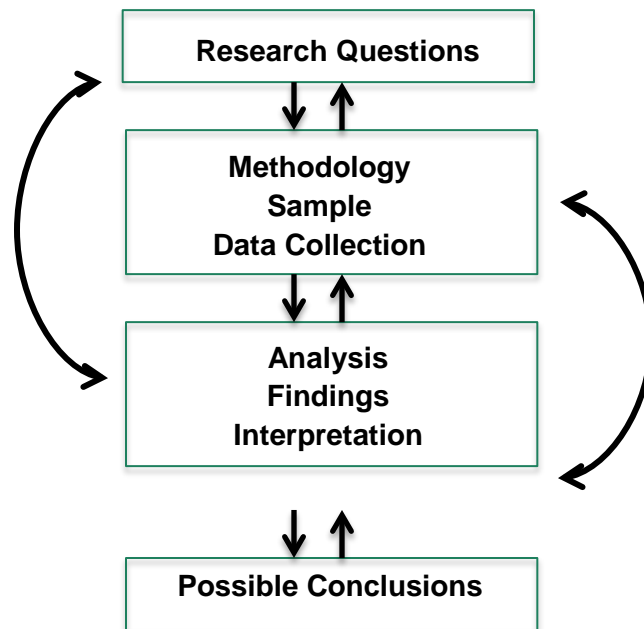
Don't feel tempted to pursue questions that are vague or complex. Break the issue into small bits. You can always plan future projects that go further into the issue once you understand it better.

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.

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. It 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 analyze data that will enable them to find the answers.



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, which focusses 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:

- Applications and admissions
- Courses, grades and credits earned
- Finances (tuition, financial assistance, etc.)
- Course evaluations
- Users of student services
- Co-op and other placements or co-curricular activities

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

Be aware that permission to use these data must usually be obtained from both institutional administration and the research ethics board, especially if public dissemination of the results is planned. Difficulties in using these data may occur because they were not collected originally for research purposes. Data from sources like these 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 different 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 data provide rich information for conducting research on postsecondary participation and outcomes. Simply be aware that considerable time may be needed to organize, merge and reconcile the data in order to answer your question. You will probably need administrative permission, ethics approval and help from institutional administrators to access and use these data.



Considerable time may be needed to organize, merge and reconcile institutional data.

Data Collection

There are many ways to collect data:

- Surveys
- Interviews
- Focus groups
- Observation
- Standardized tests
- Experiments
- Assessment of learning or leadership styles

How to choose? Perhaps the biggest concern is to be sure that methods and tools measure or tap into what you are really interested in learning. A thorough reading of the technical literature on standardized tests and/or careful consideration about constructs or concepts underlying researcher-developed instruments will help to ensure their fit to study objectives. Your review of the literature should uncover information about the reliability and other measurement qualities of instruments developed elsewhere. If developing an instrument in-house, it is essential to pilot test questions and formats with people who are similar to those you will be studying.

When unsure of the measurement quality of their instruments, researchers are often tempted 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 several approaches are possible. Criteria such as the background and experience of the investigator, the nature of the question and acceptance by stakeholders of the approach should be taken into account when deciding. Researchers should not feel bound to use methods advocated in their home fields, but should also consider branching out into the riches available in educational research. A brief overview of qualitative, quantitative and mixed methods methodologies follows.

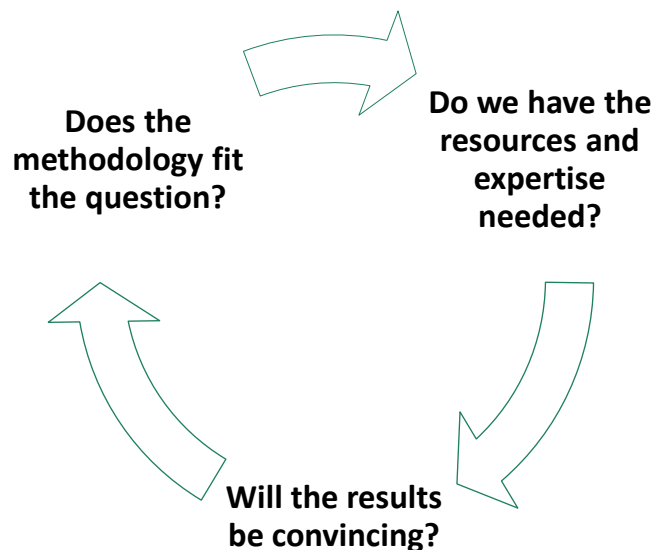
Methodology vs. Method

The word “methodology” refers to the major research approach, usually referring to quantitative, qualitative or mixed methods. The term “method” is used to refer to specific data collection or

analysis methods used within methodologies. There are a multitude of methods: survey, interview, tests, inventories, focus groups, textual analysis, hierarchical linear modeling, and so on. The term “mixed methods” stands out, partly because it is so often used in research on postsecondary issues and partly because it has a confusing name. Due to the history of the field, mixed methods contains in its name the word “method” but is usually thought of as a methodology.

Methods are combined in many ways to become research approaches. We have chosen to highlight just two – action research 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 appropriateness of the methods to the research questions must be primary concerns to researchers. Ethical issues, which we discuss further in Section 3, also need attention from all researchers.



Methodology: the major research approach

Methods: specific ways in which data are collected or analyzed

Quantitative Methodology

There are many ways to collect numeric or quantitative data in postsecondary research including surveys, tests, counts and other forms of measurement. There is a large body of knowledge both on how to collect and how to analyze quantitative data. Quantitative postsecondary researchers often wish to achieve a broad understanding of the student body, perhaps to find out more about student attitudes (for example, their attitude toward Welcome Week) or characteristics (for example, scores on standardized tests). They may survey or test all the students, students of a certain type (perhaps in a specific course), or they may choose some of the students by sampling, discussed in a later section. Possible objectives of a quantitative study of this kind are to study the relationship among variables (for example, hours of study and employment status), longitudinal tracking, or description (did students like Welcome Week?). Other projects are more experimental in nature, wherein the researcher may manipulate an aspect of instruction, for example, to compare test results from students who were taught using different methods. This latter method is called a quasi-experimental design. In some cases, it is possible to infer cause from experimental designs, but it is difficult to do so using survey methods.

Quantitative data are frequently analyzed using inferential statistics, with the objective of confirming findings using measures of statistical significance. While a detailed treatment of this topic is beyond the scope of this publication, some of the resources listed in Appendix B provide further information.



The following sources focus on quantitative methodology: Murname and Willett (2011) and Trochim (2006). Details are included in Appendix B.

Researchers also take advantage of the many ways in which quantitative data can be used descriptively, as percentages or in graphs for example. Quantitative studies may be exploratory or descriptive as well as theory (hypothesis)-driven and deductive.

Before beginning any quantitative study it is important to consider how the resulting data set will be analyzed. The research design must allow statistical testing that addresses the research questions. Unless you are experienced in quantitative methodology, you may wish to consult a colleague or hire a statistician for a few hours at the beginning of the project to ensure that the data collected are appropriate for the planned analyses and study objectives. You do not want to end up with unanalyzable data: it happens!

Things to consider:

- Make sure that appropriate measurement tools are available and that you or your collaborators are knowledgeable of their applicability.

- Make sure that institutional data (if you plan to use them) will be available to you in a form that can be used in your research and in time for your analyses.
- 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, or reading enjoyment.

Qualitative Methodology

There are many qualitative research methods; central to them is the interpretive search for meaning. The data addressed may be text, pictures, artefacts, sound, or video. Most often, qualitative researchers look to the data first and turn to or develop theory once a deep understanding of the data has been achieved. In other words, qualitative researchers may begin with a topic or issue, but most often do not select a theoretical stance in advance of analysis. This way of building up understanding from the data is referred to as an inductive approach. It is quite possible, although less frequent, to use qualitative methods in a theory (hypothesis)-driven or deductive way; this approach is most frequent in research examining practice.

Data from interviews and focus groups, observations and documents are typically in the form of text, although they may also take the form of audio and video recordings, photographs and other data formats. Researchers strive to understand the meanings that study participants have constructed – how they make sense of their experiences in a particular social setting and how they act on their understandings. Qualitative methods often seem quite approachable and even easy; however, complexities may arise from what is often a huge amount of data.

Researchers bring their own experiences and knowledge to the work, yet they need to remain as open as possible to whatever they see and sense in the research process and the data collected. Part of the research process is for researchers to be reflexive or to scrutinize their personal experience 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. While quantitative researchers are expected to take a neutral stance, qualitative researchers are expected to acknowledge and use their personal experience to inform their understanding. It is important to note that there are a number of recognized qualitative approaches (for example, grounded theory, phenomenology, ethnography, narrative inquiry and content analysis). Researchers should identify and learn about the essential elements and assumptions of the approach they are using.

Analysis of qualitative data starts at the very 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 (copied to text files) 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 the underlying meanings. 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 to the context. Occasionally, researchers count incidences of codes or themes in order to facilitate the presentation of findings. However, detailed and rich description is the core of qualitative enquiry. Although there are a number of software packages that can be used for qualitative analysis, the bulk of the insights will flow from reflection on the data by a researcher or team.

Things to consider:

- Identify the qualitative tradition within which you will be working and consult the works of a major authority on it prior to beginning data collection.
- Since qualitative data analysis is very time consuming, collect only what you need.
- Confidential data collection and storage is especially important for qualitative studies.



For more information about qualitative methodology, the following references will be helpful: Creswell (2012), Merriam and Associates (2002) and Miles and Huberman (1994).

Lisa was initially excited by the idea of a student survey that would allow data collection from a wide range of students. She reflected further on the issues she wanted to address. She really didn't know what students did when looking for advice and wondered how she could formulate effective survey questions. She saw the promise of a qualitative study because it might allow a thorough understanding of students' ideas and practices.

Mixed methods

There is a growing literature on mixed methods research, which combines qualitative and quantitative approaches. 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 based on both qualitative and quantitative data; the two kinds of data must truly be mixed and must complement each other.



The texts by Creswell and Plano Clark (2007) and Teddlie and Tashakkori (2009) would be good places to start reading about mixed methods.

Things to consider:

- Do you have or can you access the expertise to carry out both qualitative and quantitative approaches?
- At what point(s) in your project will you blend the approaches?
- Do you really need both approaches, or would you be better to focus your efforts on one or the other?



Mixed methods research is not simply research that is based on both qualitative and quantitative data; the two kinds of data must be mixed and must complement each other.

Research Approaches

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

Case study is a method used in many disciplines, but in postsecondary education research the case is almost always a single social entity such as a study group, a class, a department, or an institution. Case study is often thought of as a qualitative approach, but quantitative and mixed methods case studies are also possible.

Action research in education (sometimes called practice-based inquiry) stems directly from teaching practice. It starts from the needs and problems of classroom participants. Usually the action researcher is an instructor or student service provider who uses reflective self-inquiry, data collection and analysis, sometimes along with students, to study techniques implemented in practice. 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 practice.

Research Quality

All researchers surely have the intention of carrying out “good” research. How we discern and describe good research varies according to the research area and methodology used. Quantitative researchers often use the term “validity” as a way to talk about whether measures used in the study tap intended constructs, and “reliability” to talk about the consistency of measurement. Qualitative researchers may also use these terms, or may refer to “trustworthiness” and “credibility”. To increase the likelihood of carrying out a study of high quality, researchers should familiarize themselves with the literature associated with their chosen methodology and apply suggested research procedures rigorously.

In the end, Lisa settled on a qualitative design, centred on data collected by observing and listening to students as they used the website and described their reactions and reasoning while they proceeded through the menus (a method called “think aloud”). A brief interview would provide supplementary demographic and personal information.

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 statistically significant findings and thus the persuasiveness or generalizability of the results – depends on the size and nature of the sample. The contribution of sampling 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 the 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 McLaughlin (2004) provide an overview of both qualitative and quantitative approaches.

In addition to 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, as 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.

The generalization of results is limited to samples from the population under study. For example, when we study undergraduate student learning in a particular postsecondary institution, the outcomes may not generalize to other adult populations that are not made up of postsecondary students or graduates, or to other institutions.

Purposive sampling

Most often, researchers with a qualitative perspective use purposive sampling. The goal here is to choose a site or situation that will yield the most information about the issue or topic under study. 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) of the population, but to collect data from diverse perspectives. (Simply identifying perspectives of interest may take considerable preparatory time in the field.)

Random sampling

Researchers using a quantitative perspective often wish to select a random sample from whatever population is of interest. Random choice typically (but not necessarily) 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 through which 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.

Lisa estimated that she would need data from 16 to 20 students, all currently enrolled at her institution. At first, she thought she should sample randomly because she wanted to ensure a diverse group. She wanted data from students with varying ability levels, year of study, computer skills and gender. After consulting a research methods text, she realized that a random sample might not result in the variability she wanted. For that, she would need to sample purposively.

Snowball sampling

Snowball sampling is a non-random method of gathering respondents through which respondents recruit further respondents from among their acquaintance. Although convenient, and invaluable in the study of people with hidden or discredited characteristics, snowball sampling is not usually recommended for other topics due to the probable selection bias.

Sampling and research methodology

Sampling for qualitative research may seem simpler than for quantitative, since qualitative design evolves throughout data collection and sampling continues until data “saturation” is reached – that is, until the researcher feels that collecting more data would not add to the results. Both quantitative and qualitative researchers need to pay attention, though, to how unplanned selectivity in participation and dropout 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 the qualitative and quantitative data collection. It is important when planning the sampling to think about how you plan to integrate the two kinds of data. You may well wish to create a particular relationship between the samples; for example, you might want the qualitative sample to be a subsample of the quantitative.

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



Sampling for mixed methods studies will be different and perhaps separate for the qualitative and quantitative data collection

Random assignment

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

Research as Evidence

Most researchers of postsecondary education are interested in studying how to improve 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 who receive the program for some periods of time but not for other periods. 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 administrators, practitioners and other consumers of the research may hold.

3. The Ethics of Conducting Postsecondary Research

When it comes to research on humans, there are a number of ethical issues that researchers may encounter. It is important that you consider ethical implications throughout your project, beginning with the planning and implementation stages. We encourage you to contact your institution's research ethics board to learn more about their requirements and processes.

Conducting Human Participant Research

Three federal research funding councils – 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) – developed the policy on ethics concerning research with humans. Postsecondary institutions throughout Canada have adopted the 2010 Tri-Council Policy Statement: *Ethical Conduct for Research Involving Humans* (TCPS2) as the core human research ethics guideline. The Tri-Council Policy covers the ethical conduct of all faculty, postdoctoral 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 at 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 its jurisdiction. Though these boards all adhere to the Tri-Council Policy, there may be variations among institutional boards in terms of ethics education opportunities for researchers, application forms, submission deadlines, requirements and procedures.

The research ethics 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 make adjustments to their research so they can protect their participants and reach their research goals. Each institution's ethics board makes decisions independently, so different institutions may make somewhat inconsistent rulings. It is important to familiarize yourself with your own institution's research ethics board and its procedures in advance of preparing your materials – locate and visit its website or arrange a consultation.

Instructional Practice

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



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 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 for studies with low risk, while full board reviews (which are less frequent) 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 members of the research ethics board are usually active researchers and professors or volunteer professionals.

Lisa was not sure whether she would need to go through an ethics review of her project. She wanted to share the results of her study with her colleagues, on her blog and later at a conference. She looked at the website of her institution's research ethics board. It seemed pretty clear that she would need a review and the process was explained, but just to be on the safe side, she made an appointment with a representative of the board. She found out that the process would take a few weeks, longer than she had expected. She would have to defer her plan until the following term.

Key Ethical Issues

The following are issues that may arise in research on postsecondary outcomes. Because each institution's research ethics board operates independently, you need to contact your institution's ethics board for assistance in identifying and resolving ethical questions that specifically affect your planned research.

Roles and Power Differentials

A key ethical issue in educational research stems from the dual role played by an instructor, service provider or teaching assistant who is also a researcher. Those who conduct research in classes or student service settings should think through the power differentials in the relationships they have with students. Power-over relationships can influence how comfortable participants feel in declining invitations to participate in research or in 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.

As a rule, an instructor should *not* take an active role in research involving her or his course until after the course is over and final marks have been submitted. Often an instructor will have another person – a research mediator, who may be a colleague, staff member, or a more senior student – discuss the study with the students in the course and hold any consent forms or other information about participation until after the marks have been submitted. This person or a research assistant should have interim responsibility for collecting, storing and possibly undertaking preliminary analysis of surveys, interview recordings, or other instruments collected from participants. Once marks are submitted, the instructor may resume an active role as a researcher in the study.



An instructor should *not* take an active role in research involving her or his course until after the course is over and final marks have been submitted.

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

Lisa decided that she would need to hire one or two research assistants to carry out, anonymize and transcribe the recordings of the student think-aloud data since she would be acquainted with many of the students. She did not want any misunderstandings about her usual role.

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 to comply with institutional policies and collective agreements 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.

Vulnerability and Risk

According to the Tri-Council Policy, the risks associated with the project are greater when respondents are vulnerable either as individuals or due to their membership in groups or categories. The term “vulnerability” refers to diminished capacity for self-determination. Issues of group vulnerability might involve physiological needs (e.g., service dependence), cognitive/emotional qualities (e.g., very young or old in age, diminished emotional or intellectual capacity, recent trauma) or social characteristics (e.g., stigma, covert, undocumented) characteristics. Research risks increase with the invasiveness of methods, sensitivity of data, cognitive/emotional load (increased stress or anxiety) and social repercussions (e.g., dismissal, reporting, subpoena). The greater the vulnerability of respondents and the riskier the methods, the more stringent the requirements of the research ethics board should be.

Participant Burden and Consent

Students enrol 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 on the primary purpose of learning and, indeed, may wish the research to complement the learning experience. It may be that much of the required data can be collected from activities that support the learning in the course. In such cases, students do not need to give informed consent to participate in the activities because they are already part of the course. However, the students must be asked to give consent for their responses or results to be used subsequently in the research.

Sometimes, the research requires data that are not connected to regular course activities. In this case, students must give informed consent both to participate in the activities (e.g., complete an attitude survey, take part in a focus group) and for the responses to be used in the research. It is also important to note that the Tri-Council permits small amounts of course credit to be given for extra activities, but requires that students also be given an alternative way to earn the credit so that they do not feel pressed to participate in the research. In this case, the awarding of credit must be handled very carefully, with the help of a research mediator, in order to ensure that the course instructor does not learn before the final marks are submitted which students are participating in the research and which are not.

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 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 after class to talk about the study. If your institution has an online learning management system (LMS) or a virtual learning environment (VLE), a flyer, a letter of information or a brochure can be posted there so students can easily access information about the study outside of class. Recruitment pathways and consent processes are subject to institutional and research ethics board policies.

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 as intense and potentially rewarding as, but different from, that of the experimental treatment group and the benefits are distributed over both groups.

Confidentiality of Student Consent

Due to the dual role of the instructor or service provider/researcher, students might be concerned that their professor or teaching assistant (who might actually have more contact with the student) will know whether or not they took part in the research. Measures must 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 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. Information on students' academic performance at an institution is produced to evaluate the student's mastery of their program of study. Accordingly, the researcher must obtain permission from student participants to use these data for a secondary purpose, such as research. Of course, obtaining research ethics board clearance to use students' data does not compel the holder of the data, such as the registrar, to provide you with the data requested. Data that are anonymized are typically less subject to ethics restrictions than data that retain identifiers.

Data Security

Instructors already have a duty to ensure that their students' grades, assignments and accommodation needs remain confidential. The service provider or instructor/researcher must also demonstrate to participants and to the research ethics board that care is being taken to protect the privacy of the student participants and the confidentiality of their data. At a minimum, data that are 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. For additional security, many researchers encrypt computer hard drives, a requirement of some ethics review boards. Data sources, which may include identifying information, should be distinguished from data sets, which should be cleaned of markers. Anonymized data sets are often kept indefinitely. However, data sources with identifiers ought to be stored securely for a defined period of time and subsequently destroyed.

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 or suggestions the committee might have. The research ethics application process is usually relatively short when compared to other research tasks, but it can seem long because it is at the beginning! Working backwards from the date you want to begin collecting data and leaving enough time for the entire ethics review process are two simple effective ways to make the process easier.

If your project will have co-investigators at several institutions, each investigator should contact his/her institution's research ethics board early to determine their requirements and timelines. Ethics boards at different institutions will not necessarily make consistent decisions.



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

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 and of supporting documents and 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 there are plans for any ethics education events. Some ethics 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 do not have these materials posted, they might have samples they can send to you if you ask.

4. Carrying out the Study

The reality is that even before planning is complete, you need to start implementation. 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 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 plan 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 study design is being completed so that each collaborator knows his/her role and what data each will have access to for specific purposes. You might also have collaborators from other institutions or from within your own institution who are willing to provide their expertise or even help you find study participants. Again, get these commitments early and develop processes to 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.



Focus Choose an experienced researcher to act as mentor.

Choose collaborators from your own or other institutions.

With her research plan almost complete, Lisa scheduled another meeting with her supervisor, who liked her ideas and provided a few tips as well. Next, she presented her plan to her colleagues at their regular monthly meeting and received several helpful suggestions. Also, she arranged for two project advisers, one a student and one a colleague, to provide ongoing advice.

Stakeholders

Think about other project stakeholders and how they can help you refine and develop your conceptualization and/or carry out the study.

Possible supportive stakeholders:

- Colleagues,
- Students,
- Teaching assistants,
- Administrators,
- Government organizations,
- Librarians,
- Educational research consultants,
- Publishers.

Stakeholders can provide you with:

- access to research locations,
- specialized knowledge,
- “real-life” perspectives,
- funding,
- assistance with research tasks,
- a sounding board, and/or
- a way to continue the work past the project’s end in follow-up studies.

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. 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 attract the interest of 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 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 from other sources. Provincial or federal government ministries and agencies (such as the Higher Education Quality Council of Ontario (HEQCO)) might also consider funding your research.

Some agencies issue requests for proposals (RFPs) when they are interested in a specific research area. In any case, you will probably need to write a proposal in order to obtain funding.

On the advice of her supervisor and colleagues, Lisa applied for internal funding, both to the administration's small-scale funding competition and also to the student society for a small amount. Fortunately, both applications were successful.

Proposals for service contracts (e.g., in response to a request for proposals (RFP)) differ from regular research funding proposals. Organizations issue RFPs to address a specific need, and may 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.

Proposals typically 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 contributions to the field
- A timeline and budget
- A description of the research team

For more details on what might be contained under these headings, 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 foreshadows 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.

Getting Organized

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

Tasks that will need attention:

- Finalizing the research team,
- Refining the details of data collection methods,
- Making administrative arrangements,
- Obtaining ethics clearance, and
- Scheduling.

Campus Resources

Take time early on to connect with the teaching and learning centre, research office, library and ethics office. Do this – it will make your tasks easier! Such centres and offices have resources that would ease the considerable time commitment required of an individual researcher.

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) – this often 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 those 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.

Lisa drafted a job description for a research assistant position and met with the campus human resources office, which created a job posting. A few weeks before project start-up, she hired two graduate students from a different campus to work on the project on a very part-time basis. Later, she set up training sessions for them, including a joint meeting with a specialist in the think-aloud method.

Work Plan

Many researchers develop a formal work plan early in the project, often in tabular format. Column headings can be created 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 his/her tasks.

Here is an extract from an actual 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 and/or admin staff	Really the same. We need to understand what the Coordinators actually do. Need to follow up re interview with Director	Principal Investigator (PI) will follow up.	May 21 week MUST FINISH
Interview protocol for students	(a) for students taking course (b) for students through association	Research Assistant (RA)	Mid May
Interview questions for organization X	This will 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 4 th 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 how the database of contacts is coded.	THIS IS ON HOLD!!	
... AND THERE WOULD BE MUCH MUCH MORE!			

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. Bishop-Clark and Dietz-Uhler's book is excellent on study processes.

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 to identify the appropriate expertise if necessary. The instruments must be complete before ethics submission.

Take a look at the literature or the test manual to double-check the reliability of measures developed elsewhere. Review with your colleagues any instruments or questionnaires you may be developing in-house and plan to pilot test them with people similar to those who will be participating in the study – even taking a look at possible analyses ahead of time. In other words, make sure that the instruments really measure what you want to measure, that interview or focus group scripts tap constructs you wish to explore, and that your data collection and analysis methods will be robust. 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 for project staff to pilot test them. Your time and the time of respondents and study staff are too precious to waste!



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 for project staff to pilot test them.

Training and Expertise

Whether your assistance comes from students or staff, you may need to arrange specialized training for them. Some standardized tests and inventories require trained testers.

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 “Research Methodology” or “Research Methods” centres or services with staff who can help. Check to see if there is a schedule of research methods workshops offered at your institution.



Think about consulting a research methods specialist at initial stages of study implementation.

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 least expensive way 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.

Research Journal

A very important point is 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 will benefit from keeping one.

Lisa had started a research journal when she wrote the proposals and kept a record in it of all sorts of happenings, including reactions and suggestions from others as she negotiated for the funds and expertise she needed. She found that people's ideas were very helpful and that writing them down helped to focus her thoughts.

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 wish to participate. Selection bias is a danger with snowball samples.

Sampling for quantitative studies can be more challenging. Sometimes there is no need to sample, for example when a survey of all students in a class is undertaken. In other cases, it is most comfortable to include all participants who volunteer for the study. However, it is usually desirable to draw a randomly selected sample in order to reduce cost and increase the generalizability of the results. Before sampling, you need to decide how many participants you need. Statistical power analyses can be used for guidance.

In concrete terms, a way to draw a random sample when the population is small is to write ID numbers or names on pieces of paper, place them in a hat or bowl, mix them up carefully and choose the needed number of slips. This procedure, so easily understood, is usually not practical. Rather, a list of everyone eligible is drawn up in a computer spreadsheet. Before selecting the sample, you need to calculate the fraction or percentage of the total that is needed. You can use software to create a list of random numbers and choose accordingly. If this process seems rather daunting, you might do an internet search for hints or perhaps consult with a colleague or statistician for help.

Selecting possible participants is only the beginning. Refusal to participate and study dropout are huge challenges for postsecondary education researchers. It is reasonable to plan for a participation rate of only 33%, and for a dropout rate 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!



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

Recruitment of Participants

Recruitment and retention of participants in postsecondary research projects can be greatly eased with careful planning.



Cyr, Childs and Elgie (2013) provide a helpful resource on recruiting participants.

In a HEQCO publication, Cyr, Childs and Elgie (2013) describe the multiple steps in a student's decision to participate in research. They must:

- receive the participation request,
- read or listen to the request,
- want to participate,
- have the time to participate, and
- be able to access the survey or schedule participation.

If a student fails to complete any step, he or she is unlikely to participate. Accordingly, researchers need to plan strategies at several stages of the research. The way in which students are asked to participate is important, including the mode of communication, source, timing and clarity of the request. The kinds and amount of effort requested of respondents affect rates of consent. In addition research may be more or less attractive to students according to the rationales given for the importance of participation, material incentives and the social context in which the request is made. Finally, participation rate is affected by how easy it is for students to respond.

A tip sheet on recruitment strategies suggested by current researchers appears on the following page. Bear in mind that it is typically a biased rather than a representative sample of students who agree to participate in and who remain part of a research project. You will want to tailor recruitment activities accordingly to attract those students who are least likely to participate. Of course, recruitment strategies should also be cleared by your research ethics board.

Scheduling data collection around participant and institutional schedules, while simultaneously meeting research needs, can be tricky. If you are using a pre-post design, it is important to administer the pre-test at the very beginning of the term, since changes in knowledge and attitudes may happen very quickly. The post-test can be administered close to the end of the 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. Be aware of any special times when institutions may be unwilling for you to conduct research, such as the period during which course evaluations or institution-wide student surveys are distributed.

It was hard to figure out how to locate a suitably diverse group of students and also to persuade them to commit to the study. Lisa decided to work through the student society and made a presentation at one of their regular meetings. Together, she and the association executive decided to place a recruitment message on the association website and email newsletter. Lisa stressed in her presentation and messages the importance that the study might have in improving the student experience. She did not offer a personal incentive to participants other than a snack and beverage after completion of the study task. One of the research assistants handled all communications with study participants.

Tips to Encourage Student Participation in Research

Incentives
<ul style="list-style-type: none"> • Food • Draw for prizes • Small education-related item, e.g., pen, pencil, school t-shirt • Gift certificate or small honorarium
Mode of Communication
<ul style="list-style-type: none"> • Make personal visits to classes • If email: <ul style="list-style-type: none"> ○ 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 • Embed the consent form in several media: e.g., flyer, website, email
Content of Communication
<ul style="list-style-type: none"> • 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
<ul style="list-style-type: none"> • 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
<ul style="list-style-type: none"> • Keep the data collection short – few questions on few occasions • Consider giving participants their results with feedback • Use paper rather than online survey • Use institutional data whenever possible
Scheduling
<ul style="list-style-type: none"> • 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 for 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, tests or observation sheets, will need to be entered by hand into a spreadsheet or online survey software. Be aware that some institutions

and researchers prefer not to use online survey software due to privacy concerns. Your research centre will be able to advise you on an appropriate choice.

Audio or video recordings present some special challenges. With current technology, it is quite possible to code and analyze recordings directly. However, revisiting the data requires as much time as the original data collection, and as a result the majority of researchers choose to transcribe the data (that is, type the words spoken into a text file). Transcription has other advantages, such as helping researchers with recorded voices that are difficult to hear or understand. Transcription enables the use of text searches and qualitative data analysis software (e.g., NVivo or MaxQDA). Transcription itself can be costly and time consuming – estimates of the time required for transcription 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 to filter the data. Some researchers listen to the complete recording and identify by minute and second those parts of the recording that need transcription. 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 only research team members have access. (Some ethics boards require that computers be encrypted.) Someone should keep track of data as they come in, using 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 for someone to check the quality of incoming data – it would be unfortunate to continue using a malfunctioning recorder. Also recommended is use of a systematic file naming and directory system to facilitate easy data retrieval. Create a special section of your research journal to record details.



Keep track of data as they 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, or SPSS, R, 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 by using estimation techniques. Descriptive statistics and graphs should be produced in order 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), Tabachnick and Fidell (2012) or Trochim (2006).

For assistance with the more technical tasks, you may wish to engage a statistical consultant to plan for and/or complete the analysis.

For qualitative data, the analysis methods are quite different and often begin during the process of transcribing the data. Coding is central to most qualitative analyses and involves assigning names or “codes” to segments of data in order to identify themes. As data are read and re-read, the meanings of the codes are elaborated. Researchers often develop coding schemes or lists (called rubrics by some) to facilitate accurate and consistent data coding. Identifying themes and understanding how they are related require repeated encounters with the data and considerable time for reflection away from the data. It should be noted that a minority of qualitative researchers do not follow the path just described of working “up” from the data, but rather code the data according to a pre-existing theoretical framework.

Researchers working in teams benefit from regular meetings to review coding. Meetings are especially effective if each team member has coded some of the same data in advance. Coding meetings help to increase consistency and to clarify the meaning of codes as well as coordinate other aspects of the project. It is sometimes desirable to add a step once coding is complete 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 needed for understanding themes and inter-relationships among them. Some researchers use textual analysis programs that parse texts linguistically to uncover underlying themes.



Miles and Huberan (1994) are useful companions to qualitative researchers.

The research assistants recorded the sessions with students and subsequently transcribed their recordings. The transcripts contained no identifying information, but demographic and non-identifying personal data were attached. The team assigned pseudonyms to participants for confidentiality and also so that the team could easily refer to particular transcripts. Since the data were anonymous, Lisa was able to participate in the ongoing analysis. The campus had a site license for a qualitative software package, which the research team used. It was helpful, but ultimately they found that their most fruitful insights came during regular meetings to discuss coding.

Whether they are quantitative or qualitative, understanding the results of analyses takes time. 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. Some researchers find mind mapping software very helpful in understanding and describing relationships among constructs or themes. 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 last step of this stage of the research is to write the “Findings” or “Results” section of the report which consists of an account of the results of the analysis.

5. Project Completion

Completing the project requires interpreting the findings, forming conclusions and sharing them. A report or manuscript is often written; in other cases it may be more appropriate to make presentations or summaries of the findings. Sharing the work with others is usually enjoyable, and is a helpful and important component of the project.

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 and/or 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. Still, your understanding of the results can be deepened by thinking through what might have led to what you found. Drawing a diagram either on paper or with software may help in maintaining a logical flow to your thoughts.

You need to understand your results, as well as to communicate them to others. Consider:

- How each finding fits with the others both during and after the analysis process. Is there triangulation of results – that is, are the findings from different sources or methods consistent?
- How your findings fit with:
 - your expectations and the research questions
 - relevant theory
 - the literature. Are the findings consistent with those of other researchers? If not, why not?
- How your findings might influence your own future practice and the practice of others.
- The limitations of your design and analysis, and how the limitations may have affected the outcomes.
- How your findings may 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 contract, you will doubtless wish to report your results, for example in 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 based around reporting on service contracts. However, the suggestions are pertinent no matter what the purpose of the writing.



Booth, Colomb and Williams (2008) provide very helpful guidance on organizing and writing reports.

Audience

Bear in mind that the 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 is expected in final reports. Some prefer the body of the report to be an overview of the project, with graphs and diagrams but few technical details such as statistical tables. Others prefer the technical details to be included in the body of the report. Before writing, find out the preferred style of the funder. You may wish to share an outline of the report in advance, along with a little text, to facilitate shared expectations. Request details about special formatting, as well as the style guide if available. For example, will the report be published online? Printed? Translated? It is always a good idea to read a few of the reports already published by the funder to get a better idea of the acceptable style. Consider how you will provide a summary of your results to the study participants as well.

Readability

A recurring complaint of applied researchers is that no one reads their reports or articles. You can help increase interest by choosing a vivid descriptive title and by using a reporting structure that is 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 or 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. Make the report as visually attractive as possible by using an interesting layout, graphs, diagrams and possibly art. Try to schedule a meeting (with light refreshments!) to present the completed 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, where applicable. The report should begin with an introduction that includes a description of the underlying educational problem addressed in the study. Next, it is usual to include a review of the literature, research questions, information about methods and data collection, findings, discussion and conclusion. The table on the following page contains a suggested outline.

Conclusions

Be careful when you formulate your conclusions. After months of hard work, we are all tempted 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 this is the case, and it is important to report your findings and your thoughts. 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, explain them and make appropriate recommendations.

Executive Summary

Reports on contracted research should begin with an executive summary. Somewhat longer and more comprehensive than an academic abstract, 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.

Lisa asked the research assistants to prepare summaries of the major themes of the research. After that, it was up to her to interpret the findings and make recommendations about possible changes in the advising website. She created a draft report and circulated it for suggestions to the research assistants, her supervisor, project advisers and a couple of colleagues. Her report to both funding sources contained considerable description of the results, including a diagram of relationships among themes and screenshots to illustrate her points. She presented some reflections in her blog.

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 lays the foundation for future publications 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
<ul style="list-style-type: none"> • Needed for service contract research
Introduction
<ul style="list-style-type: none"> • Topic, reasons why the study is important, major related literature • Background on the institution and the intervention, if applicable
Review of the Literature
<ul style="list-style-type: none"> • 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
<ul style="list-style-type: none"> • Clearly articulate the research or define the problem
Methodology and Data Collection
<ul style="list-style-type: none"> • 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
<p>For quantitative data:</p> <ul style="list-style-type: none"> • 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 <p>For qualitative data, sometimes the findings and discussion sections are merged:</p> <ul style="list-style-type: none"> • Identification of the major themes in the data • Supporting quotes and examples • Written summaries, often accompanied by diagrams, of the relationships among themes
Discussion
<ul style="list-style-type: none"> • 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 conduct 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 necessary for the effects to take place? How generalizable are the results?

As you are writing the final report and continuing to apply and perhaps develop an innovation, you will want to share your findings with others orally or in writing. You might begin with an informal presentation to close colleagues before proceeding to a larger-scale presentation within your institution and next to a conference presentation. As the audience grows broader, your presentation will probably become more formal. You may wish to start by publishing an informal article in the department newsletter or a blog post before you proceed to a formal journal publication.

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 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) clearly and succinctly describing the context, implications, approach, results and further research.

For help with academic publishing, researchers can 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 publications, facilitate media connections and help out with social media distribution. 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 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 Canadian Society for the Study of Higher Education (CSSHE), the Society for Teaching and Learning in Higher Education (STHLE) and the International Society for the Scholarship of Teaching & Learning (ISSOTL). 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 and researchers. A list of journals that publish research on postsecondary outcomes is maintained by Virginia Tech at <http://www.cideronline.org/jihe/>.

Lisa presented her results to her department colleagues and the student association executive. Both presentations were helpful and interesting. She met with staff at her institution's computer services department for discussions about how to increase the effectiveness of the advising website. She applied to a postsecondary conference to present a paper on part of her findings, having obsessed about choosing a snappy title, and is waiting to see if the application is accepted.

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 when 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.



Many institutions are developing formal knowledge mobilization programs to connect researchers with research users so as to maximize research impact.

Concluding Thoughts

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

As we developed this guide, we reflected on our own experiences of conducting applied social research. We have 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 adapted by Beth Marquis, McMaster Institute for Innovation and Excellence in Teaching and Learning (MIETL) from a previous version by Nancy E. Fenton.

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 valuing of research and 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 applied responsibly 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 that 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, SoTL does not usually inform them directly at this stage.

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).

References

- Allen, M., & Field, P. (2005). Scholarly teaching and scholarship of teaching: Noting the difference. *International Journal of Nursing Education Scholarship*, 2(1), 1-14.
- Bass, R. (1999). The scholarship of teaching: What's the problem? *Inventio*, 1. Retrieved from <http://doit.gmu.edu/archives/feb98/andybass.htm>
- Bernstein, J. (2012). Defending our life: The scholarship of teaching and learning in an academy under siege. *International Journal for the Scholarship of Teaching & Learning*, 6(1), 1-5. Retrieved from http://academics.georgiasouthern.edu/ijstl/v6n1/invited_essays/Bernstein
- Boyer, E. (1990). *Scholarship reconsidered*. Princeton, NJ: Princeton University Press.
- Brew, A. (2011). Higher education research and the scholarship of teaching and learning: The pursuit of excellence. *International Journal for the Scholarship of Teaching & Learning*, 5(2), 1-4. Retrieved from http://academics.georgiasouthern.edu/ijstl/v5n2/invited_essays/Brew
- Cambridge, B. (2001). Fostering the scholarship of teaching and learning: Communities of practice. *To Improve the Academy*, 19, 3-16.
- Chickering, A. W., & Gamson, Z. F. (1987). Seven principles for good practice in undergraduate education. *AAHE Bulletin*, 39(7), 3-7.
- Christensen Hughes, J. (2005). Improving the quality of teaching and learning in higher education through the development of a framework for supporting the scholarship of teaching and learning in Canada. Unpublished position paper.
- Dewar, J. M. (2008). An apology for the scholarship of teaching and learning. *Insight: A Journal of Scholarly Teaching*, 3, 17-22.
- Glassick, C. E., Huber, M. T., & Maeroff, G. I. (1997). *Scholarship Assessed: Evaluation of the professoriate*. San Francisco, CA: Jossey-Bass.
- Healey, M. (2000). Developing the scholarship of teaching in higher education: A discipline-based approach. *Higher Education Research and Development*, 19(2), 169-189.
- 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, CA: Jossey-Bass.
- Hutchings, P., & Shulman, L. S. (1999). The scholarship of teaching: New elaborations, new developments. *Change*, 31(5), 10-15.
- Kreber, C. (2002). Teaching excellence, teaching expertise, and the scholarship of teaching. *Innovative Higher Education*, 27(10), 5-23.

McKinney, K. (2007). *Enhancing Learning through the Scholarship of Teaching and Learning*. Bolton, MA: Anker Publishing.

Richlin, L. (2001). Scholarly teaching and the scholarship of teaching. *New Directions for Teaching and Learning*, 86, 57-67.

Thompson, S. B. (2001). Tutorial on the scholarship of teaching and learning (SoTL). Retrieved from <http://www.issotl.org/SoTL.html>

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. (2013). The scholarship of teaching and learning: A selected bibliography. Retrieved from <http://www.mickhealey.co.uk/?wpdmact=process&did=Ni5ob3RsaW5r>

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 edition). Washington, DC: National Academy Press. Available to 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 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.

General Works on Research Methodology

Bishop-Clark, C., & Dietz-Uhler, B. (2012). *Engaging in the Scholarship of Teaching and Learning: A guide to the process, and how to develop a project from start to finish*. Virginia: Stylus Publishing.

The authors provide friendly and knowledgeable guidance for SoTL researchers new to educational research.

Creswell, J. W. (2013). *Research Design: Qualitative, quantitative, and mixed methods approaches*. 4th 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. 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 and 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. (2013). *Qualitative Inquiry and Research Design: Choosing among five approaches*. 3rd ed. Thousand Oaks, CA: Sage.

Yes, it's the same Creswell! This classic book dates back to 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 edition, he discusses online data collection and qualitative data analysis (QDA) software.

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

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

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

Murnane, 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. (2012). *Using Multivariate Statistics*. 6th ed. Boston, MA: 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. (2011). *Designing and conducting mixed methods research*. 2nd ed. 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 and 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. (2013). *Action Research: Principles and practice*. 3rd ed. London: Routledge Falmer.

This is a widely used resource.

Carrying out the Study

Cyr, D., Childs, R., & Elgie, S. (2013). *Recruiting Students for Research in Postsecondary Education: A Guide*. Toronto: Higher Education Quality Council of Ontario.

<http://www.heqco.ca/en-ca/research/research%20publications/Pages/Summary.aspx?link=114&title=Recruiting%20Students%20for%20Research%20in%20Postsecondary%20Education:%20A%20Guide>

HEQCO recently published this guide because so many researchers experience difficulty recruiting student research participants. The authors present a theoretical and procedural model, accompanied by numerous suggestions and applied examples.

The references listed above on methodologies and on the Scholarship of Teaching and Learning will be helpful during implementation and analysis.

Report Writing & Knowledge Diffusion

Booth, W. C., Colomb, G. G., & Williams, J. M. (2008). *The Craft of Research*. 3rd ed. Chicago, IL: University of Chicago Press.

The material on writing in this volume is outstanding, with many examples and variations on wording. Helpful attention is paid to organizing ideas, presenting logical and qualified arguments, writing good sentences, visual communication, editing and more.

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/>

CSSHE

Canadian Society for the Study of Higher Education
www.csshe-scees.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 include 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 proposals; RFPs are issued by governments and other organizations to

request plans and budgets for research and other products

SoTL

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

SSHRC

Social Sciences & Humanities Research Council of Canada
<http://www.sshrc-crsh.gc.ca/>

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 that enable online teaching and learning by providing options for displaying course material, assignments and assessments, student evaluation and virtual discussion spaces