Research on Teaching & Learning

Guidebook

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BRIGHTER WORLD

McMaster University

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About us

We collaborate to explore, enhance, support, and recognize teaching and learning experiences at McMaster.

We offer a wide variety of programs, workshops, services and supports to all members of the McMaster community to cultivate an environment where learning deeply matters, and teaching is valued and recognized. Through these activities, educators have the opportunity to build teaching skills, develop and redesign courses, gain knowledge of educational technology tools and much more.

Since 2013, the MacPherson Institute has experienced considerable growth and change. We have expanded the quality and quantity of our supports and services; developed partnerships with educators across the McMaster community; and advanced the Scholarship of Teaching and Learning at McMaster and beyond.

In 2018-19 we embarked on a journey to re-discover what the teaching and learning communities wanted from us. The self-study process helped us create a roadmap for our strategy moving forward that resulted in our new Strategic Plan. The Strategic Plan outlines three key pillars that will help guide our mission and mandate moving forward.

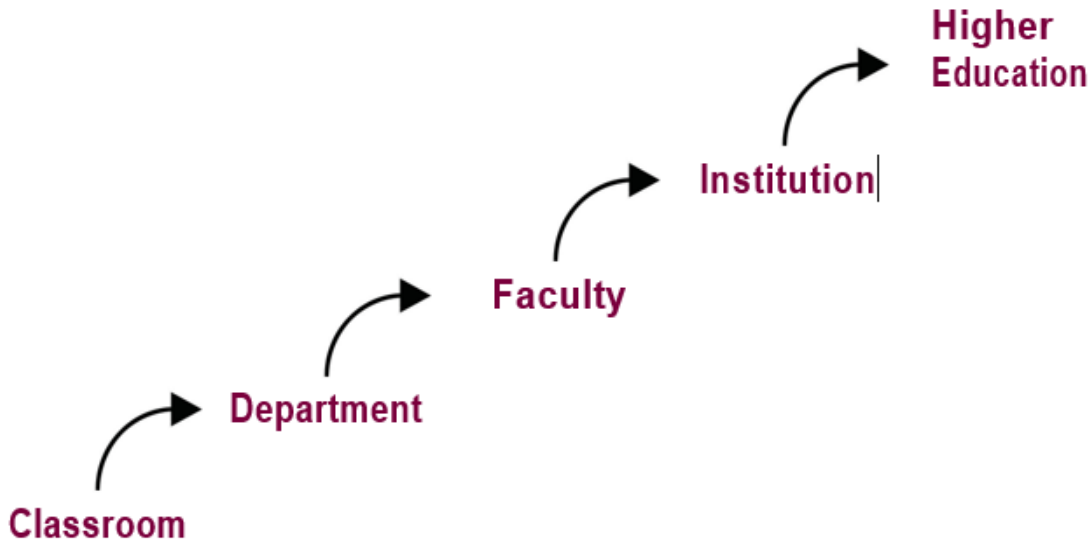
Partnerships: We will continue to connect and collaborate with the McMaster communities.

Programs and Services: We will continue to support teaching through scholarship, supports and activities to foster positive student-centred learning.

Process: We will commit to procedures and policies that support the Strategic Plan and the culture of McMaster and the MacPherson Institute.

Teaching and learning are the heart of what we do. Together with you, we look forward to building on past successes and developing new initiatives to address the teaching and learning priorities that have been identified by our community. We will continue to ask, listen and respond to feedback as we continue to grow, adapt and change.

Teaching & Learning Research Projects in the MacPherson Institute



The MacPherson Institute places a high priority on supporting both the research efforts of students, staff and faculty and the utilization of research results by key stakeholders who are positioned to integrate these results into their practices. The MacPherson Institute encourages all researchers to use this guidebook to facilitate their success in documenting teaching and learning work in ways that are widely accessible and useful, in order to ensure that their research results generate the greatest possible benefits to student learning.

Introduction

One telling measure of how differently teaching is regarded from traditional scholarship or research within the academy is what a difference it makes to have a "problem" in one versus the other. In scholarship and research, having a "problem" is at the heart of the investigative process; it is the compound of the generative questions around which all creative and productive activity revolves. But in one's teaching, a "problem" is something you don't want to have, and if you have one, you probably want to fix it. Asking a colleague about a problem in his or her research is an invitation; asking about a problem in one's teaching would probably seem like an accusation. Changing the status of the problem in teaching from terminal remediation to ongoing investigation is precisely what the movement for a scholarship of teaching is all about. How might we make the problematization of teaching a matter of regular communal discourse? How might we think of teaching practice, and the evidence of student learning, as problems to be investigated, analyzed, represented and debated?

(Bass, 1999, Introduction, para. 1)

Teachers who engage in scholarship of teaching and learning (SoTL) take what the scholarly teacher does one step further and "go public" with their work – making it available to colleagues in a public forum and accessible to peer review. This one step represents a change in practice that can transform casual observations about student learning into scholarly work that frames the questions, systematically gathers and explores evidence, reflects on and refines new ideas, and crafts the results in a form that is suitable for public presentation.

The purpose of this guidebook is to provide you with an introduction to SoTL research – including key teaching and learning concepts, the cycle of scholarship of teaching and learning, work sheets, and useful resources that are meant to assist you.

In this guidebook, the terms "Research on Teaching and Learning" and *scholarship of teaching and learning* may be used interchangeably. Research on teaching and learning, primarily referred to in the literature as the scholarship of teaching and learning (SoTL), is a distinctive form of research that is shaped by multi-disciplinary contexts and focuses on practice-driven, institutional-curricular-classroom inquiries with an explicit transformational agenda (Hubball & Clarke, 2010).

Research on teaching and learning welcomes the context of the classroom in all its complexity as a resource for understanding (Cross & Steadman, 1996). The uniqueness of this research involves interactions between a teacher, a learner and a context. Classroom teachers can make an enormous contribution to the practice of teaching by using their classrooms as laboratories for the study of learning (Cross & Steadman, 1996). Scholarship or research on teaching and learning involves both continuous learning and productive contributions to knowledge.

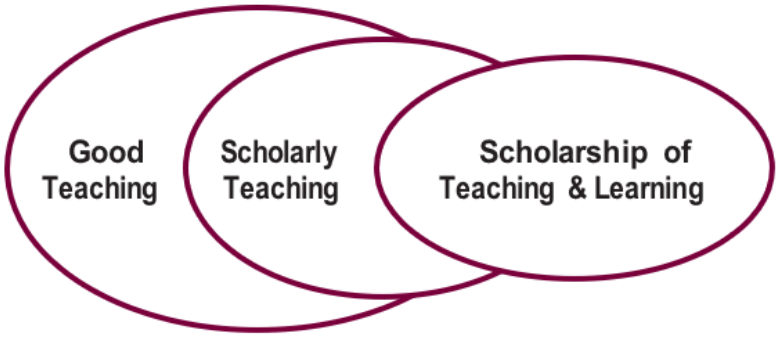
This guidebook has been developed to introduce new entrants – faculty, instructional staff, post-doctoral fellows, and graduate students from across a full range of disciplines and fields – to the purposes and methodologies of classroom research. We have written this guidebook to encourage individuals to engage in discussion about

teaching and learning that might enrich their research projects.

Understanding Teaching and Learning Concepts

One of the most important aspects of entering any new field of work is to understand the language and main concepts used in it. In early publications, you will often see the term scholarship of teaching, which is now more commonly referred to as the scholarship of teaching and learning (in the U.S.). Yet, one of the many sources of confusion about this work and its value to higher education is the issue of the distinctions between good teaching, scholarly teaching and the scholarship of teaching and learning (Dewar, 2008). The lines are often blurred between these terms in the literature. Some argue there are distinct overlaps between these three aspects of teaching and learning (Kreber, 2002).

Figure 1 - Teaching & Learning Concepts



Good Teaching

Teaching involves all faculty, instructors and graduate students engaged in teaching activities. Good teachers become aware of their own teaching processes and of the effect of these processes on student learning. Teachers at this stage are reflective about what is taking place in their classrooms and may seek out colleagues with whom to discuss their ideas about how to improve student learning (Bernstein & Ginsberg, 2009; McKinney, 2004; Weston & McAlpine, 2001). Good teachers generally focus on their own personal growth in teaching by continually refining their teaching activities in relation to student learning. While good teachers often engage in institutional teaching development activities and purposefully evaluate their own teaching to make improvements, at this stage, SoTL does not usually inform them directly.

Scholarly Teaching

Scholarly teachers are informed not only by the latest developments in the field, but also by research about instructional design and methods of assessing student learning and teaching in their field (Bass, 1999). Scholarly teaching focuses on engaging with the

scholarly contributions of others, reflecting on one's own teaching practice and on student learning within a particular disciplinary context, and communicating and disseminating aspects of practice and theoretical ideas about teaching and learning with others (Felder & Brent, 2001). Scholarly teachers engage in communities of practice and mentor other teachers in the discipline in order to develop an understanding of teaching and learning. Scholarly teaching means using the teaching and learning literature to inform and enhance your practice.

The Scholarship of Teaching & Learning

The teacher at this stage considers a teaching problem as an opportunity for scholarly investigation (Bass, 1999). The scholarship of teaching and learning may involve elements of discovery, application and integration (Boyer, 1990) and is intended to improve practice within and beyond a researcher's own classroom. The teacher who engages in the scholarship of teaching and learning may design and implement a study and collect data that will help him or her make sense of student learning. This work focuses on conducting research, developing results for peer review and publicly disseminating the research outcomes so others can learn from and build upon them. The scholarship of teaching and learning explores a specific question about teaching and learning by engaging with the literature, carrying out research, and making public the research results (Bernstein & Ginsberg, 2009).

What Counts as Research?

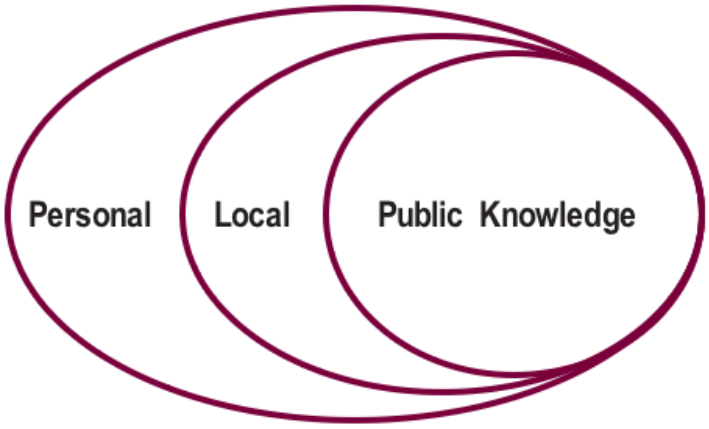
A question often asked by faculty and students new to the scholarship of teaching and learning (SoTL) research is, what counts as research? Again, drawing distinctions can be helpful as you begin. In this regard, Trigwell and Shale (2004) suggest that the distinctions depend on the audience who benefits the most from the research results. They argue that SoTL research can generate different kinds of knowledge for different audiences:

- Personal Knowledge – to inform oneself
  e.g., classroom assessment technique/research to improve personal practice

- Shared/Local Knowledge – to inform a group within a shared context
  e.g., assessment/research to inform teaching team/department/institution, without broader dissemination

- Public Knowledge – to inform a wider audience e.g., assessment/research shared to inform broader community, with public review

Figure 2 - Who Benefits from SoTL Research?



Adapted from Trigwell & Shale (2004)

Classroom Assessment

The purpose of classroom assessment is to make teachers and students more aware of the learning that takes place – or perhaps doesn't take place – in the classroom; it is an assessment of learning in process, during the semester, in a given course (Angelo & Cross, 1993). Classroom assessment describes what is happening and typically answers questions about 'what' students are learning (e.g., what did students learn from the class discussion?). Classroom assessment often raises questions about how well students learn, which can lead instructors to classroom research.

Classroom Research

Classroom research has been defined as the ongoing and cumulative intellectual inquiry by teachers into the nature of teaching and learning in their own classrooms (Cross & Steadman, 1996). Classroom research is primarily focused on improving learning by assessing the impact of course design and pedagogies on student learning. Classroom research is often concerned with the 'why' questions (e.g., why did students respond as they did?).

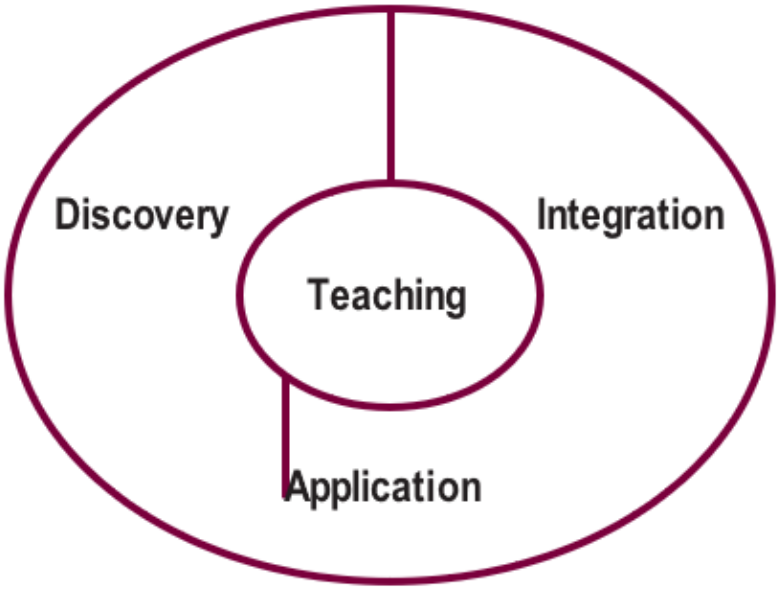
The Scholarship of Teaching & Learning

In the Scholarship of Teaching and Learning, the work of the classroom is positioned as a site of inquiry; questions about students' learning are posed and explored in order to improve one's own practice and to advance the knowledge base of teaching and learning. Increasingly, this scholarship activity is essential for dealing with the challenges of learning and with the need to ask new questions about what to teach and how best to engage students in learning. The scholarship of teaching and learning provides a mechanism to improve teaching effectiveness and to enhance student learning outcomes, and has the potential to change academic cultures and communities (Brew, 2001).

Scholarship of Teaching and Learning - Revisited

The core of academic life in higher education lies in the scholarship in which faculty engage. Scholarship is at the heart of the profession. Ernest Boyer, in his book entitled Scholarship Reconsidered (1990), attempts to define the variety of scholarship in which faculty participate. Four key overlapping forms of scholarship were described in this seminal work – 1) scholarship of discovery; 2) scholarship of integration; 3) scholarship of application; and 4) scholarship of teaching (more recently renamed scholarship of teaching and learning). It may be more helpful to position the scholarship of teaching at the center.

Figure 3 - Research on Teaching & Learning



Adapted from Boyer (1990)

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

In *Scholarship Reconsidered*, Boyer challenged university administrators to embrace and promote research on teaching and learning as an important component of faculty work, an essential endeavor with the capacity to improve the knowledge and quality of faculty teaching and student learning. He proposed that scholarship be broadened beyond an emphasis on discovery (inquiry) to encompass the scholarships of integration, application and teaching. In other words, scholarship work includes classroom inquiry, synthesizing ideas from different disciplines, and improving practice. Boyer (1990) argued the need to give scholarship a broader meaning in order to frame the work of "university teachers in ways that enrich, rather than restrict, the quality of undergraduate education" (Healey, 2000, p.169).

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. Nonetheless, the core work involves inquiry (examination and documentation) into teaching and learning in your classroom in order to improve practice and to make findings available to peers. This type of work can also involve extensive research designs that extend beyond a single classroom, program or discipline (Huber & Hutchings, 2005). Since Boyer's seminal work, the concept of scholarship of teaching and learning has been refined (Glassick, Huber, & Maeroff, 1997; Trigwell, Martin, Benjamin, & Prosser, 2000) and has been at the core of the Carnegie Academy for the Scholarship of Teaching and Learning.

Given the range of perspectives on or approaches to conducting research on teaching and learning, the definition has generated a great deal of debate. Like other new areas of work, this area of research is still taking shape in different ways and to different degrees, with each placing emphasis on different aspects of the teaching and learning paradigm. Despite its shifting formation, many scholars agree that the process consists of key principles that are consistent with good research practice. For the purposes of this guidebook, we view the scholarship of teaching and learning as that which positions "the work of the classroom as a site of inquiry that involves asking and answering questions about students' learning in ways that can improve one's own classroom and also advance the larger profession of teaching" (Huber & Hutchings, 2005, p.1).

One possible definition of SoTL is provided by Nancy Chick (2015):

- Inquiry to understand or improve student learning in higher education and the teaching approaches and practices that affect student learning

- Informed by relevant research on teaching and learning conducted by members of educational community from across campus drawing from their disciplinary expertise by gathering and analyzing relevant evidence from the learners in their own specific contexts

- Shared broadly to contribute to knowledge and practices in teaching and learning

Scholarship of Teaching and Learning at McMaster

According to Huber and Hutchings (2005) the scholarship of teaching and learning (SoTL) consists of four core practices. For the purposes of this guidebook, we have adapted Huber & Hutchings' model to include five core practices. We position topics of interest as a distinct core practice, in order to acknowledge the importance of the motivations that lead you to questions about teaching and learning. Although the path is not always linear, the five practices are presented sequentially here for the purposes of clarity.

- Topics of Interest
- Framing Questions
- Gathering and Analyzing Evidence
- Trying Out and Refining New Ideas in the Classroom
- Going Public

Figure 4 - Cycle of Scholarship & Teaching

Adapted from Huber & Hutchings (2005)

Topics of Interest

The motivation to conduct scholarship of teaching and learning work often stems from a personal source of interest: something you really care about and want to know more about. A helpful strategy at this stage is observation; what you see can often lead to questions about learning and may prompt you to begin to think about the notion of a problem as a source of inquiry and about your purpose in wanting to do a SoTL project. For example, several topics that may interest you include: experiential learning, flipped classrooms, high impact practices, inclusive education, assessment methods, technology use, peer feedback, self-regulated learning, student motivation, students as partners, team-based learning, etc (adapted in part from the University of Western Ontario at https://teaching.uwo.ca/research/sotl/index.html).

Topics may start from an **animating force** – a compelling idea, problem, concern, or hunch that causes a research question to come into being within a specific context (Calloway-Thomas & Feito, 2010). These ideas force us to pay attention to something – a pressing problem – that is other than what it should be across a range of topics and/or environments (Calloway-Thomas & Feito, 2010). To assist you in the process of identifying a topic of interest, you may want to consider any one of the following:

- A felt sense of difficulty
- A sense that something is other than what it should be
- An influencer/shaper of the methodology
- A 'success' that you want to understand more deeply
- A 'failure' that you can't get your head around
- A tacit or invisible learning process that asks for more attention

The initial steps of identifying topics of interest can involve seeking as many perspectives on the issue as possible. In the early stages of your research, it's a good idea to gather ideas from a range of different stakeholders (e.g., students, colleagues, teaching assistants, librarians, educational developers) who may be interested in your research results. These perspectives should ideally be considered at the start of your research project. Considering the realities of collecting evidence, barriers to investigating the topics in question, and resources that may already be in place to assist in investigating any of these topics. It is important to choose a topic you are most passionate about.

Create a place to capture and jot down all the information you gather. A 20 questions exercise might be a useful tool to help you in generating very broad ideas for your research that can lead you to framing effective questions (see Appendix A). To assist you in identifying topics of interest you may also want to consider the ideas collected in

Table 1 (see Appendix B for the worksheet version).
Table 1 - Topics of Interest

In identifying your topics of interest, you may want to consider:	**Ideas:**
Jotting down inspirational ideas that emerge	
Using questions about student learning from teaching	
Identifying the most important learning goals in your course	
Thinking about the efficacy of one of the activities that you now use in your course	
Thinking about how the course environment either helps or constrains students as they move toward learning goals	
Listing the problems/challenges that your students encounter in your course	
Using ideas and feedback from students (e.g., what problems/challenges do students encounter in your course)	
Using your teaching experiences	
Using ideas and observations of others	
Using ideas from the literature in your specific field	
Identifying how the research results will benefit student learning	
Using ideas and information from administrative policy makers involved in decisions related to teaching and learning	

Framing Questions

Huber and Hutchings (2005) suggest that framing research questions about student learning is the catalyst for and the first step in the process of classroom research. The purpose of the research question is "to explain specifically what you want to learn or understand" about your scholarship of teaching and learning topic (Maxwell, 1996, p. 51). Questions can involve investigation of issues rather than achievement of goals (e.g., 'How do students who do not meet prerequisites fare compared to those who do'?). Often, this step begins with questions about whether a particular teaching approach will promote specific kinds of learning more effectively than traditional methods do (Huber & Hutchings, 2005). Invariably, initial "what works" questions lead you to deeper questions such as "what is" and "what might be the case if …" that are aimed at getting to a deeper understanding about what is going on in a particular teaching context. The sample questions below were adapted from recent SoTL work in the field of mathematics (Dewar, 2008) and reframed for appropriateness in any discipline:

- What-is questions examine a current situation in order to describe it fully and to determine what its constituent features might be. Descriptive what-is questions might look at the dynamics of class discussions around a difficult topic, or they might seek to document the prior knowledge and understanding students bring to a particular topic or aspect of the discipline.
    - Example: How does – fill in discipline – majors' understanding of – signature method within a discipline – evolve as they move through the curriculum?
- What-works questions seek evidence for the effectiveness of a particular method or approach. The what-works question is often one that has a ready audience.
    - Example: What courses or other learning experiences have the greatest effect on the development of students' understanding of – x – (perhaps a – key concept within a discipline –)?
- What-could-be questions provide a vision of what is possible.
    - Example: How does the addition of a civic engagement component to a – fill in discipline – course influence student learning and attitudes towards – fill in discipline –?
- Generating new frameworks questions are not so much about exploring an aspect of practice as they are about building theory for shaping thought about practice (Hutchings, 2000). For example, difficulties can be used to uncover what is most essential to understand.
    - Example: How can "moments of difficulty" provide opportunities for understanding why some things are hard for students to learn?

It is important to know that these types of questions are by no means mutually exclusive. It should also be noted that the categorization of questions above represents one model. Another model can be found in "How Could I Do the Scholarship of Teaching and Learning," an article available at

http://php.indiana.edu/~nelson1/SOTLGenres.html. In this piece, Nelson describes five different kinds of research on teaching and learning and provides readings and online resources for each (Nelson, 2000).

The research question is at the "heart of the design" and influences the purpose, conceptual framework, methodology, collection of data, and other aspects of your study. In framing your research questions about teaching and learning, you may want to consider the following (see Appendix C for work sheet):

Table 2 – Framing Your Research Question

In framing your research question about learning you may want to consider:	**Ideas:**
What you hope to find out	
What, very specifically, you are trying to describe, explain, and/or predict	
Why your question is important and worthy of investigation	
Whether your question is answerable	
Whether your question is practical	
Whether your question is sound or valid	
Whether the scope and boundaries are appropriate	
What you already know about the issue or topic (build from the literature, be critical)	
What your contribution to this research program/community will be	
How answering your question will facilitate your purpose	
Whether your question is sufficient enough to guide your study	
Whether you have tentative theories or hunches about your question	

Gathering and Analyzing Evidence

After framing your research question, the next step in the process of inquiry is to decide on a suitable research design by which to investigate it. A research design is used to structure the research and to illustrate how all the major components of the research project – sample, measures, methods – work together to address the question. Maxwell (1996) argues that the research method is driven by one focused, but functional question: "What will you actually do" in conducting the research? As with any scholarly work, methodology is critical. If the method used to collect data is not appropriate to the question being asked, analysis of the data will not provide relevant information.

As noted by Hubball & Clarke (2010), there is a rich array of methodological approaches that can be used to investigate SoTL research questions in diverse higher education settings (e.g., experimental design, self- study, case study research, grounded theory research, classroom ethnography, implementation analysis, phenomenological study, program evaluation, survey research, longitudinal research). Each of these particular methodological approaches is rooted in different ontological and epistemological assumptions, which influence outcomes for conducting the research (Hutchings, 2000; Kubler & LaBoskey, 2004).

The work at this stage is to devise ways to explore questions and, of course, no single source or type of evidence provides a broad enough view of the difficult questions raised around student learning. Selecting an appropriate methodology for your SoTL inquiry will largely depend on situational practicalities and the need to align your methodology with clearly articulated research questions. The clarity of your research questions will also enable you to develop a strong sense of who and how many people you are likely to involve, the data you will need to collect, the conditions under which it will be collected, and the time period involved. Sometimes different types of participants are needed (e.g., groups of students, single learner). Sometimes numbers make sense (quantitative), sometimes more qualitative evidence makes sense, and often a combination of both is necessary to give the fullest possible picture (i.e. mixed method approach).

Appropriate combinations of qualitative and quantitative data sources can yield reliable and critical information to enhance your results (Feldman, Paugh & Mills, 2004). This means becoming familiar with approaches that can be totally new and even against the grain (Nelson, 2000). Hubball & Clarke (2010), adapted from Mack, Woodsong, MacQueen, Guest, & Namey (2005), is a very good summary of quantitative and qualitative research approaches that will help you decide on the best methodology to use in your SoTL inquiry.

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.

Table 3 - Characteristics of Quantitative and Qualitative SoTL Inquiries

	Quantitative	Qualitative
• Research Context (e.g., broad issues pertaining to local or institutional initiatives, curricula, teaching and/or student learning)	• Seeks to confirm hypothesis about phenomena • Seeks to quantify variation or predict causal relationships about phenomena • Seeks to describe characteristics of an educational population	• Seeks to explore phenomena in educational settings • Seeks to describe and explain variation and/or relationships in complex educational settings • Seeks to describe individual experiences and/or group norms in complex educational settings
• Research Questions	• Closed	• Open-ended
• Methodological Approach	• Study design is stable • Study design is subject to statistical assumptions and conditions • Participants' responses do not influence or determine the questions asked or the way these are posed	• Some aspects of study are flexible (e.g., interview questions) • Some design is iterative - questions are altered based on what is learned (e.g., interpretative analysis) • Participants' responses influence the questions asked and the way these are posed
• Data Collection Methods	• Numerical (e.g., surveys, questionnaires, structured observation)	• Textual (e.g., interviews, focus groups, document reviews, field notes)

Adapted from Hubball & Clarke (2010)

Your disciplinary context is important in shaping the way you think about and design your approaches to the scholarship of teaching and learning (Hutchings, 2000). In fact, some argue, "developing the scholarship of teaching will only bring about change in [...] priorities if it is embedded in disciplines and departments" (Healey, 2000, p. 173; see also Gibbs, 1996). At the same time, Huber (2006) claims,

> *The scholarship of teaching and learning is typically pursued as a kind of practitioner or action research by teachers in their own classrooms, not the circumstances or settings for which the investigative methods used in most disciplines – including education and the learning sciences – are well designed. Doing the scholarship of teaching and learning sits, therefore, at the edge of most disciplines, calling on but also going*

beyond the normal knowledge practices of most fields (p.72).

SoTL research provides a big tent with room enough for all different disciplines and for interdisciplinary approaches, each of which brings rich perspectives as well as various challenges (Hubball & Clarke, 2010). At this point, qualitative and/or quantitative data sources should be selected to align with your research questions so you can meet the needs and conditions of the research context. In gathering and exploring evidence you may want to consider the following research methods:

Table 4 - Research Paradigms

Quantitative	Qualitative	Other
• Experimental Randomized (RCT) • Quasi Experimental • Single Subject • Non-experimental • Descriptive • Comparative • Correlational • Ex Post Factor	• Ethnography • Grounded Theory • Case Study • Narrative • Phenomenology	• Mixed Methods Research • Action Research • Program Evaluation Research • Instructional Design Research • Curriculum Design Research • Orientation Research

Table 5 - Gathering and Analyzing Evidence

In gathering and analyzing evidence you may want to consider:	Ideas
What types of data you need to answer you question (e.g. qualitative, quantitative or mixed methods?	
What methods you could use to gather the evidence needed, e.g., • Qualitative methods (student interviews, focus groups) • Quantitative methods (grades, course statistics) • Mixed Methods (online surveys)	
Whether you have the resources to carry out the methods (e.g. personal experience, campus resources)	
Whether your audience will find the approaches acceptable (e.g. method is sound of valid)	

See also Appendix D for an expanded worksheet.

Trying Out and Refining New Ideas in the Classroom

For those of you who become engaged in conducting research on the teaching and learning that takes place in your classrooms, you will likely find your work leading to change. Inevitably, this process of trying out and refining new ideas is a key element of this type of research. An initial step in this process is establishing a baseline measure in order to understand the point from which you are changing. You begin to think about the process as research and the results as insights to try out and use for improvement.

This step in the research process thus focuses attention on making recommendations for change and trying them out in the classroom. Consequently, you must always ask yourself how your findings might encourage people, including yourself and your students, to act. Use your data to make decisions about the question or topic you investigated. For further discussion of the 'transformational agenda' of scholar- ship of teaching & learning, see Hutchings (2000).

Going Public

A central element of the scholarship of teaching and learning is making it public, which enables you to examine your practice critically and to show it to others who can build upon it (Hutchings & Shulman, 1999). For research on teaching and learning to be properly constituted as scholarship, the study of teaching and learning must go beyond simple tips and observations of what works for you in your own classroom (Gale, 2004). Scholarship must be a formal, systematic process of inquiry that provides evidence of what works and why, and that evidence must be disseminated, critically reviewed and built upon.

The distinguishing feature of the scholarship of teaching and learning is the element of creating knowledge for the purpose of transferring it and making it available for others to use and develop (Glassick, Huber, & Maeroff, 1997). Going public means that "the intellectual work of teaching and learning is captured and documented in ways that others can build upon" (Huber & Hutchings, 2005, p.19). As with other forms of scholarship, the aims of disseminating research results are to enhance the quality of ideas, to increase circulation, and to broaden range (Huber & Hutchings, 2005). In addition, the scholarship of teaching and learning also aims to improve practice, a fact which often encourages practitioners to look for new ways of sharing their work.

Move beyond descriptive work about what you tried and why you liked it. Most published SoTL articles include a conceptual framework, a literature review, and some form of methodology and results section, yet depending on the publication, purpose/audience and discipline, the look of these may vary. See Appendix E for an

expanded view of Table 6.

Table 6 - Disseminating Your Research

To disseminate your research results effectively you may want to consider:	Ideas
Sharing results with other researchers	
Sharing results with key stakeholders (e.g., general public using popular media)	
Sharing results with key stakeholders (e.g., general public using popular media)	
Facilitating the exchange of expertise between research team members and organizations outside of the scholarly community	
Writing articles for academic, professional journals or for special issues of journals	
Developing course portfolios	
Publishing in bulletins and newsletters	
Sharing at presentations and seminars	
Contributing to a systematic review (including meta-analysis)	
Posting on websites and listserves	
Presenting results at workshops and conferences	
Discussing at communities of practice	
Developing other formats identified by research team members and research partners	

Ethics of Conducting Pedagogical Research

Knowing that instructors are busy people, and that it is difficult to create a 'one-size-fits-all' guide for all the many types of pedagogical research, the following section on research ethics has been created to provide you with the basics to get you started. We hope that it will alert you to some of the more common ethical issues that pedagogical researchers encounter, and that the advice provided will address specific questions you have or, at the very least, help you find the assistance you need to pursue your research interests.

Conducting Research at McMaster University

Human Participant Protection at McMaster University and its Affiliated Hospitals

Research involving human participants is premised on a fundamental moral commitment to advancing human welfare, knowledge and understanding. As a research-intensive institution, McMaster and its affiliated hospitals embrace this commitment. McMaster has also established policies that require all faculty (full or part-time), post-doctoral fellows, graduate students, undergraduate students and staff who conduct research with humans, their records or their tissue, to obtain research ethics clearance before research can begin.

Whilst it is standard practice for professors to regularly evaluate the effectiveness of their instructional practices by engaging in quality assurance or quality improvement assessments, these assessments do not require ethics approval. The Tri-Council Policy statement (i.e., the document that guides the ethical conduct of human participant research in Canada) advises that "quality assurance and quality improvement studies, program evaluation activities, and performance reviews, or testing within normal educational requirements when used exclusively for assessment, management or improvement purposes, do not constitute research for the purposes of this Policy, and do not fall within the scope of the REB [Research Ethics Board] review" (TCPS 2, 2018, Chapter 2, Article 2.5). However, when these data collection activities move past a basic assessment of in-course class activities with the purpose to expand knowledge, and are generalizable beyond the institution, then ethics review and clearance are required. To address the variety of human participant research carried out at McMaster and its affiliated hospitals, two research ethics boards have been established. When determining which board to submit your research to, you can use the following information to make your decision. When in doubt about the board to which to submit your application or about any other research ethics matter, help is just a quick phone call or email away.

Research Ethics Boards of McMaster University and its Affiliated Hospitals

McMaster Research Ethics Board Hamilton Health Sciences/Faculty of Health Sciences Research Ethics Board	If you are a faculty member, a staff member, or a student conducting research involving human participants, and are not in the Faculty of Health Sciences or McMaster affiliated hospitals, please go to: https://reo.mcmaster.ca/ If you are a faculty member, a staff member, or a student in the Faculty of Health Sciences, &/or you are conducting research at Hamilton Health Sciences &/or its affiliated sites and programs, please go to: https://hireb.ca/

The Review Process and its Length

When research ethics boards receive your protocol (i.e., the completed application and supporting documents such as your letter of information and consent form, posters, flyers, advertisements, email recruitment scripts, your interview guide or other instruments that you are going to use to gather your data, etc.), they determine the level of risk that your research poses to your prospective participants. 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 also influence the review time as most members of the research ethics board are also active researchers and professors. Check with the REB to which you will be submitting to discuss review times and submission dates, etc. Many classroom research projects take place in single semester courses and often data collection needs to take place right at the beginning of the course. Because ethics reviews take time, researchers need to plan accordingly.

Key Ethical Issues in Pedagogical Research

Power Differentials

A key issue relates to the dual role of instructor and researcher that professors encounter when conducting projects on pedagogy. Instructors that conduct research on their practice in the classroom should think through the power differentials in the relationships they have with their students and teaching assistants.
These power-over relationships can influence how comfortable participants might feel in declining instructors' invitations to participate in their research.

In many projects, the researcher is unknown to the potential participants and recruiting enough participants can sometimes be a significant challenge. Pedagogical research doesn't generally have that challenge but the dual role of instructor/researcher can pose challenges in regard to student participants' free choice to take part in an instructor's

study. This is especially the case when the students' behaviour in a course, their involvement in course activities and their overall performance might be the focus of the research. Putting oneself into the position of one's participants helps when trying to think about what it would feel like to be asked to take part in the study and what it would feel like if a person didn't want to take part. Students can be considered a type of "captive population" when their instructor is conducting research and recruits them to participate.

Captive Populations

A captive audience is understood to mean that the population is dependent on authority figures in their regular life and that this can infringe on their freedom in making decisions about their participation and lessens their autonomy. Students are not the only kind of potential captive population and instructor- researchers are not the only type of investigator who might work with such populations. Examples of other kinds of captive populations include; employees, hospital patients, residents of long-term care facilities, members of the military and prisoners.

Instructors should be particularly sensitive to power differentials and create appropriate safeguards to ensure that they are not exerting undue influence over their students' voluntariness to dissent or consent to participate in their research. When we conduct research, we can become so immersed and enthusiastic about the project that it is hard to step back and consider the research from the perspective of the participant. A helpful way to think about this is to envision a friend or loved one as being the potential participant and to consider how they might feel if they were asked to take part in the activities of the study. The role of the REB is to view the research with regard to how it impacts the participant and to help researchers make adjustments to the research so they can protect their participants and reach their research goals.

Participant Burden

Students enroll in courses for the purpose of gaining knowledge and mastery of a topic rather than to be participants in research projects run by their professors. When planning a study, researchers might think of ways to conduct their research so that it does not intrude excessively into that primary purpose. An additional participant burden might surface as a result of a proliferation of pedagogical research across the university's departments, especially for students in first and second year courses. Occasional invitations to take part in research might be seen as exciting and novel opportunities to get a glimpse of the research world and to take part in something important. If this happens repeatedly, students can begin to feel more like guinea pigs than students. This could have a negative impression on students' understanding of what the research endeavour is about and could also impact negatively on recruitment for other worthwhile research because students might become jaded by overexposure to classroom research.

While these are issues to think about and plan for, they should not be considered insurmountable hurdles. Researchers are encouraged to contact the university's

research ethics offices early in the research design phase, and to ask for advice about how to creatively address these and any other ethics issues that might arise. The role of the research ethics board is to review research with human participants and to educate and work with researchers to help them conduct their research ethically.

Confidentiality of Participant Data

Due to the dual instructor/researcher role that attaches to much pedagogical research, there are potential risks to the student/participant's confidentiality. Students might be concerned that their professor or teaching assistant (who might have more contact with the student) will know whether they took part. Students may be concerned that if they don't want to be part of the study there could be negative consequences. For this reason it is important to consider carefully how study documents such as consent forms or data will be collected and stored and who will have access to this material and when.

Secondary Use of a Student/Participant's Academic Data

Some pedagogical research will ask students to take part in specially designed exercises within the course; alternately, an exercise's effectiveness may be evaluated by assessing the students' performance on the exercise, their class performance, and possibly their overall grade point average in their other courses.
Because students' course results and other information on their academic performance is produced to evaluate and document the student's mastery of their program of study, the researcher must obtain permission from student participants to use this data for a secondary purpose, that is, for a purpose other than that for which it was initially intended. Canada's Tri-Council Policy Statement (TCPS2) defines secondary data use "the use in research of data contained in records collected for a purpose other than the research itself" (Chapter 5, Section D). If researchers are considering accessing student records from the Office of the Registrar they should contact that office well in advance of when they will need that information. In their research ethics application that they submit to the REB, they should also describe the process they will be using to access that data from the Office of the Registrar and how they plan to safeguard student data.

Lost Time to Participate in Instructors' Pedagogical Research

Many pedagogical research projects use course assignments, exercises or various activities normally employed to teach the course and assign grades. While this is a less intrusive way of obtaining data to be analyzed, the instructor will still need to obtain permission from the student to use this material in research. Other types of pedagogical research might introduce new activities. In either of these cases, researcher/ instructors need to ensure that their students are not losing time from the regular course hours to facilitate participation in the instructor's pedagogical or other research.

An effort should be made to use time just before or just after class to talk about the study. A technique used by other researchers for addressing this has been to post

information about the study in a flyer, letter of information or brochure in an online learning management system (LMS) such as 'Avenue to Learn'. In this way students can find the link to an anonymous online survey that they can complete at a convenient time or find the details on how to sign up for a lab experiment they can do during non-class time. This show of consideration and respect for student/participants also serves as a model for them regarding how researchers normally treat human participants. For some studies, researchers use their pedagogical research as an opportunity to provide a value added feature to the course by having all students (whether they end up participating or not) learn about the research methods to be used and what provisions will be in place to protect participants.

Timing the Researcher's Access to and Analysis of the Data

Many pedagogical researchers find that it contributes to establishing a respectful relationship with participants and allays concerns about participation if the researcher doesn't interact with the data until after the final grades have been posted by the Office of the Registrar. It is ideal to lay out this plan very clearly for the student participants in the letter of information/consent form and other study related documents. This plan should also be reiterated in any verbal explanations so students will know that the researcher will not know whether or not they took part in the study for the duration of the course.

Tutorial Assistants', Research Assistants' and Colleagues' Roles in Pedagogical Research

Many researchers find it useful to approach a colleague, another researcher or a research assistant who has no connection at all with the course to serve as an intermediary who will receive or collect the consent forms, surveys or other instruments or exercises that the students are going to be invited to complete. This person might strip any personal identifiers from the raw data and could also be the person who would create and hold securely a copy of the data key that links data to the participant if identifiers are being removed.

In classes where graduate students serve as teaching assistants and will have regular and sometimes more direct contact with student participants, it is important that their teaching assistant roles and any roles related to the study are carefully delineated to ensure confidentiality.

Data Security

Instructors already have a duty to ensure that students' grades, assignments, and special educational needs remain confidential. Respect for students' privacy is an integral part of the instructor's role. When in the dual role, the instructor/researcher must also demonstrate to the participants and to the Research Ethics Board that care is being exercised to protect the privacy of the student participants and the confidentiality of their data when it is collected and used and when the results are disseminated.

Data that is in paper form should be stored in a locked filing cabinet in the researcher's office. Minimal risk electronic data should be kept on a password-protected computer. Medium to high-risk data, as well as any identifiable data, should be encrypted and stored on a password-protected computer. Data can also be stored in the cloud; however, researchers should be aware that not all cloud services are accepted for the storage of data. As of September 2019, approved cloud services at McMaster are MacDrive, MCloud, Dataverse, MacDrop, and OneDrive. While it might be convenient, identifiable data should never be stored on external cloud services such as Google Drive, Dropbox, iCloud etc. For more information on McMaster Ethics Board's policies on data and storage, please consult the MREB Data Storage and Security Tools guide, which can be found at macrem.mcmaster.ca or contact the research ethics office for advice.

Advice for Facilitating the Ethics Review Process

Create a timeline for your pedagogical 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 milestone. For example, you might want to conduct a "pre-test" in the early weeks of the term, followed by an intervention or a new teaching technique, and then follow this up with a "post-test". Because your application for ethics clearance takes time (3-4 weeks or longer for more high risk studies) to go through the review process you want to factor this into your timeline.

Creating a timeline by working backwards from the date you want to begin collecting data and leaving enough time for the review process are two simple and effective ways to make the process easier for you. You could alert your students as early as possible, through the syllabus and with a brief verbal reinforcement of the point, that you will be inviting them to consider taking part in your classroom research project on X. Some instructor/researchers find it useful to notify their students of the planned project but leave the actual recruitment to a colleague at arm's length from the study. Such behaviours by the study's principle investigator and assistants also model appropriate researcher conduct and contribute to students' learning about methods and ethics as the research enterprise unfolds in their midst.

You might find it helpful to complete a rough draft of the application, of supporting documents such as the participant letter of information and consent form, and of your questionnaire or other data collection instruments and set 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 and those new to human participant research take advantage of this service, dispelling the misconception that researchers shouldn't contact the ethics office. Help is really just a phone call or email away.

The McMaster Ethics Office, for example, can give you advice when preparing your protocol. You can make a telephone or email query about a question you have about your project. If you are further along in developing your project, you can also call or email them to set up an individual one-on-one consultation with the research ethics staff

in order to get personalized advice on your project. Researchers find that they get the most out of these consultations if they have completed a rough draft of their ethics application and of key supporting documents such as the letter of information and consent form, the interview guide, focus group guide, survey or exercise description so that they can get more detailed advice and suggestions. An ever-expanding variety of customizable templates are available to create supporting documents. These can be found on the REB websites or by contacting the research ethics boards.

Where to find help about funding opportunities for your pedagogical research

ROADS

The Research Office for Administration, Development and Support (ROADS). The ROADS development unit supports researchers through the identification of funding opportunities, provision of information sessions, and review and editing of grant submissions. To get help with searching for funding opportunities for your classroom research, contact the Research Information Specialist at extension 23138.

Once a research grant has been awarded, the ROADS Administration and Support Unit can assist you further with getting your account activated. For more information check out the ROADS website at https://roads.mcmaster.ca

MacPherson Institute Support for Teaching & Learning Research

The Paul R. MacPherson Institute for Leadership, Innovation and Excellence in Teaching is committed to supporting the teaching community at McMaster in the process of creating knowledge about teaching and learning through research. We offer a range of programs and services designed to foster, enable and enhance the scholarship of teaching and learning on campus. Please consult the MacPherson Institute website for more information on how we can support your research on teaching and learning: https://teaching.mcmaster.ca/teaching-and-learning-scholarship/.

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Karen Szala-Meneok received her PhD from McMaster in Anthropology where she was also a faculty member in the School for Rehabilitation Sciences. For 11 years she served as the Senior Ethics Advisor with McMaster's non-medical Research Ethics Board before retiring in 2017. Over the course of her academic career, she designed and taught numerous courses on qualitative research methods and has been an invited speaker and trainer at the Canadian Association of Research Ethics Board (CAREB), CAREB Ontario, and PRIM&R. In addition, she has conducted many training workshops on research ethics to researchers and REBs at colleges and universities across Canada. Karen is also a qualitative researcher who has conducted human participant research in Maritime Canada, the Canadian sub-arctic. She was a CIHR-funded researcher examining the operation of medical research ethics board related to privacy and security. She conducted community-based health research and served as Senior Research Associate with the Canadian Longitudinal Study of Aging, a 20-year population-based study looking at successful and healthy aging among 50,000 Canadians over the age of 40.

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Appendix A

20 Questions Exercise
Adapted from: The "20 Questions" Exercise:
How to Come Up with Research Questions By Karen Szala-Meneok, Ph.D ©

Here is very short exercise, which I think you might actually enjoy doing.

Who? You. That is, anyone who wants to write an interesting paper/thesis is encouraged to give this exercise a try.
What? A 15 minute exercise designed to assist you in coming up with research questions on your topic. A sample of how this exercise was started by one person is provided below, along with a blank 20 questions exercise sheet for you to use.
When? Try to take a MAXIMUM of 15 minutes (about the time it takes to sit down and finish a cup of coffee).
Where? Sit at a table or desk. NO ARTICLES OR BOOKS, just you, the exercise and a pen or pencil.
Why? To have a chance to think about what you would like to research regarding your topic.
What if I don't get a chance to finish the whole exercise? Just do what you can.

Hints For How to Generate Research Questions:

HINT #1: A fun way to "jump-start" the research refinement process is to do the 20 QUESTIONS exercise. See the description at the end of the next page.

HINT #2: When you brainstorm, start big. Curb all efforts to edit too soon in the brainstorming process. That comes a bit later. When you do start narrowing down your topic, try to focus on one particular sub- area of research. Keep it simple and clear.

HINT #3: Generally, when refining a rough version of a research question always ask yourself: "Is this topic too broad (the more common problem) or too narrow?" Then keep adjusting until you get it right. Some people ask other people to give them a little feedback. Individuals offering feedback can also look out for your clarity issues.

Hint #4: Cut a smaller/tidy slice of the "pie of science". Do a really good job on a small topic. Rome wasn't built in a day and you AREN'T going to be able to solve the problems of the world through this research project.

HINT #5: Not all research is of the strict hypothesis-testing type. You can use something I call a "soft hypothesis". This is what I'm introducing to you by way of the research question generation discussed here. A research question using about 10-12 words should say what your research examines.

Hint #6: Strong research questions recognize and explore the relationships between a phenomenon and its presumed causes or (a.) identify and (b.) examine how aspects of a process or condition are related to each other. Avoid questions that just describe. Strong research questions should challenge assumptions, and/or delve into a deeper level of examination.

Hint #7: Watch out for "what questions" because these are often simple descriptive questions in disguise. Beware of comparative exercises because they tend to answer the simple question: Are apples different from oranges? We really haven't pushed the boundaries of science with that question. A good way to sniff out simplistic or largely descriptive research topics is to see if it will pass the "So what!" test.

Hint #8: Strong research questions tend to be inherently compelling and intriguing. They really dig into the issue. Watch out for the "straw man" question as well. This is a common trap. The problem or issue you've chosen is utterly obvious or only touches the most rudimentary aspect of the issue. An example of a less successful question of this sort would be:
Is the burning down of the Amazonian rainforest affecting that region?

The 20 Questions Exercise:

If you find it hard to come up with a strong research question, try this little trick called playing "20 questions". It takes 15 minutes to do. On the following sheet, write your very rough and very broad ideas for your topic or some keywords on the top. To the right of the numbers 1 – 20, write whatever questions come to mind about your topic. The first few may seem pretty thin, dumb or obvious but KEEP AT IT! You'll actually start to see stronger, more analytic questions emerge... If you really get stuck (please don't give up too soon), go back to the space at the top of the sheet where you wrote what your broad topic was and do a little more brainstorming and add a few more terms. By the way, this can actually be a fun exercise!

Here is a real life sample of how one person started the 20 questions exercise.
(A blank exercise sheet is available following this sample page.)

Sample: The 20 Questions Exercise:

Step 1: Clear your desk of all books and notes. Write your very rough and very broad ideas about your topic or just some keywords in the box below. Step 2: Push yourself to come up with 20 questions about the topic and write one of these beside each of the numbers. Use question marks! The first few might seem pretty thin, dumb or obvious but KEEP AT IT! Resist all efforts to give up! Don't judge, don't worry about spelling or grammar. Just write down every question that comes to mind. Remember, have some fun!
In very broad terms my topic is about ... (Hint: Use words or short phrases. Sentences aren't necessary at this point.) a) What students think about the effectiveness of small-group work in large classes. b) I wonder what data I will collect (e.g., brief written reflection - pros/cons; forced-choice questions - learning experience.)? c) Who am I studying? When will it happen? How many students? What do students think is the difference between lectures and active learning?

START WRITING YOUR QUESTIONS BELOW.

1. How do students perceive the effectiveness of small-group work?

2. Does small group work enhance comprehension of course material? Reduce anonymity associated with large lecture classes? Promote student accountability?

3. What strategies are useful for incorporating these types of active learning activities into the stucture of a large lecture class?

4. .....
5. .....

The 20 Questions Exercise for Generating Research Questions

Step 1: Clear your desk of all books and notes. Write your very rough and very broad ideas about your topic or just some keywords in the box below. Step 2: Push yourself to come up with 20 questions about the topic and write one of these beside each of the numbers. Use question marks! The first few might seem pretty thin, dumb or obvious but KEEP AT IT! Resist all efforts to give up! Don't judge, don't worry about spelling or grammar. Just write down every question that comes to mind. Remember, have some fun!
In very broad terms my topic is about ... (Hint: Use words or short phrases. Sentences aren't necessary at this point.)

START WRITING YOUR QUESTIONS BELOW.

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Well, what do you think? Have you got something to build on? If not, do just a little more thinking and try this exercise again ...

Appendix B

Topics of Interest

In identifying your topics of interest, you may want to consider:	**Ideas:**
Jotting down inspirational ideas that emerge	
Using questions about student learning from teaching	
Identifying the most important learning goals in your course	
Thinking about the efficacy of one of the activities that you now use in your course	
Thinking about how the course environment either helps or constrains students as they move toward learning goals	
Listing the problems/challenges that your students encounter in your course	
Using ideas and feedback from students (e.g., what problems/challenges do students encounter in your course)	
Using your teaching experiences	
Using ideas and observations of others	
Using ideas from the literature in your specific field	
Identifying how the research results will benefit student learning	
Using ideas and information from administrative policy makers involved in decisions related to teaching and learning	

Appendix C

Framing Your Research Question

In framing your research question about learning you may want to consider:	**Ideas:**
What you hope to find out	
What, very specifically, you are trying to describe, explain, and/or predict	
Why your question is important and worthy of investigation	
Whether your question is answerable	
Whether your question is practical	
Whether your question is sound or valid	
Whether the scope and boundaries are appropriate	
What you already know about the issue or topic (build from the literature, be critical)	
What your contribution to this research program/community will be	
How answering your question will facilitate your purpose	
Whether your question is sufficient enough to guide your study	
Whether you have tentative theories or hunches about your question	

Appendix D

Gathering and Analyzing Evidence

In gathering and analyzing evidence you may want to consider:	Ideas
What types of data you need to answer you question (e.g. qualitative, quantitative or mixed methods?	
What methods you could use to gather the evidence needed, e.g., • Qualitative methods (student interviews, focus groups) • Quantitative methods (grades, course statistics) • Mixed Methods (online surveys)	
Whether you have the resources to carry out the methods (e.g. personal experience, campus resources)	
Whether your audience will find the approaches acceptable (e.g. method is sound of valid)	

Appendix E

Disseminating Your Research

To disseminate your research results effectively you may want to consider:	Ideas
Sharing results with other researchers	
Sharing results with key stakeholders (e.g., general public using popular media)	
Sharing results with key stakeholders (e.g., general public using popular media)	
Facilitating the exchange of expertise between research team members and organizations outside of the scholarly community	
Writing articles for academic, professional journals or for special issues of journals	
Developing course portfolios	
Publishing in bulletins and newsletters	
Sharing at presentations and seminars	
Contributing to a systematic review (including meta-analysis)	
Posting on websites and listserves	
Presenting results at workshops and conferences	
Discussing at communities of practice	
Developing other formats identified by research team members and research partners	