

Inquiry-based learning in higher education: administrators' perspectives on integrating inquiry pedagogy into the curriculum

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Abstract Inquiry-based learning is one approach to improving the quality of undergraduate education by moving toward more student-directed, interactive methods of learning while focusing on learning how to learn. This paper deals with a missing component in the inquiry-related literature—the extra-pedagogical challenges of introducing and maintaining inquiry-based learning in the curriculum. Based in the collective experience of McMaster University, a mid-size Canadian university that has been a pioneer in inquiry pedagogy, the paper describes the challenges administrators faced in supporting the introduction of inquiry-based learning as components of traditional courses, as inquiry-based courses, and as inquiry-based degree programs. Derived from interviews, the paper presents a series of strategies and lessons for introducing and maintaining inquiry pedagogy in the curriculum. These lessons will be broadly useful to administrators, curriculum designers and faculty developers and should be widely applicable to institutes of higher education.

Keywords Administration · Curriculum · Educational development ·
Inquiry-based learning · Higher education

Introduction

Universities are introducing new pedagogies in response to changing social demands. They have heard from students who are seeking skills and abilities that will translate across disciplines and careers. They know that employers are looking for young men and women able to analyze issues, think critically, solve problems, communicate effectively, and take leadership. As Don Tapscott, CEO of New Paradigm, a Toronto-based think tank said, “In this new world, it’s not just what you know that counts—it’s your capacity to think and

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learn throughout your life, communicate, and above all, collaborate” (Tapscott 2006). These demands are encouraging universities to experiment with new ways of educating students. While the range of new pedagogies being tried is wide and varied, many institutions are focusing on what Ramsden (2003) calls ‘general aims and higher level abilities’ including skills in self-directed learning, collaborative problem solving, team building as well as the more traditional abilities of identifying, accessing, assimilating and communicating information. Educational institutions at all levels are introducing new courses and programs that focus on problem-based learning, discovery learning, experiential learning, cooperative learning, service learning and inquiry-based learning.

The introduction of these new pedagogies is often met with challenges and barriers within universities. This paper explores such barriers to change and how one university has endeavored to overcome some of the challenges as they have introduced inquiry-based learning (abbreviated to inquiry in this paper). As background, we begin by discussing the nature of inquiry and examine the many ways inquiry has been tried at McMaster, a mid-sized Canadian university that has been a pioneer in inquiry. We then discuss the results of a series of interviews conducted with inquiry-experienced deans and other administrators who were asked to reflect on the value of inquiry and the extra-pedagogical barriers they faced in developing or maintaining this pedagogy. From these interviews, we present a set of strategies used at McMaster to introduce and maintain inquiry in an otherwise more traditional curriculum.

This research is drawn from a single institution. Because of the depth of experience at McMaster, we regard this as a study of a unique and revelatory case which provides rich insights into processes of curriculum change within its real life context (Darke et al. 1998). We believe these insights will be applicable to other institutes of higher education and that the lessons will be useful to others interested in developing and supporting student-directed learning.

Theoretical background

Introducing new pedagogies within an existing program or curriculum is a challenge. In part this is the result of tensions between three types of actors within the single organization change process—change strategists, change organizers, and change recipients. Within universities deans, administrators and faculty members seeking change often play the role of change strategists and change organizers while professors and departments are for the most part reluctant change recipients. The broader organizational change literature suggests that efforts at change within organizations very often fail due to both macro-level variables related to structural features of the organisation and to micro-level variables such as individual factors related to acceptance or resistance to change (Devos et al. 2007). The literature on change within universities (e.g., Vas and Lejeune 2004) suggests that they have special change resistance qualities—they have multiple visions of purpose, an environment constructed around academic freedom, and ideals of consensus-based decision making—which differentiate them from other types of public and private organizations. Understanding the special nature of resistance to change within universities and the contextual challenges these pose to change strategists and change organizers is a key to successful pedagogical innovation.

Our analysis of the events that took place during the introduction of inquiry at McMaster University draws upon Pettigrew’s (1985) framework of ‘*content*,’ ‘*context*’ and ‘*process*’. In this framework ‘*content*’ refers to the substance of change, ‘*context*’ to the

cultural and climactic environment surrounding change, and ‘*process*’ to the manner of enactment of change (Armenakis and Bedeian 1999). Our research embeds this framework in social construction theory (Berger and Luckmann 1966; Palinscar 1998). We have analyzed interviews with university administrators using an interpretative paradigm focusing on points of view of relevant actors on the content, context and process during the introduction of different aspects of inquiry into the curriculum. The analysis draws upon individuals’ perceptions regarding the emergence of new views of what is acceptable within the institution and the way these perceptions shape organizational reality.

The idea of inquiry

The idea of inquiry has a long history in the public school system, especially in the teaching of science, and is traceable back to educational theorists such as Dewey, Bruner, and Postman and Weingarten. Inquiry reflects Dewey’s belief that students need to develop critical thinking rather than memorization skills. Inquiry has been used by some authors (e.g., Lee et al. 2004, pp 9–10; Mahony et al. 2003) to refer to a broad category which incorporates a wide range of teaching and learning methods including problem-based learning, contract learning and work-based learning. We use the term in a somewhat narrower sense; inquiry refers to instructional practices designed to promote the development of high order intellectual and academic skills through student-driven and instructor-guided investigations of student generated questions (Hudspith and Jenkins 2001; Justice et al. 2007a). Students focus on answering compelling questions, or getting a better understanding of the questions they have raised. Instructors support this process, acting as resource people and animators, and introducing intellectual and academic skills as they are needed. This work occurs in an environment supportive of open-minded discussions, the questioning of assumptions, and the critical assessment of information, evidence and argument. Inquiry refers both to the process of seeking knowledge and new understanding as well as to a method of teaching grounded in this process. By learning through inquiry, and learning to become inquirers, students master the processes and enabling skills involved in establishing concepts and facts, preparing the way for them to become researchers and lifelong learners. In addition, active engagement with content putatively results in deeper understanding and greater integration and internalization than traditional didactic, memory-oriented approaches to learning (Abdal-Haqq 1998). Inquiry as a teaching method seeks to develop inquirers and to use curiosity, the urge to explore and to understand, as motivators leading to learning through personal engagement.

Within higher education, the term may first have been used as a pedagogical entity by Suchman in his 1961 paper *Inquiry training: Building skills for autonomous discovery*. Other early publications pertaining to inquiry in higher education include a 1985 article “How I Kicked the Lecture Habit: Inquiry Teaching in Psychology” (Zachary 1985) which describes inquiry learning in a college level general psychology course. On a much broader scale the inquiry-based curriculum at Hampshire College was the focus of a 1989 volume of *New Directions in Teaching and Learning* (Weaver 1989). A growing body of research literature (e.g., Justice et al. 2007b, 2009) points to the efficacy of this form of pedagogy. Inquiry is also a way in which universities can effectively link research and teaching (Brew 1999; Healey 2005). This literature encourages institutions of higher education to consider introducing inquiry courses or programs but does not describe the challenges they may face.

Embedding inquiry in the curriculum: inquiry at McMaster

McMaster University has been involved in the *process* of introducing inquiry into the curriculum since 1979 when the Arts and Science planning committee led by Herb Jenkins put inquiry at the core of pedagogy for this new interdisciplinary program. An in depth description of the program is contained in the book, *Combining Two Cultures* (Jenkins et al. 2004). This was followed by the Engineering and Society Program, instituted by the Faculty of Engineering in 1991, which also made inquiry a core pedagogy in its required courses. Then in 1997, first-year inquiry seminars were developed in the Faculties of Humanities, Science and Social Science. These initiatives led to the development of another inquiry-based program, the Bachelor of Health Sciences, and to a variety of free-standing inquiry courses as well as the development of inquiry components within more traditionally taught courses. Before describing the challenges and barriers administrators faced in introducing inquiry into the curriculum, we offer as background descriptive examples of how inquiry has been developed at three curricular levels.

Inquiry as a component of a course

The level of development of inquiry at McMaster can be seen in the variety of the ways it shapes the curriculum. Beginning with a description of how inquiry has been embedded in components of courses and moving through descriptions of inquiry courses and programs the following descriptions demonstrates the breadth of its influence. For example, the first-year course in gerontology (a full-year course) had two linked “self-directed research and writing assignments” which formed the inquiry component of the course. Students began with a starting question related to gerontology from a list of “burning questions” generated by the group on the first day of class. They did some background reading on the topic, conducted a preliminary library search, and critically summarised four related journal articles. The end result of the first assignment was a refined and well thought out research question that was specific, relevant to current literature, and of genuine interest to the student. After receiving feedback, students located and wrote critical summaries of six more articles and then wrote a short (4–5 page) synthesis of their work organised to shed light on their question and to reveal the meaning and the patterns seen in the literature. The process was integrated into the course through the provision of skill-based lessons at the beginning of regular lectures. The skills, including such things as developing questions, assessing research literature, and synthesizing ideas, were presented in the sequence dictated by the needs of the students’ inquiries in the course.

Inquiry based course

The course described here was one of three courses for first year students developed independently by the Faculties of Science, Social Science and Humanities in 1997. Inquiry 1SS3, or Inquiry in the Social Sciences, was a first year seminar course taught in sections of 20–25 students assigned to one instructor. Sections were taught collaboratively meaning all sections used a common schedule, reading material, process of assessment, and goals. The classes met for twelve 3-h concurrent sessions each Wednesday evening which allowed occasional large-group sessions such as the cross-cultural simulation, *Bafa Bafa* (Inglis et al. 2004). All of the sections investigated aspects of the same broad social science theme and addressed a common inquiry thematic question related to representation and

images. Within this theme, individual students developed their own questions which were meaningful to them such as: “Why does the movie industry portray cops as tough, mean guys, when in reality the police force is made up of a variety of personality types?” Weekly class work involved students learning how to investigate their questions through a process of developing and testing hypotheses using secondary sources. Class activities included instructor guided exercises and tasks for building the students’ critical and research abilities which were introduced at a time when students required that particular ability for their developing investigations. The course emphasized the development of skills such as independent and collaborative learning, searching for and evaluating information, synthesis, oral and written communication, and self and peer evaluation. A lot of class time was also used for groups of four or five students to assist each other in such things as clarifying understandings, sharing ideas and resources, or planning research strategies.

Two inquiry based programs

Begun in 1991, the *Engineering and Society Program* is a 5-year program which allows students to complete the engineering course requirements of any of the nine disciplines in engineering offered at McMaster while taking newly designed core courses dealing with the place of engineering in society. Completion of the Program earns the degree Bachelor of Engineering and Society. The planning committee made inquiry pedagogy a major component of the core curriculum, seeing it as analogous to the front-end of the design process where problems are defined before their solution is attempted. Inquiry courses comprise three of the seven core courses (each are one-semester courses) unique to the Engineering and Society Program. They focus on the development and practice of question-driven and self-directed research. The skills of critical thinking, posing questions, anticipating possible findings, researching, weighing evidence, and presenting findings both orally and in writing are developed through workshops and projects. The emphasis on learning how to learn is complemented by use of small-group learning and other active teaching and learning tactics in the classroom. The first of the three inquiry courses is used to teach the art of inquiry using the theme of a sustainable society. Since the art of inquiry is to be a part of engineering practice (as opposed to a theoretical research effort), local issues and situations are used as starting points for questions that students pursue in small groups. In the second inquiry course (at level four) students work in pairs to explore the application of preventive engineering to issues of sustainability. The third inquiry takes place in the student’s fifth year. Each student works independently with a faculty supervisor from any department in the university to inquire into a question of his or her own choosing, culminating in a major paper and an oral presentation on the results of their inquiry.

The *Bachelor of Health Sciences* program began in 2000. An objective of the program is to have students become autonomous and independent members of the Health Sciences learning community, envisioned as a complex adaptive system (Barrett et al. 2005). There is a concerted effort to build the entire program around inquiry. Each year there is an inquiry course which is integrated with and mutually supportive of other courses that contribute to developing the skills of inquiry. The first-year inquiry is a full-year course and focuses on skill development and group work. Students in this course participate in benchmarking activities which stimulate them to form their own ideas about the skills they need to develop and to self-evaluate. Groups of students, guided by a facilitator and peer

tutors, form questions based on such themes as homelessness and pursue these questions. Year-two inquiry continues skill development using groups of ten, and leads to students formulating their own learning objectives. They pursue these objectives in a year-three inquiry project. In fourth year, students do a thesis and can choose between a number of inquiry courses; in one of these students participate in activities such as peer tutoring first-year inquiry students which reinforces inquiry skills in both the tutors and those being tutored.

Administrative experiences of inquiry

In this section of the paper, we report on the results of interviews with a number of the key people involved in the introduction, promotion and administration of inquiry at McMaster. We asked four deans, three senior administrators and five others with extra-pedagogical experience in inquiry teaching for their views about the development of inquiry at McMaster and about the challenges and barriers they faced in introducing and supporting inquiry. In addition, three of the authors (Jenkins, Hudspith and Roy) have various types of administrative experience with the introduction, delivery and maintenance of inquiry. The research was based on a semi-structured interview with open ended questions meant to probe the respondents' views and experiences. We wanted to know what interested them in seeking to introduce the process into the curriculum and the barriers they faced and steps they took to overcome these challenges. We were also interested in knowing how they encouraged faculty members to become engaged in inquiry teaching, the strategies they discovered for gaining support from administrative units such as departments, and what recommendations they would make to other university administrators who might want to introduce inquiry. The findings represent an amalgam of comments made during the process and the strategies and recommendations were drawn from the material and checked with the respondents; a close-to-finished copy of our analysis of this material was sent to the administrators to ensure that our synthesis of their comments did not violate the spirit of what they had said.

The growth in interest with the idea of inquiry occurred for a number of reasons. At one level, administrators spoke of enhanced awareness—both on their parts and those of students—of the potential inadequacies of educating and instructing undergraduate students within research-intensive universities where a faculty member's research interest (and publications) form the core of the universities' 'purpose'. For some, the solution seemed to lie in offering a more integrated education through focusing more on process and outcomes and opening up the boundaries of individual disciplines. At McMaster there was the example of the problem based learning (PBL) process used in the McMaster Medical School for which they have gained considerable recognition and thus an advantage when looking for the most capable students. University administrators were interested in taking advantage of this reputation for innovation. In addition, Deans who were providing information sessions for new students and their parents were often asked about innovative programs in their faculties. It appeared that there was a growing demand for this type of education; students were looking for new types of programs which went beyond the typical lecture format. Finally the Arts and Science program, the first to experiment with inquiry pedagogy, proved to be very popular with students. This success encouraged other deans to introduce inquiry into parts of their curriculum.

Administrators' views of the benefits of inquiry

All of the administrators we interviewed were clear in their belief that inquiry pedagogy enhances student learning. For example, we were told that a professor's ability to teach anything is limited by the student's ability to learn, which in turn depends on identifiable skills and attitudes and that inquiry courses offer a practical approach to honing these skills and attitudes. We were also told that inquiry necessitates faculty–student contact, which fits the best practice model defined by Chickering and Gamson (1987) and is highly valued by students and that in some cases their inquiry instructors are the only ones students really know. Administrators believe that students learn to learn by doing inquiry and thus it improves the depth and quality of their learning in other courses. Administrators also point out that students rate inquiry courses in student evaluations relatively highly and that graduates often comment on the value of the inquiry skills for their life and work.

Administrators also stated that inquiry has immediate benefits for the recruitment and retention of students. For example, one dean believed that offering inquiry helps with recruitment of good students, because both students and parents are attracted to the aims and skills involved, and to the higher degree of engagement which such courses generate.

We were also told by administrators that inquiry has other long term benefits to the university. Faculty get to know students in an inquiry course, and the relationships can be “eye-openers” for instructors who more directly experience the effects of their work and “come to appreciate students' hopes, dreams, and insecurities” leading to a deeper appreciation of issues facing students. Administrators also believe that instructors benefit from experimenting with different approaches to teaching and that principles of inquiry diffuse into other teaching. Inquiry often offers a context in which teaching is under the scrutiny of peers and that creates a sustained dialogue in which creative ideas about how to teach more effectively are exchanged. A McMaster based study (Maurer 2007) discovered that teaching year-one inquiry subsequently changed instructors' other teaching including the use of more open-ended projects, more student self-assessment, increased likelihood of using groups, and more student-centered assignments. Teachers who had taught inquiry were also more likely to volunteer for a subsequent inquiry course, and more likely to develop new inquiry courses in their home department, (though this may reflect more on who they are and why they volunteered in the first place).

Despite what they see as benefits of inquiry pedagogy, administrators identified several core challenges that had to be overcome when seeking to introduce this pedagogy into the curriculum. These include resistance to the very idea of inquiry, difficulties in finding appropriate and willing instructors, and barriers related to power and financial structures. In what follows we look at each of these areas in turn focusing on the nature of the administrative obstacle and strategies and suggestions administrators had for meeting these challenges.

Resistance to the idea of inquiry

Acceptance of the pedagogy of inquiry based learning—which is simply referred to as inquiry at McMaster—is complicated by the common currency of this term as a synonym for research or investigation. Administrators noted that although there was an assumption of understanding of what “inquiry” meant, in fact there was limited understanding within the university community of what was meant by the inquiry as a pedagogy.. Administrators saw this lack of understanding of the core elements of inquiry leading to both rejection of

the idea and resistance to learning more about it. Some faculty members thought that inquiry was just another “fad, and like other fads would soon disappear”. On the other hand, administrators reported that some of those faculty members who had a better idea of the meaning of inquiry were also resistance to the idea. The primary objection of these faculty members was that inquiry focused more on skills development and less on discipline content. As described by one dean, faculty members made claims such as “academic’s professorial responsibility is to impart core discipline content and that reducing the number of discipline courses in favour of inquiry courses undermined students’ education”. We also heard that some professors also see teaching of skills as a distraction from higher purposes of a university education and believe that students who gain entry to university should already have the necessary skills to do university work. Administrators also heard from faculty that they already develop inquiry type skills in their regular classes and so introducing inquiry into the curriculum as a special method, class or program is redundant and wasteful.

To counter these sorts of resistance administrators reported the need to publicize and explain the idea of inquiry. One dean described how important it was to *hold information sessions* about the concept. Speakers were invited to make faculty wide presentations about the idea and to introduce the concepts to faculty members who were interested in developing inquiry into their existing courses.

Another strategy used was *anticipating criticisms and developing sound counter-arguments*. For example, one administrator reported countering the claim that inquiry is a fad by arguing that although inquiry is relatively new as a university-level pedagogy, learning how to inquire as a “question-driven search for understanding is an age-old tradition”. Another senior administrator countered claims that inquiry is somehow inappropriate in a university by arguing that “it is, after all, what we do in our own research”. Another administrator regularly pointed to the longevity of inquiry in order to counter the possibility of people dismissing it as a current fashion or fancy.

Administrators felt there is some truth to the notion that introducing inquiry takes time away from acquiring content knowledge in a subject area. They agreed that students have a finite amount of time to invest in their programs and they recognized that time students spend on skill development is not available for them to learn content. However, the administrators argue that the higher level of engagement with the subject in inquiry leads to deeper learning of whatever substantive content is engaged and that the skills developed are broadly useful in acquiring instructor-directed content in other courses as well as more student-directed content. One administrator recounted the need to constantly ask those committed to disciplinary ‘content’ how much they could remember of the detailed, discipline-specific content of their own university education.

One administrator expressed the concern that some faculty members resisted the idea of inquiry when they come up against what they take to be a ‘holier than thou’ attitude of converts. The enthusiasm for new pedagogical models is often accompanied by denigration of the old as an ineffective way of teaching. This often led professors who have built a reputation on excellent lectures, and who have been greatly appreciated by their students, to feel deeply and personally affronted by arguments about the claimed superiority of inquiry.

A strategy suggested by several administrators is to *start with an able champion*. When it comes to larger institutional changes (a new program or a new faculty-wide course) having the right leader seems to matter. Individuals who have strong credentials are likely to be more persuasive than others when they associate their credibility with the new program. Administrators tend to believe that most successful programs owe a significant

portion of their success to the passion and commitment of individuals who were able to inspire others to participate. Developing a history of successful experience with these professors will eventually help to enlist some of the more skeptical ones.

Finally *knowledgeable resource persons and animators can help people think about inquiry*. Administrators highly valued that role played by members of the instructional development centre whose members understood well and were sympathetic to the inquiry approach. In general we were told that instructional development staff have knowledge of organizational development and the diffusion of innovation and thus can be key players in diffusing and clarifying the concept, and connecting various efforts around the campus so that successful innovations in one area are shared with others.

Finding appropriate and willing instructors

An equally challenging barrier identified by the administrators is finding instructors willing to teach inquiry. Many faculty members see new pedagogies such as inquiry as a threat to their roles and responsibilities. Existing demands for research and publications have become normalized within the institutions and faculty members know how to respond to these demands. New demands focused on teaching and particularly teaching focused on student centered learning places new and untested demands on faculty member's roles and responsibilities. Administrators recognized that this made many faculty members feel vulnerable and left them with a feeling of loss of control. Finding faculty members who were prepared to take the risk of teaching with a new pedagogy was one of the major challenges of introducing inquiry in different parts of the university.

Administrators also reported that many faculty members see teaching inquiry as more work than other teaching assignments and as having certain constraints such as less freedom to teach what and how they please compared to inquiry. Moreover, instructors who teach outside their departments (for example, in an inquiry program) report that they will receive less credit from their own department chair for excellence in teaching than for the same level of achievement within their own department.

Finally, the administrators were concerned that those new faculty members who took on teaching inquiry courses could potentially hurt their academic careers given that the reward system does not adequately recognize teaching. Further, the first time an instructor teaches inquiry; his or her student ratings typically drop.

In order to attract faculty members, administrators have used a variety of tactics. The most important of these was to *increase compensation for instructors or their departments*. For example, instructors teaching an interdisciplinary course were offered twice the regular rate for overload teaching. Deans offered other incentives as well. Some faculty members were offered new computers and others were offered grants for conferences, workshop and books related to inquiry. New recruits were also told about the research opportunities that existed within inquiry and they were given support to develop their own research agendas.

In order to attend to issues of risk, the Deans often *sought out more experienced faculty members to teach inquiry*. They looked for people who had already developed a research reputation and who were more secure in their academic careers. It was suggested that inquiry is best taught by tenured faculty members.

From a pedagogical perspective *inquiry instructors should be selected carefully*. Deans and administrators claimed that inquiry requires a type of environment and attitude. There are professors who are comfortable acting as facilitators of learning and supporting student efforts to come to an understanding for themselves, while others have always based their

teaching efforts in their disciplinary expertise. Administrators believe it is wise to begin with the former, though the latter may make good inquiry instructors if they can be slowly convinced to give up the exclusive control of content for the benefits of more self-directed learning.

Deans said they wanted to *enlist faculty members who could encourage students* to undertake self-directed learning and who were able to *motivate* students in developing academic skills. It is important to find people-oriented professors—those who enjoy teaching and thinking about teaching. They may be, but are not necessarily, star teachers who are effective in large classes. Administrators were unanimous in saying that they looked for professors who like to teach and who already value student-directed learning.

From a broader perspective, administrators talked about *looking for an appropriate educational philosophy when interviewing new faculty members*. The idea was that new recruits with a positive orientation towards interactive learning were more likely to support the ongoing development of inquiry type courses and add to the strength of teaching within departments.

Where enrolments make it feasible, administrators said there are many advantages of *enlisting a diverse team of instructors* to design and teach an inquiry course. Perhaps the most important of these is that for most faculty, teaching inquiry requires a significant role change (from discipline expert to facilitator), and this is easier to do in the company of others. One McMaster model that one administrator thought workable is for teams to have 3-year, staggered membership. This allows new members of the team to receive reassurance from their more experienced colleagues. Experienced members may need to explain more than once the aims of an inquiry course, and make suggestions based on their experience about tactics that work.

Peer tutors add a special dimension to inquiry courses. Deans and administrators claimed that some of their strongest allies in introducing curriculum change were senior students. They talked about the strategy of recruiting them from the outset and consulting with them on the design of the course and later involving them in teaching the course as peer tutors for the lower level inquiry courses. Deans and administrators felt their positive attitude towards the courses reassures new instructors that the course will be successful, and provides valuable insight into how students actually experience inquiry. Peer tutors can receive course credit for their work through the creation of an upper level course in which they learn more about inquiry, teaching, and learning in a university environment, and they apply some of what they learned as a peer tutor.

Structural barriers

When administrators sought to introduce inquiry in their faculties they encountered resistance from the departments. In part this resistance arose because departments could find no obvious payoff for allocating teaching resources to inquiry. There can be both perception and reality that inquiry cuts into disciplinary time and resources. Even if the pedagogy is accepted, administrators report that inquiry meets resistance where it threatens to alter the existing flow of power and resource allocation.

Though an inquiry course can be discipline-centered, inquiry into questions arising from student-centered questions is almost certain to cross disciplinary boundaries. When inquiry is developed in an explicitly interdisciplinary context, political resistance includes rejections of inquiry by those who believe that it will divert power and resources from central educational tasks, i.e., those dedicated to conveying the structure and content of

disciplinary knowledge. On the other hand, departments may support students learning new skills but are reluctant to have to teach these skills or have them taught within their department. As one administrator said, while everyone agrees that students should write well, few outside of the English Department see it as their responsibility to teach them how to do it. Finally departments argue that teaching inquiry is simply too expensive vis a vis courses taught in a traditional manner.

Administrators report that departments have the authority to make academic decisions affecting their curriculum particularly if these decisions concern existing programs. The teaching resources (principally faculty time) of a university are often largely 'owned' by departments, hence by disciplines, with their own important mandates to fulfill. A difficulty arises, however, when there are institutional goals that do not properly fit into any single discipline. One administrator claimed "that there are really no effective tools within the university structure to allow them to alter discipline structured departments". While Deans are able to introduce special projects within their faculties and even experimental programs, they are basically unable to alter the structure of existing programs without the consent of the faculty members making up the department.

Some administrators, however, took a variety of approaches to induce departments to release faculty for inquiry courses. The primary strategy has been for deans and administrators to *require* departments to provide a faculty member to take responsibility for teaching in an interdisciplinary inquiry course or program. A second strategy was enhanced compensation to departments who release instructors.

Administrators needed to *develop arguments appealing to cost benefit analyses on longer time scales and appeals to the greater good*. While the Administrators recognized the extra expenses in offering inquiry, they felt that when compared with many laboratory and other courses where skills are taught, the expense was in line. The costs also compare favorably in this regard with low-enrollment senior classes built around an individual professor's specialty. Administrators also argued that the cost-benefit analysis should take into account longer-term potential benefits as well as the more obvious immediate costs. For example, since, as our administrators tend to believe, an inquiry course can improve retention of students (and is less costly than recruitment) these savings can be factored in. Developing intellectual skills is essential for academic success and such skill courses as language or laboratory courses must be kept relatively small since skills are best developed through coached practice. The investment in skills should make it possible for students to succeed in larger courses, multiplying the returns from investment. If more students succeed in senior capstone courses, and later in graduate school, then these benefits can also be weighed. Finally, administrators advanced the argument that faculty members also change as a consequence of their involvement with inquiry and bring skills back to their departments.

Well designed assessments of the gains an inquiry course can achieve will play an important part in testing the claim that inquiry courses are good investments when their benefits are taken fully into account. Deans and administrators felt it was important to start tracking the outcomes of the new initiative from the beginning. This will provide a benchmark, or baseline, and identifies the introduction of inquiry as a scholarly activity. It allows instructors to refine their approach to teaching inquiry, and to be able later to provide evidence of the efficacy of the inquiry course. When looking for outcomes, use both traditional measures, (grades etc.) and measures that will better capture the sorts of changes in student learning that you expect inquiry to achieve, such as enhanced self-direction and critical thinking ability and proclivity.

Finally, administrators though the chances of more permanent change were increased when inquiry was instituted as one of the main forms of pedagogy in a program of studies if possible. Having two or three inquiry courses in the core curriculum has at least three benefits: the skills of inquiry can be introduced in a first course and then reinforced and practiced in later upper level courses; inquiry is more permanent, not dependent on the interests of an instructor; and, the process of teaching inquiry can be developed over several years.

Conclusions

From the perspective of those administrators who have experience introducing and supporting various forms of inquiry into the curriculum, the benefits of inquiry are many. They believe inquiry can enhance student learning and student performance in other courses. They also believe inquiry can make an important contribution to the way faculty members approach their other teaching responsibilities and that it helps attract and hold onto students.

Yet at McMaster administrators encountered various types of resistance to the development of inquiry pedagogy. There was not only resistance to the idea of inquiry, but there were challenges in finding instructors willing to teach inquiry and in getting the support of departments who allot teaching responsibilities. These barriers to curricular change can usefully be seen in terms of content, context and process dimensions.

Unlike other environments, introducing any idea into a university is a special challenge. Ideas are the 'stock and trade' of academics and by nature they spend considerable time exploring the pros and cons, having debates about their values and thinking about the issues from many points of view. This means the change process within a university can be slow and difficult to 'manage.'

At McMaster the idea of inquiry based pedagogy was resisted by both those who understood it and those who assumed they understood it, but did not. Inquiry was variably portrayed as a "passing fad" or "what I have been doing all along". But inquiry shifts the relationship between professors and students and between content and process which can be objected to both at face value and for the personal challenges posed. In moving students to become self directed learners faculty members would have to shift from being disciplined based content experts to becoming facilitators of student explorations. Understandably this shift threatened those who felt unable or unsuitable to perform adequately or to those whose reputations or careers were grounded in lecture based pedagogy. The debates about the value of inquiry are still going on within the university.

In examining the strategies and tactics that administrators used it appears that an important strategy is promotion of the idea. They had to encourage academics to think about the idea and to enter into debate and dialogue. Once discussions began, it was possible to identify and recruit those teachers who appear interested in the idea and receptive to becoming engaged. Having heard voices objecting to the change, it became possible to develop and promote effective counter arguments.

While the content of the debate is important the context also has critical dimensions. The context is shaped by the expectations that faculty members have about how administrators and various committees will reward their meeting their roles and responsibilities through promotions and raises. The university context includes general issues of trust and power negotiation between administration, departments and individual professors. But of primary importance at McMaster there existed a healthy skepticism among many that

despite rhetoric or promises, excessive effort at teaching was a fool's game as ultimately teaching accomplishments would take a distant second place to research related activities in advancement decisions. The difficulties in finding professors willing to teach inquiry spoke in part to contextual issues of trust in the probability of being rewarded or punished for participation.

On the basis of the variety of strategies developed it seems that administrators recognized the reality of this context. They came to lean towards filling inquiry teaching positions with student peer tutors and secure senior faculty and to select from among those who are by nature oriented to inquiry style teaching. They also sought to make the context richer by offering incentives and providing additional benefits and status to those who took on the process of teaching inquiry and in some cases to departments releasing instructors.

The development of inquiry at McMaster was fundamentally a top down process. Despite efforts to develop feelings of ownership among faculty, such as having teams of faculty more or less autonomously do the actual course development, little widespread sense of ownership developed. This is likely linked to the general sense of reluctance to alter existing teaching responsibilities. Such process issues are especially important in the context of higher education where individual faculty members are more powerful vis-à-vis the administration than are workers in other corporations. They are more autonomous, feel higher levels of control of their work environment, and are harder to punish. They also have more freedom to accept or reject proposed changes or simply to disregard the efforts of those trying to introduce change. Likewise, departments have relative autonomy within the overall structure of the university and have a high degree of control over resources, giving them power to resist change. One dean tells the story of a Vice President administration who came from the corporate world and simply could not understand why departmental chairs did not tell the faculty member what to do and threaten them with punitive action if they did not do it. The very idea of this type of authority is alien in the academic world.

In order to introduce change deans and administrators developed many tactics they used to overcome process barriers. They found it was key to develop feeling of ownership regarding the idea of inquiry so that those who were interested in the notion would be prepared to defend it with other faculty members. They began by engaging diverse sets of instructors who were interested in introducing a student-centred pedagogy. Once they established such a group they could build on this support and use it as an example for others to follow. They engaged senior students who were interested in being peer tutors which built ownership and demand within the student body. Finally, they looked to engage senior people who could both provide leadership in developing the curriculum and influence others' opinions.

Even after being part of the curriculum for many years inquiry pedagogy is still under pressure. In the Arts and Science program there has been consideration about reducing the number of inquiry based courses. The Social Sciences and Sciences are still finding it challenging to get faculty members to teach the course and while things are going well in Engineering and Society, there is no guarantee that it will continue this way. If there is one key message it is that deans and administrators who support the introduction of inquiry into the curriculum have to remain vigilant.

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