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Developing Useful and Transferable Skills: Course Design to Prepare Students for a Life of Learning

Christopher Justice
McMaster University, justice@mcmaster.ca

James Rice
McMaster University, ricejame@mcmaster.ca

Wayne Warry
McMaster University, warrywa@mcmaster.ca

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Keywords
Inquiry, Inquiry-based learning, Transfer of learning, Quasi-experimental study, Academic skills, First-year seminar

Developing Useful and Transferable Skills: Course Design to Prepare Students for a Life of Learning

Christopher Justice
McMaster University
Hamilton, Ontario, Canada
justice@mcmaster.ca

James Rice (Professor Emeritus) McMaster University Hamilton, Ontario, Canada
ricejame@mcmaster.ca

Wayne Warry McMaster University Hamilton, Ontario, Canada
warrywa@mcmaster.ca

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Introduction

The changing nature of the workforce, the information age, and new understandings in the science of learning are leading to a changing consciousness about the goals of higher education (National Research Council 2000: 4; Barnett 1999). Increasingly, the focus has moved from “teaching” to “learning” (Barr and Tagg 1995) and developing “active learners who seek to understand complex subject matter and are better prepared to transfer what they have learned to new problems and settings” (National Research Council 2000: 12). Educational institutions at all levels are introducing new courses and programs that focus on student centered learning.

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This educational orientation has taken many forms: active learning, self directed learning (Knowles, 1975), intentional learning (Bereiter and Scardamalia 1989), discovery learning, experiential learning, cooperative learning, problem based learning, autonomous learning (Thomas and Rohwer 1986), learning to learn (Smith 1990), and lifelong learning (Knapper and Crosley 2000). But while these terms all have distinguishable technical meanings, they all suggest aspects of the same thing, the growing importance of student centered learning and learning-how-to-learn (Knapper 2004). This orientation implies the need to focus higher education more solidly in the development of what Ramsden (2003) calls "general aims and higher level abilities" including skills in self-directed learning, collaborative problem solving, and team building as well as the more traditional abilities of identifying, accessing, assimilating and communicating information. In the most general sense these skills are meant to prepare students for both enhanced success in their formal studies and a lifetime of learning.

Many university educators assume that students learn skills as a by-product of the overt curriculum consisting primarily of knowledge-oriented classes (Appleby 2001), that learning in one subject area enhances ability to learn in another, and that there are generalisable learning outcomes that accrue from a collection of university courses, such as abilities to analyse or think critically. That is, there has been a broad assumption that any abilities that are developed will be transferable to other academic contexts and to real life situations (Sheperd 2000). However, the relatively extensive literature on transfer of learning (Billing 2007) suggests that such assumptions about the natural accrual of useful academic skills and the ability to put them to general use may be unwarranted. Thus, the issue of skills transfer is highly significant to the idea of learning how to learn.

In broadest terms, transfer of learning occurs when previously learned knowledge and skills affect the way new knowledge and skills are learned and performed (Cormier and Hagman 1987). Stated another way, transfer is the process of using knowledge or skills acquired in one context in a new or varied context. Rather than simply generalizing across problem contexts, transfer implies domains and tasks that are similar but not the same (Alexander and Murphy 1999). Perkins and Salomon (1988, 1989, 1992) distinguish between 'near' and 'far' transfer. Near transfer of learning takes place when the contexts are similar as, for example, driving one kind of car after learning in another. Far transfer refers to transfer when the context is more remote or alien, such as using skills learned in team sports in a business context. These are intuitive notions and represent end-points on a spectrum – many examples would fall somewhere between near and far. Research evidence has shown that when a new challenge is sufficiently similar to a previous one, differences can be handled without much conscious thought; near transfer of knowledge or skills is commonplace. However, in situations which are sufficiently different, there is an abundance of evidence that transfer of learning often does not occur as hoped or expected (Perkins and Solomon, 1992).

Assuming transfer is achievable but not trivial, much work has been done investigating the underlying factors and conditions supporting transfer. Perkins and Solomon (1992) concluded that transfer is more likely under two different conditions: when there is diverse practice of routines (called low road transfer) and when learners mindfully and explicitly search for abstract connections and self monitor their learning (called high road transfer). Recent research carried out by Chiabura and Marinova (2005) indicates that skills transfer depends upon two broad factors: individual dimensions such as goal orientation and training

self-efficacy, and contextual factors such as supervision and peer support. In his 2000 book *Key Skills: Teaching and Learning for Transfer,* Shepherd suggests that a transfer-friendly pedagogy is characterized by active and student-centered learning in which students and instructors engage in critical dialogue and where students are engaged and evaluated on project work and build on past knowledge. Enhancing transfer is also presumed to involve making students aware of their skills, emphasizing the utility of skills to other contexts, and linking skills to each other. The National Research Council (2000) suggests that metacognitive activities such as self-reflection and self-assessment support the transfer of learning into other realms and contexts. In a recent review of the evidence, Billing (2007) concludes that transfer is enhanced when a) learning focuses on general principles of reasoning and abstract concepts and principles, b) there is explicit recognition of skills and how problems resemble each other, and c) when learning occurs in a cooperative social context which favours developing explanations, provision of feedback, and expectations of individual responsibility for learning.

This article focuses on research examining whether a first year seminar course designed to enhance a range of self-directed learning skills (Justice et al 2009) and their transferability to other learning contexts, in fact provided a set of skills that were useful and transferable to other academic settings. The evidence derives from a comparison of a sample of academic work from two groups of Social Sciences students, one comprised of students who had taken the course Inquiry 1SS3 and the other who had not. The student work consists of 1) papers submitted by participants who were asked for the best paper they had written at university and 2) descriptive narratives provided by participants of the steps they took in researching and writing that paper. Qualitative and quantitative analysis by multiple Raters using a blinded protocol was conducted to explore the differences between students' skills and proclivities in researching and writing papers. While writing a paper may reflect generalized problems of researching and communicating effectively, each new paper arises in a new context, creates new challenges, requires new ways of expressing ideas, and requires finding the internal motivation to succeed at the task. As such, it is a complex task relying on many skills that we consider to be sufficiently 'far' that it reflects an example of meaningful transfer of learning from one context to another.

The intervention - Inquiry 1SS3

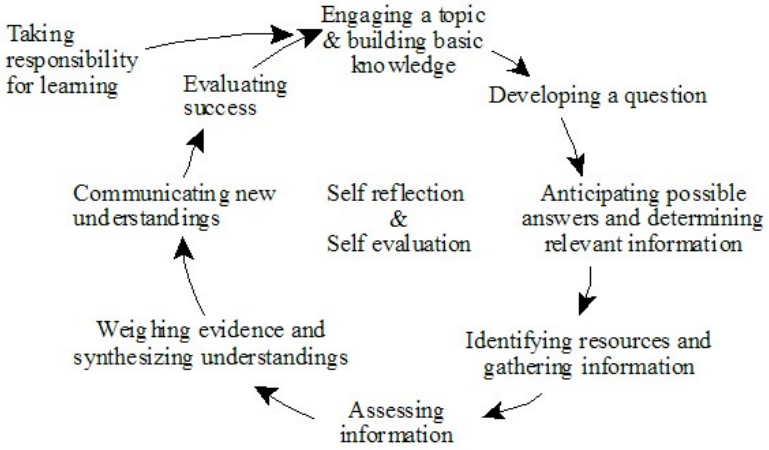
The Inquiry 1SS3 course design, learning exercises, assessment methods, and guidance given to instructors, are described in two previous publications (Justice, Warry, Cuneo, Inglis, Miller, Rice & Sammon 2002; Justice, Rice, Warry, Inglis, Miller & Sammon 2007). Inquiry 1SS3 was an experimental first year seminar for Social Science students at McMaster, a mid-size Canadian research-intensive university. Designed to be taken upon entering university, the main goal of the course was to prepare students to get the most out of their subsequent university courses and to build a set of tools for enhanced learning beyond university. More specifically, the course aimed at developing students' abilities to conduct sound and thoughtful research and to communicate process and results clearly. The vision was of developing 'inquirers' – people with enhanced academic research skills and habits for learning through the engaged pursuit of knowledge about matters that interest or effect them.

The design of Inquiry 1SS3 assumed that for students to become inquirers involves the development of: 1) a set of academic and intellectual skills; 2) a general procedural

strategy for using these skills to pursue knowledge and; 3) a willingness or proclivity to use those skills and strategy independently in a variety of learning contexts.
Inquiry 1SS3 aimed to develop a range of both general and specific academic and intellectual skills. General skills included deep and critical approaches to knowledge development, reflexive practice, collaboration, and academic engagement. More specific skills include those immediately relevant to conducting an inquiry and communicating. For example, students were asked to think about and practice reading and writing critically, formulating questions, thinking through research strategies, using research libraries and the Internet, evaluating information, and putting interpretations and conclusions together in thoughtful ways facilitative of communication.

Students were encouraged to learn and engage in a procedural strategy called the inquiry cycle consisting of a progressive series of stages beginning with the formulation of a complex question and moving toward deeper understanding of the factors related to the question (Figure 1).

Figure 1. The Inquiry Cycle (adapted from Justice et al. 2002)



The thinking underlying the course pedagogy was constructivist; it was assumed that knowledge developed through active engagement leads to enhanced integration and internalization (Abdal-Haqq 1998). The course was designed to create conditions in which students felt they were in charge of what they learned. The course was also designed around a substantive theme of social representation intended to allow opportunity for students to grapple intellectually with their own social experiences and thus to become personally engaged with a topic. Students actively worked together both to explore their topics and to consciously develop new capabilities and awareness of learning processes and inquiry strategies. It was assumed that these features of the learning environment would ultimately lead students to take on more responsibility for their own learning and to seek knowledge that fulfilled their own learning objectives. It was assumed that by developing a strategy for pursuing knowledge and understanding, and explicitly teaching that strategy in an environment meant to foster personal engagement, self-direction and the enjoyment of learning, academic skills would be more transferable to other circumstances

Methodology

This study was part of a larger McMaster Innovative Learning Study which is briefly summarized below and more fully described in Justice, Rice and Warry (2009). The larger study compares skill levels and academic performance over time of students who had taken Inquiry 1SS3 when they began university with students who had not taken this course. The two samples were drawn from a five year population of Social Sciences students. From the potential pool of 6244 candidates, 54 students who had had taken Inquiry 1SS3 (referred to as 'Inquiry students' or 'Inquiry group') and 71 students who had not taken Inquiry 1SS3 ('Non-Inquiry students' or 'Comparison group') completed the study. Students were paid $100.00 to participate in the study and were not aware of the purpose of the study, only that it concerned innovative learning.

During the process of this larger study participants were asked to submit a paper they had written while in university that they considered to be their best, irrespective of the content of the paper or the mark they received for it. At the same participants were asked to prepare a brief narrative regarding the steps they had taken in researching and writing the paper that they had submitted. The instructions asked them to be thoughtful and truthful about the details of the process and to write about their thoughts and actions from the time the paper was first assigned until it was handed in to their instructor. This paper deals with the analyses of these two components of the larger study.

We are aware of the complexities of conducting research in an educational setting where it is not possible for ethical or practical reasons, nor desirable for pedagogical reasons, to randomly assign students to a course. The fact that students chose whether or not to take the course means that measured differences between Inquiry and Non-Inquiry students are potentially related to either the effects of the course or to pre-existing differences between groups related to the self-selection process. As a result, we tested for any pre-existing differences in all dimensions for which we have data and looked at the results of our findings to identify areas where we could test for non-course related difference between the two groups. As Table 1 shows there are no meaningful differences between the study groups in gender, age or high school performance, nor in level 1 grade average. Nor were there significant differences in self-reported parents' income, student loans or highest degree students' had earned at the time of study.

Table 1. Comparison of variables between Inquiry and Non-Inquiry Students (from Justice et al 2009)

Level	*Means*				
	% Female	Age	HS English	HS GPA	Level 1 Avg.
Non-Inquiry	82	19.2	77.0	79.5	6.9
Inquiry	74	19.1	79.3	79.8	7.0
Total	78	19.2	78.1	79.6	6.9

It is difficult to directly answer the important question of whether students who chose ISS3 were more academically motivated or not. However, any motivational difference is reflected in neither high school nor first-year university performance. Part of the larger study,

students also had completed a 140 item questionnaire related to university experiences and attitudes toward learning (Justice et al 2009). Comparisons revealed no differences between the two groups in areas which would suggest pre-existing motivational differences. We thus feel it is reasonable to consider having taken or not taken Inquiry 1SS3 the explanation for differential performances between study groups.

Analysis of Student Papers

To test whether participation in Inquiry 1SS3 had an effect on subsequent student performance, we removed any identifying information and randomly assigned papers to volunteer Raters. The Raters were professional educators from universities across Canada who were recruited using names from the Society for Teaching and Learning in Higher Education (STLHE) Networking Guide. Each Rater was sent up to 32 papers so that each paper was independently assessed four times.[1]

Raters assessed papers using a rubric (Appendix A) consisting of a global score and a rating on sixteen items using a five point scale. The rubric was structured around discerning the skills and strategy of the inquiry cycle (Figure 1) as well as making inferences about social awareness and approaches to learning. Raters were given a set of basic procedural instructions but we relied on their experience to discern the meaning and make judgments about the rubric items.

We assumed that the number of years a student had attended the university would have an effect on many of the performance indicators that we were measuring. To allow for this we analysed results by university level as well as study group. Participants were divided into those who had completed fewer than 84 units (Lower Level) versus those who had completed more than 84 units (Upper Level).

Based in analysis of variance, we calculated effect size, that is, a measure of the magnitude of the treatment effect independent of the size of the sample, using Cohen's d (Cohen, 1988). Because we were testing for the effects of a single course and controlling for level with a relatively small sample, we expected to see low effect sizes and relatively high p. values. We decided to accept differences as *meaningful* if they met both conditions of having a minimum effect size of 0.2 (which Cohen considers to be a small effect) in combination with a reasonable probability value which, we judge to be 0.2., an approach more fully elaborated in Justice et al (2009).

Component Name	Variable
1. Awareness of social issues	Cultural issues awareness
	Political issues awareness
	Social differences awareness
2. Deep and self-directed learning style	Self-directed approach to learning
	Deep approach to learning
3. Inquiry Cycle Strategy Indicators	Focussed around question
	Hypotheses to focus research
	Discusses limitations
	Evidence of self-reflection
4. Sound writing indicators	Clearly written
	Well organised
	Critical thinking
	Synthesized to coherent whole
	Proof-read & copy-edited
5. Sound evidence and well referenced	Academically sound evidence
	Correctly referenced

A factor analysis of the questions in the rubric (not including "Global Score") resulted in the five components presented in Table 3.

Table 3. Factor Analysis

An analysis of variance was carried out using the five components against group and level. Two-way interactions were not meaningful and were removed from the model. Results are shown in Table 4. The top half of the table shows differences between lower level students (Lower) and upper level students (Upper), the bottom half of the table shows differences between students who had taken Inquiry 1SS3 (Inquiry) and the comparisons (Non-Inq). Bolded numbers are considered meaningfully higher. Negative effect size numbers indicate positive results for upper level and the Inquiry group respectively.

Table 4. Effect sizes and F-values by Group and by Level, Component Results

	Mean Estimates		Effect size	ANOVA	
Component	Source			F	p.
	Level	Lower	Upper			
Global score		70.3	77.5	-1.225	49.255	.000
Awareness of social issues		69.2	75.1	-.664	14.461	.000
Inquiry Cycle Strategy Indicators		55.9	60.4	-.534	9.348	.002
Sound writing indicators		67.8	76.7	-.971	30.953	.000
Deep and self-directed learning style		62.7	71.4	-.635	18.271	.000

Sound evidence and well referenced	67.1	74.6	-.699	16.038	.000
Group	Non-Inq	Inquiry			
Global score	72.7	75.1	-.422	3.274	.071
Awareness of social issues	71.2	73.1	-.213	.835	.361
Inquiry Cycle Strategy Indicators	56.3	60.1	-.454	3.786	.052
Sound writing indicators	70.1	74.3	-.462	3.928	.048
Deep and self-directed learning style	63.5	71.2	-.549	6.648	.010
Sound evidence and well referenced	68.8	72.8	-.378	2.631	.106

As one would expect, upper level students scored meaningfully higher than lower level, (with moderate to large effect sizes in all factors), suggesting that time spent at university (an average of two full years between Upper and Lower) improved students' skills in assembling evidence and writing a good paper.

The results also show meaningfully higher assessments for students who had taken Inquiry 1SS3 compared to those who had not. All mean estimates except "Awareness of social issues" are higher for the Inquiry group and most differences are meaningful within the effect size and significance levels chosen for this study. The effect sizes are small to moderate suggesting that having taken Inquiry 1SS3 also improved students' skills in assembling evidence and writing a good paper, though to a lesser extent than two full years of university.

The results were considered sufficiently robust after testing random subsets of the data and finding similar results to further investigate the individual variables making up the components. The results of this analysis of variance and the effect size calculations are shown in Table 5. Again, the top half of the table shows differences between lower level students (Lower) and upper level students (Upper), the bottom half of the table shows differences between students who had taken Inquiry 1SS3 (Inquiry) and the comparisons (Non-Inq). Bolded numbers are considered meaningfully higher. Negative effect size numbers indicate positive results for upper level and the Inquiry group respectively.

Table 5. Effect sizes and F-values by Group and by Level, Variable Results

			Mean Estimates		Effect size	ANOVA	
Rating Variable	Component	Source				F	p.
		Level	Lower	Upper			
Global score			70.3	**77.5**	-1.225	49.255	.000
Social differences awareness	1		68.1	**77.1**	-.898	26.479	.000
Cultural issues awareness	1		71.1	**75.3**	-.399	5.227	.023
Political issues awareness	1		68.5	**72.8**	-.400	5.246	.023
Deep learner	2		58.5	**67.7**	-.817	21.887	.000
Self-directed learner	2		65.5	**73.0**	-.732	17.585	.000
Discusses limitations	3		42.0	**49.3**	-.729	17.438	.000
Evidence of self-reflection	3		54.1	**63.1**	-.719	16.984	.000

Focused around question	3	70.7	71.0	-.024	.020	.889
Hypotheses to focus research	3	56.9	58.3	-.124	.505	.478
Clearly written	4	72.5	**80.7**	-.755	18.705	.000
Critical thinking	4	64.0	**75.5**	-.939	28.915	.000
Proof-read & copy-edited	4	61.9	**72.7**	-.867	24.659	.000
Synthesized to coherent whole	4	68.9	**76.2**	-.615	12.422	.000
Well organised	4	71.5	**78.4**	-.591	11.455	.001
Academically sound evidence	5	69.2	**77.2**	-.722	17.119	.000
Correctly referenced	5	65.0	**71.9**	-.530	9.217	.003

		Group	Non-Inq	Inquiry			
Global score			72.7	**75.1**	-.422	3.274	.071
Social differences awareness	1		72.8	72.4	.039	.029	.866
Cultural issues awareness	1		72.2	74.2	-.181	.606	.437
Political issues awareness	1		68.7	**72.7**	-.384	2.711	.100
Deep learner	2		60.7	**65.5**	-.434	3.472	.063
Self-directed learner	2		66.5	**72.0**	-.551	5.583	.019
Discusses limitations	3		44.0	**47.4**	-.340	2.125	.146
Evidence of self-reflection	3		57.6	59.5	-.154	.435	.510
Focused around question	3		67.0	**74.7**	-.607	6.778	.010
Hypotheses to focus research	3		56.5	58.7	-.184	.626	.429
Clearly written	4		74.7	**78.5**	-.361	2.396	.122
Critical thinking	4		68.1	71.3	-.262	1.268	.261
Proof-read & copy-edited	4		64.8	**69.8**	-.413	3.132	.077
Synthesized to coherent whole	4		70.9	74.3	-.294	1.590	.208
Well organised	4		72.2	**77.7**	-.470	4.070	.044
Academically sound evidence	5		71.2	**75.2**	-.370	2.524	.113
Correctly referenced	5		66.5	**70.4**	-.304	1.700	.193

Upper level students scored meaningfully higher than lower level in all but two variables. Upper level students were no more likely than lower level students to focus their research around a question or to develop hypotheses. Though having taken Inquiry 1SS3 is also not associated with an increase in the use of hypotheses to focus research, having taken the course is associated with the likelihood of using a question as the focus of the research process, one of the central aspects of the Inquiry learning cycle strategy (Figure 1). Though the individual variable results by group are not statistically significant in every case, the pattern of these results is compelling – in every variable but one Inquiry group scores are higher than those of the Non-Inquiry comparisons. The taking of Inquiry 1SS3 is associated with an overall improvement in papers written in other university courses as well as the specific use of procedures developed in that course.

Narrative Study

The narratives that students provided describing the steps they had taken in researching and writing the paper were analyzed by three independent Raters (different than the Raters who reviewed the papers described in the previous section) who were blind to the study design and purpose of the research, and did not know whether the participants had taken the Inquiry course or not. Raters were trained using selected cases until their analytical results converged sufficiently. To assess the narratives, Raters used a structured coding sheet (Appendix B) developed to gage the degree to which students followed processes related to the inquiry cycle strategy - for example whether students focused their research around a question - and to document other aspects of the research procedures followed by students such as consultations with peers, teaching assistants and librarians. Raters were also asked to make several inferences about the student's learning style, for example the degree to which the narrative seemed to reflect a self-guided learner.

Raters found several overall differences between Inquiry and Non-inquiry students in how (they said) they went about researching and writing their papers. Inquiry students were more likely to have described focussing their research around a question than Non-inquiry students. Inquiry students were also judged to be less likely to have described a superficial research strategy, less likely to have indicated a concern with grades in conducting the research, and less likely to have indicated the re-using of a paper from a previous course. Inquiry students also indicated spending greater amounts of time researching their paper than the comparative groups.
Lower Level Inquiry students (though not upper level Inquiry students) indicated more critical assessment of evidence than Non-inquiry students and indicated making greater use of a system for synthesizing their research. Similarly, Lower Level Inquiry student narratives indicated more meaningfully engagement in the research process and more overall satisfaction with that process. Table 3 presents a summary of these process differences.

Table 6. Summary of differences in researching and writing processes

Process area	**Meaningful advantage for Inquiry students**	**Meaningful advantage for upper levels**
Was meaningfully engaged	Yes*	--
Focused research around a question (not a topic)	Yes	Yes
Did not try to prove something already known	--	--
Had a strategy for data collection	--	--
Accessed academically sound evidence	--	Yes
Critically assessed the evidence	Yes*	--
Had a system for synthesizing the evidence	Yes*	--
Proof-read /copy-edited the paper	--	Yes
Was aware of the limitations of the process	--	--
Was satisfied with the process overall	Yes*	--
Was not concerned with grades	Yes	--
Did not re-use a paper	Yes	--

Made statements critical of own work	--	--
Did not indicate superficial strategy to please professor	Yes	--
Spent more time on research	Yes	Yes
Spent more time on writing	--	Yes

* difference exists only among lower level students

At both levels, there were noteworthy differences between Inquiry and Non-inquiry students related to the diversity of resources students utilized to do their research and write their papers. Inquiry students indicated higher rates of resource consultation than the comparison students, suggesting either actual higher rates or an enhanced consciousness of this as an aspect of researching and writing a paper. Upper level Inquiry students report consulting the library, the internet, and their peers with greater frequency than their upper level Non-inquiry students. Lower Level Inquiry students report consulting professors with higher frequency than the Lower Level comparisons
Overall, of sixteen coding themes that refer to procedure, there are notable group differences in nine. In five areas the difference is meaningful for all Inquiry students and in four areas the difference is meaningful for only lower level students. In the remaining seven areas there was no difference between Inquiry and Non-Inquiry students; however, in no case does the comparison group have higher score counts.

In areas in which Raters were asked to make inferences about the student authors based on their narratives, Raters discerned several meaningful differences found between Inquiry and Non-inquiry students but only amongst the lower level participants. Inquiry students were judged to be more critical in their thinking, and more interested in cultural, political or social issues than Non-inquiry students.

Discussion

Several limitations in research design should be considered in interpreting the results of this study. As mentioned, students were not randomly assigned to study groups but chose whether or not to take Inquiry 1SS3, raising the only partially answerable question of whether students who chose ISS3 were more academically motivated or not. We collected no information on what participants took in university after first-year, nor on the types of papers submitted by participants. Also the study sample was relatively small and though participation was invited in a random fashion, participants chose to engage in the project for unknown reasons. Finally, the difficulty of measuring an educational effect against a complex background of possible causes is compounded by the relative size of the intervention being measured which was a single course out of a total of as many as forty courses completed and taken as long as five years previous to the study.

The results of the analysis of the students' papers and narratives show that against a background of general improvement associated with time spent at university, Inquiry students had an advantage over students who had not taken the course. The analysis of student papers showed inquiry students demonstrated comparatively stronger use of a variety of skills related to sound writing and appeared to be more self-directed and deep learners in their approach to constructing their papers. The narrative study showed

differences between students who had taken Inquiry 1SS3 and those who had not in a number of 'attitudinal' areas. Inquiry students were judged to be have been more engaged and satisfied with the process of constructing the paper they submitted and less oriented to grades or to superficial strategies to please the professor.

The narrative study findings suggest that taking the Inquiry seminar is associated with students using the inquiry cycle strategy to develop a coherent research and writing process. Both time spent in university and taking the inquiry seminar is associated with focusing research around a question as opposed to a thesis or topic. However, with the passage of time since taking the Inquiry course the use of this strategy and the general procedural advantage becomes less obvious. Many of the procedural differences are only obvious when comparing lower level students. This suggests the Inquiry course provided students with a set of skills and procedures generally developed in university, but provided it earlier in their studies.

There is other evidence, both self reported in the narrative and confirmed by inference from the results of student's research and writing processes, that some aspects of the inquiry cycle strategy were transferred to other contexts. In the analysis of student papers, papers submitted by students who had taken Inquiry 1SS3 were judged to be more often built around research questions, more likely to discuss limitations, and more clearly written and well organised. Inquiry students distinguished themselves from the comparison group in the narrative study by more often describing focusing their research around a question, critically assessing evidence, and having a system for synthesising evidence. The Inquiry group's use of questions as a focus of research identified both in the procedure descriptions and papers themselves, is particularly compelling as evidence of transfer from Inquiry 1SS3 as it is not only the cornerstone of the inquiry cycle strategy but is also one of the only variables in the analysis of the paper that did not 'naturally' improve with time spent in university.

Comparing the results of the two studies, upper level students had a clear advantage over lower level students in the analysis of student papers, but they had a much more muted advantage in the narrative study. The pattern was opposite to that seen when examining the data by study group; Inquiry 1SS3 students were very clearly distinguishable from the comparisons in the narrative analysis but less so in the analysis of student papers. This suggests that Inquiry students more clearly took away from the course a theoretical or abstract sense of learning skills and processes. They were consequently better able or prone to articulate the procedures they knew. But knowledge of this process did not necessarily translate into better papers as judged by Raters. Time spent in university, on the other hand, was associated more clearly with greater skill and procedural prowess, but not necessarily the ability or predilection to describe those skills and procedures.

Finally, though in the analysis of student papers the effect of Inquiry 1SS3 participation was as strong for upper level students as for lower; in the narrative study the Inquiry effect was stronger among lower level students. This may suggest that methodologies measuring performance may have more success in documenting skills transfer than those measuring more abstract procedural knowledge.

Conclusions

The literature suggests there are critical components to curricula design that enhance knowledge and skills transfer to other contexts – a process integral to learning to learn. Transfer does not just happen -- it is not a natural bi-product of education; rather it is a process that needs to be consciously fostered through course design, and nurtured in the classroom.

Inquiry 1SS3 was developed to prepare students to be more successful learners in their subsequent university courses and beyond. As such the design of the course considered the development of specific academic and intellectual skills *and* their transferability to other learning contexts. The design of Inquiry 1SS3 meets a number of the conditions identified by Chiabura and Marinova (2005) by providing the opportunity for individual attainment of personal educational goals and skills and the contextual support of individual supervision and peer support. Shepherd (2000) argues that this type of transfer-friendly pedagogy encourages students to take control of the learning environment, to place their own interests at the center of their learning and to enter into discussions about their academic work. Three aspects of the course were developed with the idea of enhancing the transferability of learning skills. First, the substantive theme of the course allowed a broad selection of possible individual inquiries related to personally relevant and engaging topics. Second, skills were developed in the context of a general strategy for independent learning, the inquiry cycle. Finally the learning environment, based in the self-directed pursuit of an individual inquiry with regular support and feedback by the instructor and other students, was designed to emphasize a reflective and critical approach to knowledge and conscious awareness of developing skills and their relevance to learning.

This research focused on the larger picture of whether students transferred these skills to other learning situations by looking for evidence of enhanced skills and the use of the inquiry cycle strategy in papers written for other courses and in student accounts of how those papers were constructed. The study results provide evidence that the Inquiry learning process was transferred from the course. First, the enhanced use of questions as the focus of research and writing is the fundamental and distinctive marker of the inquiry cycle strategy. Second, it appears that to a greater degree than actual skill development the students who had taken Inquiry 1SS3 were conscious of what they were doing; they could describe and had a language for the steps they had taken which allowed them to express their research and writing in clear terms. By demonstrating an increased ability to write well, Inquiry students confirm that they can take skills developed in one course and use them in new situations. The assessments of the papers and the descriptions in the narratives supports the notion that Inquiry students transferred subject matter knowledge, learning strategies and an interest in what they are learning into new situations. This research thus supports the hypothesis that transfer of core skills occurs under particular learning conditions that can be fostered through course design and enhanced through specific pedagogical objectives.

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[1] Inter-rater reliability was assessed by examining a sum of all the rubric items except the global score. Box plots and other examinations of the between Rater differences were carried out. The results of a single Rater were eliminated. Missing data was replaced with the mean of the other three Raters for that participant.

APPENDIX A: RUBRIC FOR 'BEST PAPER' RATERS

Paper Assessment Form **Paper ID #**
McMaster Innovative Learning Study **Assessor's Name**_____
A. Global Score:

1. All things considered, and with reference to the other papers, please provide a numerical grade out of 100: _____.

B. Analysis of Paper	Strongly Agree (5)	Generally Agree (4)	Neutral, N/A or Cannot Say(3)	Generally Disagree (2)	Strongly Disagree (1)
The paper is clearly written	5	4	3	2	1
The paper is well organised	5	4	3	2	1
The author has focussed the research around a question	5	4	3	2	1
The author used hypotheses to focus the research	5	4	3	2	1
The author used academically sound evidence	5	4	3	2	1
The author demonstrated critical thinking	5	4	3	2	1
The paper is correctly referenced	5	4	3	2	1
The paper is synthesized into a coherent whole	5	4	3	2	1
The paper is carefully proof-read and copy-edited	5	4	3	2	1
The author discusses limitations of the paper	5	4	3	2	1
The paper demonstrates evidence of self-reflection	5	4	3	2	1
C. Analysis of Learning Style	Strongly Agree (5)	Generally Agree (4)	Neutral, N/A or Cannot Say(3)	Generally Disagree (2)	Strongly Disagree (1)
The paper suggests the author is a self-directed learner	5	4	3	2	1
The paper suggests the author is a deep learner	5	4	3	2	1
D. Analysis of Awareness	Strongly Agree (5)	Generally Agree (4)	Neutral, N/A or Cannot Say(3)	Generally Disagree (2)	Strongly Disagree (1)
The paper demonstrates awareness of cultural issues	5	4	3	2	1
The paper demonstrates awareness of political issues	5	4	3	2	1
The paper demonstrates awareness of social differences	5	4	3	2	1

Appendix B. Scoring Sheet for Narrative Raters

Rater initials:____ **Case #**
McMaster Innovative Learning Study: Writing Process Assessment Form

A. Global Score:	A	B	C	D	F

	(4)	(3)	(2)	(1)	(0)
All things considered, the author probably is in the following GPA range	4	3	2	1	0

B. The following items refer to the narrative submitted by the students (not to the best paper described in the narrative)	Strongly Agree (4)	Generally Agree (3)	Generally Disagree (2)	Strongly Disagree (1)
The narrative was on topic (followed instructions)	4	3	2	1
The narrative provided a *thorough* description of the process undertaken	4	3	2	1
The narrative was clearly written / is readable*	4	3	2	1

* Point form was allowed in the instructions

	Mentioned				**Not mentioned**
C. The following items refer to the process they used to construct their paper (as judged from what is described in the narrative)	Strongly (4)	Generally Agree (3)	Generally Disagree (2)	Strongly Disagree (1)	No basis for judging (0)
The author seemed to be meaningfully engaged with the topic	4	3	2	1	0
The author focussed the research around a question (as opposed to a thesis or topic)	4	3	2	1	0
The author seems to have set out to prove something already known	4	3	2	1	0
The author seems to have had a plan for selecting the information that would be used (e.g. as opposed to developing the paper based on what was found)	4	3	2	1	0
The author seems to have accessed academically sound evidence	4	3	2	1	0
The author seems to have critically assessed the evidence	4	3	2	1	0
The author seems to have used some system for synthesizing the research - (connecting ideas / constructing a resolution)	4	3	2	1	0
The author seems to have proof-read /copy-edited the paper	4	3	2	1	0
The author seems aware of the limitations of the process	4	3	2	1	0
The author seems to have been satisfied with the process undertaken	4	3	2	1	0
The author seems to have been concerned with grades	4	3	2	1	0
The author seems to have re-used a paper or had more than one purpose for the paper	4	3	2	1	0

	Mentioned				**Not mentioned**
C. The following items refer to the process they used to construct their paper (as judged from what is described in the narrative)	Strongly (4)	Generally Agree (3)	Generally Disagree (2)	Strongly Disagree (1)	No basis for judging (0)
The author made statements critical** of their own ~~work,~~ paper such as "it is not the best paper I have ever written"	4	3	2	1	0
The narrative indicates a superficial strategy for doing well (such as putting in buzz words from the syllabus, ideas that the professor likes, finding out what the professor wants etc)	4	3	2	1	0

** Means negatively critical, as in criticizing, not critical as in analytical

D. The following items refer to the time spent on the best paper	Several weeks (4)	A week or so (3)	Few Days (2)	Just a few hours (1)	No basis for judging (0)
Over what time period does it seem the author did the research	4	3	2	1	0
Over what time period does it seem the author wrote the paper	4	3	2	1	0

E. The following items refer to whom or where the author consulted during the process	More than once (2)	Once (1)	Not mentioned (0)
Peers	2	1	0
Teaching Assistants	2	1	0
Professors	2	1	0
University programs, e.g. writing clinic, peer helper program	2	1	0
The library	2	1	0
The Internet	2	1	0

F. The following items refer to the author	Strongly Agree (4)	Generally Agree (3)	Generally Disagree (2)	Strongly Disagree (1)
It seems the author is a self-directed learner	4	3	2	1
It seems the author is a deep learner	4	3	2	1
It seems the author is a critical thinker	4	3	2	1
It seems the author is capable of self reflection	4	3	2	1
It seems the author is a clear communicator	4	3	2	1

It seems the author is interested in cultural,political, or social difference issues	4	3	2	1
It seems the author enjoys learning	4	3	2	1