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In light of these factors, this pilot study explored (via an electronic survey of instructors) the ways in which creativity is defined and taught across McMaster University's six faculties. Results suggested areas of both commonality and difference across disciplines in terms of academics' understandings of creativity and their stated strategies for developing creativity within their students. In this respect, our data provide preliminary support for the notion that creativity teaching may be at least partially discipline-specific, and suggest that further work in this area is warranted.

Keywords
Creativity, Disciplinary perspectives, Pedagogical approaches, Discipline-specificity

Creative Differences: Teaching Creativity Across the Disciplines

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Abstract

Several authors have suggested that educational institutions have a responsibility to foster creativity in their students. Yet, research has shown that creativity is a variable concept that can mean different things in different fields and contexts (Kaufman & Baer, 2005). As a result, generic pedagogical techniques for developing creativity may not be equally appropriate across domains.

In light of these factors, this pilot study explored (via an electronic survey of instructors) the ways in which creativity is defined and taught across McMaster University's six faculties. Results suggested areas of both commonality and difference across disciplines in terms of academics' understandings of creativity and their stated strategies for developing creativity within their students. In this respect, our data provide preliminary support for the notion that creativity teaching may be at least partially discipline-specific, and suggest that further work in this area is warranted.

Keywords: Creativity; Disciplinary Perspectives; Pedagogical Approaches; Discipline-Specificity.

Introduction

In recent years, researchers and policymakers alike have argued that it is essential for institutions of higher education to higher education to foster creativity in their students (Craft, 2006; Csikszentmihalyi, 2006; Jackson et al., 2006; EUA, 2007, McWilliam, 2008; McWilliam & Dawson, 2008, Robinson, 2001). According to several writers, creativity is an essential tool required to face and to flourish within the ever-changing contemporary world, and, as such, educators have a responsibility to develop students' creative capacities. A 2007 report issued by the European Universities Association, for instance, claimed, "the complex questions of the future will not be solved 'by the book', but by creative, forward-looking individuals and groups who are not afraid to question established ideas and are able to cope with the insecurity and uncertainty that this entails." (p.6). Accordingly, the report's objective was to provide higher educational institutions with "operational recommendations on how to foster creativity" (2007, p.6).

While we in Canada have lagged somewhat behind Europe in thinking through the importance of creativity in higher education, recent Canadian research is confirming the trends articulated elsewhere (Kelly, 2008; Kelly, 2012). At the same time, creativity has

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also been afforded a significant position within the guiding institutional philosophies of many universities in this country (e.g. University of Western Ontario, 2006; University of Saskatchewan, 1993). At McMaster University, the context for the study described in this paper, for instance, the institutional mission and vision statements are built upon the cornerstone of "inspiring innovation and discovery" (McMaster University, 2002). In light of such converging evidence pointing towards the significance of fostering creativity, the question of *how* institutions of higher education might go about inspiring students to be innovators becomes paramount.

While the literature does describe a number of general strategies for developing creativity, including creating an environment that supports risk taking, and attempting to increase students' internal motivation (Beghetto, 2010; Cropley 1997), much research suggests that creativity is nonetheless a variable concept that means different things in different fields (Csikszentmihalyi, 1990; Kaufman & Baer, 2005; Reid & Petocz, 2004). There has been an extensive debate in the psychological literature, for example, about whether creativity is a general phenomenon that applies across contexts, or a domain-specific skill that does not generalize to alternate areas or disciplines (Baer, 2010). According to the domain-specific advocates in this debate, one might be a creative mathematician, for instance, but this fact does not mean that one will simultaneously be a creative writer, physician or product designer.

Likewise, creativity is always to some extent defined and evaluated in relation to the field in which it operates (Csikszentmihalyi, 1999; Jackson & Shaw, 2006). For an individual or a product to be called creative in biology or in marketing, for example, requires that individual or product to build on, expand and/or develop the existing contours of the field in a manner that is seen as valuable by its practitioners. As Anna Reid & Peter Petocz put it, "A creative product in different domains is measured against the norms of that domain, with its own rules, approaches, and conceptions of creativity" (2004, p.45).

One implication of this domain-related variability, then, is that generic pedagogical techniques for developing creativity may not be equally appropriate across disciplinary lines. To date, however, little research that expressly considers domain specific means of fostering creativity in higher education has been published. While Jackson & Shaw (2006), for example, surveyed "academics and field-based practitioners" in four disciplines (Earth & Environmental Science, Engineering, History, and Social Work), inquiring about participants' understandings of creativity and about their strategies for developing creativity in students (2006, p.90), the published discussion of this portion of their research focuses largely on the ways in which creativity is *conceptualized* across the four disciplines.[i] In other work that considers the teaching of creativity in different fields (e.g. Reid & Petocz, 2004), the number of disciplines represented is small. Given what Jackson and Shaw call "the general absence of discussion about creativity in disciplines" (2006, p.104), it is perhaps not surprising that discussions of ways and means of teaching creativity across domains are especially rare.

In light of these overlapping factors, we undertook to gather descriptive information about the teaching of creativity across various disciplines at McMaster University. In particular, the pilot study reported here sought to uncover the way(s) in which instructors in various disciplines at this one institution define, value and teach creativity.

Research Context & Methodology

McMaster University is a mid-sized, research-intensive university located in Hamilton, Ontario. As noted previously, creativity and innovation are named values within the institution's mission and vision statements. The university employs approximately nine-hundred full time faculty members, plus a range of clinical faculty and part time instructors, housed across six Faculties: Business, Engineering, Health Sciences, Humanities, Science, and Social Sciences.

The present study was a pilot designed to begin investigating how this diverse group of instructors define and value creativity, and how, if at all, they attempt to foster it in their students. To collect this information, an electronic survey instrument containing a range of forced-choice, likert scale and open-ended questions was sent to approximately 1750 full and part time instructors at McMaster University in May 2010. In addition to inquiring about demographic information (e.g. disciplinary background, employment status, teaching experience), this survey asked respondents to provide their own definitions of creativity, to select factors that seemed central to creativity in their disciplines, to rank the importance of creativity to their fields, and to describe their strategies, opportunities and ideas for fostering and assessing students' creativity in their teaching. Many of the questions asked were conceptually similar to those reported by Jackson & Shaw (2006).

Full-time faculty (including clinical faculty and instructors with contractually limited appointments), professors emeriti and sessional lecturers were all invited to participate. During the two-week period in which the survey was active, 87 responses were submitted (a response rate of approximately 5%). Sixty-one of these submissions (70%) came from individuals who indicated that they held full time positions at the University, while eight (9%) came from part-time, sessional or retired instructors. Eighteen participants (21%) did not specify whether their employment with the university was full- or part time. Each response was voluntary and anonymous.

Instructors from each of McMaster's six Faculties submitted survey data. The greatest number of responses came from the Faculty of Health Sciences (35% of the total response pool, n=30), while the Faculty of Engineering generated the fewest responses (6% of the total, n=5). The Faculties of Business, Humanities, Science and Social Sciences accounted for 8% (n=7), 16% (n=14), 18% (n=16) and 17% (n=15) of the total responses, respectively. The specific disciplines with which respondents identified are given in Table 3 below.

Participants represented a variety of career stages. 16.1% of respondents had been post-secondary instructors for 5 years or less, while 21.8% had 25 plus years of experience. The average respondent had been teaching in the higher education sector for 16 years. 38 respondents (43.7%) identified as female, while 45 (51.7%) identified as male and 0 as transgendered. 4 respondents declined to indicate their gender.

While this sample of participants does resemble the total instructional population at McMaster University in some respects, it is important to underline that it is far too small to be considered representative of either the McMaster teaching community or the broader disciplinary groups with which its members identify. (See Tables 1-3 for a comparison of our sample and the total McMaster instructional population along several key dimensions). Nonetheless, it is our hope that the insights provided by this small initial sample might provide the basis for further discussion and research. As was the case with Jackson & Shaw's survey, that is, this "exercise must be viewed as an initial step in articulating the meanings of creativity in disciplines and the intention is to promote further discussion and

expression within the community, rather than to claim definitive representation" (2006, p.94).

Table 1. Comparison of **full time** instructors in the study sample and in the total McMaster instructional population

	Sample	**Population**
Total Number of Faculty	79*	1306
Faculty Affiliation		
Business	6 (8%)	66 (5%)
Engineering	4 (5%)	143 (11%)
Health Sciences	27 (34%)	619 (47%)
Humanities	13 (16%)	132 (10%)
Science	15 (19%)	219 (17%)
Social Sciences	14 (18%)	124 (9%)
Contract Status		
Tenured	34 (43%)	47%
Tenure Track	7 (9%)	9%
Permanent/Permanent Track	7 (9%)	2%
CAWAR (Continuing Appointment without Annual Renewal)	8 (10%)	20%
CLA	5 (6%)	10%
Not indicated	18 (23%)	n/a
Gender		
Male	39 (49%)	860 (66%)
Female	36 (46%)	446 (34%)
Not indicated	4 (5%)	n/a
Average Years @ University	16 (77 responses)	10.9
Rank		
Professor	14 (18%)	414 (32%)
Associate Professor	16 (20%)	483 (37%)
Assistant Professor	16 (20%)	378 (29%)
Lecturer	3 (4%)	31 (2%)
Not indicated	30 (38%)	n/a

Since data about the full population of part time/retired faculty at McMaster are not available, the **8** respondents in our study who do not hold full-time positions are excluded here for purposes of comparison. Source for population information: McMaster University Fact Book 2009-2010.

Table 2. Comparison by Faculty of **full time** instructors in the study sample and in the total McMaster instructional population

	Business		Engineering		Health Sciences		Humanities		Science		Social Sciences	
	S	**P**	**S**	**P**	**S**	**P**	**S**	**P**	**S**	**P**	**S**	**P**
Total # of Faculty	6	66	4	143	27	619	13	132	15	219	14	124
Gender												
Male	4	50	4	134	11	363	6	69	8	167	6	75
Female	2	16	0	9	15	256	6	63	7	52	6	49
Not indicated	3	n/a	0	n/a	1	n/a	1	n/a	0	n/a	2	n/a
Rank												

Professor	1	24	1	63	2	143	2	35	4	107	4	42
Associate Professor	2	22	0	54	7	248	3	51	3	66	1	41
Assistant Professor	0	14	1	14	10	225	2	39	3	39	0	35
Lecturer	0	6	0	0	0	3	1	7	0	7	2	6
Not indicated	3	n/a	2	n/a	8	n/a	5	n/a	5	n/a	7	n/a
Average Years @ University	18	12.8	11	10.4	15.6	9.6	14.5	12.4	16.1	12.9	19.3 *	12

*Average calculated for 12 respondents. 2 did not respond.
S = Sample. P = Population.
Since data about the full population of part time/retired faculty at McMaster are not available, the **8** respondents in our study who do not hold full-time positions are excluded here for purposes of comparison. Source for population information: McMaster University Fact Book 2009-2010.

Table 3. Departmental representation within Faculties in the study sample and in the total McMaster instructional population (full time faculty only)

School of Business	**% Faculty - Sample**	**% Faculty - Population**
Accounting & Financial Management	0% (n=0)	18.2% (n=12)
Business (general)	33% (n=2)	18.2% (n=12)
Finance & Business Economics	0% (n=0)	1.5% (n=1)
Human Resources & Management	33% (n=2)	18.2% (n=12)
Mgmt Science & Info Systems	0% (n=0)	13.6% (n=9)
Strategic Market Leadership & Health Services Management	17% (n=1)	30.3% (n=20)
Not indicated	17% (n=1)	n/a
Faculty of Engineering		
Bachelor of Technology	25% (n=1)	3.5% (n=5)
Chemical Engineering	0% (n=0)	11.2% (n=16)
Civil Engineering	0% (n=0)	10.5% (n=15)
Computing & Software	0% (n=0)	17.5% (n=25)
Electrical & Computer Engineering	0% (n=0)	23.1% (n=33)
Engineering Physics	50% (n=2)	10.5% (n=15)
Materials Science & Engineering	0% (n=0)	9.1% (n=13)
Mechanical Engineering	25% (n=1)	14.7% (n=21)
Faculty of Health Sciences		
Anasthesia	0% (n=0)	1.8% (n=11)
Biochemistry and Biomedical Sciences	4% (n=1)	4% (n=25)
Clinical Epidemiology & Biostatistics	11% (n=3)	5% (n=31)
Family Medicine	4% (n=1)	4.7% (n=29)
Medicine	19% (n=5)	30.4% (n=188)
Nursing	26% (n=7)	9.9% (n=61)
Obstetrics and Gynecology	4% (n=1)	3.7% (n=23)
Oncology	4% (n=1)	0.65% (n=4)
Pathology and Molecular Medicine	7% (n=2)	4.7% (n=29)
Pediatrics	7% (n=2)	9% (n=56)
Psychiatry & Behavioural Neurosciences	7% (n=2)	9.9% (n=61)
Radiology	0% (n=0)	0.3% (n=2)
Rehabilitation Science	7% (n=2)	3.9% (n=24)
Surgery	0% (n=0)	12.1% (n=75)

Faculty of Humanities		
Classics	8% (n=1)	6.8% (n=9)
Communication Studies & Multimedia	15% (n=2)	8.3% (n=11)
English and Cultural Studies	15% (n=2)	19.7% (n=26)
French	0% (n=0)	11.4% (n=15)
History	23% (n=3)	15.9% (n=21)
Linguistics and Languages	8% (n=1)	12.1% (n=16)
Philosophy	8% (n=1)	11.4% (n=15)
School of the Arts	23% (n=3)	14.4% (n=19)
Faculty of Science		
Biochemistry and Biomedical Sciences	7% (n=1)	n/a *
Biology	33% (n=5)	14.2% (n=31)
Chemistry and Chemical Biology	7% (n=1)	12.8% (n=28)
Geography and Earth Sciences	13% (n=2)	13.7% (n=30)
Integrated Sciences	0% (n=0)	0.9% (n=2)
Kinesiology	0% (n=0)	10% (n=22)
Mathematics & Statistics	13% (n=2)	16.9% (n=37)
Medical Physics & Applied Radiation Sciences	0% (n=0)	3.7% (n=8)
Physics & Astronomy	13% (n=2)	13.7% (n=30)
Psychology, Neuroscience & Behaviour	7% (n=1)	14.2% (n=31)
Not indicated	7% (n=1)	n/a
Faculty of Social Sciences		
Anthropology	7% (n=1)	10.4% (n=13)
Economics	21% (n=3)	22% (n=27)
Health, Aging, Society	0% (n=0)	3.2% (n=4)
Labour Studies	0% (n=0)	1.6% (n=2)
Political Science	14% (n=2)	18.5 (n=23)
Religious Studies	29% (n=4)	12.9% (n=16)
Social Sciences (gen)	0% (n=0)	2.4% (n=3)
Social Work	14% (n=2)	12.1% (n=15)
Sociology	14% (n=2)	16.9% (n=21)

*****Biochemistry numbers are included in Health Sciences in the University Fact Book, but this individual identified the Faculty of Science as his/her primary Faculty affiliation.
Since data about the full population of part time/retired faculty at McMaster are not available, the **8** respondents in our study who do not hold full-time positions are again excluded here. Source for population information: McMaster University Fact Book 2009-2010.

Results

Definitions of Creativity

Data indicated that respondents held similar understandings of creativity, regardless of the discipline in which they worked. For instance, a forced choice question asking participants to select definitions of creativity with which they agreed yielded the following results:

- 54 people (62%) selected 'Creativity is an attribute of individuals or groups'
- 48 (55%) selected 'Creativity is a process'
- 48 selected (55%)'Creativity is influenced/determined by sociocultural or environmental factors'
- 5 (6%) selected 'Creativity is an attribute of products'
- 1 (1%) selected 'None of the above'
- 23 (26%) did not respond.

These numbers suggest a relatively strong agreement amongst those who answered this question that creativity can be understood as both a process and as a human characteristic, and that – furthermore – it is shaped by the sociocultural context in which it appears. Indeed, 34 participants (39%) selected all three of these possible response options. These thirty-four individuals were drawn from across McMaster's six Faculties, with five coming from the School of Business (representing 5.7% of the total participant pool), three from the Faculty of Engineering (3.4%), eleven from the Faculty of Health Sciences (12.6%), four from the Faculty of Humanities (4.6%), five from the Faculty of Science (5.7%), and six from the Faculty of Social Sciences (6.9%). Since the Chi-squared test, the statistical measure typically used to analyse relationships between groups in this type of situation, is not appropriate for use with such a small subject pool, statistical tests for significant differences between Faculties were not computed. Anecdotally, however, the fact that respondents associated with a range of departments across the McMaster campus shared this pattern of response raises the possibility that, at a broad level, definitions of creativity espoused by individuals within disparate disciplines may nonetheless have much in common.

An open-ended question that asked respondents to define creativity produced similar results. In this case, individuals from across McMaster's six Faculties offered definitions of creativity that shared many of the elements common to understandings espoused in the literature. In line with one of the leading definitions used in creativity research, for instance (see, for example, Plucker & Makel, 2009), nine participants (~10%) suggested that creativity involves ideas, processes or products that are both novel and useful. For example, a Health Sciences instructor wrote: "Creativity is: departing from tradition; original and valuable." Likewise, a respondent from the DeGroote School of Business noted, "Creativity is the ability to produce something that is both (1) novel, and (2) useful." Others from the Faculties of Health Sciences & Business offered similar definitions, as did individuals from Engineering, Science & Humanities.

At the same time, another group of respondents underlined the novelty or originality half of this equation in their definitions, without stressing utility or value. This focus on novelty alone was also seen across disciplinary lines. The following definitions, provided by instructors in the Faculties of Science, Social Sciences and Engineering, respectively, are illustrative in this regard:

> [Creativity is] The ability to establish new ideas and/or process[es] that are not linearly derived from established examples. (Science instructor)
>
> [Creativity is making new ideas or things or developing new ways to think about or use existing ideas or things. (Social Sciences instructor)
>
> [Creativity is] the ability to generate something that wasn't there before. Can be a thing, a thought, a process, anything. (Engineering instructor)

In total, the idea of novelty figured in an additional twenty definitions beyond those in which it was paired with usefulness, meaning that 23% of participants displayed this pattern of response. Six of these definitions emphasizing novelty in the absence of utility were offered by participants from the Faculty of Health Sciences, five were provided by Science instructors, four were given by individuals from the Faculty of Social Sciences, two were offered by Engineers, another two were written by School of Business respondents, and one

was provided by a participant from the Faculty of Humanities. For its part, originality and/or unconventionality featured in the definitions of an additional fifteen participants (17%): four from the Social Sciences, two from Business, and three from each of Health Sciences, Humanities, and Business. As these examples begin to suggest, instructors of various disciplines evinced understandings of creativity that displayed many overlapping elements.

In spite of this general agreement, instructors from different Faculties displayed some variability in their selection of elements that are important to creativity in their fields. Overall, the top five creativity-relevant factors selected from a list of twenty-one options were:

- Challenging assumptions/conventions (n=32)
- Generation of novel/original ideas/outcomes (n=29)
- Problem solving (n=29)
- Examination of phenomena from multiple points of view (n=28)
- Problem finding (n=27)

The most common selections by Faculty, however, produced a slightly different list of elements deemed significant to creativity, as shown in Table 4 below. For example, the most commonly selected factor by instructors in Engineering was the generation of multiple ideas or outcomes (n=3), while two of the most commonly selected factors by Humanities participants were the generation of detailed or elaborated ideas or outcomes (n=6) and expressiveness (n=6). Likewise, for participants from the Faculty of Health Sciences, innovation (n=9) and flexibility (n=9) were the creativity-relevant factors selected most often. Given that some of the items selected most frequently by instructors in these three Faculties were not common to the overall list, there may be discipline-related variability here that is worth exploring further with a larger subject pool.

Table 4. Factors most commonly selected as relevant to creativity, by Faculty

Faculty	Most-commonly selected factor(s)	n selecting
Business	Generation of novel/original ideas/outcomes	5
Engineering	Generation of multiple ideas/outcomes *	3
Health Sciences	Innovation * Flexibility *	9 9
Humanities	Challenging assumptions/conventions Generation of detailed, elaborated ideas/outcomes * Expressiveness *	6 6 6
Science	Challenging assumptions/conventions Generation of novel/original ideas/outcomes Examination of phenomena from multiple points of view	7 7 7
Social Sciences	Challenging assumptions/conventions	8

*= item not included in the top five ranked elements overall

Estimations of Creativity's Importance

Across Faculties, instructors indicated that creativity held a significant place in their disciplines. A question that asked participants to rank the importance of creativity to their fields produced an average rating of 7.63/10 (for 59 responses). The highest mean ranking came from Humanities instructors (8.73/10) and the lowest from Social Sciences instructors (7/10). A Kruskal-Wallis test indicated no significant differences between means by Faculty.

Likewise, no significant difference was found between Faculties (again using a Kruskal-Wallis test) in terms of mean ranking of agreement with the following statement: 'My department/school has a responsibility to develop students' creative capacities as these relate to my discipline.' The highest mean agreement ranking was found amongst Business instructors (4.29/5), while Science instructors generated the lowest mean ranking (3.45/5). The average agreement, across all 58 responses, was 3.86/5. This relatively high average rating suggests that instructors across McMaster's six Faculties believe that creativity is not only important to their disciplines, but that it also is (or that it should be) a significant aspect of university education in their fields. Of course, these results might be reflective of the fact that respondents self-selected for participation in this study. It is entirely feasible that instructors who chose to respond to our survey might value creativity more highly than does the general population of instructors at McMaster.

Thirty respondents (34.5%) claimed that the development of students' creativity was a stated learning objective in their teaching. This number included instructors from each of the six Faculties. Twenty-five participants (29%) indicated that creativity did not figure in learning objectives for their courses, and thirty-two (37%) did not respond. While the Chi-squared test was again not computed due to the small sample size, a rough analysis of the data suggested some potentially interesting trends. In particular, more than 50% of respondents in Humanities (82%), Engineering (75%), and Health Sciences (54%) indicated that they named creativity as a learning objective, while less than 50% of respondents in Science (45%), Social Sciences (44%), and Business (29%) claimed to do so. This issue might thus be worth exploring with a larger group of participants.

Teaching Creativity

The majority of respondents (n=47, 54%) suggested that creativity in their disciplines could be taught. This was true across Faculties, as between 70% and 100% percent of respondents in each group agreed that creativity was a teachable phenomenon. (Business: 6 of 7 respondents, 86%; Engineering: 4 of 4 respondents, 100%; Health Sciences: 13 of 15 respondents, 87%; Humanities: 11 of 11 respondents, 100%; Science: 7 of 10 respondents; 70%; Social Sciences: 6 of 8 respondents, 75%). Only 9% (n=8) of the total participant pool claimed that creativity could not be taught, while 37% (n=32) did not respond to this question.

The strategies that instructors claimed to have used to foster the development of students' creativity displayed slightly more variability. The most commonly noted techniques included: collaborative projects (n=6, 6.9%); presenting and discussing exemplars of creativity (n=6, 6.9%); challenging students to find new answers to existing problems (n=5, 5.7%); and encouraging and/or allowing students to present their ideas using non-standard formats (e.g., video, imagery, narrative, poetry, etc.) (n=5, 5.7%). While these strategies were noted by instructors from multiple Faculties, each one was named by relatively few respondents overall.

Other techniques described were unique to the individual in question (at least within this group of participants). A selection of these less commonly reported strategies can be seen in the quotations below.

> Since they are exposed to Min Basadur's work on creative problem solving in second year, I take 30 minutes or so to refresh them on the process. In many of the case studies, there are specific times for divergent thinking which tries to reinforce this work. (Business instructor)

> As a starting point for an engineering design project, I will often introduce them to a recent scientific discovery. They are then expected to exploit that discovery to design a new device, understand the improvements and limitations of their device [with regard to] conventional devices. Since the discovery is new, existing devices will not employ it, forcing a new solution. (Engineering instructor)
>
> since activism is inherent to the discipline, i generally ask them to participate in some sort of direct action, even if it's just getting their figurative toes wet. these usually involve some sort of creative intervention which also helps to foster their sense of agency. (Humanities instructor)
>
> tutorial facilitation - open to help the students link learning style with content with creativity; individual learning plans by nature allow for creativity. (Health Sciences instructor)
>
> Giving students a worksheet with many drill questions; my expectation is that students will get bored with it and ask themselves - is there a way i can finish this faster, can i see the answer without going through all these boring steps? -- discovering patterns, shortcuts, is essential in math! (Science instructor)
>
> Role model creativity; talk about inquisitive stance to practice and how this helps clients; provide required readings on creativity within social work; invite discussion and debate about other ways of thinking about concerns or issues; provide case examples of how creativity was and wasn't used and the outcome of both processes; 'reward' students for creativity through grades on assignments; reference and cite changes within the field and how that is connected to creative processes; invite students to think about the possibilities. (Social Sciences instructor).

Interestingly, many of these descriptions make explicit reference to disciplinary features (e.g. the importance of discovering shortcuts in math) and/or to teaching methods that are understood as signature pedagogies of the field in question (e.g. case studies in Business, self-directed tutorials in the Health Sciences). In this respect, they again point to an issue that might be explored further with more participants, suggesting that creativity might best be taught in discipline-specific ways, or at least that instructors might believe this to be the case.

While some instructors (n=4) admitted that they had no direct proof of the efficacy of their creativity-enhancing techniques, most believed strongly in their methods, and many suggested that the evidence of their efficacy lay in what they saw as the creativity of the student work produced (n=20).

Discussion

Despite its small participant pool, this pilot study suggests some provocative possibilities that seem worthy of further exploration. To begin with, it indicates that faculty definitions of creativity might differ slightly by discipline, while nonetheless maintaining a strong core of similarity. In this respect, this work corroborates Jackson & Shaw's finding that "while

being creative means particular things in disciplines, [certain] general patterns of meanings can be distinguished" (2006, p.104).

In particular, respondents from across McMaster's six Faculties emphasized the importance of novelty, originality, and – to a lesser extent – utility in their definitions of creativity, echoing common understandings espoused in the creativity literature. In fact, insofar as a relatively large number of our participants offered definitions that focused on novelty and/or unconventionality in the absence of usefulness, this study also provides initial confirmation for Smith & Smith's contention (2009) that the requirement of quality is not as central to educational definitions of creativity as it is to conceptualizations used in psychological research. As Smith and Smith suggest of educators more broadly, it appears to be the case that for many of the respondents in the present study "'Outside of the box' is fine, even if it comes from 'out of left field'" (2009, p.255). Finally, like Jackson & Shaw's (2006) survey participants, the individuals in this study also frequently underlined the notions of problem finding and problem solving in their definitions of creativity, providing further evidence of the generality of these elements to conceptions of what it means to be creative.

At the same time, the minor variations between instructors in different Faculties in terms of elements selected as important to creativity in their fields begin to suggest particular lines along which to distinguish creativity in different academic disciplines. Although there is certainly not enough evidence here to make broad or conclusive claims, these initial data point to the idea that concepts like 'expressiveness' might be especially significant to creativity in the Humanities, while 'flexibility' might be seen as central to being a creative Health Scientist.

Perhaps more significantly, this preliminary work also provides initial evidence of the extent to which instructors in higher education settings attempt to teach creativity in discipline-specific ways. On the one hand, in a few cases, respondents from different Faculties and departments referred to *similar* creativity-fostering techniques in this study, suggesting that some pedagogical strategies that enable creativity might be used and seen as appropriate across disciplines. Some of these techniques, such as the encouragement of collaboration, also mirror approaches commonly espoused in the domain-general creativity teaching literature (Craft, 2008; Cropley, 1997; Smith & Smith, 2009).

At the same time, however, indicators of potential generality in our data were largely overshadowed by the overall diversity of participant response. Broadly speaking, the tactics that respondents in this study claimed to use to foster creativity varied widely, with very few strategies being noted by a significant number of people. Furthermore, a number of participants' ideas for teaching creativity were characterized by distinct, discipline-relevant features, a fact which brings the issue of the domain back to the forefront and ultimately raises the question of whether or not some of these disciplinarily-coded techniques might be named by additional members of represented fields given a larger sample size. In this respect, our data also indicate that means of developing creativity in students might need to be tailored to disciplinary contexts, or – at the very least – that discipline-specific strategies for teaching creativity might exist alongside and in addition to more broadly applicable techniques.

The principle of constructive alignment, originally advanced by John Biggs (1999), provides one potential framework by which to reconcile these varying findings. According to Biggs:

> 'Constructive alignment' starts with the notion that the learner constructs his

> or her own learning through relevant learning activities. The teacher's job is to create a learning environment that supports the learning activities appropriate to achieving the desired learning outcomes. The key is that all components in the teaching system - the curriculum and its intended outcomes, the teaching methods used, the assessment tasks - are aligned to each other. All are tuned to learning activities addressed in the desired learning outcomes. The learner finds it difficult to escape without learning appropriately. (2003, p1).

Both discipline-specific and discipline-general strategies for teaching creativity can be accommodated by this model. From this perspective, provided that instructors in any discipline (a) name the development of creativity as an intended learning outcome for their students (as a number of respondents across Faculties did in this study), (b) develop learning activities designed to help students meet those outcomes, and (c) construct assessments that encourage creativity and measure its relative achievement, student learning of creativity should be enhanced. While some of the specific teaching and learning activities and assessment strategies that figure within this process might be appropriate for use across disciplines, others may well be unique to the individual field in question. Rather than upholding a dichotomous conception that suggests that the teaching of creativity must be either domain-neutral *or* discipline-specific then, it may be more sensible to acknowledge that creativity might be developed by both of these means at once, and to focus instead on elaborating and testing the efficacy of the various techniques that can function to enhance student learning of creativity both across and within disciplines.

While the survey used in this study, with its reliance on retrospective, self-reported claims about teaching and learning activities and their effects, cannot provide concrete evidence that any of the named strategies for developing students' creativity actually work, the fact that many respondents *believed* that these techniques were effective is a start in this regard. As Mihaly Csikszentmihalyi has noted, the perceptions and evaluations of disciplinary experts constitute an essential part of establishing creative status. He writes: "[M]ost novel ideas will be quickly forgotten. Changes are not adopted unless they are sanctioned by some group entitled to make decisions as to what should or should not be included in the domain. […] In physics, the opinion of a very small number of leading university professors was enough to certify that Einstein's ideas were creative" (1999, p.315). In this study, the respondents themselves can be understood as part of the group of disciplinary experts licensed to sanction ideas and/or products as creative in their fields. In Anna Reid and Peter Petocz's words, "[a]s teachers, we are experienced in understanding what is an 'average student performance' and can distinguish between that and something that is truly exceptional. We have this ability because we know what can be counted as 'ordinary' within a discipline and what is not" (2004, p.54). Because many of our respondents claimed that their creativity-fostering techniques resulted in student work that the instructors, as experts in the field, deemed creative, one might infer that these techniques have some potential efficacy. Of course, however, this supposition would benefit from further exploration and evidentiary support, particularly given the bias that might attach to faculty members' evaluations of the efficacy of their own work.

Considering the ostensible importance of fostering creativity – as argued by much recent literature and echoed by the instructors in our study – the questions and possibilities raised by this pilot study seem essential to pursue. As such, we plan to refine the survey instrument used in this project, and to subsequently circulate it again to McMaster instructors and to faculty at other Ontario Universities in order to increase our subject population. We also hope to explore some of these issues more deeply by running cross-

Faculty focus groups with instructors at McMaster, at which participants might flesh out some of the ideas mentioned here and also have an opportunity to reflect and to comment upon suggestions made by individuals from other disciplinary communities. Should analysis of the resulting data sets confirm some of the initial trends suggested in this pilot project, it might be possible to build on these insights by conducting quasi-experimental research designed to test more directly the efficacy of creativity-fostering techniques in various fields.

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[i] It should be noted that Jackson & Shaw (2006) also discuss the results of a supplementary piece of research that examined 18 QAA Subject Benchmarking Statements in the U.K. for evidence of attention to the issue of developing student creativity. While this work does attend to the issue of teaching creativity in various disciplines, it focuses more on the way in which the presence or absence in Benchmarking Statements of factors associated with creativity speaks to the relative valuation of creativity within different fields.

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