

FRACTAL: FReshman Advising Connection for Teaching and Learning

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McGill's Macdonald Campus FRACTAL program is a relatively new initiative that provides freshman (U0) students with the structure and academic skills necessary for a smooth transition into all aspects of university life. Central to this initiative are three leading factors: (a) the program director and the academic advisor are also the professors for the majority of the freshman courses, (b) the freshman seminar course combines academic advising with study and life skills coaching, (c) an exhibition-style Majors' Fair at the end of freshman year displays the available programs of study. This integrated approach of teaching and (intrusive) advising, the use of STEM research-based best-practices, along with the latest teaching technology in the classroom, has drastically reduced the number of students on academic probation, while also increasing retention.

McGill University, in the Greater Montreal area of Quebec, Canada, is a medium-sized university with two campuses and approximately 36,000 students. It is one of North America's leading research-intensive universities with an internationally diverse student body from over 150 countries. McGill is typical among English-language universities in that it has a distinct educational structure within Canada, and indeed within North America; undergraduate students can enter McGill from two different levels. In the province of Quebec, the university years are called U0 (freshman), U1 (sophomore), U2 (junior), and U3 (senior).

A student in the province of Quebec finishes high school with Grade 11 and then spends two years at a junior college (CEGEP), before entering university (in the U1 year); the CEGEP combines the academic material normally covered in Grade 12 with the university freshman year material. However a student who comes to McGill from a high school outside Quebec (for example, from Pittsburgh or Vancouver) must enter McGill in the freshman year (U0). Thus a student who has secondary school education from outside the province of Quebec starts out in the standard freshman (U0) year, while one who comes to McGill from within Quebec starts university studies in the U1 year.

McGill's two campuses consist of the downtown campus in Montreal, an urban setting, and the Macdonald Campus, about 25 miles away. The latter is a residential campus, housing the Faculty of Agricultural and Environmental Sciences (FAES)

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and the School of Dietetics and Human Nutrition (DHNS), in a suburban setting surrounded by nature, parks, and a farm. The Macdonald Campus has a total undergraduate enrollment of about 1,100 students, with smaller class sizes than the downtown campus. This allows professors, staff, and students the opportunity to become acquainted more easily. Freshmen registered on the Macdonald Campus study in one of five degree programs: B.Sc. (Agricultural and Environmental Sciences), B.Sc. (Food Science), B.Sc. (Nutritional Sciences), Concurrent B.Sc. (Fd. Sc.)/B.Sc.(Nutr. Sc.), and B. Eng (Bioresource). For the 2010-11 academic year, 128 freshmen enrolled in FAES, of which typically 35% were Canadian, 35% American, and 30% were international. It is for this campus that the FRACTAL (FReshman Advising Connection for Teaching and Learning) program was designed.

The philosophy behind the FRACTAL initiative is to create a supportive, welcoming academic environment for Freshmen (U0) students to help them adjust to university life. A key element of the FRACTAL initiative is that the Freshman Program Director and Freshman Academic Advisor are both full-time academics. With doctorates in theoretical physics and organic chemistry, respectively, they together teach 10 of the 13 required freshman math and science courses, in addition to providing intrusive academic advising. For reference, Table 1 shows the list of required courses that a freshman normally takes—this is a full load of 30 credits.

TABLE 1

Required Course List for Freshmen

Fall Courses (Sept.–Dec.)

General Biology
 General Chemistry 1
 (Introductory) Physics 1
 Calculus 1
 Freshman Seminar 1

Winter Courses (Jan. –Apr.)

Elective/Cell Biology/Linear Algebra
 General Chemistry 2
 (Introductory) Physics 2
 Calculus 2
 Freshman Seminar 2

As is typical of a science-oriented freshman year in Canada, there are no general education or non-science courses required. Both the director and the freshman advisor are involved at each stage of a prospective freshman student’s contact with McGill (from recruitment, open house, and campus connect through the fall academic orientation), and they help newly-admitted students with questions pertaining to the academic curriculum and faculty members. As professors for the freshman courses, they then extend and solidify their connection with the students once they arrive on campus. They see the students each day in class and become well-acquainted with their learning styles, studying skills, and interactions with each other. These are key factors in preventing minor problems from becoming major ones. The director and freshman advisor are the common point of contact for students seeking assistance from various university services

and act informally as liaison between the students and the student affairs, student services, and student life groups.

The cornerstone of FRACTAL is the Freshman Seminar, administered by the freshman advisor and geared toward helping students with transition to the university. It covers academic skills, such as academic expectations and university standards, including study methods, time management, test-taking, and avoiding plagiarism. During the first few days of class, a required entry-level diagnostic precalculus mathematics assessment determines students' background preparation for calculus. The results are used to recommend that at-risk student take a precalculus lab in conjunction with calculus 1. The second formative evaluation is the first-semester midterm assessment, given after the first round of midterm exams. This evaluation is designed to alert students to potential problems with their academic progress as students often do not understand the impact poor midterm grades have on their academic standing. The assessment also allows academic advisors to guide students to appropriate university services, such as tutoring or counseling.

Other topics covered in Freshman Seminar include Surviving Freshman Year (presented by former freshmen), as well as presentations on life skills such as budgeting and careers. In the second semester, faculty members conduct presentations on research interests and degree programs; this culminates in March with the Majors' Fair—an exhibition-style set-up with booths corresponding to the faculty's programs and majors—staffed by academic program directors, future academic advisors, and upper-level students. In keeping with the integrative philosophy of FRACTAL, staff representatives from the student affairs office, student services, career and placement services, and internship office are present at the Majors' Fair and available to answer questions. This is a "one-stop-shopping" environment that allows students to browse the FAES programs and majors in an informal and personal setting.

The freshman science and math courses incorporate research-based best practices in teaching and learning, including Active Learning Strategies (Student Response System Clickers, Peer Instruction), lecture recording, extensive use of the course management system WebCT, as well as PowerPoint lectures via Tablet PC. The freshman program office is also involved in the development of Peer Tutoring Network (PTN) and Supplemental Instruction (SI) in conjunction with McGill's tutorial services, again in keeping with the holistic philosophy of the freshman program. The director stresses vertical integration of all levels of SI via the freshman instructional unit, which includes personal tutors, group tutoring, and teaching assistants. The freshman advisor encourages networking among the students and assists in matching up peer tutors with tutees.

McGill's Macdonald Campus Freshman Program dates from 2006 and has been in its current form, with the current director, since 2008. Data shown in Table 2 indicate that the percentage of students on academic probation has dropped while retention has increased. Qualitative assessments include observations of student adjustment and well-being. Quantitative year-end results since that time, such as enrollment, academic standing, failure rates, and retention numbers, have

been provided by McGill's first-year office and the Macdonald Campus student affairs office. For example, 46 freshmen enrolled on the Macdonald Campus in the 2005-2006 academic year and 93 freshmen were enrolled for the 2009-10 academic year. In 2005-2006, 4 out of 46 students were in unsatisfactory/probationary academic standing (8.7%), whereas in 2009-2010, 3 out of 93 students were in unsatisfactory/probationary academic standing (3.2%). Details for the intervening years appear in Tables 2 and 3.

Since 2008, there has been no variation in teaching staff for the main freshman courses (biology, chemistry, calculus, physics, and seminar). The program director and academic advisors have been essentially the same since 2008, with the following caveat: Prior to the fall of 2010, Dr. Cherestes was the official academic advisor for all freshman students except those in the professionally accredited nutritional sciences programs offered by DHNS. The official DHNS freshman advisor was a registered dietician who did not teach freshmen. In practice however, all freshmen (DHNS included) sought out Cherestes for assistance, academic or otherwise, as she was their instructor in several courses. Cherestes worked closely with the DHNS advisor, referring freshmen to DHNS for specific program-related questions, but handling matters involving first-year transition difficulties herself. The advising process was streamlined in Fall 2010 when the DHNS freshmen were officially given over to Cherestes as the advisor, while Dr. Knutt took over the advising of the B. Eng. (Bioresource) freshmen. This change meant that all students were officially under the FRACTAL advising umbrella.

The freshmen demographics have remained approximately constant over the past five years, with 35–40% Canadian, 35–40% American, and 20–30% international. Student background preparation and interests appear stable. Course-level variables, such as textbooks, course content, labs, assignments, examination styles, and grading schemes have been largely unchanged. Since 2008, there has been a commensurate modernization in recruitment style, including a freshman website, video, and involvement of the program director and freshman advisor in all stages of recruitment and orientation. Qualitative assessments, based on information gathered from freshman seminars as well as social networking, indicate positive student adjustment and satisfaction.

TABLE 2

Academic Standing for Freshmen

Academic Year	Total Enrolled	Unsatisfactory or On Probation	Failure Rate
2010-11	128	---	---
2009-10	93	3	3.2 %
2008-09	57	8	14.00 %
2007-08	88	20	22.70 %
2006-07	69	11	15.90 %
2005-06	46	4	8.70 %

TABLE 3

Table 3: Retention after Freshman Year

(Number and Percentages of Students)

Academic Year	Transfers		Left McGill: Status & Reason Unknown	Left due to Academic Reasons	% Students Retained by Faculty	% Students Retained by McGill
	to other Faculties at McGill	to other universities (not McGill)				
2010-11	7	2	4	1	~85%	~92%
2009-10	15	3	2	1	~78%	~90%
2008-09	9	4	1	2	~75%	~87%

In summary, the three most important aspects of the FRACTAL initiative that have implications for other institutional settings are as follows:

1. Freshman instructors should be full-time faculty members who are simultaneously academic advisors for the students. This allows the students to recognize the advisors as faculty members, and also puts the instructors in regular contact with their advisees. The students get to know their professors well, which makes it easier for them to discuss their concerns and seek assistance when needed.
2. The freshman seminar course gives the students a structured learning environment in which they can learn to handle the academic side of university. It is also a place where they get assistance regarding other transitional difficulties, such as relating to various life skills, for which they otherwise might not seek help.
3. Majors' Fair is a "one-stop shopping" environment in which students can meet their future advisors and/or professors, talk to upper-level undergraduates, peruse various degree programs, and investigate careers. This leads to a much more personal interaction than a website or brochure.

In conclusion, McGill's Macdonald Campus FRACTAL program assists freshmen with transition to university life by providing them with a caring, supportive environment in which the professors they see every day are also their academic advisors. The FRACTAL initiative uses freshman seminar to address academic and life skills issues, and uses STEM research-based best-practices in the classroom. The end of the freshman year culminates with an exhibition-style Majors' Fair displaying available programs of study and is attended by future advisors, professors, and upper-level undergraduates. The integration of teaching and advising provides a level of personalized attention and support that has drastically reduced the number of students on academic probation while increasing retention.