

## Freshman Fellows: Recruiting and Retaining Great Students Through Research Opportunities

The Freshman Fellowship Program at Northern Michigan University (NMU) was established in the mid-1980s to coordinate the placement of academically talented incoming freshmen with university faculty members willing to take them on as junior researchers. The program has matured and evolved and now aims to aid in recruitment of talented high school seniors and to help retain them once they are on campus. In this article I'll discuss a primarily quantitative study I conducted regarding program achievement towards these goals, through comparisons of program participants since 2006 with students who did not participate, but who were otherwise qualified for the program.

The study explored program value, retention, semesters needed to earn a degree, and students' GPAs at graduation, using university databases and online surveys of past, current, and incoming Freshman Fellows. As a corollary, NMU admissions officers were surveyed regarding their perceptions of undergraduate research as a recruitment tool.

My findings demonstrate the Freshman Fellowship Program has a limited positive effect as a recruitment tool, but a considerably greater positive effect on retention. About one third of current and former fellows indicated that acceptance to the program was important in their choice of college, but about half of the students said acceptance didn't significantly affect their decisions to enroll. However, a significant positive difference in annual retention rates was noted for the cohorts of Freshman Fellows compared to control groups, particularly after two years of coursework. Positive differences, although not statistically significant, also were noted both in students' GPAs at graduation and in graduation rates.

### The Freshman Fellowship Program

Northern Michigan University is a rural public institution serving approximately 9,000 undergraduate students, with an academic staff of about 450. Freshman Fellow scholarships are offered to up to 40 incoming freshmen interested in working one-on-one with a faculty mentor over the course of an academic year. For their efforts, the

students are eligible to receive up to \$1,000, paid as an hourly wage. At the current wage scale, the work equates to an average of four hours of work each week, so engagement in the program is not a significant hardship. Application to the program is open to any incoming freshman meeting minimum high school GPA and standardized test (ACT or SAT) scores.

Faculty members receive no additional stipend for their involvement in the program, but they are eligible for funding of up to \$500 for expenses, up to an annual maximum of \$5,000 for all faculty participants. Few faculty members actually request these funds, however. Typically, faculty mentors either involve the students in their existing research or develop a new yearlong research project in collaboration with the student. Students present their projects at a year-end university symposium, and both the program and the individual departments typically support several student presentations at regional or national conferences each year.

Funding for the program comes from the general funds' budget of the dean of Graduate Studies, Grants and Research, and Continuing Education. In addition to the \$45,000 available for direct student and faculty support, the dean also pays for a secretary and a faculty director who devotes 10 percent of his or her time to the program. Historically, the program was housed within the honors program, but recently it has become aligned with the Ronald McNair Post-baccalaureate Achievement Program at the university.

### Undergraduate Research for Recruitment, Retention

The Freshman Fellowship Program is intended to assist student recruitment through a number of means:

- Students are awarded the scholarships prior to committing to the university. Faculty mentors are not identified until the student commits, however, and students are informed that the best alignment between student and faculty interests occurs when they commit early.

- The scholarship of \$1,000 per academic year contributes to the student's overall financial package.
- The program helps present undergraduate research as evidence of the university's academic quality to external audiences, which include prospective students, parents, and school counselors.
- Admissions officers showcase the program as an example of the quality of work being undertaken at the university.
- Past fellows become excellent ambassadors in the recruitment effort when they return to their hometowns and talk about their experiences.

The Freshman Fellowship program is designed to have positive effects on student retention by:

- Providing challenging research activities, workshops to improve academic skills, and social events that hone social skills, thus creating a comfortable, cohesive, and energetic environment for capable students;
- Developing an esprit de corps through a cohort model;
- Developing in students an early grounding in advanced concepts, research techniques, and ethics, making future endeavors more productive;
- Providing opportunities to participate in all aspects of research;
- Providing opportunities for students to actively engage in research with faculty members and be recognized for their contributions;
- Encouraging presentation of student work at on-campus symposia and, within some disciplines, at regional and national conferences;
- Providing an access point for future research by increasing one-on-one connections with faculty;
- Connecting students with other research programs that extend beyond the freshman year;
- Applying critical thinking skills to real-world projects, thus improving the connection between didactic and project-based learning; and
- Introducing students to the academic, research, and real-world experiences that surround their chosen career fields.

## Prior Research

Scholars who study the influence of undergraduate research on college selection report that the data are frequently nebulous or focused on specific disciplines, although research opportunities are often identified as a benefit of college attendance (Hoke and Gentile 2008; States News Service 2009). Actual research opportunities are not often arranged prior to students' decisions to attend particular institutions and, consequently, cannot easily be linked to those decisions. Undergraduate research is reported as a component of successful recruitment and community building in the STEM (science, technology, engineering, and mathematics) disciplines (Hoke and Gentile 2008); recruitment of both genders to enter physical science programs (Conrad et al. 2009); and recruitment of under-represented students (Lopatto 2007; Conrad et al. 2009).

It has been reported that, as with recruitment, most findings regarding the relationship between undergraduate research and retention are either unsupported claims or lack adequate documentation (Seymour et al. 2004). Gregerman et al. (1998) reported that undergraduate research experiences positively influenced retention among under-represented students. Positive career influences stemming from undergraduate research have been identified (Kremer and Bringle 1990), and students perceive the research learning experience to be more valuable than that of ordinary classes on a number of parameters (Ward, Bennett, and Bauer 2002). Increases in student capabilities have been attributed to the research experience (Gafney 2010; Hunter, Laursen, and Seymour 2007; Kardash 2000; Lopatto 2007), which could improve retention. Undergraduates have reported strong positive responses to their research experiences, which potentially could also improve retention in college (Seymour et al. 2004).

Several studies have identified undergraduate research opportunities as crucial to developing a worldview of education beyond the undergraduate level (Alexander et al. 2000; Conrad et al. 2009; Dahlberg et al. 2008; Olson 1988). Participants involved in summer research at Rice University, for example, had a high propensity to enter graduate school (Alexander et al. 2000), and one-third of participants in an undergraduate research program in computer science moved on to graduate work in the field, with the remaining students continuing their undergraduate work in computer

science (Dahlberg et al. 2008). Undergraduate research and mentoring have also been identified as crucial to the academic success of minorities and women, as evidenced by recent articles by Davis (2009), Johnson (2011), Shultz et al. (2011) and Espinosa (2011). Hu, Kuh, and Li (2008, 77), however, demonstrated that, while associated with wide academic gains, inquiry activities did not have similar value for all students and that students demonstrated “negative effects on gains in general education and personal development”. In a rare quantitative report, Berkes (2007) noted that 54 percent of STEM majors at the University of California-Berkeley participated in research, compared to 45 percent of non-STEM majors.

Wanner, Lewis, and Gregorio (1981) showed that, 30 years ago, the nature of the work and the supportive environment found at quality post-secondary institutions provided greater opportunities for students in the natural sciences than in other fields. While many subsequent studies regarding undergraduate research focused on STEM fields (for example, Lopatto 2004 and 2007, and Espinosa 2011), positive effects were also demonstrated in recent findings in the social sciences, humanities, and arts. In 2002, for example, Ishiyama noted self-reported gains in critical thinking, information amalgamation, and independent learning among social science and humanities students who participated in research, with earlier research participation having a more profound effect on first-generation students. Buckley (2008) reported that students reported gains in their intellectual, research, and collaborative skills in a study of seniors completing research in different fields at 63 institutions. And CUR has devoted considerable efforts to fostering research in the non-sciences in recent years.

## Subjects and Methodology

The Freshman Fellowship Program at NMU has served 129 students since 2006. Seventy-eight (60.5 percent) of these current and former participants responded to an online survey regarding the importance of undergraduate research in their selection of a college. Thirteen current students completed a truncated survey in the spring of 2011, focused solely on the role of the program in their decision to attend NMU. Finally, a separate online survey, completed by 13 (87 percent) of the university’s admissions officers, asked participants to identify the relative recruitment value of nine different potential positive aspects of the university, one

of which was the opportunity for undergraduate research. This survey also asked the admissions officers to indicate the degree to which research was stressed with students of different academic abilities and programmatic interests.

Retention statistics were derived from university data comparing the status of the Freshman Fellows from 2006 through the present with the comparable cohort of students of the same years who met the eligibility requirements of the program but did not participate. These data were analyzed for differences in graduation rates of the initial cohort, students’ GPAs upon graduation, and year-by-year retention at the university.

## Recruitment Findings

The Freshman Fellowship program is different from many undergraduate research programs at other institutions in that participants are accepted into the program prior to actually committing to the university. Consequently, it is possible to directly query participants regarding the effect of being accepted into the program on their ultimate decisions to attend NMU.

The program was indeed a contributing factor in the decision to attend NMU for a number of students. Twenty-five of the fellows (32.9 percent) responding to the online survey of past participants identified research opportunities as an extremely or very important factor in their initial search for a college, while 43 (56.6 percent) were neutral and 8 (10.5 percent) indicated that these opportunities were not important. Receiving the fellowship was an extremely or very important factor in the decision to attend NMU for 27 (35.5 percent) of respondents. Thirty-eight respondents (50 percent) were neutral regarding the effect of receiving a fellowship if they enrolled on their decision to attend the university, and 11 (14.5 percent) indicated that program acceptance was not important to their decision.

Future fellows also identified research opportunities as a factor in their initial search for a university. Eight students (53.3 percent) entering the program in fall 2011 indicated that research was extremely or very important in their college search, while six (40 percent) were neutral and one (6.7 percent) indicated that research was unimportant. Of these students, seven (46.7 percent) said acceptance in the program was extremely or very important in their decision to attend NMU. Four (26.7 percent) were neutral regarding

the program’s importance in their decision to attend the university, and a comparable number indicated that program acceptance was unimportant in their decision. Obviously, many factors other than research opportunities come into play with regard to college choice, but the fellowship program was very important to one-third to one-half of them.

University admissions officers utilize a variety of tools to encourage students to select NMU. The 13 university recruiters noted above who responded to my brief online survey were asked to rate the relative importance of several factors, including undergraduate research, commonly identified as positive features of the university. Research proved to be one of the least important recruitment factors, ranking seventh of nine options on the list (Table 1) but, interestingly, it demonstrated the highest degree of deviation among the respondents. No significant differences in responses were observed based on respondents’ years of service as admissions officers, the only demographic data solicited.

Admissions officers were then asked to identify the degree to which they used undergraduate

**Table 2. Importance of Research as a Recruitment Tool used Admissions Officers for Different Student Groups**

Student group	Mean*	Median	Mode	S.D.
<b>By academic proficiency<sup>b</sup></b>				
Higher achieving students	3.33	30	3	0.65
Average students	2.50	2.5	3 <sup>a</sup>	0.80
Lower achieving students	1.67	1.5	1	0.78
<b>By discipline</b>				
Science, technology, or mathematics students	3.33	4.0	4	0.98
Professional degree students (such as teaching or nursing)	2.83	3.0	4 <sup>a</sup>	1.11
Social science students	2.42	2.5	3	0.90
Business students	2.08	2.0	2	0.79
Fine arts students	1.75	2.0	2 <sup>a</sup>	0.75
Foreign language or international studies students	1.75	2.0	2 <sup>a</sup>	0.75
Career (two-year) or certificate students	1.64	1.5	2 <sup>a</sup>	0.80

Notes: N=12 (80 percent current NMU admissions officers.) \*Scale 1 (rarely), 2 (sometimes), 3 (most of the time), and 4 (always). <sup>a</sup> Multiple modes. Highest value is shown. <sup>b</sup> “Higher,” “average,” and “lower” levels of achievement were not specifically quantified for the recruiters, but were based on information available to recruiters (high school GPA, SAT and ACT scores) and considered with regard to disciplinary averages of typical incoming students.

**Table 1. Relative Importance of Recruitment Components Utilized by Admissions Officers**

Recruitment Component	Mean*	s.d.
Overall quality of education	86.5	10.5
Quality of education in student’s program	83.4	13.9
Geography and city environment	81.1	15.9
Cost of education	78.8	22.6
Recreation opportunities	70.4	14.5
Student groups and organizations	66.6	15.2
Research opportunities	54.2	23.4
Sports	54.1	19.7
Study abroad opportunities	52.2	16.6

Notes: N=13 (87 percent current NMU recruiters.) \*Sliding scale 0 (very unimportant) to 100 (very important).

research as a recruitment tool for different groups of prospective students. Recruiters stressed research opportunities primarily to those students identified as high achieving or interested in STEM programs of study (Table 2). No significant differences were observed based on the admissions officers’ years of service.

Admissions officers were asked to identify the primary recruitment device in their toolbox. None of the individuals could identify a specific factor or tactic they used. Rather, they identified myriad components that were essential for a successful recruitment. Components identified by several recruiters included establishing a personal connection with students, encouraging campus visits, stressing the quality-to-cost benefit ratio, demonstrating the options for involvement, and perhaps more significant to this institution than others, the opportunities for access to the natural environment.

## Retention Findings

Retention data for the Freshman Fellows is readily quantifiable using university records. This study compared NMU fellows enrolled from 2006 through 2010 with all other students of the same years who met the requirements of the program but did not participate. Significant differences in retention were found between the fellowship and control cohorts ( $\chi^2(1, 1416) = 4.473, p = .034$ ).

Fellowship recipients demonstrated a higher annual retention rate for each of the study years (Table 3) relative to their non-participating peers. The majority of students from the 2006 cohorts who are no longer enrolled have graduated, but some left the institution, either to study elsewhere or to discontinue their education. Available data did not clarify the status of students who did not graduate but are no longer enrolled. Since NMU also provides a community college function, the differential in retention rates is pronounced following the second and third years of enrollment, when students are most likely to transfer to other universities (Table 3). The findings demonstrate that, over the study period, 8-percent fewer fellows were no longer enrolled relative to their peers. If the 2006 year is eliminated so as to remove the graduation factor, the Freshman Fellow cohort has a 92.7 percent retention rate compared to 81.6 percent for the control group, a difference of 11.1 percent.

To elaborate on this last point, only one of the cohorts (2006) has had at least eight semesters of coursework

and, consequently, the standard minimal time required for graduation. Although numbers for fellows from 2006 are small (20 fellows) and not amenable to statistical comparison, data show a considerably greater percentage (Table 4: 19.4 percent) of Freshman Fellows from that cohort year have graduated relative to their non-participating peers and, consequently, are no longer at the university (Table 4). For those students from the 2006 year who have not graduated, the Freshman Fellows cohort also demonstrates a 5.9 percent positive increase in retention over their peers. Graduating Freshman Fellows attained a small, but not statistically significant, higher average GPA relative to their peers (Freshman Fellows GPA = 3.52 v. peer GPA = 3.43).

## What Have We Learned?

The undergraduate research experiences provided through the NMU Freshman Fellowship Program serve as a valuable mechanism to bolster student retention. The program likely has value as a recruitment tool, but this is not as demonstrable.

The study I conducted provides evidence of program challenges that are likely not unique to the institution.

- Undergraduate research at NMU, as this study discovered, is considered by admissions officers to be of interest primarily to high-achieving students interested in STEM fields. Recruiters may be harboring an outdated conception of “research” as something only for honors or gifted students, and that it is undertaken primarily in STEM disciplines. While practical and historical assumptions may play a role in this, hands-on research opportunities can be valuable to a significantly broader range of students, including those in education, law enforcement, nursing, social sciences, and the arts, to name the most obvious at this institution. While many articles reviewed for this paper strongly focused on STEM areas, the importance and value of similar experiences in other fields should not be minimized.
- Applicants to the Freshman Fellows Program are highly concentrated in the sciences. Levenson (2010) indicated that a strong STEM focus was



Physics Professor Mark Jacobs, senior Amelia Shirtz (back), and Freshman Fellow Andi Shepherd examine computer-based astronomical test images. The trio is modifying a CCD camera for attachment to the university's telescope.

**Table 3. Retention of Freshman Fellows Versus Comparable Non-Participants, 2006-2010 Enrollments**

FIRST YEAR	FRESHMAN FELLOWS		CONTROL COHORT		% DIFFERENCE BETWEEN GROUPS
	Not Enrolled N (%)	Now Enrolled N (%)	Not Enrolled N (%)	Now Enrolled N (%)	
2006	18 (90.0)	2 (10.0)	170 (70.8)	70 (29.2)	-19.2%
2007	3 (12.0)	22 (88.0)	76 (27.3)	202 (72.7)	15.3%
2008	2 (5.7)	33 (94.3)	57 (21.8)	204 (78.2)	16.1%
2009	3 (14.3)	18 (85.7)	47 (17.9)	216 (82.1)	3.6%
2010	0 (0.0)	28 (100.0)	13 (5.3)	234 (94.7)	5.3%
Total	26	103	363	926	8.0%

Note: Freshman Fellow n=129, Control n=1,289.

initially observed in an undergraduate research program at Florida State University, but that fully 60 percent of student researchers were in non-STEM areas following a concerted three-year effort to encourage arts and humanities faculty members to take students on as research assistants. While there are similar possibilities at NMU, a broad-based outreach mechanism has not been implemented that would connect NMU researchers in non-STEM fields with students prior to their arrival on campus.

- Possibly related to the narrow outreach emphasis by admissions officers, the Freshman Fellows Program frequently reaches faculty capacity in certain disciplines more quickly than in other disciplines. This creates an acceptance discrepancy, with lesser-qualified students in certain fields having a greater chance of being accepted to the program due to less competition in certain fields.

Additional lessons gleaned from anecdotal comments of both faculty mentors and student participants may be of potential benefit, although they have not been rigorously studied. Comments include assertions that:

- Faculty must be the final decision-makers in student assignments. Faculty involvement is greatly improved

if potential mentors have the opportunity to review a candidate's interests and actively make the decision to accept the student into the fellowship program.

- A good interpersonal connection between the student and the faculty mentor is critical. The greatest number of positive comments by students regarded the development of a personal relationship with their mentor.
- While many research skills are highly transferable, placing students with a research mentor who shares similar research interests improves the student's perception of the value of the experience. Most negative student comments concern a lack of personal interest in the research topic. While attempts are made to connect students with researchers in their area of greatest interest, this is not always possible.
- Students who perceive their research tasks to be important to the overall work of a team, and not just make-work, have a much better experience.
- Faculty training in mentoring for this program is limited and should be expanded to better ensure a quality experience. Mentors receive a CUR-produced booklet on undergraduate mentoring (Merkel and Baker 2002); correspondence regarding the mentoring

**Table 4. Graduation and Retention Comparisons for 2006 Freshman Fellows and Control Group**

	GRADUATED N (%)	ENROLLED, NOT GRADUATED N (%)	NO LONGER ENROLLED N (%)	TOTAL N (%)
Control	121 (50.6)	56 (23.4)	62 (25.9)	239
Freshman Fellows	14 (70.0)	2 (10.0)	4 (20.0)	20
% Difference (Control/FF)	-19.4%	13.4%	5.9%	

role and student and mentor responsibilities; and face-to-face, phone, and email interactions with the director of the program, as needed, to manage any concerns that develop.

- It would be desirable to require a written research plan signed by both the student and the mentor. This becomes a de facto contract and focuses the student's work.
- The program now requires an end product, such as an oral or poster presentation or a report. This provides a focused goal and deadline for the student. Encouragement and support of public and conference presentations and journal publications is also important.
- Students want to interact with other fellows, so social activities must be a part of the experience.

## Future Research

Successful recruitment and retention are functions of multiple factors, most of which were not included in this study. For example, my survey did not ask for students' socioeconomic demographics, which could influence the decision to conduct research, based on students' need to work and the time commitment required to complete research. Related to this, it would be good to know the incoming students' perceived career goals, which would help to indicate their desired terminal degree.

In addition, the quality of the faculty-mentor relationship needs to be more deeply explored. The added value to research students of skills development and academic success, the development of relationships with peers and faculty within a department, and the sense of belonging that potentially develops because of the experience should have positive effects on student retention and career choice, but this needs to be verified.

A broader national examination of admissions officers' perceptions regarding the relationships among undergraduate research, student achievement levels, and STEM fields is needed. College recruiters may continue to harbor an antiquated opinion of research as important only to a specific subset of students. If so, colleges may be missing opportunities to recruit talented students who never learn that research is an option in their chosen discipline. Clearly,

the "science" of research is beneficial to students of all fields and abilities.

Finally, longitudinal examinations of the mentoring relationship should be undertaken to identify those components that foster long-term benefits for both students and faculty members, as well as those that hinder or hamper the relationship. This would be useful information for new faculty mentors and would aid in the identification of best practices.

While the effect of the Freshman Fellowship Program on recruitment requires more research, the connection between participation in the program and student retention at NMU has been established. Anecdotal evidence exists indicating long-lasting relationships between some students and mentors when a tight connection is initially forged. Some labs currently have three cohorts of Fellows working together. For institutions willing to provide appropriate fiscal and technical support, our program could serve as a model to help attract and retain talented students.



NMU Freshman Fellows Nikki Stuckman, Brianna Jones, and Amanda Sterzick (l to r) presented two poster sessions at the NCUR conference in Ithaca, NY in 2011. The students shared their experiences with their peers through a Prezi found at <http://prezi.com/uclatzj41dfy/freshman-fellows/>.

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