Research into Attrition Rates of the Faculty of Science at the University of Regina

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Student retention at postsecondary educational institutions has been a major topic of study for the last three decades. The U.S. Department of Education, National Center for Educational Statistics (NCES, 2002) reported that, between 1995 and 1998, one-third of students entering postsecondary programs left before completing the program with the greatest number leaving within the first year of study. The NCES study also found that students who entered a program with specific educational objectives were far more likely to complete their program than those who entered unsure of their final educational objectives. This phenomenon is supported by Mashburn (2000-2001) who developed a psychological process of college student dropout. Factor analysis supported the model’s conclusion that students with greater thoughts of dropping out did so more frequently. One can then postulate that individuals with no specific educational goals would harbour greater thoughts of leaving postsecondary programs and therefore leave in greater numbers than those with specific educational goals. Mashburn’s model also associates higher dropout rates with lower levels of student satisfaction.

The NCES (2002) study found that students who received low grades in their postsecondary courses were more likely to leave the program before completion. Financial constraints were also cited by students as reason for leaving postsecondary programs. Heverly (1999) supports this conclusion in her findings that financial considerations were a main contributing factor to student attrition. The Heverly study also found that students who dropped out had greater problems acquiring information about programming and institutional practices during their tenure at a post-secondary institution. Berger (2001-2002) in his empirical synthesis of colleges and universities as organizations found that as the level of bureaucracy increased in an institution, so did dropout rates.
Both the NCES (2002) study and a study completed by Freeman, Anderson and Jensen (2007), found that a sense of belonging was associated with greater likelihood to complete postsecondary education. Emerging adulthood is a fairly recent concept of human development which encompasses individuals 18-25 years of age (Arnett, 2000). Arnett argues that, in industrialized nations, changes in society have occurred in the last half century which have altered the development of individuals in their late teens and early twenties. The numbers of emerging adults pursuing postsecondary education is increasing and “college education is often pursued in a nonlinear way, frequently combined with work, and punctuated by periods of nonattendance” (Arnett, 2000, p. 471). These new approaches to the pursuit of education in turn have implications to post secondary institutions.

Though those previously mentioned are the most commonly sited, other reasons for the dropout of postsecondary students have been identified and publications can be found which prescribe treatments to reduce attrition rates. Braxton and Mundy (2001-2002) published a list of 47 recommendations to improve retention based on Tinto’s (1993) three principles of effective retention. Heverly’s (1999) study was used to develop retention programs for the Delware County Community College in Pennsylvania. From his analysis of literature, Berger (2001-2002) presents “ten empirically-based recommendations for practice that are designed to help campus leaders improve the effectiveness of retention efforts on campus” (p. 3).

There seems to be no shortage of reasons for dropout and recommendations for retention programs, yet very little research has been done specifically on retention of students within science programs. The following research sought to determine the reason(s) why a large proportion of students at the University of Regina who enrol in science, particularly those who take the first two introductory courses in biology, appear to leave science and the Faculty of
Science after their first year. Specifically from 2004 to present, an average 68% of Biology 100 students go on to take Biology 101 but only 26% of those students take additional biology classes after Biology 101. Over the same three years, the 27 individuals granted with Bachelor of Science degrees majoring in biology, representing approximately 40% of those students who took second year classes. Preliminary data suggests that the majority of students who vote with their feet and leave the science program after one year, are those who have passed their biology courses and have a reasonable academic standing. Why then do they choose to leave?

Method

Participants of the study were all students of Biology 101 at the University of Regina during 2007 and 2008. Of the 140 participants, 40 were male and 100 were female. A total of 100 participants completed the survey in spring 2007 and 40 completed the survey in spring 2008. The composition of the participant group by age was 71% under 20 years, 21% between 21 and 25 years, 4% between 26 and 30 years, and 4% above 30 years. The students were asked to complete an online survey which elicited demographic information as well as information on instruction, teacher assistants, laboratory experiences, subject matter, evaluation, overall educational experience and suggestions for improvement of courses. Information on expectations to continue taking biology courses was also ascertained. As Biology 100 is a prerequisite of Biology 101, the participants were surveyed during Biology 101 and were asked to complete survey questions pertaining to both Biology 101 and Biology 100. In total, 97% of participants responded items related to Biology 100. Survey items varied from nominal data to Likert type responses and free response items. The responses were evaluated to determine the percentages of respondents for each year as well as the overall percentage of respondents to hold specific views
about the first year biology courses. A compilation of free response items is also presented in the results section.

Hypotheses

Based on the literature reviewed and the beliefs of the faculty in the Biology department, the following non-mutually exclusive hypotheses were proposed:

1) Students do so poorly academically that they perceive their best chance at getting a degree is to leave science.

2) Students realize after one year that Biology is just not of interest so they transfer to other scientific disciplines.

3) Students are accepted into a Professional Program or realize that their aspirations for a Professional School are not going to be fulfilled and transfer to other departments or out of the faculty because biology was never really an interest, just a requirement.

4) Students are turned off biology, even though they retain an interest, by poor teaching.

Results

For hypothesis 1, students do so poorly academically that they perceive their best chance at getting a degree is to leave science, the relevant data were gathered and are displayed in Figure 1. Of those students who indicated they had no plans of taking Biology courses past the 101 level, 56% of the combined 2007 and 2008 participants indicated low grades as one of the reasons.

For hypothesis 2, students realize after one year that Biology is just not of interest so they transfer to other scientific disciplines, the relevant data were gathered and are displayed in Figure 2. Of those students who indicated they had no plans of taking Biology courses past the 101 level, 40% of the combined participants indicated a change of interests as a reason, 49% indicated that
they realized that biology was not of interest to them, and 49% indicated a lack of interest in course material as a reason for discontinuing biology courses.

For hypothesis 3, students are accepted into a Professional Program or realize that their aspirations for a Professional School are not going to be fulfilled and transfer to other departments or out of the faculty because biology was never really an interest, just a requirement, the relevant data are displayed in Figure 3. Of the students that indicated that they had no plans of taking biology courses past the 101 level, 63% felt that more biology courses would not benefit their future career goals, and 72% did not need more biology courses for their program/major.

For hypothesis 4, students are turned off biology, even though they retain an interest, by poor teaching, the relevant data are displayed in Figure 4. Of those students who indicated they had no plans of taking Biology courses past the 101 level, 51% said it was because the quality of instruction was poor.
Figure 1. Data relevant to hypothesis 1 concerning academic standing.

Question Identifier:

A) identified one of the key elements of a successful course as the grade received
B) identified expected good grades as one of the reasons for taking Bio100/101
C) identified dissatisfaction with the evaluation criteria for the labs of Bio100/101
D) identified dissatisfaction with the appropriateness of the test and exams for Bio100/101
E) identified dissatisfaction with evaluation criteria of Bio100/101
F) felt instructors of Bio100 did not evaluate student work fairly
G) felt teaching assistance of Bio100 did not evaluate student work fairly
H) felt instructors of Bio101 did not evaluate student work fairly
I) felt teaching assistance of Bio101 did not evaluate student work fairly
J) indicated low grade as one of the reasons that Bio100 did not meet expectations
K) indicated low grade as one of the reasons that Bio101 did not meet expectations
**Figure 2.** Data relevant to hypothesis 2 concerning interest.

Question Identifier:

A. identified one of the key elements of a successful course as interesting material
B. identified interest in subject material as one of the reasons for taking Bio 100/101
C. identified dissatisfaction with the topics taught in Bio 100/101
D. identified dissatisfaction with the introduction to lecture topics in Bio 100/101
E. identified dissatisfaction with topic covered in the labs of Bio 100/101
F. indicated disinterest with course materials as one of the reasons that Bio 100 did not meet expectations
G. indicated disinterest with course materials as one of the reasons that Bio 101 did not meet expectations
H. indicated loss of interest in initial university program as one of the key factors for changing major/faculty

**Figure 3.** Data relevant to hypothesis 4 concerning pre-professional programming.
An analysis and compilation of the most common recommendations for changes to the Biology 100 lab sessions were:

1) have the labs match the course material more closely (22 participants)
2) have the labs contain more interesting activities which consist of hands-on work (15 participants)
3) reduce the amount of memorization (11 participants)
4) reduce the amount of material presented (14 participants)
5) revise the lab manual as it is difficult to use and get information from (9 participants)
6) concern with evaluation/suggested evaluated experiment write-ups (12 participants)

An analysis and compilation of the most common recommendations for changes to the Biology 101 lab sessions were:

1) more opportunity for evaluation (9 participants)
2) have lab material better follow the course material (16 participants)

An analysis and compilation of the most common recommendations for changes to the Biology 100 lectures were:

1) instructor moved through material too quickly when using powerpoint (11 participants)
2) slow down instruction and have more examples taught interactively (10 participants)
3) do not switch instructors midway through the course (12 participants)
4) less material covered (12 participants)

An analysis and compilation of the most common recommendations for changes to the Biology 101 lectures were:

1) less material covered (10 participants)
2) less repeat of material from Biology 100 (9 participants)
3) have a more enthusiastic and interesting instructor (17 participants)

4) evaluate more often/ have evaluation better match what is taught in class (17 participants)

Discussion

The results support the conclusion that all four hypotheses have merit in explaining the reasons which undergraduate students drop out of Biology courses. With 72% of participants stating that they did not need more Biology courses for their program, it seems that many students take biology, not solely out of interest, but as a requirement. Being that Biology courses enjoy this ‘captive audience’, it would seem that more students would stay in the subject if they developed an interest within their first two courses. With 49% of participants indicating a lack of interest in course material, this does not seem to be a likely outcome. One suggestion to reduce the dropout rate of Biology students would be to re-evaluate the course content and the order in which content is delivered in order to present a more appealing course. One comment that was often presented by students was that the content of 100 was repeated in 101 which may have made Biology 101 less interesting. Also to be considered is the presentation of the material. Fifty-one percent of participants cited poor instruction as a reason for not continuing with further Biology courses. Poor instruction may result in a decreased interest in the subject. Instructors of both laboratory components and lectures need to evaluate their instructional styles to try to engage more students. One common complaint by students was that lecture and lab material did not correlate and they felt as thought they were taking two separate biology courses. Many also found that labs were not ‘hands-on’ enough of the time. A common complaint about the lectures was that instructors lacked enthusiasm or an interest in teaching.

The above observations and recommendations are based solely upon survey responses and do not consider the required content of Biology 100 and Biology 101 courses nor the
environment in which the instructors operate. Therefore, suggestions need to be evaluated by the
department to determine the merit and feasibility of the implementation of changes based on the
survey responses.
References


