Randy Moore, Philip A. Jensen

# Do Policies That Encourage Better Attendance in Lab Change Students' Academic Behaviors and Performances In Introductory Science Courses?

*Reducing the number of allowable absences from three labs to two labs per semester improved students' lab attendance, lab grades, and course grades in an introductory biology course.*

Science courses with hands-on, investigative labs are a typical part of the general education requirements at virtually all colleges and universities. In these courses, labs that satisfy a curricular requirement for "lab experience" are important because they provide the essence of the scientific experience – that is, they give students hands-on experience with designing experiments, handling and studying organisms, learning laboratory skills, analyzing data, and communicating results. To help ensure that students obtain this experience, most introductory courses have attendance requirements for lab (e.g., students can miss no more than 20% of the laboratory periods per semester).

Although there have been many studies of students' overall performances in introductory science courses (Burchfield & Sappington, 2000; Congos, Langsam, & Schoeps, 1997; Friedman, Rodriguez, & McCombs, 2001; Grisé & Kenney, 2003; Moore, 2003; Sappington, Kinsey, & Munsayac, 2002), there have been virtually no studies of students' performances in the laboratory portions of introductory science courses. This lack of research regarding students' performances in lab probably results from the fact that students' lab performances are usually embedded in students' overall course-grades (e.g., lab usually accounts for 25% to 50% of students' grades in introductory science courses). Given the importance of lab experiences to the integrity of introductory science courses, as well as the fact that these courses are often characterized by significantly higher rates of absenteeism (Friedman, Rodriguez, & McComb, 2001) and failure (Congos, Langsam, & Schoeps, 1997) than other courses, we wondered what an analysis of students' lab performances could tell us about students' overall performances in introductory science courses.

**Despite the importance of attendance to success in science courses, absenteeism in introductory courses often exceeds 25%, even in classes taught by award-winning instructors.**

This paper reports a study of students' academic engagement in labs of an introductory biology course. Class attendance is the leading indicator of academic engagement (e.g., students' course-related effort and activities) because it requires a consistent and ongoing effort that is directly related to students' academic success (Moore, Jensen, Hatch, Duranczyk, & Koch, 2003; Rumberger, 2001). Students *choose* to attend class. Despite the importance of attendance to success in science courses, absenteeism in introductory courses often exceeds 25%, even in classes taught by award-winning instructors (Friedman, Rodriguez, & McComb, 2002; Thompson, 2002). Romer (1993), who notes that absenteeism in introductory courses is "rampant," describes the situation this way: "A generation ago, both in principle and in practice, attendance at class was not optional. Today, often in principle and almost always in practice, it is" (p. 174). Many students

skip lectures because they believe they can "make up" their absences by downloading or copying notes, reading the textbook, or talking with a classmate (Moore, 2003). However, students usually cannot "make up" a missed lab because of the logistical problems associated with offering the lab experience (e.g., the restricted availability of equipment, reagents, and specimens).

For many years, we noted that students who missed three of a semester's fourteen labs earned disproportionately lower grades in both the lab and lecture portions of the course and had only about a 20% chance of passing (Moore, in press). We concluded that although a policy of allowing students to miss three labs during a semester complied with the minimum standard set by the university for a laboratory experience, most students who missed two or three labs earned a D or F in the course. Since there is little consolation for a student who meets a university requirement yet still fails a class, we wondered if raising the laboratory attendance requirement would improve students' attendance in lab. That is, would lab attendance improve if there were fewer allowable absences? Given the strong correlation of class attendance and course performance in introductory science courses (Moore, 2003), would improved lab-attendance also improve students' lab grades? And finally, would an improvement in lab "carry over" to produce similar improvements in the lecture portion of the course?

## Methods

This study was conducted in a traditional introductory biology course at the Twin Cities campus of the University of Minnesota. The course included two 75-minute lectures and one two-hour lab per week during each of the 14 weeks of the semester. This study included 1674 students enrolled during eight semesters from 2003-2006. These students had an average ACT composite score of 20 (this matches the national average; Hoover, 2003), an average high school graduation percentile ranking of 56%, an average age of 20, and an average gender-distribution of 48% females and 52% males. These students' ethnic diversity was as follows: 17% African American, 2% American Indian, 16% Asian American, 4% Chicano/Latina, 58% Caucasian, and 3% Other. We did not include students who withdrew from the course before the final exam, students who earned grades of incomplete, or students who flunked the course because they cheated.

### The course and course policy

The course and its policies were identical in each semester of the study (e.g., the same labs, lab manual, grading policies, textbook). Labs, which comprised 33% of students' overall grade in the course, covered topics typical of a traditional introductory biology course. All sections of lab enrolled 12 or fewer students and were taught by teaching assistants (TAs) who completed a week-long orientation each year to ensure similar standards and pedagogical approaches in lab. Attendance was recorded by TAs at every lab by determining students' actual presence in lab (i.e., not with a sign-in sheet on which students could list classmates who were absent). To be counted present at a lab, a student could be no more than 30 minutes late for the lab. If, for whatever reason, a student came to lab more than 30 minutes late, they were counted absent, but could still submit lab reports and do the required activities. Such occurrences were rare.

**Many students skip lectures because they believe they can "make up" their absences by downloading or copying notes, reading the textbook, or talking with a classmate.**

Students received no points for merely attending lab, but attending lab enabled students to earn points by taking the weekly lab-quizzes (about that day's lab and the previous week's lab) and doing the lab activities. Grades in lab were independent of those in lecture; lab exams included no questions from lectures. Each lab was independent of other labs (i.e., missing a lab did not penalize students in subsequent labs), and each lab contributed the same amount to students' lab grade. Regardless of the students' work throughout the semester, missing a lab and its quiz meant that students lost 7% (i.e., 1/14) of their possible lab grade.

During four of the semesters of this study, students were allowed to miss three labs; if they missed four labs, for whatever reason, they automatically failed the course, regardless of their performances in other parts of the course (e.g., lecture exams). During the other four semesters of this study, students were allowed to miss only two labs; if they missed three labs, for whatever reason, they automatically failed the course, regardless of their performances in other parts of the course. These attendance policies were emphasized every semester during the first two weeks of lecture, in each of

the first two weeks of lab, in the course syllabus, and in the lab syllabus. In all instances, presentations of the policy were accompanied by data showing that increased rates of attendance in lab are associated with higher grades in lab (Moore, 2003). These data were also posted prominently on large posters in the lab and just outside the lab where students congregated before lab. There were no minimum attendance-requirements or points awarded for attending the lecture part of the course, but students in all sections were told about and given data documenting the strong relationship of class attendance and grades.

Students with "excused" absences (e.g., documented illnesses, emergencies) were allowed to reschedule their labs without penalty if they contacted their TA and made arrangements to attend a different lab section during the same week as their scheduled lab. That is, an illness or personal emergency did not automatically penalize students who missed their assigned lab. Given the logistics of most labs (e.g., the availability of equipment, reagents, and specimens) and the questionable nature of most students' excuses for absences (Caron, Whitbourne, & Halgin, 1992; Sappington, Kinsey, & Munsayac, 2001), students were not allowed to reschedule their labs if they did not contact their TA before their lab or if they could not provide documentation of their emergency or illness (e.g., students who missed lab without notice because of family vacations or poker tournaments were not allowed to reschedule a missed lab). Weekly meetings of TAs were used to ensure that all labs in all semesters had similar exams, did the same experiments, and had identical grading policies.

**There were no minimum attendance-requirements or points awarded for attending the lecture part of the course, but students in all sections were told about and given data documenting the strong relationship of class attendance and grades.**

### Instructors' responses to students' absences

When students missed a lab, they were sent an e-mail notifying them of their absence, their total number of absences in lab, the course's attendance policy, and their probabilities of earning various grades in the course (based on previous semesters' data). Every semester, these e-mails were sent within 1-72 hours after each absence. Students who missed two labs received an "academic alert" 1) notifying them how absenteeism affects their grade, and 2) instructing them to meet with their advisors about their poor performance in the course. When students exceeded the maximum number of allowed absences, they received an e-mail informing them that they had failed the course.

### What we measured

We monitored the lab grade, lab attendance, and course grade of all students in this study. Correlations and the significance of differences between means were determined as per methods described by Sokol and Rohlf (1969). We used independent samples *t*-tests to evaluate differences among means and Pearson correlations. Differences with probabilities exceeding 5% were considered insignificant.

### Students' knowledge of course policies

During the third week of classes (i.e., after stressing the attendance policy), we distributed a survey based on the attendance policy in effect during that semester. For example, in semesters during which students could not miss more than two labs, the survey read as follows: "During the first two weeks of classes, we have discussed the attendance policy regarding lab: If you miss three labs (for whatever reason), you fail the course. This policy was also discussed in lab and in the course syllabus. How do you interpret this policy? Check all of the following statements that apply: (a) Coming to every lab will help me make a good grade in this course. (b) The more labs I miss, the lower my grade will be. (c) If I miss only one lab during the semester, my grade will not be affected. (d) If I miss only two labs during the semester, my grade will not be affected. (e) If I miss three labs during the semester, my grade will not be affected. (f) If I miss a lab, I can make up the points later in the semester. (g) I can miss up to three labs and still make a good grade in this course." Students' responses were anonymous and were not tabulated until after final grades were submitted.

## Results

We accommodated all students who requested that they be allowed to attend a different lab. That is, all students who contacted their TA to reschedule their lab and who provided the required documentation were allowed to attend a different lab-section and take the accompanying lab-quiz. All students who were counted absent from a lab either (a) showed up more than 30 minutes after the lab had started, or (b) never came to the lab and did not

contact their TA to reschedule the lab. No students, after missing lab, were able to "make up" a lab if they had not notified their TA of their upcoming absence before the lab.

**Table 1.** Attendance patterns of students enrolled in sections of an introductory biology course that allowed no more than two or three absences.

| Measure | Maximum Number of Absences Allowed: Two | Three |
|---|---|---|
| Number of absences per student enrolled in the course | 0.39 | 0.38 |
| Number of absences per student who missed > 1 lab | 0.40 | 0.59 |
| Students who missed > 1 lab who missed 1 lab, % | 69 | 49 |
| Students who missed > 1 lab who missed 2 labs, % | 19 | 27 |
| Students who missed > 1 lab who missed > 3 labs, % | 12 | 22 |
| Average week of first absence | 6.2 | 6.0 |
| second absence | 8.8 | 8.4 |
| third absence | 10.3 | 10.8 |

### Attendance patterns

The attendance patterns of students enrolled in the two different types of sections are shown in Table 1. The average number of absences per student was similar in both types of sections (0.39 vs. 0.38 overall absences per semester per student). However, when absences were distributed among only those students who missed at least one lab (instead of among all students enrolled in the course), reducing the number of allowable absences from three labs to two decreased the average number of absences per student from 0.59 + 0.04 (s.e.) labs to 0.40 + 0.05 (s.e.) labs. This difference in lab attendance was statistically significant ($p < 0.001$).

In sections that allowed only two absences, 69% of the absences were accounted for by students who missed only one lab; in sections that allowed three absences, this percentage was smaller (i.e., 49%; Table 1). The percentages of absences accounted for by second-misses and third-misses were much smaller in sections that allowed only two absences than in sections that allowed three absences (19% vs. 27%, and 12% vs. 22%, respectively; Table 1). Changing the number of allowable absences did not change the average week in which students missed lab; on average, students' first absence occurred during the sixth week of the semester, their second absence during the eighth week, and their third or greater absence during the tenth week (Table 1).

### Grades

The lab grades and final course-grades (lecture plus lab) of students who missed various numbers of labs are shown in Table 2. Reducing the number of allowable absences from three labs to two increased the percentage of students who missed no labs from 71% to 79%, and reduced the percentage of students who missed two or more labs from 13% to 5%. Reducing the number of allowable absences from three labs to two also increased students' average lab-grade from 74 + 0.8 (s.e.) to 79 + 0.7 (s.e.), and their average course-grade from 70 + 0.7 (s.e.) to 74 + 0.6 (s.e.). Both of these improvements were statistically significant ($p < 0.001$). Larger numbers of absences in lab were associated with significantly lower lab-grades and course grades (Table 2).

In sections of the course that allowed no more than two absences from lab, the correlation coefficient ($r$) of lab attendance and lab grade was 0.68, and the coefficient of determination ($r^2$) was 0.46 (i.e., variation in lab attendance accounted for 46% of the variation in students' lab grades). In these sections, 8% of students earned an A, 30% a B, 38% a

**Table 2.** Lab grades and final grades of students who missed various numbers of labs in sections of an introductory biology course that allowed no more than two or three absences. Numbers in the table are percentages.

| Number of Absences | % of Students: Two | Three | Lab Grade: Two | Three | Course Grade: Two | Three |
|---|---|---|---|---|---|---|
| 0 | 79* | 71 | 84 | 82 | 77 | 77 |
| 1 | 16 | 15 | 73 | 72 | 67 | 68 |
| 2 | 2 | 5 | 46 | 52 | 43 | 51 |
| 3 | 3 | 3 | 36 | 33 | 33 | 34 |
| 4 | -- | 5 | -- | 31 | -- | 34 |
| Overall | 100 | 100 | 79 | 74 | 74 | 70 |

*For example, 79% of the students in the sections that allowed no more than two absences missed no labs.

C, 13% a D, and 11% an F. In sections of the course that allowed no more than three absences from lab, the correlation coefficient ($r$) of lab attendance and lab grade was 0.65, and the coefficient of determination ($r^2$) was 0.43 (i.e., variation in lab attendance accounted for 43% of the variation in students' lab grades). In these sections, 8% of students earned an A, 27% a B, 28% a C, 17% a D, and 20% an F. Students who received "academic alerts" after their second absence in lab had the following final grades in the course: A = 0%; B = 0%; C = 11%; D = 13%; F = 39%; W = 37%.

In sections of the course that allowed no more than two absences from lab, 1% of students earned an F because of excessive absences. In sections of the course that allowed no more than three absences from lab, 8% of students earned an F because of excessive absences from lab. However, all of these students were failing all aspects of the course, and all of them almost certainly would have failed the course anyway, even if there had been no attendance-related penalty.

*Survey*. Students' responses to the survey questions are listed in Table 3. Surveys were returned by 83% of students enrolled in the course.

## Discussion

After repeatedly observing that students who missed three labs had only about a 20% chance of passing the introductory biology course, we reduced the number of allowable absences in lab from three labs to two labs per semester. This change in course policy improved students' attendance in lab. Indeed, the new policy increased the percentage of students who missed no labs from 71 to 79%. The new policy also changed the distribution of absences in lab; among students who missed at least one lab, the new policy increased the percentage of students who missed only one lab from 49% to 69%, and decreased the percentage of students who missed two or more labs from 13 to 5%. These results indicate that data-based changes in attendance policies such as the one described here can improve students' academic behaviors.

**Although the new course-policy increased students overall rates of lab attendance, it did not alter the general chronology of absences among students who missed at least one lab.**

The increased rate of lab attendance associated with our new policy correlated with a significant improvement in students' laboratory grades. Indeed, students' average lab grade increased from 74% to 79%. This was the first time during the past six years that there had been a significant increase in students' lab grades. These results support the claim that increased levels of course-engagement (as measured here by lab attendance) increase students' grades in labs of introductory science courses. Although other studies have reported this correlation for attendance in lecture parts of introductory courses (Launius, 1997; Moore, 2003; Romer, 1993), this is the first report of this correlation of lab attendance and students' lab grades. These results indicate that data-based changes in course policies can produce significant improvements in students' lab grades.

The strong correlation of lab attendance and lab grades is not altogether surprising; after all, missing a lab automatically meant that students lost 7% of their total lab points. However, students who missed one lab had lab grades that were 10-11% lower than students who missed no labs (Table 2). These results indicate that missing one lab has a disproportionately greater impact on lab grades than can be accounted for by the absence alone. This disproportionate impact of lab absences is much more dramatic for students' second and subsequent absences. For example, students who missed two labs had lab grades 30-50% lower than students who missed no labs, and 20-30% lower than students who missed one lab. These students failed both the lecture and lab portions of the course. This is probably due to these students' other poor academic behaviors; students who skip labs also skip lectures, do not turn in homework assignments, and usually ignore other opportunities to improve their grades (Moore, 2006). These results emphasize the importance and the predictive power of students' attendance in lab for their overall academic performances in introductory science courses.

Although the new course-policy increased students overall rates of lab attendance, it did not alter the general chronology of absences among students who missed at least one lab. On average and regardless of the lab-attendance policy, the first absence was most likely to occur during the sixth week of the semester, the second absence during the eighth week of the semester, and the third (and greater) absence during the tenth week of the course. (We could find no campus events to account for this pattern.) These results indicate that absences from lab are not random; on the

contrary, the rate of absenteeism in lab accelerates. It takes only one-third (2 weeks/6 weeks) the time to reach the second absence as the first absence from lab. This accelerating rate of lab absenteeism throughout the semester also produces an accelerated drop in students' grades.

The new course-policy regarding lab-attendance also did not alter the percentages of As or Bs, but it did increase the percentage of Cs while decreasing the percentages of Ds and Fs. These results indicate that the improved attendance associated with the new policy disproportionately improved the grades of students who were earning average and below-average grades. Students who earned an A or B in the course were rarely affected by the policy because they usually attended all of the labs, regardless of the policy.

Although the new attendance-policy improved many students' grades, it did not help everyone; despite our warnings, some students exceeded the allowable number of absences and failed the course. These students are characterized by a variety of poor academic behaviors (Grisé & Kenney, 2003) that often began in high school, where they had relatively insignificant consequences (Alexander, Enwisle, & Horsey, 1997; Fallis & Opotow, 2003; Gewertz, 2006; Young, 2002). These results are consistent with reports that penalties for excessive absences do not eliminate excessive absenteeism and the resulting poor grades (Berenson, Carter, & Norwood, 1992). Nevertheless, the new policy described here did reduce the percentage of Fs from 20% to 11%, reduced the combined percentage of Ds and Fs from 37% to 24%, and reduced the percentage of students who failed the course because of excessive lab-absences from 40% (i.e., 8/20) to 9% (i.e., 1/11). These results indicate that course policies can improve the academic behaviors and grades of some students.

Although virtually all (i.e., 99% of) students understood that coming to every lab would help them make a good grade in the course and that missing two or more labs would hurt their grade, 14% of students mistakenly believed that their grade would not be affected by missing one lab. Similarly, 28% of students mistakenly believed that they could "make up" the points lost by missing a lab (Table 3). These results suggest that a significant percentage of students may view one absence as a "freebie" that does not affect their grades, despite being told (and given data indicating) otherwise.

Early warning systems have been touted as an effective tool for helping at-risk students (Bridgeland, Dilulio, & Morison, 2006). However, students in this study who received such alerts earned no better than a C, and most earned grades of D, F, or W. These results indicate that in introductory science classes, as in others (Brothen, Wambach, & Madyun, 2003; Hansen, Brothern, & Wambach, 2002), early alerts seldom have a significant impact on students' work, behaviors, or grades.

Although academic behaviors are strongly associated with academic results, correlation does not necessarily imply causation. In our study, increased rates of lab attendance might help produce better grades, or students' desires to earn better grades might underlie their high rates of lab attendance, or both. Moreover, high rates of course engagement do not guarantee academic success; some students who attended every lab earned poor grades. Nevertheless, the conclusion here is unmistakable: Students who attend the most labs earn the highest lab-grades, regardless of the course policy about absences.

**Table 3.** Students' responses to a survey administered during the third week of the course. Numbers in the table are percentages of students who agreed with the statements.

| Statement | % |
|---|---|
| Coming to every lab will help me make a good grade in this course. | 99 |
| The more labs I miss, the lower my grade will be. | 90 |
| If I miss only one lab during the semester, my grade will not be affected. | 14 |
| If I miss only two labs during the semester, my grade will not be affected. | 2 |
| If I miss three labs during the semester, my grade will not be affected. | 1 |
| If I miss a lab, I can make up the points later in the semester. | 28 |
| I can miss up to three labs and still make a good grade in this course. | 1 |

## Lab Attendance and Course Grades in Introductory Science Courses

College instructors have a variety of attitudes and policies regarding class attendance. As Druger (2003) has noted, "Some instructors don't care if students attend class at all … [whereas] other instructors feel strongly about the importance of class attendance. Some instructors check attendance at every class; others don't check it at all" (p. 350). Most

science instructors agree with Davis (1993), who noted that "attendance should not be mandatory or a factor in your grading policy. Rather, grades should be based on students' mastery of the course content and not on such nonacademic factors as attendance" (p. 138). However, this policy clashes with the fact that most students do not come to class as often if they do not get points for attending class (Launius, 1997; Moore, 2003). Regardless, most instructors recognize the importance of class attendance for academic success. As Thompson (2002) has noted, "If a student ever complains about a grade or how tough the course is, one of the first things I look at is class attendance. That usually says it all" (p. B5). Data presented here are consistent with Thompson's conclusion and show that changes in course policies can improve attendance and grades.

Although attendance is strongly correlated with success in introductory science classes (Moore, Jensen, Hatch, Duranczyk, & Koch, 2003), it is difficult and time-consuming to accurately monitor attendance in large lectures of introductory science courses. Data presented here show that lab attendance, like lecture attendance, is also a strong predictor of students' academic performances in introductory science courses; students who miss increased numbers of labs earn progressively lower grades, regardless of the course policy about lab attendance. Because labs enroll fewer students than lectures, students' attendance in lab can be measured easily, quickly, and accurately, beginning the first week of classes. As demonstrated in this study, instructors need not make any subjective judgments about students' levels of preparation or in-lab effort. They can simply note whether a student attends lab and, as a result, be able to identify at-risk students as early as the first day of lab and long before the first lecture-exam.

## *References*


Alexander, K. L., Enwisle, D. R., & Horsey, C. S. (1997). From first grade forward: Early foundations of high school dropout. *Sociology of Education, 70* (2), 87-107.

Berenson, S. B., Carter, G., & Norwood, K. S. (1992). At at-risk student in college developmental algebra. *School Science & Mathematics, 92* (2), 55-58.

Bridgeland, J. M., Dilulio, J. M., & Morison, K. B. (2006). *The silent epidemic: Perspectives of high school dropouts*. Washington, DC: Civic Enterprises.

Brothen, T., Wambach, C., & Madyun, N. (2003). Early alerts II: An experimental evaluation. *Research and Teaching in Developmental Education, 20* (1), 22-28.

Burchfield, C. M., & Sappington, J. (2000). Compliance with required reading assignments. *Teaching of Psychology, 27*, 58-60.

Caron, M. D., Whitbourne, S. K., & Halgin, R. P. (1992). Fraudulent excuse making among college students. *Teaching of Psychology, 19* (2), 90-93.

Congos, D. H., Langsam, D. M., & Schoeps, N. (1997). Supplemental instruction: A successful approach to learning how to learn college introductory biology. *Journal of Teaching and Learning, 2* (1), 2-17.

Davis, J. R. (1993). *Better teaching, more learning: Strategies for success in postsecondary settings*. Phoenix, AZ: Oryx.

Druger, M. (2003). Being there: A perspective on class attendance. *Journal of College Science Teaching, 32,* 350-351.

Fallis, R. K., & Opotow, S. (2003). Are students failing school or are schools failing students? Class cutting in high school. *Journal of Social Issues, 59* (1), 103-108.

Friedman, P., Rodriguez, F., & McComb, J. (2001). Why students do and do not attend classes. *College Teaching, 49* (4), 124-133.

Gewertz, C. (2006). High school dropouts say lack of motivation top reason to quit. *Education Week, 25* (26), 1, 14.

Grisé, D. J., & Kenney, A. M. (2003). Nonmajors' performance in biology. *Journal of College Science Teaching, 33* (2), 18-21.

Hansen, G., Brothen, T., & Wambach, C. (2002). An evaluation of early alerts in PSI general psychology course. *The Learning Assistance Review, 7* (1), 14-21.

Hatfield, J. (2003). *Office of Research and Evaluation-Research 2002-2003*. Minneapolis, MN: General College, University of Minnesota.

Hoover, E. (2003, August 20). ACT scores hold steady from last year. Retrieved from http://chronicle.com/prm/daily/2003/08/200308200ln.htm.

Launius, M. H. (1997). College student attendance: Attitudes and academic performance. *College Student Journal, 31,* 86-92.

Moore, R. (In press). Are students' performances in labs related to their performances in lecture portions of introductory science courses? *Journal of College Science Teaching*.

Moore, R. (2003). Does improving developmental education students' understanding of the importance of class attendance improve students' class attendance and academic performance? *Research and Teaching in Developmental Education, 20* (2), 24-39.

Moore, R. (2006). Do introductory science courses select for effort or aptitude? (pp. 137-145) In J. L. Mintzes and W. H. Leonard (Eds.), *Handbook of College Science Teaching*. Arlington, VA: National Science Teachers Association.

Moore, R., Jensen, M., Hatch, J., Duranczyk, I., & Koch, L. (2003). Showing up: The importance of class attendance for academic success in introductory science classes. *The American Biology Teacher, 65* (5), 325-329.

Rumberger, R. W. (2001). Why students drop out of school and what can be done. Retrieved March 23, 2006, from http://www.civilrightsproject.harvard.edu/research/dropouts/dropouts_papers.php

Sappington, J., Kinsey, K., & Munsayac, K. (2002). Two studies of reading compliance among college students. *Teaching of Psychology, 29,* 272-274.

Sokol, R. R., & Rohlf, F. J. (1969). *Biometry*. San Francisco: W. H. Freeman.

Thompson, B. (2002). If I quiz them, they will come. *The Chronicle of Higher Education, 48* (41), B5.

Yaworski, J., Weber, R. M., & Ibrahim, N. (2000). What makes students succeed or fail? The voices of developmental college students. *Journal of Reading and Learning, 30* (2), 195-221.

Young, J. R. (2002). Homework? What homework? *The Chronicle of Higher Education, 49* (15), A35-A37.

**Randy Moore** is a professor of biology at the University of Minnesota, 3-104 MCB, 420 Washington Avenue SE, Minneapolis, MN 55455. Correspondence pertaining to this article may be sent to RMoore@umn.edu.

**Philip A. Jensen** is a graduate student in the Department of Genetics, Cell Biology & Development, University of Minnesota, 312 Street, SE, Minneapolis, MN 55455.