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ABSTRACT

This report describes a program designed to encourage minority and financially, socially, or educationally disadvantaged incoming, freshman students to pursue health profession career goals. Sixteen at-risk students were selected to participate in a summer intervention program in West Virginia; a control group of 16 pre-medicine or pre-dentistry subjects was used for comparison. The intervention program was a four-week residential summer program in which students received a monetary weekly allowance with all meals, room and board, and transportation provided. Subjects were pretested in biology, chemistry, mathematics, reading, writing, and study skills; individualized programs were set up based on testing results. Study halls were mandatory, and each student received social support from instructors, formal seminars, site visits, and group social activities. Intervention students completed the Learning and Study Strategies Inventory (LASSI) and the Perceptions, Expectations, Emotions, and Knowledge About College (PEEK) instrument; all participants completed the Nelson-Denny Reading Test. It was found that incoming, at-risk freshmen who planned to pursue professional heath care training, and who completed the one-month intensive intervention program, were more academically successful than control students during the first semester of college. Student LASSI scores changed significantly in five categories after the intervention. In addition, intervention participants attempted and earned significantly more credit hours than students in the control group. (Contains 24 references.) (NAV)

Impact Of Intervention On Disadvantaged First Year Students Who Plan To Major In Health Sciences

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Abstract

Incoming, at risk freshmen, who plan to pursue professional health care training and who completed a one month intensive intervention program, were more academically successful than students from a control group during the first semester in college. Students received instruction in biology, chemistry, mathematics, writing, and study skills (including time management and organizational skills). Students were given the Learning and Study Strategies Inventory (LASSI), the Perceptions, Expectations, Emotions, and Knowledge about College (PEEK), and the Nelson-Denny Reading Test. Student LASSI scores changed significantly on five of the categories. Participants in the intensive intervention program attempted and earned significantly more credit hours than students in the control group.

Impact Of Intervention On Disadvantaged First Year Students
Who Plan To Major In Health Sciences

The number of intervention programs for undergraduate students has increased over the past decade. Most programs focus attention on incoming freshmen who do not meet regular admission requirements (e.g., Lipsky & Ender, 1990; Polansky, Horan, & Hanish, 1993). While the length of these programs vary, usually the intervention lasts for several weeks or months (e.g., DuBois, Staley, Guzy, & DiNardo, 1995; Walsh, 1985). Some of these programs have demonstrated long terms effects on academic performance (e.g., Haught & Hill, 1996).

Fewer programs focus on short-term intervention. One such program was described by Thombs (1995). First semester freshmen completed an intensive summer developmental program for students who did not meet academic standards for regular admission. They were assessed in the behavior areas of study habits, time management skills, relations with faculty, control of alcohol use, and general self defeating behaviors. After identifying poor study habits (56.8%) and time management (54%) as two primary problem areas among the freshmen, Thombs (1995) concluded that a need for student support services exists, particularly at institutions with low admission criteria. These services should be broadly focused to respond to a student's total life experience.

In a literature review of out-of-class experiences which impact learning and cognitive development in college students, Terenzini, Pascarella, and Blimling (1996) concluded that specific experiences can positively shape academic learning. Factors which might affect incoming freshmen students include (1) living in a residence hall where students'

academic and nonacademic lives are purposefully integrated, (2) working part time on campus, (3) discussing ethnic and racial issues, (4) socializing with others from different racial or ethnic groups, and (5) interacting with other students or faculty members.

Brooks and DuBois (1995) reported that environmental factors important to freshmen college success should be addressed through stress management instruction and group participation which promotes the formation of social support networks among first year students.

Pre-professional freshmen do not fit the general definition of "at risk" and have received little attention. Research has generally been limited to special populations of premedical students. Henry (1993) examined the effects of completing a career development course on the professional identities of nontraditional premedical students; while Henry, Bardo, and Henry (1992) investigated the effectiveness of career development seminars with African American premedical students. However, Thomas (1994) briefly reviewed the HCOP program and concluded that it has created opportunities for African Americans to enter the health professions. There is a need to examine these students, to determine what experiences promote success in their chosen professions. This information is vital given that a need exists in many states, including the state of West Virginia, for dentists, pharmacists, and medical doctors. In West Virginia more than eighty percent of the state's counties (45 of 55) have health care shortages (Federal Register, 1996). West Virginia University has a yearly population cohort of approximately 1,500 undergraduate freshmen (half of the incoming freshmen class) who come from disadvantaged backgrounds, many of whom have the desire and potential to become health professionals. Frequently these students come

from rural parts of the state where funds are scarce and education is not a top priority. They may be minority students, financially disadvantaged students, and/or educationally and socially disadvantaged students.

The program described in this paper is one effort designed to encourage these students to pursue their health profession goals. One purpose of this paper is to demonstrate the impact of summer intervention on academic performance of disadvantaged, first year students who plan to pursue professional training in dentistry, pharmacy, or medicine. Secondly, this information can assist universities in recruiting, educating, and supporting at risk, students who plan to study in the health professions.

Method

Participants

Of fifty applicants, sixteen students were selected to participate in the summer intervention program. Each participant was disadvantaged as defined by the Health Careers Opportunity Program (HCOP) Federal Register guidelines and had to be accepted at the University sponsoring this program. Each student met eligibility criteria which included (a) a high school grade point average of 3.0 or higher, (b) composite ACT scores or SAT scores in the top 50% of their minority or disadvantaged population, (c) having excellent letters of recommendation, and (d) exhibiting a strong interest and desire to pursue a health career in dentistry, pharmacy, or medicine as assessed by a statement of purpose written by each applicant as part of the application process. Applicants were also ranked according to need, with hierarchical priority given to minority, financially disadvantaged, and educationally disadvantaged students in that order. The two ranked lists were then compared, and the

16 highest ranking students who fell into the top of both of the lists were selected.

For the purpose of this investigation, subjects who were from disadvantaged backgrounds were educationally disadvantaged which was defined as coming from an environment that has inhibited the individual from obtaining the knowledge, skill, and abilities required to enroll in and graduate from a health professions school or from a program providing education or training in an allied profession. Some of the subjects were economically disadvantaged which was defined as coming from a family with an annual income below a level based on low-income thresholds according to family size, published by the U.S. Bureau of the Census, adjusted annually for changes in the Consumer Price Index, and adjusted by the Secretary for use in all health professions programs.

Students entered the summer intervention program following high school graduation and immediately prior to entering the University during the Fall 1995 semester. Of the sixteen participants, there were ten females and six males, thirteen White and three African-American students. All participants were West Virginia residents. One White, female student (subject 15) chose not to attend the University and is included in all analyses except those that compare the participants with the control group. A control group of sixteen subjects was obtained from admissions and records for comparison purposes. All students included in the control group sample were state residents who had been admitted into the pre-dentistry or pre-medicine programs. The investigation was approved by the Institutional Review Board for protection of human subjects and was conducted in accord with APA ethical guidelines.

Intervention Program

The intervention program was a four week residential summer intensive educational experience conducted on the West Virginia University campus. Parents brought students to a welcome luncheon of participants, parents, coordinators, and faculty on the first day of the program and picked up their children at the end of the month. Students lived in college dormitories and received a monetary weekly allowance. All meals and transportation were provided. Students stayed on campus for the entire program but were allowed visitors on Sunday afternoons.

The intervention program formally began with pretests to assess each student's level of competence and knowledge. These tests were structured to measure the students' reasoning abilities as well as the students' knowledge of the subject areas as compared to what is expected of the average freshman. Participants were tested in these subjects: biology, chemistry, mathematics, reading, writing, and study skills. Individualized programs were then set up for each student so that the most time and effort was spent strengthening weak areas in preparation for college-level performance. However, all students spent time working in each of the course content areas. One week of the summer schedule is shown in Appendix A.

All content areas were taught by university faculty from the College of Arts and Sciences and College of Human Resources and Education and were designed specifically for the particular needs of this program. The aim was to enhance each student's chances for success in their regular university courses. Complete descriptions of the biology, chemistry, math, and writing courses can be found in Appendix B.

The study skills course was designed to help the students develop reading and study skills necessary for academic success and included six

hours of instruction. The major topics covered in the course included managing time; studying for various academic disciplines; reading in the social sciences, the behavioral sciences and literature· reading and taking exams; and developing spelling skills, vocabulary, and reading efficiency. During the first nightly study hall, students viewed a video, The Secrets to College Success (1993). Reading and study skill strategies were explained. Then, students were given practice using the strategies to deal with the textbooks and lecture materials used in their other intervention courses. Taking class notes, reading textbooks, preparing mock exams, developing a personal glossary, and constructing charts which condense material were practiced in conjunction with the biology course. Reading math and chemistry word problems was practiced in conjunction with the math and chemistry courses. Students were given complimentary copies of The Original Student Calendar (Ross, 1995) and instruction on using an organizational planner.

The study skills course content was largely based on the learning skills described by Heiman (1987) in the Learning to Learn system. Once a skill has been learned, the student can stop performing it overtly because the process of learning how to learn has been internalized. In broad terms, the skills included lecture note taking, textbook reading, organizational and time management skills, and test taking skills. The combination of these skills was intended to enable students to become more effective and efficient learners through the development of active learning strategies.

These courses were designed to offer the intervention program students a unique educational experience aimed specifically at enhancing their ability to succeed. Identification of each student's strengths and

weaknesses permitted the faculty to concentrate on those weaknesses, thus assuring the greatest gain for the individual student.

To help the student develop a routine for studying, a mandatory study hall was held for one hour each evening Monday through Thursday. One faculty member was available for consultation during that hour. Students were also encouraged to consult faculty members during the day by visiting them after classes or by setting up appointments during free time.

Social support was offered in many different forms. The instructors guided the students on how, when, where, and why to get help during the school year. Formal seminars were provided to increase the participants' awareness of the challenges to be met in preparing for a health sciences profession. Examples included "Financial Aid Seminar," "Drug and Alcohol Seminar," and "AIDS and Other STDs' Seminar." Students visited a rural hospital setting and spent a day on a nearby lake, collecting water samples from ten locations and conducting a mini-study of water acidity. These field trips were interwoven with side-trips to historical sites and entertainment. Every effort was made to develop a spirit of cooperation among the students. Planned campus-based social activities involved both students and faculty. Examples of these activities included ice cream sprees, picnics in a park, bowling parties and video/pizza parties. The participants were encouraged to attend university concerts, exhibits, and lecture series.

At the end of the summer program, the progress of each student was assessed in every course through a post test. In addition, each student received guidance in developing a workable fall schedule congruent with their interests, goals, and abilities.

Study Skills Measures

The Learning and Study Strategies Inventory (LASSI) (Weinstein, Schulte, & Palmer, 1987), which according to the LASSI User's Manual is "designed to measure college students' use of learning and study strategies and methods" (Weinstein, 1987, p. 1), served as the pre- and post-test for students enrolled in the summer intervention program. The LASSI has been useful in assessing student improvement and course effectiveness in study strategies programs. Mealey (1988) suggested that the LASSI be administered at the beginning and end of such a program. Other researchers have used the LASSI to measure college students' cognitive and affective growth after completing a study strategies course (Nist, Mealey, Simpson, & Kroc, 1990). The LASSI has been used to measure significant change in students who completed a comprehensive study strategies course (Haught & Hill, 1996; Haught, Hill, Walls, & Nardi, 1996).

Students in the summer intervention program also completed the Perceptions, Expectations, Emotions, and Knowledge about College (PEEK) (Weinstein, Palmer, & Hanson, 1995) which was designed to assess students' ideas, attitudes, beliefs, and expectations about what college will be like for them. Researchers suspect that student expectations about college are critical factors that may help determine success or failure. The PEEK manual states, "the degree to which students' expectations accurately reflect their college environment will have a critical impact on their academic performance and satisfaction" (Weinstein, Palmer, & Hanson, 1995, p. 2). A sample PEEK item for the academic experiences category is "My college grades should be about the same as were my high school grades." Similarly, a sample PEEK item for the personal experiences category is "I will not need any outside help to do well in my courses," and

for the social experiences category is "I will have to work at making new friends."

All participants were given the Nelson-Denny Reading Test (Brown, Fishco, & Hanna, 1993) . The Nelson-Denny assesses vocabulary, reading comprehension, and total reading score (which is a combination of vocabulary, comprehension, and reading rate).

Results

How do those students enrolled in a summer intervention program manage as compared to the control group that did not take the course? The independent variable was participation versus non-participation in the intervention program. The dependent variables were semester grade point average, cumulative grade point average, credit hours earned, and credit hours attempted. Semester and cumulative grade point averages, total credit hours attempted, and total credit hours earned were obtained for students from the experimental and control groups from the Fall 1995 semester. To determine whether differences in academic performance occurred between the experimental and control groups, independent t-tests were conducted for all dependent variables. Those students who completed the summer intervention program attempted and earned significantly more credit hours than the control group. No significant difference in semester or cumulative grade point averages was observed. Means and standard deviations for Fall 1995 grade point average, cumulative grade point average, total credit hours attempted, total credit hours earned, as well as, the *t* values are reported in Table 1.

Insert Table 1 about here

The pre- and post-LASSI scores for students in the intervention program also served as dependent variables and permitted further evaluation of the effectiveness of the intervention program. The pretest and posttest LASSI mean scores and level of significance are presented in Table 2. Paired samples t-tests between the group means on the ten

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Insert Table 2 about here

LASSI categories were conducted. Significant statistical differences were observed on five LASSI categories including time management (t = 3 133; p < .01), anxiety (t = 2.698; p < .05), concentration (t = 2.092; p < .01), information processing (t = 2.381; p < .05), and selecting main ideas, (t = 3.905; p < .001). In summary, the sixteen students perc ived themselves as less anxious, better able to concentrate, better time managers, able to select main ideas more easily, and better able to process information after completing the summer intervention program. No significant differences were observed on the remaining categories, even though motivation (setting short term goals) was close to significance.

Student z scores on the PEEK are reported in Table 3. Z scores

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Insert Table 3 about here

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between -3 and -1 indicate that the student's expectations about the items in that category (Academic, Personal, or Social Experiences) are in less agreement with what the university expects the student experiences to be like. Z scores between -1 and +1 indicate that the student's expectations about the items in that category are generally about the same as other

students' scores. Finally, Z scores between +1 and +3 indicate that the student's expectations about the items in that category are in more agreement with what the university expects the student experiences to be like.

The range in total scores for each of the three categories is 50 (10 statements at 5 possible points maximum). The mean raw scores for the academic, personal, and social experiences categories are 32.94, 29.50, and 33.69, respectively. The standard deviation scores for the same three categories are 2.46, 4.23, and 2.57, respectively.

The Nelson-Denny was given and raw scores were changed into scaled scores, percentile scores, grade equivalent scores, and stanine scores. Student percentile scores on all parts of the Nelson-Denny Test are summarized in Table 4. Students were given a personal record of the

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Insert Table 4 about here

Nelson-Denny Reading Test which reported student percentile ranks and included information on interpreting individual scores.

Additional analyses were conducted by other program faculty on data from their courses. The biology instructor performed a one-way analysis of variance to test for a difference in mean student performance between the biology pre- and post-tests. The improvement was significant ($F = 48.13$, $p < .0001$). Mean scores on the biology pre- and post-test (each worth 60 points) were 22.2 and 38.4, respectively. The math instructor provided pre- and post-test scores. Based on tests of 50 points, mean math pre- and post-test scores were 28.94 and 34.13, respectively. A

t-test on pre- versus post-test math scores yielded a significant difference (t =3.457, p <.01) Students showed significant improvement in the biology and math content areas after completing the four week intervention.

Discussion

Predictably, the analyses show that completing the program has a positive affect on academic performance. Students in the intervention program attempted and earned significantly more credit hours than the students in the control group. Since these students were pre-health science majors, earning more credit hours would speed up the time required to complete their demanding programs of study which would result in a financial savings, as well. Mean semester GPAs for the experimental and control groups were 2.82 and 2.29, respectively. Mean cumulative GPAs for these groups were 2.83 for the experimental group and 2.33 for the control group. Even though these differences were not significant, the means did differ by at least one half point.

Analysis of LASSI Scores. Students who completed the intervention program had significant gains in 5 of the 10 LASSI categories. The HCOP participants made better use of time, had less anxiety about school performance, had better concentration on academic tasks, were better able to process information to acquire knowledge, and were more able to select main ideas and recognize important information while studying. These gains are remarkable given that the intervention lasted one month and students received only six hours of instruction in study skills. The structure and content of the intervention resulted in positive gains on post-LASSI scores for the program participants. Students in the intervention were less anxious about school, had better concentration,

could manage their time better, were better able to identify main ideas and process information.

Students received a copy of their pretest LASSI profile which provided feedback on their performance. A discussion of the various LASSI categories was held in class. Suggestions were made concerning what students could do to improve in areas with low percentile scores. Specific recommendations were made in terms of which areas students should pay close attention during study strategy instruction. Students were also given feedback on their posttest performance with a hard copy list of suggestions offered in class for ways to improve in areas with low percentile scores. All of these efforts were designed to inform the students of their identified weaknesses and to insure that the students were given strategies to help address these weaknesses before they began their post-secondary training.

Analysis of PEEK Scores. Few student scores fell into the final PEEK category, Z scores between +1 and +3. Three subjects (numbers 9, 12, and 15) indicated that they believed that their academic experiences were in agreement with what the university expects. Four subjects (numbers 5, 12, 14 and 15) indicated that they believed that their personal experiences were in agreement with what the university expects. Four subjects (numbers 2, 7, 12, and 14) indicated that they believed that their social experiences were in agreement with what the university expects. Few students had Z scores that were in less agreement with what the university expects. Three students (numbers 4, 5, and 13) indicated that they believed that their academic experiences would not be at the expected level. Three students (numbers 10, 13, and 16) indicated that they believed that their personal experiences would be below what the

university expects. However, five students (numbers 1, 3, 5, 8, 9, and 12) indicated that they believed that their social experiences would be below university expectations. One student (number 13) had Z scores that indicated that expectations on all three PEEK categories were below what the university expects. Additional one-on-one counseling would have been beneficial to that student.

Student responses on the PEEK resulted in some interesting observations. From the PEEK Academic Category distribution report, HCOP students (1) thought that it was less important to memorize class information than to think about it (69%), (2) did not expect instructors to monitor their academic efforts (69%), (3) thought that they would be responsible for understanding text book material and other reading assignments (63%), and (4) expected their college grades to be about the same as their high school grades (56%). From the PEEK Personal Category distribution report, students expected (1) to take responsibility for learning (88%), (2) to have difficulty to discipline themselves to prepare and attend classes (75%), (3) to feel overwhelmed by the workload (63%), and (4) to generate interest in their courses (56%). Strong student perceptions identified on the PEEK Social Experiences distribution report included (1) expecting to meet students from many different cultural backgrounds (75%) and (2) exposure to students from a wide range of ages (63%).

These students had fairly accurate expectations of the college experience. One area of concern is their belief that their college grades will be similar to their high school grades. Given their chosen careers, it is highly likely that they will not do as well academically as they did in high school. However, these students possessed a sense of purpose for doing

well academically and were prepared to manage their time which should enable them to be successful (Talbot, 1990). The expectations to meet people of different ages and cultural backgrounds can contribute to learning and cognitive development (Terenzini et al., 1996).

Analysis of the Nelson-Denny Scores. The HCOP students scored exceptionally well on the Nelson-Denny Reading Test. After completing the NDRT, suggestions were made to some students to visit the university Reading Lab to work on the areas of reading comprehension or reading rate. No students scored low on the vocabulary section of the test. In fact, seven of the students scored above the 90th percentile on the vocabulary part of the test. Only subject 16 scored low, at the 51st percentile, on the reading comprehension part of the test. However, six students (subjects 6, 7, 8, 9, 12, and 14) scored very low on the reading rate component of the test. Given the mass amount of information that dental, pharmacy, and medical students are required to read and digest, this is pertinent information given early enough so that students can make the needed changes to insure that they obtain their academic goals.

Summary. The present intervention program brought together 16 at-risk, incoming freshmen and exposed them to a rigorous month long review in the areas of biology, chemistry, mathematics, writing, and study skills. During those four weeks these students lived, ate, attended classes, and socialized together. Frost (1993) reported that "social bonding seems to pay off, and involved students are less likely to drop out of college" (p. 23). The students were placed in a mandatory orientation course for HCOP students in the Fall 1995 semester. They will continue to have contact with one another and with other students who have similar career goals. Brooks and DuBois (1995) found that social support networks among first

year students can contribute to college success. Terenzini et al. concluded "the most powerful source of influence on student learning appears to be students' interpersonal interactions" (p. 158). This ongoing bonding process should serve to assist these students in achieving their goals as health care professionals.

Caution is warranted before generalizing these results to other populations. This sample was small and very selective; all students were West Virginia residents and had met the HCOP criteria for determining at-risk status. These factors also limit the conclusions that can be drawn. The sample size could be increased by including former participants from the previous 10 years. Also the sample size could be increased by adding data from future HCOP participants. These findings could be compared to other HCOP programs to better determine how to assist these future dentists, pharmacists, and medical doctors in fulfilling their personal career goals which would benefit society by reducing the shortage of these health care professionals.

In summary, this paper described one intervention program for pre-health science students. Determining ways to assist at-risk students to succeed in the health professions is important if the need for health professionals is to be met. The information presented in this paper provides a base on which future research can build. This type of program can positively impact at-risk, freshmen. The review of the natural sciences, writing, and study skills and the social bonding will enable these students to be academically successful. Presently, little knowledge exists about this specific population. Possible research questions include: (1) Do academically successful high school students benefit from learning strategies that were developed primarily for students who have

experienced academic difficulty?, (2) Is there a relationship between student expectations of college experiences and actual academic performance?, and (3) What role does reading ability have on academic success in the health professions?

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1995 SCHEDULE
SUMMER EDUCATION
ENRICHMENT PROGRAM

CLASSROOM ASSIGNMENTS:
Biology - 212 Clark - Dr. Vavrek
Chemistry - 206 Clark - Dr. Strohl
Math - 212 Clark - Dr. Mays
Writing - 206 Clark - Dr. Miles
Study Skills - Dr. Haught
Study Hall - 711 Allen Hall

Week 2 **Dates: July 17 - July 23**

	17 MONDAY	18 TUESDAY	19 WEDNESDAY	20 THURSDAY	21 FRIDAY	22 SATURDAY	23 SUNDAY
8:00-9:00	I Math II Chemistry	I Math II Chemistry	Orientation	I Math II Chemistry	I Math II Chemistry	Preston Memorial Hospital Leave 8:30	
9:00-10:00	II Math I Chemistry	II Math I Chemistry		II Math I Chemistry	II Math I Chemistry		
10:00-11:00	I Writing II Biology	I Writing II Biology		I Writing II Biology	I Writing II Biology		
11:00-12:00	II Writing I Biology	II Writing I Biology	ID Photos	II Writing I Biology	II Writing I Biology		
	LUNCH	LUNCH	LUNCH	LUNCH	LUNCH		
1:00-3:00	Study Skills 212 Clark Hall	Study Skills 212 Clark Hall	1:00 - 2:00 I Math II Chemistry 2:00 - 3:00 II Math I Chemistry	Biology Lab	Biology Lab	Cheat Lake pH Survey after morning fieldtrip	
3:00-5:00	Faculty Meeting (Ann's Office)	Office Hours and Tutorials (By Appointment)	3:00 - 4:00 I Statistics II Biology 4:00 - 5:00 II Statistics I Biology	Biology Lab continued	Biology Lab continued		
5:00-6:00	DINNER	DINNER	DINNER	DINNER	DINNER		
6:30-7:30	Study Hall	Study Hall	Study Hall	Study Hall	Study Hall		
7:30-9:00							

Faculty Offices and Phones
Vavrek 320 Brooks, 293-5201 Ext 533
Haught 609G Allen Hall, 293-2515 Ext 1364
Mays 320 Armstrong, 293-2011 Ext 324
Miles 456 Stansbury, 293-3107 Ext 448
Strohl ? Clark, 293-3435

Appendix B: Complete Descriptions Of Biology, Chemistry, Math, And Writing Courses

The biology course was structured to introduce the students to the college-level lecture style course and to a laboratory experiment. Lectures covered topics such as the scientific method, biomes, prominent ecological issues, biogeochemical cycles, community ecology, cell constituents, and elementary molecular genetics. This course enabled students to practice learning via a lecture format, to work on taking good notes, to work on proper study techniques using their notes, to work on test-taking skills, and to work on learning from their mistakes. To help the students gain the most from this experience, the study skills instructor used the biology lecture material as a medium for improving study skills.

The biology laboratory was designed to introduce the students to the scientific method. Each student developed and tested a hypothesis concerning the effect of environmental change on *Arabidopsis thaliana*, and carried the experiment to completion. This research included researching the topic in the library and through the Internet, writing up a scientific paper using a word processor, applying statistical analysis, and delivering a presentation on the topic to the class members, faculty, and coordinators of the program in a mini-colloquium. The laboratory project was closely coordinated and integrated with the writing course.

The chemistry course was designed to introduce students to the college-level chemistry class. Problem sets and lecture material covered topics such as stoichiometry, equilibrium, balancing equations, solution chemistry, electrochemistry, shapes of molecules, gases, heat, and nuclear chemistry. In problem solving, the instructor stressed how to set up problems by identifying the needed information given, discarding any

unnecessary information given, identifying and obtaining any additional information needed (from tables or previous sections), and identifying the asked-for information. Calculators were provided and instructions on general use and programming techniques were offered. The more advanced students were encouraged to handle more advanced topics while the students weaker in chemistry were given extra attention to assure they understood the basic concepts before they moved on to a new topic. Student progress was assessed by frequent quizzes (every two-three lectures) and from in-class participation.

The math course was designed to accommodate students working at multiple levels so that each student could develop a level of mastery sufficient to begin college algebra, pre-calculus or calculus in the fall semester. The weaker students reviewed the topics from high school algebra in the University's Pre-College Algebra Workshop so that they could master the material and move on to college material as quickly as possible. The workshop students spent two hours a day using a self-paced program supervised by a trained staff member. The stronger students spent one hour a day working on topics concerning functions and graphing. The emphasis of the lectures was different from a typical pre-calculus course in that more time was spent on word problems, especially problems involving applications to chemistry, biology, or the health professions. Time was spent integrating the material covered to stress study and organizational skills appropriate for mathematics courses. Student progress was continually assessed by exams and homework. Weaknesses were addressed in individual conferences and written comments. Supplemental hour lectures were held both for those who were extremely advanced and for those who needed a little more attention on basics. In

these supplemental lectures, computer software appropriate for promoting learning math concepts was introduced.

The writing course emphasized mastering basic rules of grammar and punctuation, learning to use a word processor for writing and revising, becoming acquainted with the nature of the writing and revision process, learning to recognize the qualities of a good prose style and to use those qualities to revise one's own prose, learning to proofread, preparing and writing in-class essays and becoming acquainted with college standards for evaluating and grading written work. Additionally, the writing course was closely integrated with the biology course. The biology lab was used for teaching the students how to write effectively within the scientific disciplines and how to follow the standard format for presenting scientific information.

Table 1
Fall Courses GPA, Cumulative GPA, Total Credit Hours Attempted, and Total Credit Hours Earned Means and Standard Deviation Scores and *t* values for the Fall 1995 Semester

Dependent Variable	Summer Program Students		Control Group		*t* value
	M	SD	M	SD	
Fall Courses GPA	2.82	0.63	2.29	1.07	1.67
Cumulative GPA	2.83	0.63	2.33	1.07	1.57
Total Credit Hours Attempted	15.20	1.61	13.60	1.88	2.50*
Total Credit Hours Earned	14.20	1.74	11.60	3.92	2.35*

*$p < .05$.

Table 2

Mean Scores for Categories on the Learning and Study Strategies Inventory (LASSI) (N=16)

Category	Pretest	Posttest
Attitude and interest	34.06	35.25
Motivation, diligence, self-discipline, and willingness to work hard	33.50	34.94
Use of time management principles for academic tasks	25.69	28.88**
Anxiety and worry about school performance	26.81	30.31*
Concentration and attention to academic tasks	29.69	31.88**
Information processing, acquiring knowledge, and reasoning	29.81	32.44*
Selecting main ideas and recognizing important information	19.75	21.81***
Use of support techniques and materials	29.63	30.94
Self testing, reviewing, and preparing for classes	31.81	33.00
Test strategies and preparing for tests	31.88	32.88

*p <.05. **p <.01. ***p <.001.

Table 3

Z Scores for Categories on the Perceptions, Expectations, Emotions, and Knowledge about College (PEEK)

Subject	Academic Category	Personal Category	Social Category
1	.43	.35	-1.82
2	-.38	-.35	2.06
3	-.79	-.59	-1.04
4	-1.19	.59	.90
5	-1.19	1.30	-1.04
6	.03	-.35	-.66
7	-.79	-.59	2.84
8	-.38	-.59	-2.21
9	1.24	.12	-1.82
10	.43	-1.30	.90
11	.03	-.12	.51
12	2.06	1.06	1.29
13	-1.19	-2.96	-2.21
14	.84	2.48	2.06
15	1.65	2.25	-.66
16	-.79	-1.30	.90

Table 4

Nelson-Denny Reading Test Percentile Scores for All Subjects

Subject	Vocabulary	Comprehen-sion	Total Reading	Reading Rate
1	89	80	88	90
2	98	99	99	80
3	92	95	96	90
4	97	89	96	59
5	86	89	90	69
6	74	74	76	34
7	87	99	96	47
8	76	97	88	34
9	99	98	99	28
10	86	61	78	80
11	94	97	96	75
12	80	85	85	7
13	81	89	88	75
14	92	93	94	9
15	93	98	96	73
16	80	51	67	59