

UNDERGRADUATE  
STUDENT RESEARCH  
AT  
LEBANON VALLEY COLLEGE

ABSTRACT

Title: Undergraduate Student Research

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More than a decade ago, Jim Hickman visited Lebanon Valley College to talk to high school summer program participants about the actuarial profession. Then, and at other times since, Jim has expressed sincere interest and concern for undergraduate education, and special affection for the small liberal arts college.

Thus, this conference honoring Jim Hickman's contributions to education and actuarial science seems an appropriate setting to describe some student undergraduate research projects undertaken by actuarial science students at Lebanon Valley College.

This paper will briefly consider getting students involved, where to get ideas for projects, types of projects, and then summarize some specific projects which have been completed by Lebanon Valley students.

## Undergraduate Student Research

### I. The setting

The actuarial science program at Lebanon Valley College averages about six graduates a year, roughly 80% of whom eventually earn professional actuarial designations. Most of the graduates are among the strongest students in the College. They are career oriented, intelligent, and well motivated.

Faculty members at LVC have the opportunity to work with these undergraduate students in personal and meaningful ways. One significant experience is supervising individual independent study projects.

Over the past few years one or two actuarial science students a year has undertaken a research project. These projects provide an excellent educational experience for the student and the faculty member. It is hoped that this paper will encourage more actuarial faculty to get undergraduates involved in research projects.

### II. Getting started

The two obvious ingredients in student projects are students and projects. In my situation getting interested students has been easy. All have been part of our College Honors program and needed a research project to complete the program. These students enroll for 3 credits of independent study for one semester to complete their project. The projects have all been done during the senior year.

Ideas for projects have also not been a problem. Students are encouraged to pursue their own ideas. But, I also frequently suggest topics. Faculty supplied projects probably more closely simulate the project assignment mode in industry.

Our most common source of ideas for projects has been Lebanon Valley College. There are regularly department and college concerns which provide opportunities for investigation and analysis. Local projects have the advantages of real student connection to the problem and local access to data. Four of the six projects described in this paper are of this type.

### III. The Process

Once a topic is selected, most of the responsibility of the project is given to the student. Students meet with me weekly. He or she must at least check in at the assigned hour. Sometimes we meet for substantial time, sometimes the meeting is a brief progress, or no progress report.

Even working with capable students, papers always require significant rewriting. Procrastination is a regular problem, so some students have spent some long nights of writing and rewriting. Producing a neat, well written final paper is an important part of this experience. The student selects at least two other faculty readers in addition to the supervisor.

In addition to research, analysis, and writing, students are required to make a public oral presentation of their results. These sessions usually attract 15-30 students, faculty, administrators, and sometimes parents. The students make all the arrangements for the presentation, including a required practice session.

#### IV. Some Examples

The following contains summaries of six studies conducted by Lebanon Valley College students as senior honors independent study projects. The summaries have been written without consultation with the authors.

##### A. Two Sociological Studies

The following two studies were concerned with sociological issues related to actuarial careers. Both considered relationships between exam preparation and other factors of an actuarial career and social/family life. The first, used LVC actuarial science graduates as the population of study. The second study was more extensive and used as its population the membership of the SOA.

##### Example 1:

**TITLE:** An Actuarial Career and its effects on Social Relationships

**AUTHOR:** Stacey Brundin (now Stacey Brundin Anthony, ASA; a member of the actuarial staff of Blue Cross/Blue Shield of Virginia)

**DATE:** April 29, 1988

**PURPOSE:** To investigate the relationship between actuarial exam preparation and social relationships, especially marriage.

**ORIGIN:** The idea for this project was student generated from a concern about career objectives and her impending marriage.

**METHOD:** A survey was sent to each known LVC actuarial science graduate requesting data on marital status, exam status, age, gender. The survey then asked responses to open ended questions on relations between marital status and career, children and career, exams and social relationships, and finally an open invitation for any relevant response.

RESULTS: While the numerical results were not very enlightening the expository responses were interesting and provided the author with some supportive information. This work was the basis for a feature article by Stacey Brundin in The Actuary (September 1988).

Example 2:

TITLE: THE ACTUARY: Education Background and Social Relationships

AUTHOR: Dawn DiDonato (currently employed by Meridian Mortgage Corporation)

DATE: April 29, 1991

PURPOSE: To study the educational background of actuaries as it relates to exam progress, and to study the relationship between marriage and family, and actuarial careers.

ORIGIN: This study was a direct outgrowth of the author having attended the oral presentation of Example 1.

METHOD: The staff at the SOA office generated a random sample of 400 members of the SOA and provided mailing labels for those individuals. An extensive survey was mailed and 79% were completed and returned. The data was then summarized and analyzed and the written responses were summarized.

RESULTS: This paper is published in ARCH 1991.2.

B. Campus based Projects.

Example 3:

TITLE: An Enrollment Study for Lebanon Valley College

AUTHOR: Leslie Marlo (ACAS currently employed as a consulting actuary at Peat Marwick in Philadelphia. Upon graduation from Lebanon Valley, Leslie studied at Herriot-Watt University in Scotland on a Fulbright Scholarship)

DATE: December 2, 1988

ORIGIN: The idea for this project had been in my head for a year or two and originated with Problem 9.4 in Actuarial Mathematics.

METHOD: The idea was to use actuarial techniques to model enrollment at LVC. In particular, it was desired to answer the question: Assuming a stationary population, how many new students are required to maintain a certain student body size? To estimate probabilities of decrement, all students entering the College

between 1979 and 1984 were to be included in the study. When the reality of handling that much data finally set in, only those with last name up to H were actually included. This provided a sample of 749 people. Mortality table construction concepts were used to estimate decrement probabilities. The data was entered and manipulated in lotus 1-2-3.

**RESULTS:** The presentation of the model was well received by the College administration. The data for the student body in following year was modeled very accurately. But for a variety of reasons, further use of the model did not occur. This was the most demanding of all the undergraduate projects I have directed. The data was extensive and the concepts challenging.

**Example 4:**

**TITLE:** Actuarial Science at Lebanon Valley College: A Market Survey

**AUTHOR:** Melissa Askey (currently an actuarial student with Summit National Life in Lancaster PA).

**DATE:** May 1, 1991

**ORIGIN:** In the fall of 1990 a poster describing the Actuarial Science Program at Lebanon Valley College was sent to 4800 high schools in the Mid Atlantic region. The poster had tear off cards which could be sent in to get further information. We needed to make a decision on whether the poster was a cost effective recruiting tool.

**METHOD:** Melissa was to analyze the poster by studying the return postcard response and surveying teacher response.

**RESULTS:** This example proved that not every project is a great success, even given the best effort of the student and director. The response rate to the survey was low (about 20%), slow, and provided little useful information. Only about 300 cards were returned and the only useful information obtained was that females requested information earlier in their school career than did males. While we both learned some lessons about problems with surveys and the need to do better planning, the project was overall a somewhat discouraging exercise.

**Example 5:**

**TITLE:** Freshman Attrition at Lebanon Valley College in the Class of 1994

**AUTHOR:** Keith Schleicher (currently a Ph.D. student in statistics at Ohio State University)

DATE: December 5, 1991

PURPOSE: To study freshman attrition at LVC

ORIGIN: Attrition was a significant topic of discussion at LVC over the late 1980's due to falling enrollment. Leslie Marlo's study on enrollment was also involved in Keith's selection of this topic. Keith wanted to do a follow-up and attrition was an obvious candidate.

METHOD: The LVC class of 1994 was used because it was the most recent class for which freshman year attrition could be studied. The project led to some interesting privacy issues which the student had to work out with relevant administrators (possibly the most valuable lesson of the project). After the data was obtained, MINITAB and SPSS were used to search for statistically significant predictors for freshman attrition.

RESULTS: The only identified statistically significant factor for freshman attrition turned out to be gender (only admit females and a significant portion of our attrition problem would disappear). For a variety of political, legal, ethical, and practical reasons the College was not able to make much use of this (already known) result.

Example 6:

TITLE: A Statistical Analysis of the 1992 Lebanon Valley College Scholarship Program

AUTHOR: Vickie Davis (Currently in her first year as an actuary with National Liberty Corporation in Valley Forge PA.)

DATE: May 11, 1993

ORIGIN: In 1992 LVC initiated a radical scholarship program (four year, half tuition for any student in the top 10% of their high school class, one-third tuition for the next decile and one-quarter for students in the third decile. There are grade requirements for retention). The program replaced a much more limited and highly selective merit scholarship program. The new program was available only for new enrollees, not for current students. The change attracted considerable student attention and studying some financial impacts was an obvious project. As one who felt adversely effected by the change Vickie had a special problem (which she handled very well) of keeping personal resentment from biasing her study.

**METHOD:** Approval for the project was first obtained from the College President, who had initiated the scholarship program. Random samples of 75 members of the classes which enrolled in 1992 and 1990 were obtained through the College registrar. Financial data on these students was obtained from the financial aid office. Methods were developed to obtain the data without the investigator knowing who any of the students were by name. Students were classified by gender, major, home location. Financial data was available on family income, need, scholarship amounts, loan amounts, work study. Minitab was used to handle the data.

**RESULTS:** A variety of interesting observations resulted from the study, most confirming the overall success of the new program (new student enrollment jumped from about 230 in 1991 to 340 in 1992 and 380 in 1993 with positive overall budget impact). SAT and class rank improved slightly, and family income dropped slightly. This last fact was somewhat of a surprise (the scholarship program being merit rather than need based it was expected that family incomes would increase). The most useful observations came from visual inspection of graphs-a valuable lesson. The oral presentation was well attended and received by college administrators as it provided them with some useful information.

#### V. Conclusion

The experience represented by the examples presented in this paper were a valuable part of the education of the six undergraduates involved. Independent study provides the opportunity to work on unstructured problems. The participants had to work with other people, frequently on sensitive matters. They gained experience in gathering and analyzing significant data. They have written and presented substantial papers.

For the faculty advisor the benefits are also significant. Independent study projects provide a chance to get to know students at a personal and professional level not usually possible in the classroom situation. The projects also offer the faculty member a variety of educational experiences similar to those received by the students.

Undergraduate independent study is stimulating, educational, and frequently fun.

