Stories of Statistics Graduates: Results of an Alumni Survey

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Abstract
The results of a survey of alumni of Eastern Kentucky University's undergraduate statistics program are presented. This paper summarizes data gathered regarding the types of jobs the program's alumni have held, whether they attended graduate school, the skills and content they have used in their positions or in graduate programs, the software and programming languages they have utilized, how they felt about the program and their advising experience, and other information provided on a 2021 survey. The results obtained in 2021 are compared with the results from similar surveys conducted in 2000-2001, 2006, and 2014. Suggestions for potential updates to the program based on survey results will be discussed.

Key Words: statistics, alumni, survey, undergraduate, jobs, skills

1. Introduction

Alumni data can tell stories about the kinds of jobs individuals with undergraduate degrees in statistics obtain after they graduate, the skills developed in their undergraduate experience that they use in graduate school and on the job, and the skills they wish they had acquired while they were in college. The results of a survey of alumni of Eastern Kentucky University's undergraduate statistics program are presented. Data gathered regarding the types of jobs the program's alumni have held, whether they attended graduate school, the skills and content they have used in their positions or in graduate programs, the software and programming languages they have utilized, how they felt about the program and their advising experience, and other information provided on a 2021 survey are summarized. The results obtained in 2021 will be compared with the results from similar surveys conducted in 2000-2001, 2006, and 2014, the first of which formed the basis of the article "Where Do All the Undergraduate Statistics Majors Go?" which appeared in *STATS* in 2002 (Costello & Kay, 2002). The 2021 study is the first one in which the Department of Mathematics and Statistics attempted to survey both statistics and mathematics alumni at the same time. The survey also included a section of questions devoted to the department's graduate programs for those students who pursued a graduate degree after completing one of the department's undergraduate programs. (A separate survey was sent to those who completed one of the graduate programs but not one of the undergraduate programs.)

2. Alumni Survey

A survey of EKU's statistics alumni was conducted in the spring semester of 2021. There are approximately 210 living statistics alumni. Contact information was incomplete or unavailable for many alumni. The authors used available email addresses and social

media to distribute the survey. There were 69 alumni who responded to the survey. It is important to note that the survey results may not generalize to all alumni because of the voluntary-response nature of the sample.

3. Survey Results

3.1 Jobs

Of the 69 alumni who answered a question regarding whether they were currently employed, 63, or 91.30% said that they were. Of those who are not currently employed, three graduated in 2019, one in 2015, one in 2016, and one graduated in 1985. Two of the recent graduates are currently in graduate school, one is in law school, and one is a stay-at-home parent; the status of the other recent graduate is unclear. Sixty-two respondents answered a question regarding whether they use mathematics or statistics in their current job, and 55 (88.71%) said "Yes." This suggests that most of the program's graduates are finding work in their field. Table 1 compares this value to the results from previous alumni surveys; the percentage indicating that they use statistics in their current job has been consistently near 80% in past surveys (Costello & Kay, 2002; Kay & Costello, 2014). The 2021 result is closer to 90%, but that might be at least in part due to the change in the question to include mathematics. Of the 61 current job titles provided by alumni in 2021, 14 included "teacher," "professor," or "instructor"; 8 included "analyst"; 8 included "data"; 6 included "manager"; 5 included "director"; and 3 included "programmer."

Table 1: Use of Mathematics or Statistics in Current Job

Year	Use Mathematics and/or Statistics in Current Job (Earlier Versions Mentioned Only Statistics)
2000-2001	45/58 (77.6%)
2006	46/57 (80.7%)
2014	52/66 (78.8%)
2021	55/62 (88.7%)

Alumni were given a list of software packages and computer languages and were asked how often they had used each one in the past year and in the past five years in any of their jobs. Table 2 and Figure 1 summarize the responses for the past year. Power BI, StatCrunch, and Tableau were the only packages mentioned more than once under "Other." Questions regarding use of software and languages on past surveys were worded slightly differently. Results from the 2021 survey show a greater use of R and less usage of SAS as compared to results from the 2014 survey (Kay & Costello, 2014). Python was not listed on the 2014 survey but has been used recently by more than 36% of the 2021 respondents.

Table 2: Software and Computer Packages Used in Past Year by Alumni in Their Jobs

Package/ Language	Used Within the Past Year		
	Never	Occasionally	Frequently
Mathematica	50 (94.34%)	3 (5.66%)	0 (0.00%)
MATLAB	51 (98.08%)	0 (0.00%)	1 (1.92%)
LaTeX	46 (86.79%)	6 (11.32%)	1 (1.89%)
SAS	35 (62.50%)	9 (16.07%)	12 (21.43%)
R	32 (58.18%)	14 (25.45%)	9 (16.36%)
Minitab	45 (81.82%)	7 (12.73%)	3 (5.45%)
StatExact	52 (100.00%)	0 (0.00%)	0 (0.00%)
Stata	50 (96.15%)	2 (3.85%)	0 (0.00%)
SPSS	42 (79.25%)	8 (15.09%)	3 (5.66%)
HLM	51 (98.08%)	0 (0.00%)	1 (1.92%)
Excel	3 (4.92%)	7 (11.48%)	51 (83.61%)
Visual Basic	49 (90.74%)	3 (5.56%)	2 (3.70%)
C++	51 (96.23%)	0 (0.00%)	2 (3.77%)
Java	48 (90.57%)	2 (3.77%)	3 (5.66%)
JavaScript	46 (86.79%)	5 (9.43%)	2 (3.77%)
Python	33 (63.46%)	11 (21.15%)	8 (15.38%)
Perl	50 (96.15%)	2 (3.85%)	0 (0.00%)
SQL	25 (46.30%)	13 (24.07%)	16 (29.63%)
Access	33 (61.11%)	13 (24.07%)	8 (14.81%)
Swift	49 (98.00%)	1 (2.00%)	0 (0.00%)

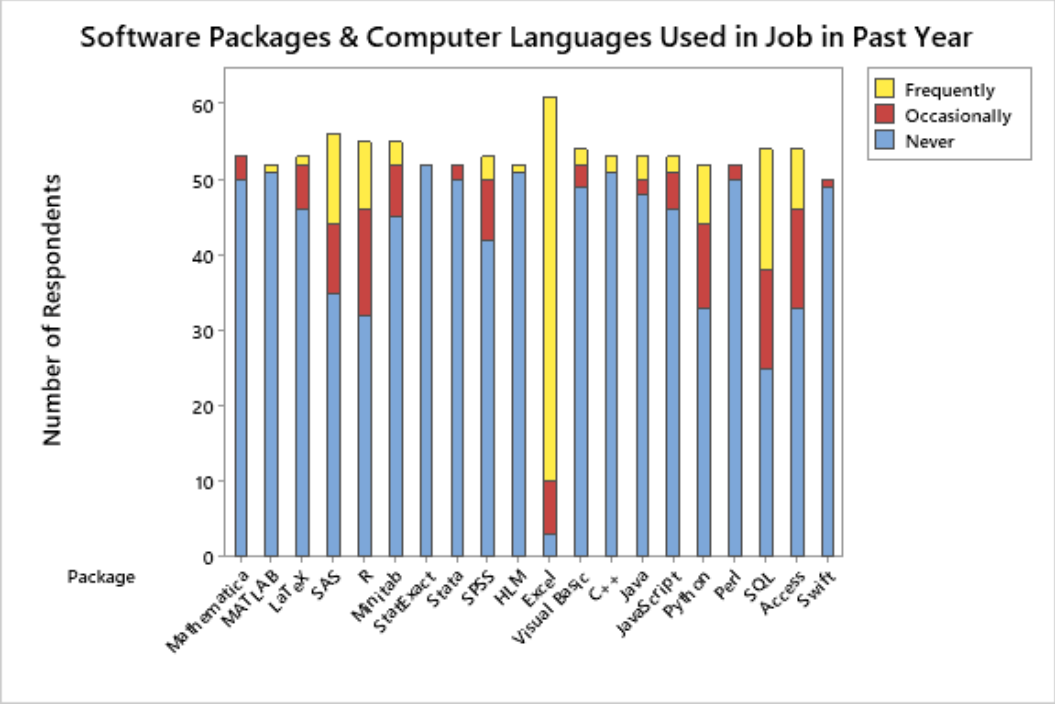

Figure 1: Software and Computer Packages Used in Job in Past Year by Alumni

Statistics alumni were also asked about how often their work experiences in the past five years and the past ten years involved mathematics instruction, mathematics modeling, quantitative reasoning, computer programming, statistical analysis, and data science. Table 3 provides a summary of the responses for the past five years; statistical analysis was the most commonly used skill. Survey respondents also answered a question regarding mathematical and statistical content used in past or current jobs. Table 4 summarizes the responses.

Table 3: Work Experiences Within the Past Five Years

Work Experiences	**Used Within the Past Five Years**		
	Never	**Occasionally**	**Frequently**
Mathematics Instruction	32 (59.26%)	9 (16.67%)	13 (24.07%)
Mathematical Modeling	22 (40.74%)	17 (31.48%)	15 (27.78%)
Quantitative Reasoning	18 (32.73%)	12 (21.82%)	25 (45.45%)
Computer Programming	24 (42.11%)	10 (17.54%)	23 (40.35%)
Statistical Analysis	11 (18.64%)	19 (32.20%)	29 (49.15%)
Data Science	13 (22.41%)	23 (39.66%)	22 (37.93%)

Table 4: Mathematical and Statistical Content Used in Past or Current Jobs

Content	**Used in Past or Current Jobs**		
	Never	**Occasionally**	**Frequently**
Trigonometry	31 (57.41%)	18 (33.33%)	5 (9.26%)
Calculus	25 (48.08%)	20 (38.46%)	7 (13.46%)
Linear Algebra	24 (46.15%)	21 (40.38%)	7 (13.46%)
Differential Equations	44 (86.27%)	6 (11.76%)	1 (1.96%)
Discrete Mathematics	36 (69.23%)	11 (21.15%)	5 (9.62%)
Real/Complex Analysis	45 (88.24%)	6 (11.76%)	0 (0.00%)
Abstract Algebra	46 (90.20%)	5 (9.80%)	0 (0.00%)
College Geometry	40 (78.43%)	10 (19.61%)	1 (1.96%)
Number Theory	45 (88.24%)	5 (9.80%)	1 (1.96%)
Cryptology	44 (86.27%)	7 (13.73%)	0 (0.00%)
Graph Theory	39 (75.00%)	13 (25.00%)	0 (0.00%)
Descriptive Statistics	8 (13.56%)	16 (27.12%)	35 (59.32%)
Basic Inferential Statistics	9 (15.79%)	18 (31.58%)	30 (52.63%)
Applied Inferential Statistics	23 (42.59%)	15 (27.78%)	16 (29.63%)
Regression Analysis	16 (28.07%)	19 (33.33%)	22 (38.60%)
Experimental Design	23 (41.07%)	19 (33.93%)	14 (25.00%)
Nonparametric Statistics	33 (61.11%)	14 (25.93%)	7 (12.96%)
Quality Control	27 (51.92%)	18 (34.62%)	7 (13.46%)
Sampling Methods	16 (28.57%)	27 (48.21%)	13 (23.21%)

3.2 Graduate School/Additional Degrees

Of the 65 alumni who answered a question on the 2021 survey regarding graduate work, 38 responded affirmatively: 28 have completed a graduate degree, and 10 are currently pursuing a graduate degree. Alumni were given a list of software packages and computer languages and were asked how often they had used each one in other degree programs. Table 5 and Figure 2 summarize the responses. BMDP, Fortran, and Tableau were mentioned under "Other." It is interesting to note that only one respondent indicated that R was used occasionally in other degree programs; all other alumni responded with "Frequently" or "Never."

Table 5: Software and Computer Packages Used in Other Degree Programs by Alumni

Package/ Language	**Used in Other Degree Programs**		
	Never	**Occasionally**	**Frequently**
Mathematica	26 (89.66%)	3 (10.34%)	0 (0.00%)
MATLAB	20 (71.43%)	6 (21.43%)	2 (7.14%)
LaTeX	17 (60.71%)	5 (17.86%)	6 (21.43%)
SAS	15 (50.00%)	6 (20.00%)	9 (30.00%)
R	16 (57.14%)	1 (3.57%)	11 (39.29%)
Minitab	21 (70.00%)	7 (23.33%)	2 (6.67%)
StatExact	27 (90.00%)	3 (10.00%)	0 (0.00%)
Stata	25 (92.59%)	2 (7.41%)	0 (0.00%)
SPSS	21 (72.41%)	5 (17.24%)	3 (10.34%)
HLM	26 (96.30%)	0 (0.00%)	1 (3.70%)
Excel	9 (28.13%)	12 (37.50%)	11 (34.38%)
Visual Basic	25 (89.29%)	2 (7.14%)	1 (3.57%)
C++	25 (89.29%)	2 (7.14%)	1 (3.57%)
Java	26 (92.86%)	1 (3.57%)	1 (3.57%)
JavaScript	26 (92.86%)	1 (3.57%)	1 (3.57%)
Python	22 (78.57%)	3 (10.71%)	3 (10.71%)
Perl	27 (96.43%)	1 (3.57%)	0 (0.00%)
SQL	20 (71.43%)	6 (21.43%)	2 (7.14%)
Access	24 (82.76%)	3 (10.34%)	2 (6.90%)
Swift	27 (100.00%)	0 (0.00%)	0 (0.00%)

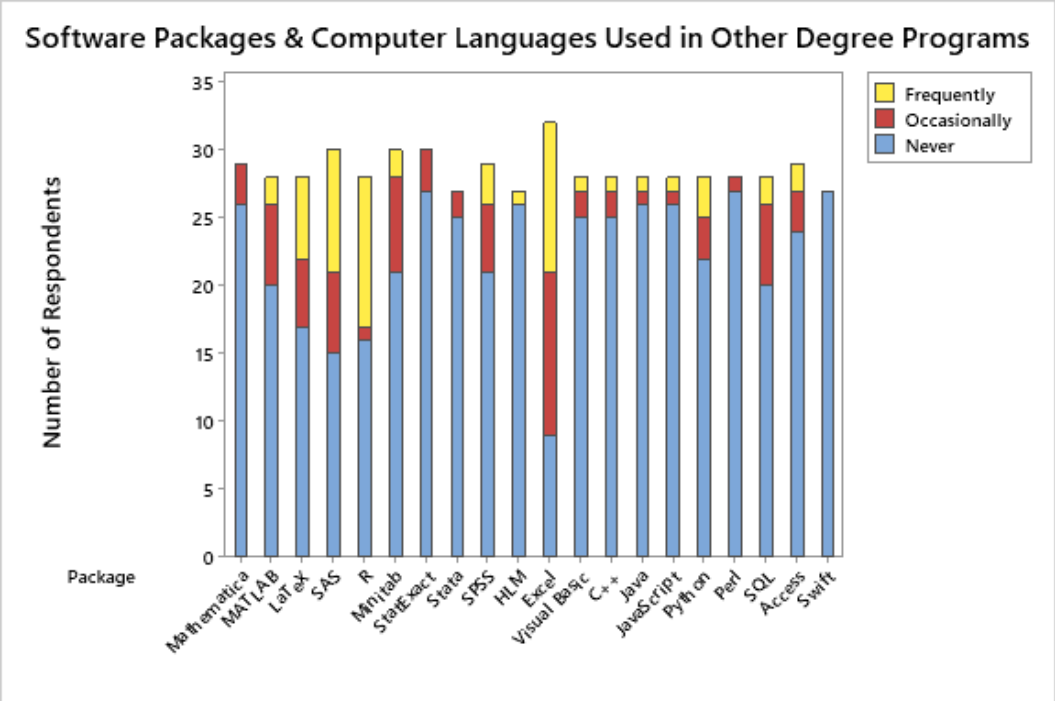

Figure 2: Software and Computer Packages Used in Other Degree Programs by Alumni

4. Program Strengths and Suggestions for Improvement

Of the 64 alumni who responded to a question regarding level of satisfaction with the statistics program, 47 (73.4%) indicated they were very satisfied, and 17 (26.6%) indicate they were satisfied. Of the 63 alumni who responded to a question regarding level of satisfaction with statistics advising, 51 (81.0%) indicated they were very satisfied, 10 (15.9%) indicated they were satisfied, 1 (1.6%) indicated they had no opinion, and 1 (1.6%) indicated they were dissatisfied. Some strengths identified by the alumni include the faculty, SAS preparation, foundational skills, and critical thinking. Some suggestions generated by the survey responses include the incorporation of more data science and coding skills into the curriculum, as well as a greater emphasis on the use of R, Python, and SQL.

5. Conclusion

The results of the 2021 survey of EKU's statistics alumni generally indicate that the program is preparing students for the workforce; a strong majority are using quantitative skills on the job, and some are going on to earn additional degrees. Most of the suggestions made by alumni are changes that have already been implemented or are in the process of being implemented. In particular, the BS in Statistics was recently converted to a BS in Data Science and Statistics, and changes in the curriculum are being made accordingly.

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