Using the Program R for Graduate Statistics Training in Psychology

Brief background

R is a free, open-source programming language developed specifically for use in statistical analysis and data display. Widely used in industry and academia, including other departments at WWU, R is considered the "gold standard" among statisticians (see Franklin, 2018; Weston & Yee, 2017). The Psychology department currently teaches all statistics courses using SPSS software. However, SPSS is beginning to fall out of favor, mostly because it is expensive and relatively inflexible. It is time for the WWU Psychology department to catch up with the academic and industry standard, and begin teaching R. The biggest obstacle to the goal of teaching R in the psychology department is that the vast majority of faculty members, ourselves included, have not yet had the opportunity to learn R.
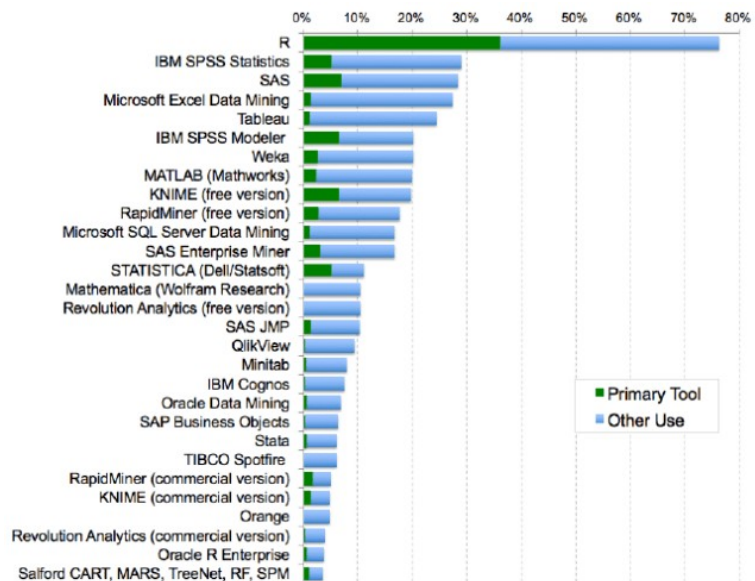
Our goal with this proposal is to learn R ourselves so that we can include it in graduate statistics courses beginning in Fall 2019 (PSY 512 taught by Lemm and PSY 513 taught by Lehman). This summer, we will work together to learn the R programming language with sufficient proficiency to teach it at the graduate level. We will also need to massively overhaul both courses, including new lecture examples and homework assignments. This will be a challenging and time-consuming task, but we are confident we can succeed by working together and making use of the wide array of supporting instructional materials that are available online through the worldwide community of R users. We are applying for this grant together in recognition of the limited number of teaching grants available across the University.

The graph above shows results from the 2015 Rexer Analytics Survey. In this survey, data analysts indicated their primary statistical tool, as well as other tool(s) they used. R was the most commonly used program, both for primary use and total usage. Image from Munchen (2010-2017).

Learning R will expand our expertise as teachers.

R represents the future direction of statistical education. Because the program is open source, statistical advances are rapidly translated into scripts available for R. Knowledge of R will allow us to keep updated with future developments in statistics pedagogy. For example, some new developments in data visualization and graphing are available only through R, so learning the program will allow us to update potential future topics for use in our courses. Our versatility with the program will benefit not only the two specific courses mentioned above, but also our formal and informal research mentoring of undergraduate and graduate students.

Learning R will enhance our professional development in other ways.

Both of us use advanced statistics extensively in our own research. We currently use SPSS and a variety of other statistical packages. Proficiency in R will provide another important tool for our research. Most

importantly, it will allow us to more efficiently adopt cutting edge statistical tools and best practices, and ultimately will benefit our research.

Learning R will enhance specific courses, the program, and the departmental curriculum.

The MS program in Experimental Psychology requires a two-course sequence that is designed to provide high quality instruction in statistics to prepare students for PhD programs and non-academic jobs. This proposal will immediately benefit PSY 512 and PSY 513. R also has the potential to be useful for students taking PSY 315, *Applied Cognition UX Design*, a recently created course for students who wish to learn how to conduct research in User Experience. Eventually, we would like to make R the standard package for all undergraduate Psychology research methods/statistics courses (PSY 301, 302, and 303). We both teach these undergraduate courses, along with several other members of the department. Our experience teaching R in the graduate courses will help us develop materials that we can share with other faculty teaching in the undergraduate statistics/methods sequence.

Integrating R into our classes will enhance student learning and better serve students, the department, and the university.

Psychology students currently graduate with the capacity to use statistical tools to address local community needs. However, the prohibitive cost and lack of access to SPSS is a barrier to students trying to use their statistics knowledge after graduation. With an understanding of R, students who go on to work as therapists, in non-profits, or other community organizations will have ready access to the statistical program. This access may have positive reverberating consequences for the department and the university as a whole. In addition, both of us sometimes serve as informal statistics consultants to faculty members within and outside of our department. Our updated proficiency with R will be helpful in those interactions. Using R will also be a cost savings to the University. Currently, in addition to requiring expensive SPSS software, we use other costly programs such as AMOS, EQS, HLM, and MPlus. R can be used for all of the more specific applications for which these programs are used. Many free and low-cost resources are available to support and advance statistics using R, and these resources are continually updated by users.

Students will benefit significantly from exposure to R in their classes.

In addition to pursuing further education, many Psychology graduates go on to public or private sector data analysis jobs, working at companies like Google and Microsoft, or working at community colleges and other university settings. Students who enter doctoral programs after completing our MS program typically report feeling exceptionally well prepared for additional quantitative training. In recent years, however, both students pursuing doctoral study and those working as data analysts have suggested that our students would benefit from receiving instruction in R. One recent WWU graduate pursuing doctoral work reported that she could have waived the statistics requirements if she had also been proficient in R. Other graduates working as data analysts reported that they had to work independently to learn R to help make themselves more competitive for industry jobs. User experience researchers at Google who recently met with Psychology faculty reported that proficiency with R would provide applicants with a substantial advantage for jobs in that field.

Teaching R to Psychology students promotes the mission of the department, college and the university.

The mission statement of the Department of Psychology notes that the department emphasizes using "scientific methodology to enhance critical thinking, writing, research skills, and promote the application of psychological knowledge to the world's needs and problems." The College of Humanities and Social Sciences promotes a mission to "pursue research and foster life-long learning to contribute to the wellbeing of communities from local to global." R is widely used in "big data" analyses. Such analyses have impacts on our understanding of the effects of insurance access on public health, effects of human activity on climate change, and effects of climate change on worldwide mortality, just to name a few examples. Teaching R to Psychology students will enhance students' research skills, better preparing them for careers

in both academia and industry, and may ultimately be able help them to solve many of the world's needs and problems.

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