Using a Utility Value Intervention to Increase Student Academic Success in Online Statistics and Research Methods Courses

Sponsoring Department: School of Psychological Science

Sponsoring College: College of Liberal Arts

Abstract

Statistics and Research Methods courses are necessary to a holistic education in psychological science (American Psychological Association, 2016). The content of these courses is typically challenging for students, whichis exacerbated by the perceived and real difficulty of online learning contexts (DeVaney, 2010; Dunn, 2014; Sizemore & Lewandowski, 2009l Hedges, 2017). Instructors need to adapt pedagogy for these online courses to facilitate student engagement and improve academic achievement. The aim of this project is to determine if a motivational intervention (called a utility value intervention) facilitates competence and motivation in traditionally challenging courses like statistics and research methods. The findings of this study will help to determine whether this easy-to-implement activity is helpful for online students in statistics and research methods courses. If successful, this type of intervention would be relatively easy to scale up for use to improve outcomes in other online courses that are also traditionally perceived as difficult.

Statement of the Problem

Within any undergraduate psychology program, research methods and statistics courses are central to the curriculum (American Psychological Association, 2016; Gurung & Christopher, 2020; Perlman & McCann, 1999). Not only do undergraduate psychology majors need to pass these courses to continue in the major, but the rapid expansion of online graduate programs is creating a further demand for online statistics and research method courses (Dunn, 2014). Even though these courses provide essential skills and knowledge needed to become a holistic and competent psychologist, they are oftentimes met with a strong disliking and unfavorable views by psychology majors (Murtonen, 2005; Sizemore & Lewandowski, 2009). Although disliking may not be problematic per se, previous research has demonstrated a link between perceptions of interest and student academic success (Tempelaar et al., 2012; Silvia, 2006). In online, asynchronous versions of these courses, students' disliking is coupled with higher levels of statistics anxiety and less favorable attitudes toward statistics compared to students taking these courses in an in-person format (DeVaney, 2010; Hedges, 2017). This is also demonstrated at OSU, as the average DFUW rates for 2019-2020 for these courses were 15% face-to-face and 21.4% for online (CORE). Previous research has found a positive connection between perceived course relevance and interest in course content (Heddy et al., 2017; Vittengl et al., 2004). Hence, there is a clear need to improve the success of students in these courses. The proposed project seeks to determine whether an easy-to-implement utility value intervention can increase students' motivation and/or performance in online psychological statistics and research methods courses.

Background

Previous research has hypothesized that taking a research methods or statistics class could change students' valuing of the courses by exposing them to the material (Manning et al., 2006). Although this has been effective in other fields such as biology, research that has followed students enrolled in a methods course showed an average decline in utility perceptions throughout the semester, indicating that the course material itself may not be enough to demonstrate relevance and utility to students (Sizemore & Lewandowski, 2009). Further, students who take an online version of these courses find the material to be less favorable and demonstrate higher levels of statistics anxiety, leading to less student engagement and academic achievement (DeVaney, 2010; Hedges, 2017). It seems clear that to help students find more relevance and success in these courses, more direct action must be taken to increase student interest and perceived utility. One option is to implement a utility value intervention that asks students to articulate the ways in which course content may be useful to them.

Expectancy-Value Theory of Achievement Motivation

A contemporary sociocognitive theory of achievement motivation that speaks to students' valuing of college courses is the Expectancy-Value Theory (EVT). According to EVT, task value is the reason students believe they should engage in a task (Eccles, 2005; Eccles & Wigfield, 2002). There are four sub-categories of task value: intrinsic value, attainment value, utility value, and cost value. Intrinsic value (also referred to as interest value) is operationalized as a person's liking or feelings of enjoyment of a particular task. Attainment value refers to a person's belief of the value of the task for their sense of self. Utility value is defined as a person's belief of the usefulness of the task, especially in reference to their future goals. Finally cost value is described as a person's assessment of the amount of effort and resources that are required to be successful

at the task. These values have been associated with academic choice (Bong, 2001; Bruinsma, 2004), success (Wigfield & Eccles, 2000), and interest development (Hullmeman et al., 2010).

Task Value Interventions

Although all task values can motivate a student to engage in a task, they may encourage differing types of engagement. For example, utility and attainment values have shown to be predictive of positive achievement outcomes (Cole et al., 2008). Research on task value interventions, specifically utility value, indicates that simply having college students write about how course material related to their lives and future goals increased levels of utility value, topic interest, and academic performance (Hulleman et al., 2010). Utility value interventions provide an opportunity for students to make explicit connections between course content and their own lives (Hulleman et al., 2016). Studies, primarily in biology courses, have shown that utility value interventions are effective for improving students' interest, value, and performance in the course (e.g., Canning et al., 2018; Hulleman & Harackiewicz, 2009). Further studies looking at online courses have also demonstrated that teaching students the relevance and utility of course material can impact student motivation and achievement (Fritea & Opre, 2015). These utility value intervention-type assignments are also especially effective for "at-risk" students (e.g., first-generation college students; Harackiewicz et al., 2016a). Given that statistics courses have high failure rates (Allen & Baughman, 2016), and students tend to have negative attitudes and anxieties toward statistics that is intensified by an online course offering (DeVaney, 2010; Emmioğlu & Capa-Aydin, 2012; Onwuegbuzie, 2004; Ramirez et al., 2012), our research seeks to use utility value intervention to increase motivation and success in online psychology statistics and research method courses.

The Proposed Study

The proposed study will examine the impact of a utility value intervention on students' attitudes, motivation, and performance in online statistics and research methods courses. Only one previous study (Acee & Weinstein, 2010) has investigated the use of a utility value intervention in statistics (in a laboratory setting) and no research to date has examined the relationship between utility value and statistics or research methods in an online classroom setting. The results of this study will help to determine whether this easy-to-implement activity is helpful for students in introductory, college-level psychological statistics and research methods online courses. In addition, dissemination of the study results will contribute meaningfully to both educational practice (e.g., help institutions, departments, and/or instructors in making wiser decisions regarding which interventions to adopt) and to the "under-researched and under-developed" pedagogical culture for teaching research methods in the social sciences' (Roberts, 2016, p. 2). Currently, this project has limited financial support from the APA Division 15 Early Career Grant to fund undergraduate research assistants to work on the project looking only at statistics courses with no major emphasis on online pedagogy. Given that statistics and research methods courses are both notoriously difficult for psychology majors and the online learning context presents further unique difficulties (Murtonen, 2005; Sizemore & Lewandowski, 2009), we wanted to expand the study to focus on online pedagogy for both courses.

Research Questions

The primary research question of the proposed project is to determine whether a utility value intervention improves student motivation and performance compared to viewing videos

about the importance of statistics and research methods in an online setting. Although research has investigated students' liking and anxiety about statistics, relatively little research has used a theoretical perspective to examine students' motivation in online psychological statistics and research methods courses. Thus, a secondary research question of the proposed project is to describe students' actual levels of motivation in these online courses at the beginning of the term and changes to student motivation over the time.

Method and Design

Participants

Participants will be students enrolled in PSY 298 (Quantitative Methods in Psychological Science) and PSY 301 (Research Methods in Psychological Science) at Oregon State University Ecampus (distance learning) courses. Previous research in our department suggests that when the consent process occurs at the beginning of the term in Canvas, we can expect about a 92% consent rate in on-campus courses and a 70% consent rate in Ecampus courses (Becker-Blease, Almuaybid, & Soicher, 2017). As an estimate (based on prior enrollments), this would give us the following samples from Winter 2022 to Winter 2023

Course	**Total Enrollment**	**Corvallis**	**Ecampus**	**n Consented Corvallis**	**n consented Ecampus**	**Total Consented**
PSY 298	475	225	250	207	175	382
PSY 301	625	400	225	368	157	525
Total n				**575**	**332**	**907**

The Proposed Intervention

Every term the School of Psych Science provides 2 sections of Research Methods (301) and 2 sections of Quantitative Methods (298) in an online format. Each course will have its enrolled Ecampus students randomly assigned to either the treatment (utility intervention) condition or control condition. We have designed the utility value intervention based on previously published work (e.g., Harackiewicz et al., 2016). Students first watch 1-2 videos about the importance of statistics/research methods. In the experimental condition, students then reply to the following prompt: "Discuss the potential relevance of statistics/research methods to your own life. Be sure to include some concrete information, explaining why this specific information is relevant to your life or useful for you. Be sure to explain how the information applies to you personally and give examples." In the control condition, students watch the same videos but reply to the essay prompt "Describe three new things you learned from the video(s). For each piece of new information, explain why this information stood out to you and why you find it interesting. Be sure to include concrete information from the videos.

Procedure

In the first week of the academic term, students enrolled in these courses will be randomly assigned to complete either a utility value intervention or view videos about the importance of statistics and research methods. Students will also self-report their attitudes toward and motivation in the course (expectancy, value, and cost). Attitudes and motivation will be

measured again at mid-term (week 5 of an 11-week term), and again at the end of the term (week 10). Completion of the initial assignment and the subsequent motivation surveys will be required for all students. However, there will be a separate link to read about the research and provide informed consent for the researchers to use their classroom data for research purposes. By using an external link for the consent process, instructors will remain blind to student consent. This information will only be accessed after final grades have been submitted. For this research, only data from students who have given informed consent will be analyzed. The researchers will not access any data until final grades have been recorded. Furthermore, all procedures for maintaining participant confidentiality and data security will meet IRB standards. \

Measures

Attitudes Toward Statistics/Research Methods. All items measure students' attitudes toward statistics are modified from Harackiewicz et al. (2016). These items will be measured on a 7-point scale from 1 (Not at all true) to 7 (very true).

- Students' *background in statistics/research methods* will be measured with three items. A sample item is "I have a strong background in statistics/research methods."
- Students' *competence* will be measured with two items. A sample item is "It is important to me to do well in this course."
- Students' *confidence* will be measured with three items. A sample item is "I expect to get a good grade in this course."
- *Interest* will be measured by five items. A sample item is "I am excited about statistics/research methods."
- *Utility value* will be measured with four items. A sample item is "This class is important to my future."

Expectancy-Value-Cost. Expectancy, value, and cost measures will use a 6-point response scale from 1 (Strongly Disagree) to 6 (Strongly Agree). Expectancy and value measures are adapted from Kosovich and colleagues (2015). Cost items are from Flake et al. (2015).

- *Expectancy* will be measured with three items. A sample item is "I know I can learn the material in my statistics/research methods class".
- *Value* will be measured with three items. A sample item is "I think my statistics/research methods class is important".
- *Cost* will be measured with 19 items with four subscales: task effort, outside effort, loss of valued alternatives, and emotional cost. A sample item is "This class demands too much of my time."

Academic Achievement. Students' final course grade (as a percentage). In statistics, we will also examine students' cumulative quiz scores. In research methods, we will use students' final report project scores (as a percentage) as a measure of achievement.

Evaluation Plan

We will be using a true experiment with random assignment of Ecampus students in each section to either the treatment condition (students respond to the videos with the utility value intervention prompt) or the control condition (students respond to a generic essay prompt instead of utility value intervention) at the start of the term. Only students who consent to have their data

accessed will have their data used to analyze the effectiveness of the intervention in increasing utility value as well as attitudes toward research methods/statistics. This allows us to have a control condition within each of the sections, helping to eliminate any course or instructor bias that may impact student perceptions of course utility and interest.

Expected Outcomes and Plan for Disseminating Findings

The utility value intervention is a kind of "wise intervention" - a brief, psychologically precise intervention that targets "self-reinforcing processes that unfold over time...to improve people's outcomes in diverse circumstances and long into the future" (Walton, 2014, p.74). Although utility value interventions have been shown to benefit a diverse range of students in STEM courses (e.g., biology) and introductory psychology, no research to date has tested the intervention in online psychological statistics or research methods courses. Because the impact of wise interventions is context dependent, the study of the intervention in this particular setting is crucial to understanding whether we may aid students at a critical juncture in their undergraduate psychology education and help students to overcome obstacles that may be unique to online courses.

If the utility value intervention benefits students, it will be feasible to disseminate and scale-up in other online courses. This has the potential to impact psychology undergraduate students at an institutional, perhaps national level while requiring little investment in terms of time, effort, and/or cost on the part of institutions and instructors. Further, we believe that any applied research, whether successful or not, should be shared to the field of teaching in psychology to continue to update our understanding of successful teaching as well as receive feedback on conducted research. In our specific field, there is an annual Teaching of Psychology conference where some of the most reputable psychology educators gather for professional development and enrichment. This conference would be a prime location to present the initial findings of this study. Not only will it help spread the possible positive findings of this study and see further implementation in other online psychology programs, feedback and discussion will be taken into consideration when creating the manuscript that will be sent for publication. Further, utility value interventions can be modified for other subject matters and courses that are delivered in an online format. In order to disseminate these findings to other educators using online methods for teaching material, we would plan to present our findings locally to the Ecampus Faculty Forum in the Spring of 2023, as well as the Online Learning Consortium (OLC) Innovate annual conference.

Proposed Timeline

The anticipated start date for this project is January 2022 (the start of Winter quarter) and the end date is August 31, 2023. The timeline reflects 5 quarters of data collection. IRB approval is already underway.

	2021	**2022**				**2023**		
	F	**W**	**S**	**Su**	**F**	**W**	**S**	**Su**
IRB Approval								
Data Collection								
Data analysis								
Dissemination								

Team Members

Research Methods and Quantitative Methods Instructor: Jacqueline Goldman

Jacqueline Goldman earned a Ph.D. in educational psychology from the University of Oklahoma in 2018. She was hired on at Oregon State University to specifically teach the Research and Quantitative Methods course sequence for both in-person and Ecampus students. She serves on the Quantitative Methods Task Force for the School of Psychological Science focused on updating the curriculum to help facilitate student success in these notoriously difficult courses. She also has 3 years of experience in online course development. Her research includes articles on first-generation college students and engagement, as well as motivation theory, and growth mindset interventions to increase student achievement goals.

Research Methods and Quantitative Methods Instructor & Task Force Chair: Raechel Soicher

Raechel Soicher earned a Ph.D. in Applied Cognition from Oregon State University (OSU) in 2020. Her doctoral dissertation focused on implementing the utility value intervention in General Psychology courses at OSU and her complementary research program focused on both laboratory and classroom studies of pedagogical and/or learning aids. As a current Instructor in the School of Psychological Science at OSU, Dr. Soicher is the coordinator for the research methods and psychological statistics courses as well as the chair of a task force for curriculum re-development of a 'quantitative methods' course sequence. She is also currently engaged in the Ecampus Research Seminar cohort investigating the role of motivation in online learning outcomes.

Relevant Recent Publications and Presentations:

Hamilton, N. J., Heddy, B. C., **Goldman, J. A.,** & Chancey, J. B. (2021). Transforming the online learning experience. *Teaching of Psychology.*

Goldman, J., Heddy, B. C., & Cavazos, J. (2020). First-generation college students' academic challenges understood through the lens of Expectancy Value Theory in an Introductory Psychology course. *Teaching of Psychology*, https://doi.org/10.1037/stl0000263.

Soicher, R. N., Becker-Blease, K. A., & Bostwick, K. C. (2020). Adapting implementation science for higher education research: the systematic study of implementing evidence-based practices in college classrooms. *Cognitive Research: Principles and Implications*, *5*(1), 1-15. https://doi.org/10.1186/s41235-020-00255-0

Soicher, R. N., & Becker-Blease, K. A. (2020). Utility value interventions: Why and how instructors should use them in college psychology courses. *Scholarship of Teaching and Learning in Psychology*. https://doi.org/10.1037/stl0000240

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