Implementation of the utility value intervention: An adaptation of implementation science
frameworks for higher education teaching and learning research

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Abstract

The research-practice gap refers to the failure of empirical effectiveness research to translate meaningfully into practical applications. In higher education research, this is evident in the low use or uptake of evidence-based practices in college classrooms. To help address the research-practice gap, educational researchers can draw on theories, frameworks, and methodologies from implementation science. Implementation science is a field of research originating in public health specifically designed to study the variables related to the process of getting evidence-based practices into routine use. The present study adapted multiple frameworks and validated measures of implementation outcomes to identify the facilitators to and barriers of implementing a motivational intervention in university-level general psychology courses. The results highlight organizational, instructor, and student-level factors that influence implementation. The study itself provides a demonstration of how to incorporate elements of implementation science into higher education research.

There are a number of targeted interventions, based on social-psychological, cognitive, and motivation theories, that have been developed for use in educational settings (Harackiewicz & Priniski, 2018). Despite a history of empirical evidence from both laboratory and field studies demonstrating the effectiveness of these interventions, few of them have been implemented in college classrooms at scale (Daniel, 2012; Daniel & Chew, 2013; Dunlosky et al., 2013; Dunlosky & Rawson, 2019; Roediger, 2013; Roediger & Pyc, 2012). There are also concerns about the general replicability of these findings and it has been noted that more specific attention should be paid to the “how, where, who, and why” of how these interventions are implemented (Harackiewicz & Priniski, 2018). In order to better understand the process of using these interventions in college classrooms, the present study examined how a motivational intervention (the utility value intervention) was adopted and assigned by instructors and how it was perceived by students in general psychology courses. We adapted two conceptual frameworks and a set of validated outcome measures from implementation science to conduct a mixed-methods analysis of the key elements of the *process* for using and testing the utility value intervention with university students. The results of this study highlight the facilitators of and barriers to implementation of an evidence-based practice in a real-world context.

Utility Value Intervention

In a utility value intervention task, students are asked to explicitly consider ways in which academic material is relevant or useful to their current and future goals (Hulleman et al., 2010; Hulleman & Harackiewicz, 2009). The utility value intervention is derived from the expectancy-value model of achievement, which posits that achievement related choices, behaviors, and performance result from a combination of students’ expectancies and values (Eccles, 1983, 2009; Eccles & Wigfield, 2002). Expectancies for success include constructs such

as self-concept of ability, perceptions of task difficulty, and locus of control. Task values include attainment value (the importance of doing well on a task), intrinsic value (the inherent enjoyment of the task), utility value (usefulness of the task for future goals), and cost (negative consequences resulting from engaging in a task).

Tasks with utility value, because they are relevant beyond the current context, are proposed to be predictive of student achievement. In one study, highlighting the relevance of a task to students' future goals improved both task persistence and performance (Simons et al., 2003). In a college-level teaching credentialing course, students' perceptions of the usefulness of the course predicted mid-term self-efficacy ratings which, in turn, predicted course performance (Bong, 2001). In both a college classroom setting and a sports camp setting, participants' perceived utility value predicted final course grades and coach ratings of performance, respectively (Hulleman et al., 2008). These early studies indicated that the utility value of a task could be an important determinant of student performance.

In the first published study of the utility value intervention, researchers asked high-school science students to write about how the course information was useful to themselves or a close friend in the context of their daily lives and their future plans (Hulleman & Harackiewicz, 2009). The results of this experimental intervention study showed that, compared to students who simply summarized the material, students who completed the intervention showed increased interest in science and higher final course grades. Moreover, these effects were found for students with initially low performance expectations, whereas students with greater performance expectations showed no change in interest or performance (Hulleman & Harackiewicz, 2009). This study was the first to show that a specific utility value task completed by students could improve outcomes as predicted by the expectancy-value theory of student achievement.

Researchers have also investigated the effects of utility value interventions with college students. In both laboratory and classroom settings, findings from intervention studies supported the idea that utility value interventions could be used to improve students' interest (Durik et al., 2015; Fritea & Opre, 2015; Geerling et al., 2019; Hulleman et al., 2010, 2017; Kera & Nakaya, 2017; Shechter et al., 2011), perceived utility value of a particular course (Canning & Harackiewicz, 2015; Clinton & Kelly, 2017, 2019; Curry et al., 2020; Fritea & Opre, 2015; Kosovich et al., 2019; Lindeman et al., 2018; Rosenzweig, Harackiewicz, et al., 2019), and performance (Canning et al., 2018; Canning & Harackiewicz, 2015). Importantly, the intervention appeared to work best for students who needed it the most: students with low expectancies for success, first-generation college students, and students from marginalized groups (Durik et al., 2015; Harackiewicz et al., 2016; Hulleman et al., 2017). Additionally, the use of the intervention did not further advantage already high-performing students. Thus, the results suggest that the utility value intervention can be used to truly help students without widening the gap between lower- and higher-performing students (Halpern & Hakel, 2003). For a more comprehensive review of these studies, see Soicher & Becker-Blease (2020).

The format of utility value interventions generally falls under one of two types: self-generated or directly communicated. With a self-generated utility value intervention, students to imagine and articulate, through a written description, how a topic is relevant/useful to themselves or a close friend or relative (Canning et al., 2018; Canning & Harackiewicz, 2015; Harackiewicz et al., 2016; Hulleman et al., 2010, 2017; Hulleman & Harackiewicz, 2009). With a directly communicated utility value intervention, students passively read or watch a video examples of the utility value of the topic, for example by reading about it in a text or where the utility value of the task is embedded in the instructional materials reviewed by the students (e.g., Brown et al.,

2015; Durik et al., 2015; Geerling et al., 2019; Kera & Nakaya, 2017; Shechter et al., 2011; Shin et al., 2017; Simons et al., 2003). In these studies, students do not generate their own descriptions of relevance.

The consistency of benefits from the utility value intervention varies depending on the format of the intervention. Studies examining the influence of self-generated utility value interventions on university student outcomes generally find the intervention to be beneficial for students. For example, students in introductory physics courses with initially low exam scores show improved performance on a post-intervention exam and higher course grades compared to students in a control condition (Rosenzweig et al., 2019). In introductory biology courses, the disparity in final course grades between students identifying as continuing-generation from an ethnic majority group and students identifying as first-generation from an underrepresented minority group was reduced by 61% by using a self-generated utility value intervention (Harackiewicz et al., 2016). For introductory psychology students with low initial exam scores, completing a self-generated utility value intervention led to increased interest in psychology and increased intent to major in psychology, compared to a control group (Hulleman et al., 2010, Study 2). The results from intervention studies employing directly communicated utility value are less consistent than those using a self-generated utility value intervention. Durik and colleagues (2015, Study 1) showed that a directly communicated utility value intervention led to increased interest in a math task compared to a control condition for participants with low perceived confidence in math. However, in Study 2 of the same research, participants with low perceived confidence in math reported lower interest in the utility value intervention condition.

Another way in which studies of utility value interventions differ is in the timing and/or dosage of the intervention. Classroom studies tend to rely on multiple instances of the

intervention (e.g., Canning et al., 2018; Priniski et al., 2019; Rosenzweig et al., 2019) whereas laboratory studies typically rely on just one iteration of the intervention (e.g., Canning & Harackiewicz, 2015; Durik et al., 2015; Johnson & Sinatra, 2013; Shechter et al., 2011). One classroom study of the utility value intervention designed to investigate the effects of timing and dosage on student outcomes found that the intervention should either be delivered once closer to the beginning of the term or three times during a semester (Canning et al., 2018). Moreover, the beneficial effect of the intervention depended on students' prior performance: students with lower prior grade point average had higher grades when the intervention occurred at the beginning of the term but students with higher prior grade point average had higher grades when the intervention occurred toward the end of the term. These results indicate that when the intervention is implemented could affect student outcomes.

Together, the data support the power of utility value interventions, but due to the variation in format, instructions, timing, and dosage that has been used across studies of the intervention, it is unclear how best to implement the intervention for maximal benefit to students. Additionally, the details provided in published studies of the intervention do not always have the details necessary for other researchers or instructors to implement the intervention successfully. The next logical step would be to systematically investigate the *process of implementation* to better understand the elements that contribute to or hinder the successful use of the intervention in college classrooms (Lane-Fall et al., 2019; Soicher et al., 2020).

Implementation Science

Implementation refers to the process of moving evidence-based interventions (i.e., practices or programs) into routine use within organizations (Damschroder & Hagedorn, 2011; Fixsen et al., 2005; Rabin & Brownson, 2017). It is equally important to systematically study the

implementation of a practice, program, or intervention with an emphasis on external validity as it is to test the effectiveness of that practice, program, or intervention with an emphasis on internal validity (Damschroder & Hagedorn, 2011). The latter is more common in the research literature, but without the former, the translation of evidence-based practices to everyday use may be weakened, resulting in nonstandard use of the intervention across different individuals, providers (i.e., instructors), and settings (Fixsen et al., 2005). Nonstandard use may also result from the natural tendency to adapt evidence-based interventions to the local context, but data that could speak to the benefit (or harm) of these adaptations is seldom collected.

Implementation science offers new frameworks for research questions. One of the most common is the Consolidated Framework for Implementation Research (CFIR; Damschroder et al., 2009). The CFIR is a practical, yet comprehensive, taxonomy of constructs related to implementation that was designed to unify and consolidate a large number of implementation theories and frameworks. Within the CFIR, implementation constructs are organized into five domains: intervention characteristics, outer setting, inner setting, individual characteristics, and the process of implementation (Damschroder et al., 2009; Damschroder & Hagedorn, 2011). In the present study, we used the CFIR to help guide the design and evaluation of our study to better understand the factors that influence the outcome of implementation efforts. To our knowledge, this is the first study of a motivation intervention in higher education to adapt the CFIR. This should result in more generalizable findings that can be better integrated with subsequent research regarding implementation (Damschroder & Lowery, 2013).

Implementation science also provides adaptations to existing guidelines. For example, the Consolidated Standards of Reporting Trials (CONSORT) adopted in the medical sciences provides a set of guidelines to help facilitate transparent reporting of randomized controlled trials

(Schulz et al., 2010). Glasgow and colleagues (2018) have suggested modifications to the CONSORT minimum standards to include variables related to external validity. The purpose of the expanded guidelines is to “facilitate transparency, understanding, and reporting around contextual issues of recruitment, participation, and representativeness, with an emphasis on data across multiple levels including participants, clusters randomized, intervention staff, and study settings” (Glasgow et al., 2018, p. 424). These guidelines can be especially useful in implementation science reporting when considering the reach, efficacy, adoption, implementation and maintenance of evidence-based intervention efforts (RE-AIM dimensions; Glasgow et al., 2019). Studies using RE-AIM allow for the comparison of individuals participating in a study to the intended population, an improvement over typical studies that allow only for the comparison of participants between groups or between participants and non-participants (Glasgow et al., 2019). In the present study, we used the RE-AIM/CONSORT guidelines to evaluate the reach, adoption, and implementation aspects of the utility value intervention efforts.

Lastly, implementation science centers different outcomes from effectiveness studies (Proctor et al., 2011). Implementation outcomes are variables that represent the “effects of deliberate and purposive actions to implement new...practices” (Proctor et al., 2011, p. 65). An intervention cannot be successful if implemented poorly; thus, positive implementation outcomes must be obtained prior to achieving meaningful change from the intervention. Although eight distinct implementation outcomes have been proposed and defined in the implementation science literature, the present study measures three of these outcomes (acceptability, appropriateness, and feasibility) at the individual student level. Whereas typically the successful implementation of an intervention is assumed given favorable effectiveness outcomes, the focus on implementation

outcomes allows for the examination of contextual factors, resulting in more explicit decision-making about the implementation process.

The Present Study

We examined the implementation of a utility value intervention in General Psychology courses at a large public university. To our knowledge, this is the first explicit investigation of the *process* for putting the utility value intervention into routine use in higher education classrooms. The goals of this implementation study are twofold: (1) to describe the factors that facilitate and/or hinder the successful implementation of the intervention and (2) to demonstrate the interdisciplinary application of frameworks and tools from implementation science developed for public health to the scholarship of teaching and learning. The results of this implementation study will guide both future implementation of the utility value intervention and implementation studies of interventions in higher education more generally.

Methods

Context

We examined implementation of a utility value intervention in General Psychology courses at Oregon State University. Over the past four years, the Oregon State University psychology department has created and continues to refine a “General Psychology Program” to coordinate the instruction of general psychology courses (PSY 201 and 202) to undergraduate students. This program has a faculty Director and a faculty Coordinator who oversee graduate teaching assistants serving (primarily) as instructors of record for smaller sections of these courses. The program infrastructure exists to ensure consistent teaching across all sections of these courses. For example, the Director and Coordinator choose the textbook and provide

syllabus and learning management system templates for all instructors to use. The Director and Coordinator also decide on the number and types of exams to be used in the courses.

The implementation study took place between January 2020 and June 2020. The department offered 12 sections of General Psychology during both Winter and Spring quarters. Table 1 provides the details of these sections. On-campus classes offered in Winter quarter were transitioned to remotely delivered final exams because of campus closure due to the COVID-19 pandemic. Due to the continuation of the COVID-19 pandemic, all courses that were to be offered on-campus for Spring quarter were transitioned to remote delivery (synchronous delivery of the course through web conferencing software). Online courses are those courses that were always planned to be delivered online in an asynchronous format for primarily distance learning students.

[Table 1 here]

In each of these sections, instructors were provided with a self-generated utility value intervention assignment embedded in the learning management system (Canvas). They were instructed to assign the intervention in lieu of their normal in-class activity (for on-campus sections) or Applied Learning Activity (ALA, for online sections) in either week four or week five of the term. The specific wording of the utility value intervention was copied from Harackiewicz and colleagues (2016) and is provided on the Open Science Framework (OSF) project page (<https://osf.io/8msbj/>). Because this was an implementation study, not an effectiveness study, all students were assigned to complete the intervention.

Conceptual Framework

The CFIR was used both to design and evaluate the implementation of the utility value intervention in the General Psychology courses (Damschroder et al., 2009). We adapted the

CFIR to the context of the intervention and the dimensions used for this analysis, along with their relevant constructs, are presented in Table 2.

[Table 2 here]

Study Population

There were two populations studied during the implementation study: (1) students enrolled in General Psychology courses (winter $n = 886$, spring $n = 756$) and (2) instructors teaching the General Psychology courses. We did not collect demographic data from individual students. The summary in Table 3 is the enrollment data for the College of Liberal Arts at Oregon State University (where the School of Psychological Science is housed).

[Table 3 here]

No demographic information for the instructors was collected, to help retain confidentiality of their participation, but the majority are graduate teaching assistants ($n = 9$ of 10), with prior teaching experiencing ranging from no prior experience to one academic year of experience as a teaching assistant to a senior instructor.

Data Collection

Students

Implementation outcome data were collected from students in conjunction with their completion of the utility value intervention during week four or five of the academic term in which they were enrolled. After responding to the utility value essay prompt, students answered a series of survey questions to provide their perceptions of the utility value assignment. These survey items assessed students' perceptions of acceptability, appropriateness, and feasibility. Acceptability refers to how satisfied the students were with the assignment, appropriateness refers to how well the assignment fit into the overall class (how relevant/practical it is), and

feasibility refers to how easy the assignment was to complete (Proctor et al., 2011). Each of these outcome variables was measured by four items, rated on a 5-point Likert scale, as previously validated by Weiner and colleagues (2017). All items are available on the OSF project page (<https://osf.io/dmhnx/>). Students were invited to consent to have their data included in the study via a class announcement posted by their instructor in week 9 of the quarter. Consent was obtained through a brief Qualtrics survey linked in the course announcement. Instructors were blind to whether students consented to participate. All data collection and consent procedures were approved by the Institutional Review Board at Oregon State University.

Instructors

Semi-structured interviews were conducted with instructors of General Psychology courses who were part of the General Psychology program. Ten instructors of General Psychology were invited to be interviewed. Of these, eight consented to participate in the protocol approved by the Oregon State University Institutional Review Board. Two did not respond to either the first invitation or a follow-up invitation. Instructors were not compensated for participating. Interviews generally lasted thirty minutes or less and followed a prescribed set of questions with flexibility for personalized follow-up questions when necessary. Table 4 contains basic descriptive data for each instructor. Novice instructors had one year or less of teaching experience. Advanced instructors had more than one year but less than five years of teaching experience. Expert instructors had more than five years of teaching experience.

[Table 4 here]

In addition to the interview questions (the interview protocol is available on the OSF project page (<https://osf.io/gp97u/>), instructors responded to a modified form of the 36-item Evidence-Based Practice Attitude Scale (EBPAS; Rye et al., 2017), a shorter form of the original

50-item measure (Aarons, 2004; Aarons et al., 2010). The modified form removed the questions related to the three items in the “Job Security” scale, which asked about the extent to which learning to use an evidence-based practice would help a person to keep or find work. These items were not relevant to the instructor population. The EBPAS score reported in the table reflects an average total score out of a possible 5 points ($M = 3.12$, $SD = 0.30$).

Results

CFIR Evaluation

Both qualitative and quantitative results are presented according to the four dimensions of the CFIR outlined above.

Intervention Characteristics

Intervention Source. We decided a priori that the easiest way to integrate the utility value intervention into the General Psychology courses would be to deliver it as a mandate from the General Psychology Director. The Coordinator placed a copy of the assignment into the Canvas shell for each course section. Then, the Director sent the instructors an informational e-mail the week prior to the start of Winter quarter. The details of the message are on the OSF project page (<https://osf.io/dcmz3/>). Briefly, the e-mail emphasized that (1) the General Psychology Program (and classes) is a program which relies on evidence-based teaching and is also a context for evaluating teaching practices, (2) the only modifications to the assignment that could be made were the name and/or point value, (3) the assignment should take place during week four or five of the term, (4) the coordinator would be available to support integration of the assignment if the instructors experienced trouble, and (5) that instructors would receive a link to the consent form at the end of the term that they should distribute to students.

This was the only information provided to the instructors about the utility value intervention. Instructors were kept blind to the true purpose of the assignment as well as the evidence supporting the use of the assignment. Neither the Director nor the Coordinator reported receiving any clarification questions about the intervention prior to the start of the term. One instructor, Ann, mentioned two difficulties associated with the mandate. The first reflected concern over integrating the assignment.

The only thing that was difficult for me was, like, I already have my plan for the quarter. How am I going to fit this in and make it normal?

The second reflected a potential issue with the timing of the instructions for implementation.

We were told about it I think like five days before Christmas and...it was almost as if my brain was just like out of my body and just forgot that I had e-mails and then I came back [at the start of the new term] and was like, oh it's all just junk. So, I didn't really pick up on the fact that we had to get it done until a few weeks in [to the term].

Surprisingly, this description does not match the timeline of when the Director sent the message to the instructors (January 2, 2020). This may indicate that multiple messages are needed to improve implementation, both before and after school breaks. It may also indicate that, despite the explicit message from the Director about the culture of the General Psychology Program as a context for testing evidence-based practices, this is not yet a fundamental aspect of the program that the instructors are attuned to.

Adaptability. The Director explicitly addressed the inflexibility of the assignment in the message to instructors. Only the name and/or number of points for the assignment were to be

modified. This message was received by instructors, as evidenced by several quotes from instructors during the interview:

Katie: We were told by the, like, Gen Psych team not to make any changes.

John: I made zero changes to the assignment itself...I kept the same name but I added a...number just to clarify so people don't get confused, but I did not change any of the content when I received it.

In fact, none of the instructors reported making any changes to the assignment. This provides evidence that embedding the intervention in an assignment in the learning management system facilitates implementation of the assignment for instructors.

Complexity. Most instructors ($n = 5$) reported that they did not experience any difficulties associated with using the assignment. Of those that did, two mentioned issues with students understanding how to complete the assignment, as reflected in Jan's comment.

Jan: I think there were a few [students] that were confused about whether it was like one essay or if it was two separate essays.

Lastly, two of the instructors noted technical issues with implementing the assignment. One had trouble editing the due date of the assignment and the other created two copies of the assignment when importing it into Canvas. Both instructors experiencing technical issues had limited teaching experience – just one quarter as a teaching assistant – prior to the implementation of the utility value intervention. In neither case did the technical difficulty lead to students being unable to access the assignment.

Design Quality and Packaging. Very few of the instructors discussed the format of the assignment explicitly. A review of their responses to all the questions, however, elucidated at

least a few challenges. For example, Smith noted that having the assignment delivered online for an in-person class was a bit clunky.

Smith: I think that having it pre-built in there was good...but it's a bit more intuitive for an online class than the way that the shell I used for the in-person class was built.

Specific to the online courses, the utility value intervention was similar to another assignment used in the classes, but at the end of the term. This assignment was called the "course reflection" assignment. Students were asked to relate something they learned in the course to their own lives, but it was "pretty vague" (*Katie*). Importantly, this course reflection assignment did not include specific instructions about the utility value of the concept selected by the student.

Instructors who taught on-campus did not have this same assignment in their courses.

Additionally, Katie highlighted an issue with the formatting of the utility value essay prompt that was especially problematic in the online courses.

Katie: Just the way that the assignment is structured, the fact that there's two bullet points, and in each bullet point it says 'write a reflection, this many words long.' Because the way the online class is structured, every bullet point is a different part of the assignment of our ALAs. So, like it might say, like task one – first bullet point – go take this memory quiz. And then the bullet two is report your score here. Bullet three is like what does this score mean? So to say write a paper or write a reflection in a bullet point and then write a reflection in the second bullet point...some students did two, some students were confused about how many to write and reached out.

The issues described above reflect a need for the researcher to have better a better understanding of the intricacies of how the courses are taught prior to designing the implementation.

Inner Setting

Structural Characteristics. The General Psychology Program in our department was conceptualized roughly four years ago. Most of the General Psychology courses are taught by graduate students. There has always been a faculty coordinator to support graduate teaching assistants in either their role as instructor of record or teaching assistant. One year ago, the department hired a faculty Director for the program to help further develop and support the teaching of the General Psychology courses. The General Psychology program is large: two senior faculty to direct and coordinate the program, between ten and 15 instructors, and serving approximately 3,000 undergraduate students each year.

The doctoral program in the psychology department is the same age as the General Psychology Program. All incoming students are offered a graduate teaching assistantship, although some decline to accept fellowships and grant-funded research assistantships. The amount of training that graduate students receive prior to serving as an instructor of record has varied widely from year-to-year, as the doctoral program develops. Early on, some entering students began teaching while enrolled in a teaching seminar. Currently, students serve as teaching assistants for one quarter before moving to in-person teaching as instructors of record.

The cohesiveness that the program lends to the consistent teaching of General Psychology also creates an environment in which educational research is more easily facilitated compared to what is found at other institutions. Aspects that may normally vary across instructors, such as textbook choice or design of an online curriculum, have been standardized. One instructor noted the benefit of this level of standardization for research purposes:

John: I don't have to tell you how, obviously, it's easier that we have a program, you know, just the second people say 'include this', as compared to if everybody was teaching with their own book, let's say. So I'm always excited when I see someone is taking advantage of the fact or utilizing, I should say, the fact that we have the classroom to use for educational research.

Implementation Climate. As indicated by the email message from the Director to the instructors of General Psychology courses, the General Psychology program is built on a foundation of evidence-based teaching practices and supports research of potentially effective practices. However, as the Director is relatively new to the program and this study was the first of its kind to be conducted under the Director's leadership, it is not clear the extent to which this understanding is embraced as part of the culture of the department. Clearly this is a goal that the program will continue to work toward.

Several instructors did note that they were happy to integrate the intervention into their courses in support of the research study. After being asked about her feelings toward the assignment, Jan replied "I'm happy to be contributing to your research, or should I say, helping with your research." Another instructor mentioned embracing both the present study specifically and research in the General Psychology program more generally.

John: ...but as far as generally can people give us certain things to include in our courses for research purposes? Well, I was excited about that. I was excited about the fact that there's a study happening because I think that we are under-utilizing the system that we have in Gen Psych.

Compatibility. Regarding the intervention assignment, a few instructors mentioned that they "*felt like it fit*" (Ann) or that they were able to "*just treat it like a regular assignment*"

(Jasmine), without providing additional detail. Some instructors put a good deal of thought into how the intervention fit within the context of their course. For example, Sarah described feeling positively toward the assignment.

Sarah: I kind of liked it because I thought that it's good in the middle of the term because I have it in week five of a ten-week term. So, week five assignment activities to sort of reflect and have the opportunity to engage in what we've been doing so far. And then to do it again, sort of, in a way, with the psych concept reflection paper at the end. It just seems like a good way to get the people thinking more deeply about the topics that we've covered.

Other instructors provided additional detail about the meaning they ascribed to the intervention that, interestingly, reflected a misunderstanding of the purpose of the intervention. Some examples include:

Ann: Because I went and looked at the material and I was like, oh when the students do this, they're probably going to assume that this is like, kind of an evaluation of the class or an evaluation of how they're learning. So that was my assumption. I just went along with it as if it were an eval.

Amy: I just sort of assumed from a research perspective that you were probably looking at how I was analyzing stuff as well...I was like, well, I guess they're gonna see that I comment a lot.

Smith: It's good to get feedback outside of the end-of-term evaluations. A lot of people just sort of click through those, so having something that might take a little more thought to reflect on a course could prove a little more beneficial. And how the course could change or be adapted more.

Each of these perceptions indicates that future implementation efforts may benefit from providing instructors with more information about the intervention and the purpose of it.

Individual Characteristics

Regarding individual characteristics, we measured students' perceptions of the intervention assignment in terms of acceptability, appropriateness, and feasibility. Figure 1 shows the distribution of average responses, on a 5-point Likert scale (1 = completely disagree, 5 = completely agree), for each of the three implementation outcomes. The mean rating for acceptability was 3.48 ($SD = 1.07$). The mean rating for appropriateness was 4.02 ($SD = 0.87$). The mean rating for feasibility was 4.17 ($SD = 0.78$).

Figure 1

Distribution of student responses to measures of acceptability, appropriateness, and feasibility of the utility value intervention assignment.

Cronbach's alpha for internal consistency was calculated for each measure to ensure reliability. The alpha values are reported in Table 5. A confirmatory factor analysis for the implementation outcome measures can be found on the OSF project page (<https://osf.io/v6gx4/>).

[Table 5 here]

Process

Planning. Planning for this implementation resided almost wholly within the research team. No feedback was solicited from instructors nor were instructors informed beyond implementation instructions about the intervention. Careful analysis of the process of implementation highlighted some changes that could improve implementation in the future. For

example, one instructor mentioned the need for increased communication regarding the use of the intervention, suggesting that this be built into the communication plan from the beginning:

Jasmine: I wish we would have had, like the week before, we didn't really get a reminder about it. And so it was just that week of and I didn't have time to discuss with [the Director or the Coordinator], so I couldn't tell my students any more than like what I had known from the email from the first week. If we had had just a follow up...the week before we assigned it, that would have been helpful.

Planning for implementation is an iterative process. As a result of this CFIR, and the subsequent RE-AIM, evaluations, we will be able to make changes to the implementation process during the planning stages of the next implementation attempt and evaluate the impact of those changes. Likewise, other researchers and/or educators interested in using the utility value interventions in their local contexts can be forewarned about the facilitators and barriers to implementation so that their own efforts may be planned with even more detail.

Engaging. Critical to the success of the implementation effort is the involvement of both the Director and the Coordinator of the General Psychology program. Without these top-down communications, it would be more difficult to implement the intervention consistently. Future efforts for implementation will rely on increased involvement from these leaders and aim to reduce the burden placed on instructors for implementation. In the long run, this approach may facilitate implementation of the intervention at scale.

Executing. Aspects of the implementation plan that relied primarily on the researcher or the General Psychology Program leadership were executed according to plan. For example, the Director and Coordinator of the General Psychology program sent directions to the instructors at the appropriate time, providing instructors with all they would need to use the intervention in

their classes. The researcher provided the student recruitment message, containing the link to provide consent, to the instructors to be sent out during week nine of each term. However, it would appear from our evaluation that the instructors needed more support in executing the implementation.

Several instructors experienced challenges with implementing the intervention. For example, in Winter term, all instructors had students complete the intervention, but two of the instructors never posted the recruitment message linking to the consent form. In Spring term, one instructor assigned the intervention at the wrong time (the end of the term instead of the middle) and three instructors did not use the intervention assignment in their classes. As previously mentioned, this could indicate that instructors need additional support, like more frequent reminders, than what we originally provided.

It should also be noted that execution of the implementation plan was potentially affected by an international health crisis: the COVID-19 pandemic. The onset of this pandemic late in Winter quarter led to an immediate transition to remote delivery of final exams for on-campus classes. The onset of the pandemic coincided with when instructors sent out the recruitment message through their learning management systems. Thus, the uncertainty of how to best deliver the remaining two weeks of class could account for two of the instructors failing to post the recruitment message linking to the consent form. Due to the continuation of the COVID-19 pandemic during Spring term, all courses that were scheduled to meet on-campus were to be delivered remotely – a situation that the graduate students had not been trained for. Again, it is likely that this difficult transition resulted in a subset of the instructors failing to provide the intervention assignment. The COVID-19 pandemic is an example of unforeseen circumstances that occur in real world contexts. Although researchers and educators cannot plan in advance for

something as disruptive as a pandemic, the situation highlights what supports were, or were not, in place to support implementation in the face of unexpected challenges.

RE-AIM Evaluation

We applied the RE-AIM evaluation to examine the reach, adoption, and implementation aspects of the delivery of the utility value intervention. As suggested by the authors of the guidelines, researchers should decide a priori on a subset of the RE-AIM constructs that are most appropriate to their context (Glasgow et al., 2018). A summary of the evaluation, across both Winter and Spring quarters, is presented in Figure 2.

Figure 2

Expanded CONSORT figure incorporating RE-AIM analysis

The settings eligible in the figure refers to the number of eligible course sections. The number of instructors participating reflects instructors per quarter. For example, if an instructor taught one section in Winter and another in Spring, they were counted twice. This decision was made because some instructors participated in one quarter but not the other.

The RE-AIM evaluation is critical for understand the reach, adoption, and implementation aspects of the use of the intervention across the General Psychology program (Glasgow et al., 2019). Using the expanded CONSORT guidelines to emphasize aspects of RE-AIM for the implementation aids both transparency and reproducibility (Glasgow et al., 2018).

Increasing the transparency of reporting ensures that the results are interpreted appropriately.

Reproducibility refers to replication of results and, perhaps more importantly, the provision of information critical to researchers and educators for successfully using the intervention at scale.

The expanded CONSORT reporting helps to highlight not only where implementation went well, but also where in the process implementation failed to go as planned.

Adoption

Adoption refers to the proportion and representativeness of the settings that agreed to use the intervention (Glasgow et al., 1999). For the RE-AIM evaluation, the unit of analysis for the setting was each section of General Psychology offered in the Winter and Spring terms. In this case, 87.5% of the sections of General Psychology offered by the department were eligible to participate in the intervention implementation. Because we wanted to emphasize the General Psychology program, which primarily oversees graduate teaching assistants, three of the sections were excluded from the implementation of the utility value intervention. These sections were taught by senior faculty who were different in significant ways from the sections offered at the primary Oregon State University campus (e.g., different textbook, different student population).

All instructors teaching General Psychology for the eligible sections were approached to participate. No instructors actively declined to participate. We consider the 100% adoption rate among eligible course sections to be due to the nature and structure of the General Psychology program where all instructors teach cohesively under the direction of the General Psychology program leadership.

Reach

Reach is defined as the percentage of people who received the utility value intervention (Glasgow et al., 1999). The total number of potential participants equaled the number of students

enrolled in the eligible course sections. Students excluded themselves, by default, from the implementation by not completing the intervention (approximately 12%). An additional 7.3% of potential participants were never assigned the utility value intervention. Therefore, the reach of the intervention was quite good: 80.5% of the students who were enrolled in the General Psychology courses and given the opportunity completed the utility value assignment. This successful level of reach with the intervention was expected due to previous evidence that students will generally complete the assignment so long as they are provided the opportunity to do so by their instructor (Hulleman & Cordray, 2009).

One unanticipated finding related to reach is the low consent rate from students to allow their data to be used for further analysis. Although most students completed the assignment as instructed, a very small percentage of students consented to participate in the research (7.2%). Examining this further, we found that all students who accessed the consent form agreed to participate in the research. That is, no student who accessed the consent form actively declined to participate. It is unclear why students elected not to engage with the consent process. A potential explanation in Winter term could be the onset of the COVID-19 pandemic, which disrupted the normal end-of-term processes.

Consent processes are rarely explicitly documented in the published literature. More transparent reporting of these procedures in the literature is necessary to ensure replication of published findings. Details of the consent process for this implementation study are available on the OSF Project page (<https://osf.io/zneag/>). We plan to modify these consent procedures for future utility value intervention implementation research.

Implementation

Implementation refers to several processes which align to ensure delivery and uptake of an intervention (Glasgow et al., 1999). Some of these processes are at the individual level. These include adherence (i.e., fidelity, or delivery as intended) and adaptations or changes made to the intervention during the study. Settings-level processes are concerned with the consistency of the implementation across settings. In our study, there were six cases (28.6% of the course sections) where an instructor failed to implement the intervention as intended. In three of these, the instructor never assigned the utility value intervention to their students. In two of the cases, the instructors assigned the utility value intervention but never sent out the recruitment message containing the link for students to provide consent. In the last case, the instructor used the intervention at the wrong time.

Discussion

In this implementation study of a utility value intervention in General Psychology courses at a large public university, we applied two planning and evaluation frameworks from implementation science to provide critical detail for how to use the intervention at-scale in a higher education setting. These two frameworks were the Consolidated Framework for Implementation Research (Damschroder et al., 2009) and the RE-AIM framework (Glasgow et al., 1999). By applying these frameworks in a mixed-methods design, we were able to identify both facilitators and barriers to implementing a utility value intervention and increase the transparency, replicability, and generalizability of our findings.

Facilitators to Implementation

Our analysis revealed several aspects of implementation that facilitated the use of the utility value intervention across the General Psychology classes. A primary facilitator of the

implementation was the infrastructure provided by the General Psychology program where the research was conducted. In this program, a faculty Director and faculty Coordinator plan for and maintain consistency in the teaching of the General Psychology courses by standardizing course decisions (e.g., the textbook, exam types/frequency) and training and overseeing graduate teaching assistants who act as instructors of record. The program maintains a culture where the instructors are accustomed to teaching their courses as requested by the Director and Coordinator and a culture in which evidence-based pedagogy is a gold standard. Therefore, integrating the utility value intervention into the General Psychology courses was easily supported in this program.

A second facilitator of implementation was the simplicity of the intervention. The utility value intervention was designed as an assignment delivered online through the course learning management system. Once provided with the assignment, instructors inserted it into their course at the appropriate time (week 4 or 5 of the term) and asked students to complete it in lieu of a similar course activity they would have otherwise completed that week. No significant changes or adaptations needed to be or were made by the instructors. Additional feedback from students showed that they perceived the assignment to be appropriate for the course, easy to complete, and were satisfied with completing it. Selecting an evidence-based intervention that reduced the burden on the instructor to implement and the burden on the student to complete resulted in a high rate of both adoption and reach.

Barriers to Implementation

Our analysis also revealed several points in the implementation process that acted as barriers to implementation of the utility value intervention. For example, the planned implementation had communication about the intervention from the General Psychology

program Director to the instructors at one time point – just prior to the start of the term. This led to a small percentage of instructors forgetting to use the utility value assignment in their courses. To improve use of the intervention by the instructors, future implementation plans should incorporate additional reminders to the instructors about the assignment.

Although not a barrier to student completion of the intervention, the low consent rate affected several aspects of the research being conducted. First, the small sample size, especially in comparison to the number of eligible participants, severely limited the generalizability of the implementation outcomes rated by the students. It may be the case that students who did not feel favorably toward the assignment after completing it also avoided engaging in the consent process. However, we believe this to be an unlikely explanation as the students completed the assignment in the normal course of the General Psychology class, without specific reference to the assignment being part of a research study. Second, the low consent rate prevented the us from planned analyses to replicate the effectiveness of the utility value intervention. Third, the low consent rate prevented us from examining important moderator variables related to the effectiveness of the intervention, such as student identification with a marginalized group (e.g., first-generation college students). In our study, all students who chose to access the consent form agreed to participate in the research. Thus, the consent process should be modified to allow easier access for students to become informed of the research.

Conclusion

Overall, we have successfully demonstrated how to apply interdisciplinary implementation science frameworks to study the process of implementing an evidence-based intervention in a higher education setting. We identified both facilitators of and barriers to implementation of the intervention and provided recommendations for changes to future

implementation plans. Moreover, the results of our study contribute the literature on utility value interventions through increased transparency in reporting and a focus on issues of external validity with the use of the intervention. Researchers and educators interested in using the utility value intervention in their local contexts can benefit in their planning stages by considering the aspects of implementation described here.

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