What Do Students Remember About Introductory Psychology, Years Later?

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A course in introductory psychology (Intro Psych) has potential to cultivate valuable knowledge and skills, especially for first-year students. The present research is a first step at understanding this potential by surveying college seniors who took Intro Psych during their first year. We aimed to discover students' perspectives on what they learned, a sense of how much they actually retained, and whether students' course experiences predicted their academic behaviors as seniors. When asked what they learned from the course that helped them in other courses and in life, both majors and nonmajors described how Intro Psych shaped their study skills, knowledge, and perspectives on the social world. In a retest of items from their first midterm, students showed high performance (70% correct) compared to previous studies, with psychology students (majors and minors) showing better performance than nonpsychology students (81% vs. 69%), $d = .74$. Finally, we found that students' performance on a multiphase term project in Intro Psych predicted their self-reported project management skills as seniors ($r = .32$, $p < .001$). Students' enjoyment of the course, measured by their evaluations of the instructors, predicted self-reported project management skills ($r(148) = .294$, $p < .001$) and also later study skills ($r(148) = .266$, $p < .001$). Together, these findings support the importance of Intro Psych and highlight the need to further clarify and expand our knowledge of its long-term impact.

Keywords: Intro Psych, knowledge retention, long-term outcomes

Introductory psychology (hereafter Intro Psych) is the gateway course to the discipline of psychology, introducing millions of college students each year to a field that tackles fundamental questions about human behavior and experience using scientific methods. Due to both its reach and its content, Intro Psych is poised to make a lasting impact on students' education, and potentially their lives. But what do students learn from Intro Psych? What, if anything, lingers after the final exam: terms and definitions, skills, and/or new perspectives on the world?

The American Psychological Association (2014) has developed guidelines for Intro Psych that suggest what students should learn (Gurung et al., 2016). These guidelines recommend that Intro Psych courses be designed on a foundation of scientific methods, cover content representing five major psychological domains (biological, cognitive, developmental, social and personality, and mental and physical health), and incorporate specific cross-cutting themes that include, among others, the application of psychology to everyday life and real-world situations. Accordingly, students should walk away from Intro Psych with enhanced scientific literacy, foundational knowledge representing the breadth of psychology, and the ability to apply this knowledge to their lives. Others have recommended that the course should also develop essential skills, such as interpersonal and

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critical thinking skills (Landrum, 2017; Strohmetz et al., 2015).

Scholars clearly have high expectations for the big ideas and skills that students should develop in Intro Psych. In the present study, we sought to understand the long-term influence of Intro Psych by surveying senior undergraduates who completed an Intro Psych course in their first year of college. In the sections that follow, we first describe why Intro Psych has the potential to be such an influential course, particularly for first-year students. Next, we describe what we know, and do not, about what students gain from the course. Finally, we present our empirical approach, which examined what students think they learned from Intro Psych, a sense of what they actually retained, and whether their experiences in the course as first-years predicted their academic behaviors as seniors.

The Significance of Intro Psych

Intro Psych is the second most popular undergraduate course in the United States (Landrum & Gurung, 2013). Its popularity extends to high schools: Nearly one in three high school students take a psychology course by the time they graduate (Nord et al., 2011). The reach of the course is only expected to increase, given the projected growth in employment for psychology-related professions (nearly 20% by 2024; Clay, 2017) and a rising emphasis on psychology for students going into medicine (Mitchell, Lewis, Satterfield, & Hong, 2016).

Not only is Intro Psych popular, but it has the potential to powerfully influence the millions of students who take it. The course imparts content that is relevant both to students' developing knowledge about themselves and others and to a wide range of other disciplines. As a *hub science* (Cacioppo, 2007), psychology is deeply interconnected with other major sciences, such as economics, education, and medicine. Intro Psych has the potential for great influence because, as a gateway course, it disproportionately serves college students in their first year, argued to be a "sensitive" period of development (e.g., Blakemore & Mills, 2014; Brady, Hard, & Gross, 2018). For many students, the first year of college can be particularly challenging: Students must adjust to a new, demanding environment in which they do not entirely know what to

expect. These features of the first-year experience mean that a student's trajectory can be shaped more dramatically during this time than in later years of college. For example, social–psychological interventions aimed at first-year students, such as those targeting belonging, can have lasting benefits, improving students' academic performance and well-being years later (Stephens, Townsend, Hamedani, Destin, & Manzo, 2015; Walton & Cohen, 2007). Relatedly, first-year experience courses (e.g., "first-year seminars") are associated with students' first-year GPA and retention in college (see Permzadian & Credé, 2016, for a review), illustrating the potential for courses taken early in college to have a lasting impact. Thus, like any introductory course, Intro Psych has the potential to teach students foundational skills for later coursework and shape their impressions of what college is like. Intro Psych may even be an ideal course to carry this hefty responsibility, given that its content is directly relevant to academic success (e.g., memory and learning), interpersonal success (e.g., social influence and cognition), and well-being (e.g., emotions, stress, and mental health).

Current Understanding of Intro Psych's Impact on Students

And yet, we know little about whether and how Intro Psych benefits students in the long term, especially for those who take the course in their first year of college. The existing research primarily focuses on students' acquisition of specific content knowledge and suggests that lasting effects are less robust than instructors hope (see Gurung & Hackathorn, 2018, for a review). While students are more likely to remember concepts and principles that were introduced with vivid, novel instructional techniques, such as in-class demonstrations (VanderStoep, Fagerlin, & Feenstra, 2000), both classic and recent research indicates that students quickly forget course content (Eurich, 1934; Greene, 1931; Gustav, 1969; Herman, 2010; Landrum & Gurung, 2013). For example, in one study (Landrum & Gurung, 2013), students performed with about 56% accuracy on a comprehensive test of representative concepts from their Intro Psych course, taken just two years earlier. Even psychology majors enrolled in a capstone course performed at a "D" level (63%) on the test.

Assessing how much content students retain from Intro Psych is important, but so too is assessing the broader skills and perspectives that students may gain. Beyond specific facts and definitions, what do students learn and take with them, years after the course has ended? An ideal way to assess the long-term impact of taking Intro Psych in one's first year of college would be to randomly assign students to take the course in their first year, perhaps through a lottery approach, and then to assess their knowledge and skills at various points during college compared to waitlisted students who may or may not take the course in a later year. Such an effort would be most feasible at an institution where Intro Psych is oversubscribed, and would be strengthened with standardized assessments of the knowledge and skills the course is intended to teach. Researchers could examine how experiences in the course predict performance on those assessments both in the short and long term. The American Psychological Association is working to create standard assessments of this nature (American Psychological Association, 2017), but results using them are likely years away. What can we learn in the meantime using available research methods that are relatively easy to implement?

The Present Study

The present study aims to extend previous research on Intro Psych by addressing three questions, outlined below. The measures for the study were included in a broader research effort[1] that followed up with senior undergraduates who had taken Intro Psych three years earlier when they were first-year students.

First, what do students describe as the most useful knowledge, skills, and perspectives gained from their Intro Psych course, years after course completion? In the survey, students were asked to describe what from the course they found most useful to them in college and in life more broadly. Given previous findings that memory for specific content fades quickly (e.g., Landrum & Gurung, 2013), we expected that students would describe "big picture" insights and perspectives rather than specific terms, studies, or theories. We also examined whether students who went on to major or minor in psychology would describe different knowl-edge, skills, and perspective than those who did not.

Second, what do students actually retain from Intro Psych in terms of specific content? Previous studies (Landrum & Gurung, 2013) have approached this question by having former Intro Psych students retake a cumulative exam with items that were representative of the previous exam they had taken. Students may or may not have seen these the items when originally taking the course. In the present study, we gave students a subset of test items from their very first exam in Intro Psych, which covered research methods, the biological bases of behavior (i.e., genetics and evolution, the nervous system, and brain), sensation and perception, and learning. Students had all responded to these test items previously, and we were able to compare their prior performance as first-years on these items to their current performance as seniors. Based on previous findings, we expected that students would forget considerable content in the years since taking the course, and thus perform worse on the retest than on the original. We also expected that students who went on to specialize in psychology as majors or minors would perform better on this retest than those who didn't, primarily due to repeated exposure to the content in later courses.

Third, is having had a better experience in Intro Psych as a first-year student (i.e., performed better, enjoyed it more) associated with more adaptive academic behaviors in students' senior year? To address this question, we first focused on students' study strategies. In this particular course, students attended lecture three times a week and read 15 chapters in a 16-chapter textbook. There was relatively little overlap between the content covered in lectures and the content covered in the textbook, so students were required to do considerable self-study. In such an environment, students had to quickly develop their study skills and strategies. Based on the experiences of the course coordinator (the first author) in teaching the course for many years, we compiled a list of the most common strategies that students reported using in the course, and asked students about their ten-

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[1] In addition to the questions for this study, the broader research effort also included measures to assess possible long-term effects of a test anxiety intervention (Brady et al., 2018).

dency to use these strategies years later, as seniors. Next, we focused on students' ability to manage course projects. In their Intro Psych course, students completed a project designed to give them experience thinking like a psychologist— specifically, students were required to propose an original research idea, outline the methodology to test it, and discuss implications of possible results. The project was intentionally structured to model adaptive project management approaches, in that it had several different phases, included multiple rounds of feedback, and required students to attend office hours at least once. Students thus experienced the potential value of breaking large projects into manageable steps, and seeking feedback from the instructor along the way. The grade on the project was largely based on a final, revised research proposal, and most of the students in our sample performed extremely well ($M = 91.2$, $SD = 3.68$, Range = 80 to 99). We expected that success with this experience might be related to better project management skills later in college. To find out, we asked students to rate their current approach to course projects by responding to questions that were inspired by the goals of the Intro Psych research proposal project.

Method

Participants

We invited 237 senior undergraduate students who had previously taken Intro Psych to participate. These students had taken Intro Psych during their first year (either Fall or Winter quarter) at a selective, private university. Of those invited, 156 (66%) completed the relevant questions for this study.[2]

Students who responded to the survey had performed slightly better in the course (overall grade = 89.5, $SD = 5.21$) than ones who did not ($M = 87.4$, $SD = 5.82$), and this difference was significant, $t(234) = -2.69$, $p < .01$, Cohen's $d = 0.38$. Although the sample overrepresented higher-performing students, the demographic composition of the respondents was representative of the original sample. A slight majority of the respondents were women (63.5% compared to 58% in the original sample, $\chi^2 = 1.41$, $p = .23$), and about a quarter were students from underrepresented racial–ethnic minority backgrounds (27% compared to 29% in the original sample, $\chi^2 = .20$, $p = .65$).

Although we did not collect students' ages, most seniors at the university are 21 or 22 years old.

Course and Study Design

The Intro Psych course that students took during their first year offered lectures three times a week, taught by a primary instructor. A course coordinator oversaw the curriculum and assessments. Students were required to attend weekly discussion sections, led by one or two teaching assistants who were a mix of psychology graduate students and advanced undergraduates. Students' course grades were based on three noncumulative exams in the course (60%), a research proposal writing project (20%), an in-class essay (10%), and participation in their discussion sections (10%).

In the fall of their senior year, students received an e-mail from the course instructor and course coordinator, inviting them to complete a 30-min survey about their experiences in college in general and with the Intro Psych course in particular. Procedures were approved by the campus Institutional Review Board.

Students completed the survey online, via Qualtrics. After completing the consent form, students responded to a variety of questions, discussed below.[3] Participants were compensated with a $20 gift card.

Measures

All survey questions used in the study and all relevant data to this article, with the exception of student academic records, are available through the Open Science Framework at https://osf.io/tvgky/. A full data file, which includes data from students' academic records, is available from the first author.

Experience with, and reflections on, psychology. Students responded to questions about their experiences with psychology at the university. They reported whether they were majoring or minoring in psychology and how

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[2] Thirteen additional students partially completed the survey but did not respond to the questions that are the focus of this study.

[3] Students also completed other measures not related to the current project, including questions about their level of stress, their beliefs about stress, strategies for coping with test anxiety, and their feelings of belonging.

many courses they had taken in psychology. They responded to two open-ended prompts: "What, if anything, did you learn in Intro Psych[4] that has been useful to you in your other classes?" and "What, if anything, did you learn in Intro Psych that has been useful to you in your life in general?"

Course content quiz. Students also completed a brief quiz that tested a subset of 16 test items that they had completed during their first midterm in the course.[5] The original midterm contained 50 multiple choice items worth 75% of the exam and a written answer section worth 25%. The 16 items encompassed all of the topics assessed on the original midterm: research methods, the biological bases of behavior (genetics and evolution, the brain and nervous system), sensation and perception, and learning. Students' original performance on these 16 items highly correlated with their overall performance on the multiple-choice portion of the midterm, $r(155) = .78$, $p < .001$, and modestly correlated with their performance on the written answer portion, $r(155) = .43$, $p < .001$.

Approaches to coursework during their senior year. Students also answered questions regarding their current approaches to coursework. First, students rated how often they used 10 different study strategies, ranging from memorizing definitions to attending faculty office hours in order to clarify material. Second, students rated their approach to course projects by responding to questions that were inspired by the goals of the research proposal project they had completed in Intro Psych. Students rated whether, as seniors, they (1) focus on the larger goals of the project and what they could learn from it, (2) divide up projects into manageable steps, (3) complete tasks a little bit at a time, instead of at the last minute, and (4) reach out to teaching staff for support and feedback.

Intro Psych course experience (assessed three years previously). Students' responses to the online survey were de-identified and linked to their prior data from the Intro Psych course using a research ID number. Prior data included the overall course grades as well as its components: the average of three noncumulative exams, a research proposal project that involves proposing an original research study, an in-class essay, and course participation.

Prior data also included responses to an online course evaluation designed by the instructional team and delivered in class on the last day of lecture. The evaluation asked students a wide variety of questions about their course experiences. Most relevant to the present research were ratings of how interesting lectures were and the overall effectiveness of the primary instructor, the course coordinator, and the student's section teaching assistant (TA; one item each). The ratings for the primary instructor and the course coordinator were moderately correlated, $r(148) = .49$, $p < .001$, which was sensible given that they were perceived by students as co-leading the class. Thus, we averaged these two ratings together into a single average for the instructor.

Results

What Do Students Say They Learned From Intro Psych?

Our first research question was, what do senior students identify as the most useful knowledge, skills, and perspectives gained from their Intro Psych course their first year? We used thematic analysis—coding for major thematic categories—to analyze students' qualitative responses to two questions: (1) What did you learn in Intro Psych that has been useful to you in your other classes? (2) What did you learn in Intro Psych that has been useful to you in your life in general? Using an inductive approach, the second author read the entire corpus of responses and then generated a list of themes that were mentioned by a significant number of students (i.e., more than 10% of responses). Then, the second author created a codebook to quantify the number of responses that fit a set of criteria for each major theme. An additional coder also coded the responses to determine interrater reliability, which was adequate, with Cohen's κ ranging from 0.66 to 0.83.

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[4] In the survey, the Intro Psych course was referenced by its institutional course number. Here, and in later examples of student responses, we have replaced this course number with "Intro Psych."

[5] As mentioned previously, this project capitalized on another research effort to assess the long-term impacts of an anxiety reappraisal intervention (Brady et al., 2018). The 16 test items were not randomly selected, but were chosen based on which test items had shown the largest effects of the intervention when students were previously enrolled in the course.

Thematic analysis revealed two major themes in students' descriptions of what they learned that was useful in other classes: first, the development of study skills and, second, foundational knowledge for subsequent classes. See Figure 1.

About a fifth (21.2%) of students said the course helped them identify and hone study skills useful in other college classes. Of these, some students described learning in Intro Psych that applying concepts to their lives was an effective way to learn course material. Others reported that course content helped them identify effective strategies such as self-quizzing and studying in environments that were similar to the environment they would be tested in. Illustrative responses include the following:

> From [Intro Psych], I have learned that I can best grasp material in classes if I try to envision how I can apply concepts to the world around me.

> It taught me to study hard to do well in classes. I take more time to study with others in test-like environments and to quiz myself as much as possible, drawing on old information.

Another fifth of students (21.8%) said the course equipped them with foundational knowledge for future classes. Many students mentioned that the material covered in course was revisited in greater depth in their later psychology courses. In addition, some students reported the course was helpful in nonpsychology courses, such as in human biology or product design. For example,

> [Intro Psych] does a really good job at previewing course content for other classes. Almost every psych class I've taken after [Intro Psych] (if not all) brought up a topic that was touched upon on [Intro Psych]. The classes elaborate upon what I was introduced to in [Intro Psych].

> It was helpful to know about the different functions of the parts of the brain for my later human biology classes.

Some students (9.6%) mentioned specific concepts and ideas they had found memorable and useful, but these did not converge on any single themes. For example, several students mentioned *growth mindset* (Dweck, 2006), *stereotype threat* (Steele, 1997), and *memorization techniques* (e.g., semantic encoding; Hyde & Jenkins, 1973) as important concepts that they learned. A larger number of students (34%) described learning things that seemed to capture
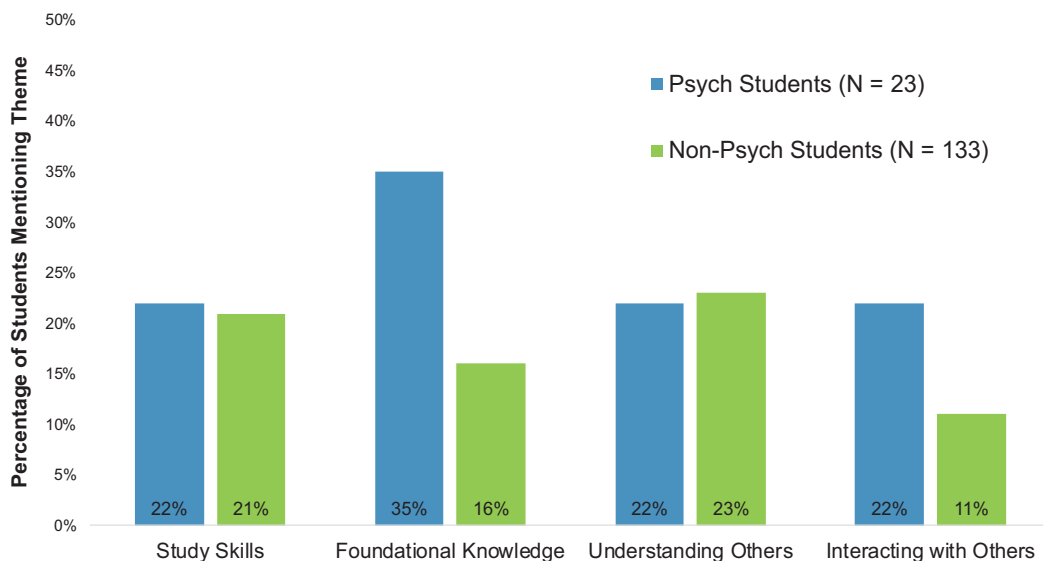

Figure 1. Students' qualitative descriptions of what they learned from Intro Psych showed highly similar themes regardless of whether the students specialized (i.e., majored or minored) in psychology or not. The only exception was that psychology students were more likely to report that the course provided foundational knowledge that was useful in later courses. See the online article for the color version of this figure.

the overarching content of the course, but were too vague to be thematic, such as "the way the mind works."

Did students who specialized in psychology as an academic major or minor report learning different knowledge and skills than those students who did not? Although the majority of the students did not specialize in psychology, 14% did (N_{majors} = 17; N_{minors} = 6). We found that themes in students' responses differed somewhat as a function of whether they specialized in psychology or not. As shown in Figure 1, psychology students were more likely to report that the class equipped them with foundational knowledge for future classes, χ^2 = 4.67, p = .03. No other differences were observed.

Thematic analysis revealed two major themes in students' response to the second question regarding what they learned in Intro Psych that was useful to their lives in general. Both themes emphasized the social relevance of the course.

A quarter of students (25%) reported that the knowledge gained in the course helped them develop a deeper understanding of people, such as an appreciation for how situations shape people's behavior, and greater empathy for others. Students said the following:

> I think it shifted my perspective on how I viewed people I previously didn't understand, and it helped me understand how each of us can act differently in the same situations.

> [Intro Psych] has been helpful in helping me to be more empathetic toward people and myself. It helps me to think critically about how or why people are who they are.

Relatedly, students described how the knowledge they gained in the course helped them interact better with others (12.8%). Students wrote the following:

> I think [Intro Psych] helped me challenge my immediate judgements and think critically about the way I and others think. It helps when thinking about how people perceive things and interacting with others.

> Studying emotion regulation and understanding how people process emotions has helped in interacting with people in healthy ways.

As with the other open-ended question, some students (10.3%) mentioned specific concepts and ideas they had found useful, but these did not converge on a specific theme. One student, for example, listed "growth mindset, bystander apathy, Pygmalion effect." A larger number of stu-

dents (35.9%) gave ambiguous responses that seemed to describe the broad content of Intro Psych, such as one student who said the course helped them recognize "different behavioral phenomenon[a] that occur." There were no differences in the types of responses to this question as a function of whether students specialized in psychology, largest χ^2 = 1.92, p = .17 (see Figure 1).

How Much do Students Actually Remember?

How well did students remember the course content, as measured by the 16-item quiz on questions they had previously completed during their first exam in Intro Psych? Did students who specialized in psychology retain the content better than students who did not? We performed a 2 × 2 mixed design ANOVA with timepoint as a within-subjects factor (first year, senior year) and academic specialty (psychology students, nonpsychology students) as a between-subjects factor. As shown in Figure 2, students answered 89% of these questions correctly when they were enrolled in the course as first-years (SD = 9.9%). As seniors, they answered significantly fewer questions correctly (M = 70%, SD = 17.2%), $F(1, 153)$ = 62.42, p < .001, M_{diff} = 18.3%, 95% CI [15.6%, 21.0%], η^2 = .12. Whether students specialized in psychology significantly predicted performance, $F(1, 153)$ = 8.27, p < .01, η^2 = .03, but this effect interacted with timepoint, $F(1, 153)$ = 7.73, p < .01, η^2 = .02. In follow-up analyses, we found that psychology students did not differ from nonpsychology students in their scores on these items as first-year students, $t(153)$ < 1, p = .38, M_{diff} = 2.0%, 95% CI [−2.5%, 6.4%], d = −0.2. However, psychology students performed better on the items as seniors, answering significantly more items correctly (M = 81%, SD = 14.3%) than nonpsychology students (M = 69%, SD = 17.0%), $t(154)$ = 3.26, p < .001, M_{diff} = 12.3%, 95% CI [4.8%, 19.7%], d = 0.74.

The superior quiz performance of the psychology students is likely driven by the higher number of additional psychology courses they took (M = 8.00, SD = 2.76) compared to nonpsychology students (M = 1.39, SD = 1.62), $t(154)$ = 16.06, p < .001, M_{diff} = 6.6, 95% CI [5.8, 7.4], d = 3.63. Nonpsychology students who took no other psychology courses after Intro Psych (N = 48) answered 66% of items correctly (SD = 17%).

We tested whether the number of additional psychology courses accounted for the effects of
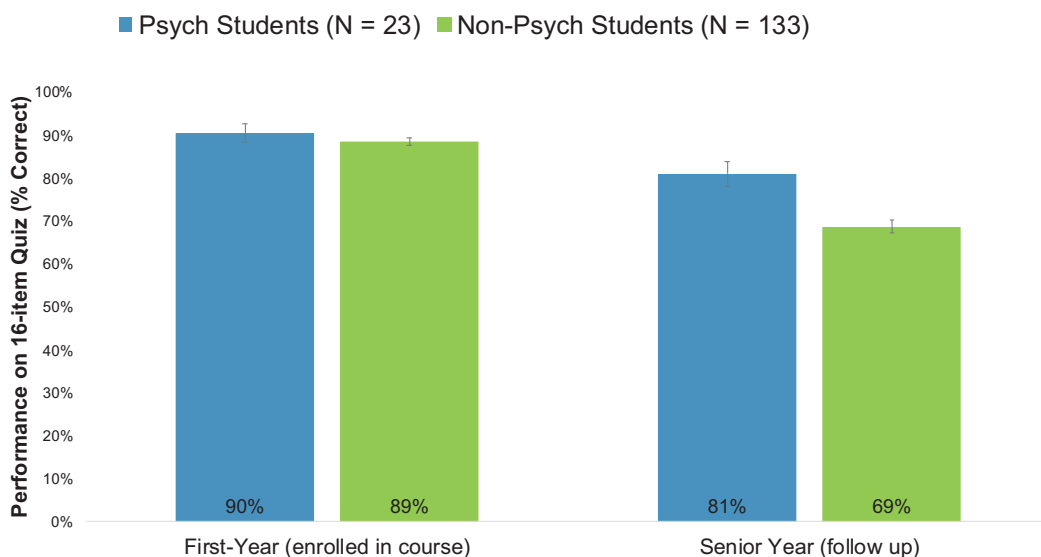
Figure 2. Overall, students performed less well on a subset of 16 exam items as seniors than they had on those same items when enrolled in Intro Psych as first-year students. Students who specialized in psychology (i.e., majored or minored) did not perform differently on the test items than nonpsychology students when enrolled in Intro Psych their first year of college. They did perform better as seniors on the same test items, however. Error bars show ±1 SEM. See the online article for the color version of this figure.

specializing in psychology on quiz performance using a hierarchical linear regression analysis. At Step 1, academic specialty (psychology students = 1, nonpsychology students = 0) was entered as the sole predictor of quiz performance and was significant, $\beta = .123$, 95% CI [.048, .197], $p < .001$. Alone, academic specialty accounted for 6.5% of the variation in quiz performance. At Step 2, we added the number of psychology courses taken to the model, which explained 4.5% additional variance in quiz performance, and this change in R^2 was significant, $F(1, 253) = 7.66$, $p < .02$. Critically, when number of psychology courses was included in the model, it was a significant predictor of quiz performance, $\beta = .020$, 95% CI [.006, .034], $p < .01$, but academic specialty was not, $\beta = -.009$, 95% CI [−.128, .110], $p = .88$. This provides strong evidence that psychology students performed better on the quiz because of their additional coursework in psychology.

Predictably, first-year performance on the items predicted senior-year performance, $r(155) = .33$, $p < .001$, 95% CI [.18, .46]. Students who answered more questions cor-

rectly while taking the course answered more questions correctly several years later.

Does Experience in Intro Psych Predict Later Academic Behaviors?

Given that many students reported that the course helped them to develop academic skills for other courses, was there any evidence that better experiences in the course as first-years predicted more effective approaches to their college coursework in their senior year, such as greater use of study strategies and more adaptive project management skills?[6] Table 1 provides descriptive statistics for students' initial performance in the course, as well as their ratings on course evaluations. Table 2 provides descriptive statistics for each item measuring students' study strategies and project management skills, as well as the averages across items.

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[6] Degrees of freedom vary somewhat across analyses due to missing data from when students originally took the course.

Table 1
Descriptive Statistics for Course Performance and Evaluations

	M [95% CI]	*SD*	*N*
Course performance in Intro Psych during first year			
Course Grade	89.59 [88.76, 90.43]	5.24	154
Average Exam Score	87.83 [86.65, 89.01]	7.45	156
Research Project Grade	91.20 [90.62, 91.78]	3.68	155
Section Participation Grade	94.06 [93.19, 94.93]	5.46	155
Evaluation ratings of Intro Psych during first year			
Lectures Overall: Satisfaction with the "interestingness and engagingness" of lectures (scale: 1 = *very dissatisfied* to 5 = *very satisfied*)	4.72	.48	148
Instructor Rating: Average overall effectiveness rating for the instructor and course coordinator (scale: 1 = *poor* to 5 = *excellent*)	4.77 [4.71, 4.83]	.38	148
Overall Effectiveness of Teaching Assistant (scale: 1 = *poor* to 5 = *excellent*)	4.27 [4.15, 4.39]	.73	148

Neither students' overall Intro Psych course grade, nor their grades specifically on exams, predicted their use of study strategies—either overall, $r(154) = -.023, p = .78$, or for any specific study strategy, smallest $p = .134$. Did students' enjoyment of the course, specifically their ratings of the course on the end-of-term evaluation, predict later study strategies? We found that overall ratings of the course instructors did predict overall use of study strategies, $r(148) = .266, p < .001$, 95% CI [.12, .42], and more specifically predicted the strategies of quizzing oneself, $r(148) = .219, p = .007$, 95% CI [.06, .37], and attending office hours to ask about confusing material, $r(148) = .174, p = .03$, 95% CI [.01, .33]. Ratings of how interesting lectures were, of their section TA, and of other features of the course did not predict study strategies.

What about students' approaches to course projects? Overall course grades in Intro Psych

Table 2
Descriptive Statistics for Study Strategies and Project Management Skills

STUDY STRATEGIES			
How much do you use each of the following study strategies before exams at [Institution Name]? (1 = *Never*, 2 = *Sometimes*, 3 = *Most of the time*, 4 = *Always*)			
	M	*SD*	*N*
Memorizing definitions	2.36 [2.23, 2.49]	.80	156
Re-reading the textbook	2.17 [2.05, 2.30]	.78	156
Reviewing lecture slides	3.38 [3.27, 3.49]	.71	146
Reviewing my own notes	3.30 [3.17, 3.43]	.84	156
Rewriting notes	2.06 [1.89, 2.23]	1.07	156
Creating mnemonics	1.78 [1.66, 1.90]	.76	156
Studying with friends	2.14 [2.01, 2.27]	.82	156
Quizzing myself	2.65 [2.51, 2.79]	.90	156
Reviewing prior assignments or problem sets	3.13 [2.99, 3.26]	.86	156
Attending office hours to ask about confusing material	2.32 [2.19, 2.45]	.84	156
Average: Overall use of study strategies	2.53 [2.47, 2.59]	.38	156
PROJECT MANAGEMENT SKILLS			
Please rate your agreement with each of the following statements:			
When working on a course project . . . (1 = *Strongly disagree*, 7 = *Strongly agree*)			
. . . I think about the overall goal of the project and what I am supposed to learn from it.	4.74 [4.52, 4.95]	1.37	156
. . . I try to break the project into smaller, more manageable steps.	5.49 [5.30, 5.67]	1.18	156
. . . I do a little but at a time, rather than putting off tasks to the last minute.	4.11 [3.85, 4.36]	1.62	156
. . . I feel comfortable reaching out to my instructor or TA for support and feedback	5.08 [4.85, 5.30]	1.43	156
Average: Overall project management skills	[4.71, 5.00]		156

did predict adaptive project management skills during the senior year, $r(154) = .24$, $p = .003$, 95% CI [.08, .38]. As shown in Table 3, all aspects of course grade correlated with later approach to projects, but students' grade on the research proposal project was the mostly strongly correlated, $r(154) = .32$, $p < .001$, 95% CI [.17, .45]. Ratings of the course instructors also predicted more adaptive project management skills, $r(148) = .294$, $p < .001$, 95% CI [.14, .44], but ratings of the section TA (who most directly mentored students on the project) did not, $r(148) = -.03$, $p = .76$.

Discussion

The present study represents a first step toward understanding the influence of Intro Psych by surveying senior undergraduates who completed the course in their first year of college. We aimed to generate insight into what students think they learned, how much detail they actually retained, and whether their experiences in the course as first-years predicted any of their academic behaviors as seniors. Although the study has a number of limitations, it provides initial evidence of the lasting impact that Intro Psych may have on students, hopefully inspiring additional, more rigorous research efforts.

Students Report Learning Skills, Knowledge, and Perspectives

Years after the course, students described how Intro Psych shaped their skills, knowledge, and perspectives. Students reported that the class fostered effective study strategies and foundational knowledge that they applied to

other courses. More broadly, students said the course shaped their perspectives on the social world by helping them understand and interact more effectively with others. By and large, students who went on to specialize in psychology reported gaining similar ideas and skills when compared to nonmajors.

This similarity between majors and nonmajors may reflect that their Intro Psych course was designed to serve majors and nonmajors in similar ways, as has been recommended by the American Psychological Association and by prominent scholars in the scholarship of teaching and learning within psychology (Gurung et al., 2016; Halpern, 2010). Alternatively, majors and nonmajors may report learning similar concepts and skills because they tend to have similar interests in an Intro Psych course. Prior work suggests that students in Intro Psych, regardless of their intended major, tend to value concepts that are relevant to their immediate needs as students, such as academic and interpersonal success. Zanich and Grover (1989) found, in their surveys of students just before and after taking Intro Psych, that students gravitate toward these topics regardless of their major, and remain similarly interested in these topics after the course is over. Our findings hint that these interests are reflected in what is retained years after the course has ended.

Content Knowledge Lingers, Especially for Majors

In comparison to previous studies, we found evidence of relatively strong retention of course concepts. We retested students on concepts originally presented on their first midterm and

Table 3
Correlations Among Course Performance, Evaluations, and Outcome Measures

	1	2	3	4	5	6	7	8	9
1. Course Grade	—								
2. Average Exam Score	.981***	—							
3. Research Project Grade	.544***	.420***	—						
4. Section Participation Grade	.450***	.356***	.284***	—					
5. Rating of Lectures Overall	−.009	−.020	.024	.026	—				
6. Rating of Instructor Effectiveness	.131	.109	.145	.138	.166*	—			
7. Rating of TA Effectiveness	−.050	−.070	.106	−.030	.053	.144	—		
8. Study Strategies	−.009	−.033	.048	.120	−.023	.266**	−.032	—	
9. Project Management Skills	.239**	.201*	.316***	.234**	.075	.294***	−.025	.382***	—

* $p < .05$.   ** $p < .01$.   *** $p < .001$.

compared their performance across the two tests. Students experienced a 21% drop in performance compared to their performance as first-year students, but still earned what would have been a passing grade of 71%—meaningfully higher than the 56%–63% performance rates found in other studies (Landrum & Gurung, 2013). Still, and consistent with prior findings, students performed better on the retest if they were majoring or minoring in psychology. Nonmajors performed better if they had taken more additional courses in psychology, and students whose only psychology course was Intro Psych scored about 65%.

There are several possible explanations for why students showed greater evidence of retention than students in prior work. One explanation relates to the nature of the sample: Students in the present study attended a highly selective university and likely had strong study skills that boosted long-term learning. Additionally, higher-performing students were more likely to respond to the survey, a self-selection bias not found in previous studies (Landrum & Gurung, 2013). Other explanations relate to the nature of the first exam in an Intro Psych course. Early parts of an Intro Psych course tend to cover foundational content (e.g., research methods, biological bases) that is likely to be revisited during later parts of the course and potentially in other courses inside and outside of psychology. Additionally, the very first exam in a course, especially during a student's first year, may be particularly meaningful and memorable. Students likely study harder for this exam because they do not know what to expect.

Course Performance and Evaluations Predict Some Academic Behaviors

Additionally, several aspects of students' academic behavior as seniors were correlated with their prior experiences in Intro Psych. Specifically, first-year students who performed better on a term project later self-reported more use of effective project management skills as seniors. This relationship hints at the potential for introductory course assignments to shape students' approach to assignments in later courses. We interpret this correlational finding cautiously, however, just as we would teach our students to do. We do not know whether students who engaged well with the project (and thus earned a good grade) developed effective project management skills, or whether students who already had effective project management skills in their first year (and thus still had them in their senior year) engaged well with the project. Additionally, our measure of project management skills is novel and quite brief. Further work is needed to determine its reliability and validity or to develop a more detailed and robust measure.

Of note, students' performance in the course was largely unrelated to their later use of study strategies. Our measure of study strategies was coarse and self-reported—we simply asked students to indicate their use of a range of different study strategies and did not capture individual differences in studying efficiency or whether students adopted the best strategy for a given context. Future work should make use of validated measures of study strategies, such as the Study Behavior Checklist (Gurung, Weidert, & Jeske, 2010) or the Ten Learning Techniques (Bartoszewski & Gurung, 2015). Furthermore, because our sample comprised students at a highly selective university who are likely relatively skilled at studying, even as first-year students, the range in use of study strategies may have been too restricted to detect a relationship with prior grades.

Although we found a modest relationship between how much students enjoyed the course, as measured by their ratings on course evaluations, and their later outcomes, these relationships were not especially revealing. We found, for example, that students' ratings of the course instructors were related to using more study strategies, on average, and with using a particularly effective study strategy: self-quizzing (e.g., Roediger, Agarwal, McDaniel, & McDermott, 2011). Students' ratings of the course instructors were also correlated with their later project management skills. Although it is possible that students were inspired by their instructors to develop these skills, it is equally plausible that students who mastered studying and tackling course projects in their first-year Intro Psych course also came to like their instructors more. There may also be a third variable: Students who were more academically engaged in their first year both liked their instructors more and developed more effective academic strategies.

There are many reasons why responses to course evaluations may be unrelated to later

outcomes. In particular, some work suggests that course evaluations do not capture the true quality of students' learning experience. They are influenced less by how much students learn than by course characteristics, such as class size, and instructor characteristics, such as gender and academic rank (Johnson, Narayanan, & Sawaya, 2013).

Limitations and Future Directions

Our study is one of only a few to follow up with students years after they have taken Intro Psych and provides initial evidence that Intro Psych teaches students much more than terms and definitions. Although the present findings provide a promising first look at the impact of Intro Psych, much remains unknown. First, how does the long-term impact of Intro Psych depend on the design of the course and the characteristics of its students? Our sample was limited to students at a selective private institution with a well-funded, highly supportive Intro Psych course. Students in this course performed very well on average and rated the course instructors very positively. Our findings were also limited by self-selection bias—students who responded to our survey were higher-performing than those who did not. Thus, our findings may describe the "best case scenario" for Intro Psych: what is possible when well-prepared students take an Intro Psych course designed to support their long-term learning. Whether and how these findings extend to different populations of students experiencing different Intro Psych courses is a question for future research.

Second, how can we learn about the broader ideas and skills that students gain from the course without relying on self-report? Students may not be fully aware of, or able to articulate, the broader ideas and skills they gain from a course, highlighting a key need for objective follow-up assessments. For example, a vast majority of students did not mention the class cultivating critical thinking skills, a key learning goal for many Intro Psych courses. Students may not understand or be able to adequately self-assess their own critical thinking. Future work may look to include standardized assessments of critical thinking skills.

A third salient question is whether and to what extent introductory courses in other disciplines predict student outcomes. Are there general academic skills and orientations that any well-developed introductory course, regardless of discipline, could help foster? We found that experiences in Intro Psych during the first year predicted approaches to coursework years later. Would performance in any of a students' intro courses, especially those taken during the first year, be similarly predictive? If so, are such courses directly developing those academic behaviors? There is little data to address this question. Although researchers have explored the long-term impact of specific coursework, such as the influence of taking college economics classes on future civic behaviors (Allgood, Bosshardt, van der Klaauw, & Watts, 2004), this work does not focus on courses taken in the first year of college. Research on the impact of first-year experience courses, largely seminars, finds that taking these courses is associated with better student achievement and persistence (see Permzadian & Credé, 2016, for a review), but does not address the development of students' academic skills. To our knowledge, no existing studies examine the long-term effect of disciplinary introductory courses taken in the first year. Future studies could obtain data from other first-year courses to examine discipline-specific impacts. Understanding how and why different first-year courses shape later outcomes could guide institutions in making better curriculum decisions and students in selecting first year courses.

Finally, how does Intro Psych influence students with different interests and goals? We found that students described similar "lessons learned" from the course regardless of whether they were majors or nonmajors, but we do not yet know whether students carry slightly different skills and perspectives with them depending on their chosen major or career (e.g., health-related professions or business-related professions).

Concluding Remarks

Intro Psych serves many students and has the potential to cultivate valuable skills and ideas that students can carry with them well beyond the final exam. Using both qualitative and quantitative data, the current research takes a critical first step to understanding the long-term impact of the course on students' skills, broader perspectives, and experiences. Given the impor-

tance of Intro Psych both to our field and, arguably, to a liberal arts education, we hope these findings inspire new efforts to clarify and expand our knowledge of this course.

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