

A Workbook for Scaffolding Mentored Undergraduate Research Experiences in the Social and Behavioral Sciences

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Research mentors strive to ensure that undergraduates gain research skills and develop professionally during mentored research experiences in the sciences. We created the SURE (Specialized Undergraduate Research Experience) Workbook, a freely-available, interactive guide to scaffold student learning during this process. The Workbook: (1) identifies mentees' relevant strengths and areas for improvement, (2) encourages effective long-term goal setting, (3) ensures clear communication to facilitate a positive mentor-mentee working relationship, (4) exposes mentees to all phases of the research process, (5) develops mentees' autonomy for research and related professional experiences, and (6) offers mentors a concrete assessment tool to evaluate student participation and development over the course of the research experience. Hands-on research experiences can be invaluable and transformative in undergraduates' professional development, and we predict that the additional structure and standardization provided by the SURE Workbook will help maximize student learning and performance during such experiences. Thinking ahead, mentees who cultivate positive attitudes about research by using the SURE Workbook may be more inclined to pursue research professions and effectively mentor others when they graduate.

Daphne was thrilled to begin her junior year as a research assistant. Unfortunately, her faculty mentor's frequent traveling made him unavailable to mentor her, and he assigned Daphne to work with one of his graduate students. Daphne came into the lab each week and completed her assigned tasks, but she rarely saw the graduate student or the faculty mentor, except at weekly lab meetings. Consequently, she failed to develop any new skills or ideas and felt discouraged that she was used for the tedious lab tasks nobody else wanted to do. At the end of the semester she decided research was not for her and took a different path.

Daphne's friend, Allison, was equally excited to begin a mentored research experience. Allison's semester was quite unlike Daphne's. Her mentor met with her regularly one-on-one and gave her opportunities to learn about various phases of the research process. Allison, like Daphne, worked hard to complete each task, but she was always aware of the long-term study goals. In doing so, she developed many useful skills and was inspired to apply to graduate school to continue doing research.

Although these specific stories are fiction, many undergraduates report similar positive and negative experiences (e.g., Linn, Palmer, Baranger, Gerard, & Stone, 2015). One of the most important factors in undergraduate student development is the nature and quality of students' interactions with faculty beyond the classroom (Astin, 1993). In the social and behavioral sciences, hands-on research experience outside of the classroom (i.e., not part of a research methods or other course)—either in an experimental laboratory or in the field—is vital for preparing students for graduate school or other professional endeavors. The National Science Foundation reports that such experiences are “one of the most powerful of instructional tools” (NSF,

1996, p. 6). Collaborations between students and faculty have even been described as the “pedagogy for the twenty-first century” (e.g., Dotterer, 2002, p. 81).

In the present paper, we highlight why undergraduate research participation is important, including the benefits to undergraduates and their mentors, and how we as mentors can increase the likelihood that undergraduates have a positive and well-rounded research experience. We then present a learning tool we developed to address some of the common challenges faced by mentees and mentors in the behavioral and social sciences: the SURE (Specialized Undergraduate Research Experience) Workbook, available in the Supplementary Materials. This interactive guide scaffolds learning in the seven major phases of the research cycle (i.e., beginning with the literature review and ending with dissemination of findings and professional development), and it is intended to be used by mentors as a structured assessment technique for undergraduate researchers.

The Benefits and Popularity of Mentored Research Experience

Undergraduates benefit from hands-on research experience (e.g., McConnell, Albert, & Marton, 2008). Likewise, research mentors—whether they are faculty, post-doctorates or graduate students—benefit from having undergraduate research collaborators. In theory, undergraduate science majors should develop an understanding of the research process and have an opportunity to explore a research area to see if it is one in which they wish to pursue a career. Such research experiences transform students into self-learners (Wolfe, Reynolds, & Krantz, 2002). Through hands-on research, students experience a higher level of engagement

compared to traditional lecture-based instruction (Elmes, 2002), and a higher level of engagement has been demonstrated to improve student learning (Bluestone, 2007). Participating in mentored research experiences engages students in experiential learning (Benson & Blackman, 2003; Bluestone, 2007; Longmore, Dunn, & Jarboe, 1996) and has been shown to increase students' self-reported interest in applying to graduate or professional programs (e.g., Eagan et al., 2013).

Additionally, there are practical benefits to undergraduate research. For example, during mentored research experiences, students develop technical and interpersonal skills, such as analytic, logic, synthesis, writing, speaking, and reading skills (Wolfe et al., 2002), as well as independent learning skills (Ishiyama, 2002; Kardash, 2000; Landrum & Nelsen, 2002). These foundational skills are transferrable across disciplines and beyond the classroom. Research experiences also increase students' marketability for graduate programs and employment (American Psychological Association, 2007; Elmes, 2002; Kiemiesky, 2005). Beyond these practical benefits, collaborative research experiences improve students' academic achievement, interpersonal interactions, and self-esteem (Prince, 2004). Thus, it is not surprising that students view research experiences positively (Chapdelaine & Chapman, 1999; Gibson, Kahn, & Mathie, 1996; Landrum & Nelsen, 2002). In fact, graduating seniors often advise first-year students to get involved in research (Norcross, Slotterback, & Krebs, 2001).

Given the benefits of participating in research experiences, one might expect (and hope) all students participate in at least one mentored research experience during their undergraduate careers. Indeed, undergraduate students commonly participate in research, most often toward the end of their undergraduate careers; however, the nature and number of opportunities for undergraduate research varies greatly across institutions. One study found that out of 3,200 students surveyed in SBES disciplines (social, behavioral, economic sciences), about half participated in undergraduate research experiences (Russell, Hancock, & McCullough, 2007). For contrast, in the field of psychology, most departments in four-year institutions *require* undergraduates to participate in at least one course-based laboratory or structured research experience, and between one-third to half of all psychology departments require an individual research project (e.g., Cooney & Griffith, 1994; Terry, 1996).

The Development of the SURE Workbook

Purpose and Objectives

We have been involved in undergraduate research experiences as mentees and as mentors at both teaching-focused and research-focused institutions. We

have worked with dozens of undergraduate students in five laboratories with 20 years of combined mentoring experience. Such experiences include supervising students on independent and honors thesis projects, supporting student conference presentations, and publishing work with undergraduates at conferences and in refereed journals. Based on our personal experiences, as well as a careful examination of Linn and colleagues' (2015) review of effective mentoring, we identified the following six goals as crucial for a mutually beneficial experience for both mentors and mentees: (1) identify mentees' relevant strengths and areas for improvement (e.g., scientific writing, using library resources), (2) encourage long-term goal setting (e.g., improve time management skills, become familiar with a new statistical method or software program), (3) establish clear communication to facilitate a positive mentor-mentee working relationship, (4) expose mentees to all phases of the research process, (5) develop mentees' autonomy for research and related professional experiences, and (6) offer mentors a concrete assessment tool to evaluate student participation and development over the course of the research experience.

In an effort to improve and structure undergraduate research experiences, we kept the above objectives in mind and created the SURE Workbook assessment tool (see Table 1 for the SURE Workbook table of contents; see Supplemental Materials for a full copy of the Workbook). Along with ensuring at least three one-on-one meetings per semester between mentors and mentees (i.e., preliminary, mid-semester, and final), the SURE Workbook was designed to scaffold learning in the six major phases of the research process: conducting a review of relevant literature, following ethical research guidelines, identifying the design and methodology for the project, analyzing data, discussing implications of the findings, and developing professionally (see Figure 1 for sample page). We designed the Workbook to be flexible for any science mentor and undergraduate researcher, including students joining a project at different stages of completion or taking on a small or large number of roles within a project. Regardless of the research stage or the mentee's role, the Workbook is designed to make mentees mindful of the entire research process by asking them to become familiar with the project's topic and research design.

We intend for mentors to also benefit from using the SURE Workbook with their mentees. First and foremost, the Workbook fosters communication by providing mentors with discussion points to strengthen the mentor-mentee working relationship. In addition, the Workbook ensures that mentees are knowledgeable of the project as a whole. Knowing more about the project is likely to enhance the mentee's feelings of ownership, which should increase mentees' effort and

Table 1
SURE Workbook Table of Contents

1. Preface	
2. Student Self-Assessment of Current Knowledge and Mentoring Style	
a. Report knowledge, skills, and comfort levels on various aspects of the research process	
b. Determine preferred mentoring style and mentee work ethic	
3. Early Semester Meeting with Research Mentor	
a. Establish expectations of student and research mentor	
b. Set realistic goals and a timeline for the semester	
c. Optional contract between mentor and mentee	
4. Mid-Semester Meeting with Research Mentor	
a. Reevaluate goals, set new goals	
b. Talking points to discuss student's experiences	
5. Final Meeting with Research Mentor	
a. Reassess original goals and timeline, discuss accomplishments	
b. Student and mentor share constructive feedback	
c. Identify and discuss student's future goals	
6. The Research Process	
a. Literature review	
b. Research ethics	
c. Methodology	
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f. Professional development	
7. Suggested Resources for Students and Mentors	
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b. Recommended readings and websites for mentors	
8. Answers to Self-Assessment Questions	
9. Appendix	

attention to detail (Todd, Bannister, & Clegg, 2004). We assert that the difference between a research “assistant” and a “collaborator” is the level of investment. Whether mentees are entering into an established research program, or developing independent projects, the SURE Workbook allows mentees to become research collaborators by fostering a global understanding of the research process with respect to the project on which they are working. Once completed, the Workbook is also a written record of a student's contributions over the term. Thus, mentors can assign sections as a form of assessment if a letter grade is to be assigned to the experience, and use the contents of the completed Workbook to enhance letters of recommendation, if requested.

Uniqueness of the Workbook

The name *SURE* was chosen to reflect our goals for the Workbook. It is *Specialized* to each student's needs. The Workbook begins with a self-assessment of students' research skills and personal work ethics. The questions are designed for a psychology student, but the downloadable Word

Document can easily be modified for other disciplines. From the results of the self-assessment, the mentor-mentee team can work to create short- and long-term goals for the experience and beyond. As described earlier, the Workbook is flexible in that it can be used at various phases of the project, from its inception and design, to its final publication. Further, students can describe their specific roles in the project and track progress towards their learning goals throughout the experience.

Next, the SURE Workbook aims to help *Undergraduate* researchers who are interested in improving their research skills through hands-on mentored research experience. To this end, we provide a professional development section with tips for applying to graduate school and jobs in order to aid in the transition to post-graduation life (see Figure 2). We intend for the Workbook to be a useful resource for students beyond the research project.

The *Research* and *Experience* components of the *SURE* title are self-evident. The overarching purpose of the SURE Workbook is to expose students to the major phases of the research process while aiding in the

Figure 1

Excerpt from SURE Workbook Analyses section. The section asks mentees to first consider how raw data will be organized, what statistical software will be used, details of hypothesis testing, and effect size. The section ends by asking mentees to sketch an appropriate figure representing the results of one of their statistical tests.

The Research Process – Analyses

Using the sample below as a guide, fill in the chart to organize the statistic(s) for each research prediction. Provide as much detail as possible. Continue on another sheet of paper if needed.

Research Prediction	Analyze Data with Descriptive Statistics?	Analyze Data with Inferential Statistics?	Why?
Mean scores for Group A will be higher than for B and C on the task.	Yes- Mean, median, mode, range, standard error, standard deviation	Yes- One-way ANOVA	Three levels of the independent variable; analyzing means.

Writing Exercise. Practice reporting some of your results in APA format. Consult the APA Publication Manual, 6th Ed. wherever needed. Remember, to clearly communicate what you found, include (1) the statistical test used, (2) the result of the test in words, (3) the result of the test in numbers, and (4) a measure of effect size. For example:

“A one-way ANOVA showed that mean scores on the spatial cognition task were significantly different across Groups A, B, and C, $F(2, 49) = 5.77, p = .002, \eta^2 = .53.$ ”

Keywords in Writing Results

The best way to become a clear mechanical writer is practice! Here are a few tips that we have picked up:

- ✓ A statistic with a p -value that is above the critical value is not “insignificant” because it is still telling you something important! However, it is written as “statistically non-significant.”
- ✓ Hypotheses are never “proven,” “true,” or “wrong.” They are either “supported” or “not supported” by your data.
- ✓ When a p -value hovers around significance (e.g., $p = .06$, if the critical value is $.05$), it is fair to say that there is a “trend” in the direction you predicted, but it is still statistically non-significant. This is often a good time to think about possible Type II error!
- ✓ In the Results, “data” is followed by a plural verb, as in, “The data were collected in a lab-setting.”

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development of a fulfilling working relationship with a faculty, post-doctorate, or graduate student mentor. In addition, the Workbook is a testament to the mentee’s hard work and visible progress, which otherwise may be overlooked or forgotten in a busy

laboratory setting. Finally, and perhaps most critically, the SURE Workbook is a method of assessing learning outcomes and ensuring achievement of the six goals of research mentoring, which we outlined above.

Figure 2

Excerpt from SURE Workbook Professional Development section. The section includes information on résumé/CV updating, tips for writing a personal statement, etiquette in requesting letters of reference, and avenues for communicating research findings.

The Research Process – Professional Development

- ✓ Identify important characteristics of individuals in your field (e.g., leadership, creativity, critical thinking), and how you embody those characteristics.
- ✓ Discuss career and long-term goals. Show that you are thinking for the future and how acceptance into their program will help you reach those goals.
- ✓ Include a hook-line in the beginning to draw your reader in and make admissions committees remember you and want to keep reading about you.
- ✓ Be original in your thoughts and how you portray yourself.
- ✓ Proofread for grammar and spelling errors!
- ✓ Weave in examples to show that you are aware of the research being done in your field (or by the major professor or specific employer with whom you would like to work).

Requesting Reference Letters. Requesting letters of reference can be a sensitive subject even if you feel comfortable with your research mentors. We recommend that you follow three steps to ask your mentors if they are willing to write you strong reference letters.

Step 1: Prepare your CV/résumé, as well as detailed descriptions of your relevant lab and class experiences with your mentors. This Workbook is a great place to start for ideas. Also, if you worked closely with graduate students, ask them to write a brief, informal reference letter.

Step 2: Set up individual meetings with your mentors. During the meeting, describe your application plan. Provide your mentors with your prepared materials (described in Step 1). Ask them to email you if they feel they could write you strong letters of reference. Ask your mentors, "Can you write me strong recommendation letters or would it be better if I asked someone else?" This gives your mentors an "out" if they do not feel able. Also, be sure to mention that you will provide them with additional materials for writing your reference letters—such as instructions and envelopes (described in Step 3)—if they agree.


Step 3: If your mentor agrees to write, the following are crucial to making the process go smoothly:

- Remember your mentor is taking time to do you a favor, so convey your appreciation
- Allow your mentor ample time to write. A good rule of thumb is at least 4-6 weeks.
- Create a personalized spreadsheet for your mentor. For each application that requires a letter, include: 1) specific reference instructions so that your mentor knows which areas (e.g., your research ability, leadership qualities, character) to focus on when writing, name of the school, name of the program, name of particular individuals with whom you'd like to work, 2) clear submission deadline dates, 3) the method of submission (e.g., specific website, through email) and the mailing or web add, and 4) notes about anything specific you would like your letter-writer to say in his/her letter about you..
- The cleaner your application folder, the happier your mentor will be. Happy mentors write happy letters!

Trouble Shooting

What if my mentor won't write me a letter of recommendation?

- Do not take it personally! Your mentor may have too much going on to commit to writing for you.
- No matter how curious you are, asking your mentor for the reason he or she refused is unprofessional.
- Reflect on potential reasons for the refusal. Did your mentor not know you well enough? Did you do the bare-minimum work? Did you not seem interested or invested in your project?



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Addressing Undergraduate Researchers' Challenges

Although research opportunities for undergraduates are common and many students have positive experiences, negative experiences are not uncommon (Linn et al., 2015). We, too, observed this following an anonymous survey at a highest research-focused doctoral institution (see Appendix). We developed this

survey to obtain information about graduate students' histories conducting research as undergraduates. We primarily focused on their perceptions of their research experiences, the quality of their research training and contact with mentors, and anecdotes that captured their experiences. After obtaining approval from the institutional review board, we surveyed 24 graduate students who participated in research experiences as

undergraduates. The survey was administered online. Students described their home institutions as baccalaureate liberal arts institutions (31%), higher research activity doctoral institutions (4%), and highest research activity doctoral institutions (65%). They also reported their undergraduate institutions considered research to be “not important” (4%), “slightly important” (12%), “important” (23%), “very important” (15%), and “extremely important” (46%). These data suggest a range of mentoring quality, campus cultures/values, and research experiences.

Respondents described their overall research experience as “neutral” (13%), “positive” (29%), or “very positive” (58%), with no participants reporting a “very negative” or “negative” experience. A variety of positive emotions and feelings were noted (e.g., excited, challenged, prepared for graduate school, appreciated, important). Further, only one respondent described their experience as “not significant” to their academic development. Despite mostly positive perceptions, 67% of respondents reported at least one negative emotion or feeling (e.g., overworked, neglected, abused, disappointed) associated with their time as an undergraduate researcher.

Six themes emerged from the negative emotions and feelings that were reported. We used these themes to further enhance the Workbook. In the next section, we review the negative experience themes our student participants reported and briefly describe how the SURE Workbook addresses the challenges perceived by undergraduate researchers.

Lack of Time or Resources

The relationship between undergraduates and their research mentors is time-bound and therefore requires that mentors prioritize their time to work with their mentees (Anderson & Shore, 2008). Additionally, mentors must use caution not to take on too many mentees, as mentors must be willing to devote a substantial amount of time and resources (e.g., access to computers, research equipment) to each mentee. Given Behar-Horenstein, Roberts, and Dix’s (2010) recent findings that mentees can feel neglected and shuttled off to unofficial mentors in the lab (e.g., mentor’s graduate students), accountability for the mentor would be beneficial. The SURE Workbook is designed to preemptively address issues of accountability. It reassures undergraduates that they will meet with their faculty mentor at least three times during the semester to discuss their projects and to set and evaluate feasible goals for the experience. In addition, the optional mentor-mentee contract establishes meeting frequencies at the beginning of the term so that both mentor and mentee can agree on the commitment (see Figure 3).

Inadequate Support

An effective mentored research experience requires guidance (i.e., structured support, scaffolding of learning), but this amount may vary with the developmental level of the mentee, the complexity of the tasks, and the goals of both the mentor and mentee. Consequently, the supervision style utilized by the mentor may either be too much (e.g., micromanaging) or not enough (e.g., mentor traveling and unavailable for regular meetings). To complicate matters, young adults are often unaware of the amount of guidance they require or may feel uncomfortable asking for additional support from mentors. In the Workbook’s provided self-assessment, the mentor and mentee will get a sense of the mentee’s entering research knowledge and skills. This should help the mentor tailor tasks and responsibilities to the student’s intellectual level and motivation. Also, during the first meeting, the SURE Workbook asks mentors and mentees to reflect on and discuss issues such as work ethic and expectations for the term. This represents another way the Workbook serves as a communication facilitator, effectively building a positive rapport between mentor and mentee.

Misunderstanding

Disappointments and disagreements often result from failures to communicate expectations (Young & Perrewé, 2000). Mentors and mentees must explicitly share their thoughts at the beginning and throughout the term. Mentors need to listen to mentees and be sensitive to both verbal and nonverbal communication, especially signs of frustration or distress. As explained above, one of the defining features of the SURE Workbook is the emphasis on communication and accountability. Through the provided discussion points, structured meetings, reflective self-assessment, commitment contract, and goal setting, the mentor-mentee partnership is enhanced by the Workbook’s communication-building exercises.

Intellectual Contributions and Authorship

To better engage undergraduates in the research process, mentors should give mentees some freedom to define and guide their research experiences. The SURE Workbook is designed to facilitate these discussions during the first mentor-mentee meeting. Encouragement, incorporation, and acknowledgement of mentees’ ideas are three important steps towards making mentees feel valued. If mentees’ contributions are significant, some discipline-specific organizations like the APA state that undergraduates should be given authorship. This authorship may take the form of publishing in an undergraduate journal (e.g., *Psi Chi*

Figure 3
Optional SURE Workbook mentor-mentee contract to be filled out during initial meeting.

Mentor-Mentee Contract

Mentor and Mentee Contract

“Better than a thousand days of diligent study is one day with a great teacher.”
– Japanese Proverb

We agree to the following terms for our mentor/mentee relationship:

Duration of mentorship: _____

Anticipated duration of project: _____

Frequency and type of meetings (e.g., lab meeting, one-on-one): _____

Preferred modes of communication (e.g., phone, email): _____

Number of hours per week mentee should spend working on project: _____

Major goals of mentee and mentor: _____

_____	_____
Mentee Printed Name and Signature	Date
_____	_____
Mentor Printed Name and Signature	Date

Journal of Psychological Research), presenting at conferences, or publishing in peer-reviewed journals. Although undergraduates can earn authorship, some mentors vary in their willingness to include undergraduates as co-authors (Fine & Kurdek, 1993). The Workbook’s initial self-assessment addresses research ethics, including authorship conflicts, to educate mentees. We agree with others (e.g., Fisher,

2003) that authorship conflicts often occur because of inadequate communication at the start and periodically throughout a project regarding the merits of authorship, expectations, and agreement on how the work shall be divided. The Workbook ensures both the mentor and mentee share and track their goals for the term, minimizing the potential for such conflicts.

Depth of Experience: Balancing Productivity and Learning

Mentors are described as being both “talent scouts” and “gatekeepers,” according to Anderson and Shore (2008). That is, mentors seek out mentees with exceptional skills and strengths, and they match mentees’ strengths to appropriate research tasks. At the same time, mentors can selectively exclude certain mentees from becoming involved in various research assignments if mentees are perceived as not being worthy of the investment. Thus, mentors are in a position of authority over mentees and may—perhaps without awareness—use this power to exploit them (Blevins-Knabe, 1992; Green & Bauer, 1995). Undergraduate mentees, compared to graduate students, may be less capable of recognizing and advocating for themselves when confronted with situations in which they may be taken advantage of (Anderson & Shore, 2008). For example, a mentor may ask a mentee to do tasks outside of the scope of the project, or academics in general, which would clearly be inappropriate (e.g., babysitting the mentor’s children). In addition, mentors may fail to integrate undergraduates into the entire research process (e.g., understanding of the background literature, theoretical motivation). In part, the cause of such problems may be that the primary goal of undergraduate research for some mentors is productivity (Kierniesky, 2005). This narrow focus can be highly detrimental to the quality of a student’s experience. Mentors must be constantly mindful of this potential conflict of interest. The SURE Workbook helps by making the student’s learning explicit and visible throughout the research process, while also encouraging the student to communicate any concerns they might have.

Organized Assessment for Mentored Research Experiences

Departments need to better integrate undergraduate students into ongoing research (Wayment & Dickson, 2008), and we think students’ research experiences need more oversight, evaluation, and structure (i.e., organized support, scaffolding for learning). In some research settings, the only requirements are that the work must be educational, and/or that students must work for a certain number of hours per week for each credit hour earned. Such requirements allow for great flexibility which, in some cases, may be useful, but which can also increase the possibility that a student might not benefit in the specific ways they expected going into the experience. Further, students may receive only vague feedback (e.g., satisfactory/unsatisfactory grade) lacking a structured assessment with personalized and constructive feedback. For students

who are designing and conducting independent studies, assessment may come in the form of a written research report. However, for students who are assisting with a project that is already in progress, assessment can be more difficult. Mentors who use the SURE Workbook have a standard assessment that can be used to assign a letter or satisfactory/unsatisfactory grade. At the end of the semester, mentees can turn in their Workbook for review and mentors can evaluate the extent to which the student has progressed through the stages of the research process with respect to the project.

Many programs and departments assume that mentors are focused on students’ learning (Kardash, 2000). While exceptionally skilled mentors exist and achieve great success in navigating undergraduates through the research process, other mentor-mentee pairs may benefit from an assessment tool for guidance and standardization for both the mentee and mentor. For this reason, department heads or undergraduate coordinators may wish to implement the SURE Workbook for all undergraduate researchers as a preventative measure against “absentee mentors.” Also, as we mentioned, there can be issues with communication between mentors and mentees when either party fails to discuss expectations of the other, or expectations of the research experience itself. Our tool may also prove to be a useful resource for research mentoring programs for graduate students to learn about the expectations for effective mentoring (e.g., Loyola University Chicago’s Research Mentoring Program, Horowitz & Christopher, 2013). Time management tips, a goal-setting section, and a midterm progress report are all provided in the Workbook, and regular one-on-one meetings between mentors and mentees are encouraged.

Conclusions and Future Directions

Recent papers, such as Linn and colleagues’ (2015) meta-analysis, highlight the need for a standardized measure for assessing the quality of undergraduate research experiences. We think that the SURE Workbook holds promise for accomplishing this goal. The Workbook allows for pre- and post-testing of students’ skills in self-identified areas for improvement, encourages open communication regarding expectations, involvement, and tailored goal-setting for the experience, and, when completed, can stand alone (or accompany a lab notebook) as a testament to the student’s development over time. While devising a tool to facilitate these outcomes is our goal, some assert that there is insufficient research on what actually makes a mentoring program effective (e.g., Gershenfeld, 2014)—indicating the need to formally test the SURE Workbook’s effectiveness.

We are interested in exploring the extent to which the SURE Workbook may influence mentors' and mentees' research experiences across different types of institutions, including teaching-focused and research-focused schools. In addition, we think it is important to assess how this tool affects mentees at various points in their undergraduate degree (i.e., new freshman through experienced senior). As we continue to use and refine the Workbook, we also hope to learn more about the Workbook's ability to enhance learning and communication for extrinsically (e.g., participating for course credit) versus intrinsically (e.g., optional independent study) motivated students. Finally, we are interested in obtaining mentors' perceptions of the Workbook, and how the Workbook changes their mentoring experience and research productivity.

As mentors, it is our responsibility—and also our privilege—to engage in mutually-beneficial research collaborations with undergraduates. Without undergraduate researchers and assistants, many research programs would simply not be possible. Rather than treat undergraduates as an exploitable resource, mentors should strive to ensure students are achieving valuable learning outcomes from these experiences. Given our careful consideration of goals for undergraduate research experiences, as well as perceived challenges these students face, we predict that the SURE Workbook will serve as a user-friendly experiential learning tool for scaffolding learning and, ultimately, for improving the overall quality of research.

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Acknowledgements

Special thanks to members of the University of Georgia's Psychology Educator Development Association for feedback on earlier drafts of the SURE Workbook.

Appendix

Graduate Student Survey

1. What type of undergraduate institution best describes the one you attended? (If you attended more than one, pick the one you attended the longest.)

- A) Liberal arts college/university
- B) R1 (public or private)
- C) R2 (public or private)
- D) Community college

2. How important was research at this institution?

- A) Not important
- B) Slightly important
- C) Important
- D) Very important
- E) Extremely important

3. Were you involved in research, outside of class (e.g., PSYC 4800), as an undergraduate at this institution? If you answer "no" you may submit the survey now.

- A) Yes
- B) No

4. Select your most memorable research experience (e.g., PSYC 4800) at this institution. How would you rate it?

- A) Very negative
- B) Negative
- C) Neutral
- D) Positive
- E) Very positive

5. How much contact did you have with the faculty supervisor (i.e., the person who gave your grade), specifically for this research experience?

- A) Multiple times per week
- B) Once per week
- C) Once per month
- D) Once per semester
- E) Never

6. How would you rate your faculty supervisor's contribution to your academic development (e.g., research skills) for this research experience?

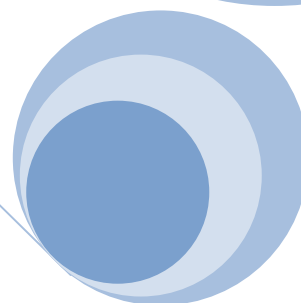
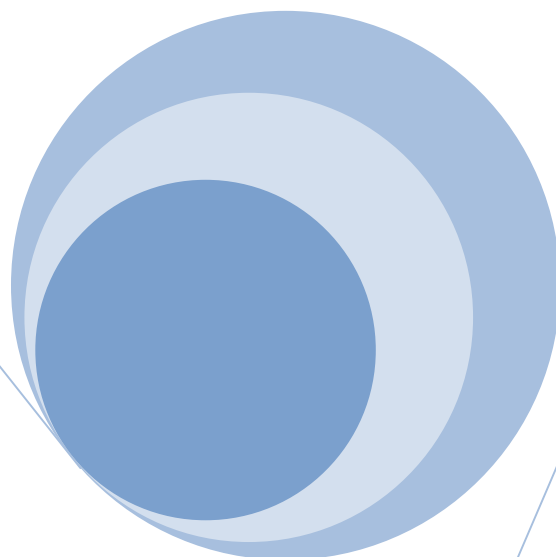
- A) Not significant
- B) Slightly significant
- C) Significant
- D) Very significant
- E) Extremely significant

7. Check all of the following adjectives which describe how you felt during this research experience.

Disrespected	Neutral	Overworked
Disappointed	Neglected	Heard
Sad	Abused	Ignored
Excited	Happy	Overwhelmed
Bored	Appreciated	Respected
Enriched	Valued	Clueless
Challenged	Supported	Confused
Unprepared for graduate school	Contributory	
	Involved	
Prepared for graduate school	Important	
	Equal	

- 8. Of those that you selected above, which 5 adjectives did you feel the most frequently during this research experience?**

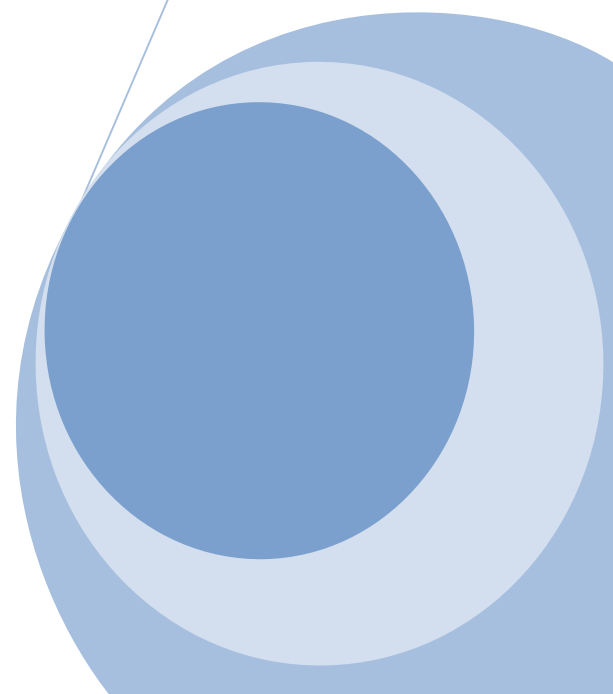
- 9. Optional: Please use this space to share additional information about the research experience above, such as: "I worked primarily with graduate students," "My supervisor was my friend, but not a good resource," or "I still keep in touch with my undergraduate supervisor."**



The Specialized Undergraduate Research Experience (SURE) Workbook

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The SURE Workbook

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Preface

Whether they go on to graduate school or straight into careers, undergraduates benefit from having hands-on research experience. Likewise, primary investigators (PIs) benefit from having undergraduate researchers to assist them at all levels of the research process. It is the joint responsibility of the mentor and student to ensure a mutually positive experience. Both individuals need some assessment tool to track research progress and learning.

At our graduate alma mater, the University of Georgia, the purpose of an undergraduate research experience is “to give psychology majors the opportunity to learn research by doing it. This means becoming familiar with the relevant research literature, understanding and formulating hypotheses, participating in the design of experiments, collecting and analyzing data, and writing reviews and reports.” While this allows for much flexibility among labs, it also increases the risk that a student might not benefit in ways he or she expected.

Our diverse research experiences have given us unique insights into the positives and negatives of undergraduate research. As undergraduates, we participated in research experiences at R1 (high research-focused doctoral) and liberal arts schools. As senior graduate students, we worked with dozens of undergraduate students in four different laboratories. Today, we are now Assistant Professors of Psychology, at a liberal arts university (ECW) and at an R1 university (EAS). Based on these experiences, we see the following goals as crucial to a mutually beneficial experience for both mentor and student*:

- Enhancing student learning through interactive research experience
- Identifying the mentee’s relevant strengths and weaknesses
- Encouraging long-term goal setting throughout the experience
- Improving communication to facilitate a positive student-mentor working relationship
- Ensuring exposure to all components of the research process
- Developing research autonomy on the part of the student

In an effort to improve and structure undergraduate research experiences, we created the SURE (Specialized Undergraduate Research Experience) Workbook. This interactive guide outlines the research process, beginning with the first meeting between research mentor and student, and culminating in the identification of professional development goals for the future.

To the Mentor: Your role is to guide your students as they independently tailor their research experience. By encouraging your students to use this workbook, they will become more proactive in their learning and therefore more invested in the project(s). An invested student is no longer an assistant, but a collaborator.

To the Student: Your role is to use the Workbook to become aware of your strengths and areas for improvement, and to communicate your expectations to your mentor. Throughout the Workbook you will be encouraged to discuss aspects of your project with your research mentor(s) who can be faculty, post-docs, graduate students, or more experienced undergraduates. In other words, do not feel like you are limited to only discussing your project with your assigned mentor. Regardless of your previous research experience, we hope you will find the SURE Workbook helpful in producing quality research and tailoring your learning about the research process.

Finally, we welcome your constructive feedback about the SURE Workbook. If you would like to be kept up-to-date on newer versions, as they are released, please email us.

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*APA Guidelines for the undergraduate psychology major. <http://www.apa.org/ed/precollege/psn/2014/09/career-counselor.aspx>

Student Self-Assessment of Current Knowledge and Mentoring Style

Before you set goals for the semester, and even before you meet with your research adviser at your first meeting, it is important to assess your entering knowledge about the research process, as well as your overall preferred mentoring style. This self-assessment contains two parts. The first part is designed to make you aware of the foundational concepts of research methods and data analysis. The second part asks you to self-reflect upon characteristics important to the mentoring experience. If you respond honestly—as opposed to using google or responding how you think an ideal mentee would—both you and your mentor will gain the most from the assessment. Bringing to light your research skills and your “working self” will allow you to better set your goals and determine which skills are the most important for you to develop during the semester.

Aim to complete the self-assessment within one hour. Your mentor will not grade it. Keep in mind, the research methods and analysis part will be further developed during the course of the semester as you work your way through the SURE Workbook, so do not worry if you do not recognize some of the material. The self-assessment answers are on Page 47.

PART I: THE RESEARCH PROCESS AND PROFESSIONAL DEVELOPMENT

A) Literature Review

1. Rate your level of confidence on each of the following skills associated with reviewing the literature. Use a scale from 1 (strongly disagree) to 5 (strongly agree). Skills that you have little to no experience with may be good places to start when filling out the long-term goals section which begins on Page 6.

- Determining the difference between scholarly and non-scholarly sources
- Searching for journal articles using Google Scholar or other Library databases (e.g., JSTOR, PsycINFO)
- Searching for print versions of journal articles at your institution’s library
- Retrieving out of print or inaccessible articles using Interlibrary Loan
- Citing sources in 6th edition APA style

2. Rank the following according to their reliability as scholarly sources:

- | | |
|---|-----------------------------------|
| a) Peer-reviewed book chapters | d) Peer-reviewed journal articles |
| b) Magazines such as <i>Scientific American</i> | e) Newspaper articles |
| c) Books written by Ph.D.s | f) Theses and dissertations |

3. Identify the errors in this 6th edition APA journal article citation:

Colbert-White, E. N., and Simpson, E. A. (2010). “Self-Assessment of Undergraduate Research Knowledge.” *Journal of Self-Assessment*, vol. 3(2), 13-16.

B) Research Ethics

1. Rate your level of confidence with skills associated with research ethics. Use a scale from 1 (strongly disagree) to 5 (strongly agree).

- Determining whether a research procedure is unethical for participants/subjects
- How to fill out an IRB or IACUC form
- The review process for research proposals
- Avoiding plagiarism of ideas

2. Decide whether each scenario qualifies as research dishonesty.

- a) Sarah does not submit an IRB form because she will never interact with her participants. She is observing window-shopping behavior in a local shopping mall.
- b) Chantel opens her research subject pool to everyone in town. When one man arrives, Chantel can easily tell that his native language is not English. Chantel provides him with a consent form which he signs, and he is allowed to participate.
- c) Brian is an undergraduate working in a lab where he developed a research project, carried it out, analyzed the data, and wrote it up. His academic adviser later publishes the work and Brian is not an author on the publication.

C) Methodology

Read the scenario and answer the True/False questions that follow. If the statement is false, correct it in the space provided.

Darrell designed an experiment to test his research hypothesis that women are more sensitive to shades of colors than men due to women’s evolutionary history as “gatherers” in ancestral societies (where choosing the wrong color fruit could have been lethal), while color sensitivity would not have been as important for “hunter” males. To test his hypothesis, Darrell shows male and female college students 20 different color swatches and asks them to verbally provide a color name for what they see. His hope is that women will show more variations for a particular color (e.g., “chartreuse” or “vermillion” for the green color swatch) than men will. If so, Darrell says it would indicate that women are more sensitive to color variations than men.

1. Darrell’s experiment design is between-subjects.
2. The null hypothesis in Darrell’s experiment is that males and females will report the same number of color variations.
3. Darrell has two independent variables: gender (two levels) and color swatch (20 levels).
4. The dependent variable is the total number of color variations given by the two genders.
5. The design of Darrell’s study is a true experiment because he is manipulating variables.
6. Experimenter bias could be a potential problem in Darrell’s study.
7. Color-blindness and education levels are extraneous variables in this study.
8. Darrell’s study has high internal validity because if women are more sensitive to colors then they should be able to readily produce different names for them.

D) Analyses

Rate your level of confidence with skills associated with analyzing data. Use a scale from 1 (strongly disagree) to 5 (strongly agree). Skills that you have little to no experience with may be good places to start when filling out the long-term goals section which begins on Page 6.

- Entering data into a spreadsheet
- Using Microsoft Excel functions and shortcuts
- Creating tables and graphs in Microsoft Excel
- Working with a statistical software package (e.g., R, SAS, SPSS, Minitab, SigmaPlot)
- Deciding whether data requires parametric vs. non-parametric statistical tests
- Concept of the p -value (i.e., alpha value, critical value)
- When to use t -tests
- When to use ANOVAs
- When to use regression analysis
- Writing results quantitatively and qualitatively

E) Discussion

Consider Darrell's experiment described earlier in the Methodology section of this self-assessment. Read the continuation of his study and answer the questions that follow.

Darrell collected his data and found that for the 20 different color swatches, women used a total of 54 unique color names to describe them and men used 26. A statistical test showed that these scores were significantly different. Darrell concludes that the "hunter/gatherer" lifestyle differences in ancestral male and female humans led to today's men being less sensitive to color shade variation than women.

1. What do Darrell's results mean with respect to his hypothesis?
2. Are Darrell's results relevant to the scientific community? Why or why not?
3. Give one future direction Darrell could take with his results.
4. List some limitations of Darrell's study.
5. How would you respond if Darrell said that his study proved his hypothesis was true?
6. Is Darrell's conclusion convincing? Why or why not?

F) Professional Development

1. Rate your level of confidence with various aspects of professional development. Skills that you have little to no experience with may be good places to start when filling out the long-term goals section which begins on Page 6.

- Building your résumé or curriculum vita
- Updating your résumé or curriculum vita
- Writing a personal statement
- Setting goals for the short-term future
- Setting goals for the long-term future

- Narrowing choices for where to apply for jobs or graduate school
- Applying for jobs or graduate school post graduation
- Networking with other academics or professionals in your field of interest
- Requesting references from faculty members or other professionals
- Speaking in front of an audience

PART II: MENTORING STYLE AND WORK ETHIC

A) Self-Inventory

Rate each statement on a scale from 1 (strongly disagree) to 5 (strongly agree). Some of your answers may be good discussion points during your first meeting with your research

General

- I hold very high standards for myself in school.
- I meet most academic/professional deadlines.
- I often over-commit myself to too many things.
- I become emotional under stress.
- I use time and resources effectively.
- I have healthy work habits.
- I always follow-through when I make a commitment.
- I am able to prioritize to get tasks accomplished.

Knowledge

- I am a naturally curious person.
- I am familiar with the area of research in which I will complete my project.
- I have read publications by my mentor.
- The area of research in which I will complete my project is one that is very interesting to me

Skills

- I would like to learn new skills.
- I am proactive in seeking out the skills I want to learn.
- I am not afraid to ask when I do not know how to do something.
- I am well organized.

Communication (This is one of the most important aspects of collaborative research!)

- I appreciate constructive feedback.
- I am good at keeping in touch with collaborators.
- I am an honest and direct communicator.
- I like to meet at least once a week.
- I work independently.
- I seek help when I need it.

B) Preliminary Expectations

What are your current expectations of your mentor?

“Make something of yourself. Try your best to get to the top, if that’s where you want to go, but know that the more people you try to take with you, the faster you’ll get there and the longer you’ll stay there.” – James A. Autry

What do you think your mentor expects of you?

Trouble Shooting

What do I do if I encounter mentorship dysfunction?

- Avoid reacting emotionally
- Evaluate your contribution to the problem
- Ask a trusted peer, supervisor, or professional
- Be polite and friendly in all communication
- Make yourself aware of departmental procedures for reporting problems
- Document problem behaviors, and the steps you took to resolve them



Reference

Johnson, W. B., & Huwe, J. M. (2003). *Getting mentored in graduate school*. Washington, DC: American Psychological Association.

Early Semester Meeting with Research Mentor

Early establishment of good rapport and open communication among collaborators is an important part of the research process. Feeling comfortable enough with your mentor to talk to him or her about the project's progress, your feelings about the workload, and your goals for the semester all contribute to whether the experience is a positive or negative one. Often times, undergraduates may feel unimportant, abused, or disconnected from the projects on which they are working. The purpose of this section is to break the ice by starting a dialogue about expectations and work ethic. In addition, there is an interactive section that allows you and your mentor to fill out goals that you have for the time you are working in the lab. We strongly encourage you to complete this section so that you and your mentor can tailor your research experience to ensure you meet, and perhaps even exceed, your goals.



Breaking the Ice. Below is a list of questions designed to open communication between you and your research mentor on the first day. Before your meeting, take a few minutes to look over the questions below and prioritize those that are the most important to you. Add others if you would like.

Questions Posed to the Student

- How did you become interested in this lab?
- Do you have any previous research experiences? If so, what kind and for how long?
- What are your future career plans?
- What do you expect from me as your research mentor?
- Describe your work ethic (e.g., prefer working alone or in groups, collaborative or independent projects, procrastinator)
- Describe your course load for the semester.
- What are your academic strengths and weaknesses?
- Ultimately, what do you expect to get out of this experience?
- What is the best way to contact you? (e.g., phone, email)

Why should I try to build a positive working relationship with my mentor?

- ❖ Learn about relevant organizations and conferences in the field.
- ❖ A strong mentor-mentee relationship can usually result in a strong letter of recommendation.
- ❖ Returning students who show interest and investment in the project could be included on publications.
- ❖ Because they are putting their time and energy into mentoring YOU!

Questions Posed to the Mentor

- What is my role as your undergraduate researcher?
- How will my work fit in to the larger project? How independent am I expected to be?
- Should I come to you when I have problems or concerns, or is there someone else?
- What do you expect for me to accomplish while I'm working with you?
- What is your approach to mentoring undergraduates and what is your preferred style?
- What skills would you like for me to develop during my time in your lab?
- Are there specific times of day that you expect for me to be in the lab? What is the best way to contact you?
- Others?

Establishing Goals for the Semester. The SURE Workbook is designed to encourage a fulfilling research experience. Now that you have completed the self-assessment, you should have an idea of your strengths and weaknesses regarding the research process and professional development. During your meeting with your mentor, record realistic goals for each of the components of the research process. We have purposefully allotted a full page for each section so that you are able to tailor the SURE Workbook to your own needs. Do not feel pressured to fill out every available goal slot. Instead, try to focus on 3-4 goals. After the goals pages is an optional contract to document the agreed upon features of your research experience. Take a look at it with your mentor and decide if it is something you would like to complete. **Use the three-point format shown below to detail each of your goals on Pages 7-18.**

1. Goals: Detailed, measurable, relevant accomplishments that you would like to see yourself reach by the end of a specified timeline. They can be short-term (e.g., learning how to conduct an ANOVA test) or long-term (e.g., improving APA formatting skills). We have included details of the different sections at the bottom of this page to help with goal-development.

2. Potential Barriers: All goals have obstacles to attaining them (e.g., busy course/work schedule, procrastination, fear of learning something difficult). By making known the barriers for a specific goal, you should be better able to think of ways to eliminate them.

3. Taking Action: List of ways that you intend to set a goal into motion.

Example:

Goal: *Improve my knowledge of APA formatting by the end of the semester.*

Potential Barriers: *Unpredictable work schedule, busy applying for graduate school and studying for GRE, long-time struggle with procrastination.*

Taking Action: *1. Purchase APA Publication Manual, 6th Ed.; 2. Organize my schedule into blocks of time for graduate school applications, GRE studying, and skimming the manual's major sections; 3. Use the manual to guide a brief write-up of my project.*



Components of the Research Process

1. **Literature Review:** Developing strategies for finding relevant literature; interpreting sources; library/internet skills; developing a research question from past research.
2. **Research Ethics:** Ensuring the safety and well-being of all participants involved in the study (human and non-human); IRB/IACUC forms.
3. **Methodology:** Developing an appropriate experimental design; sampling; avoiding experimenter and participant bias; controlling outside conditions; validity and generalizability.
4. **Analyses:** Selecting appropriate statistical tests; using statistical software; communicating results, both in words and visually.
5. **Discussion:** Interpreting the results; implications behind the findings; limitations; future directions and sharing the work with the scientific community.
6. **Professional Development:** Updating résumé/CV; writing a personal statement; requesting reference letters; communicating findings at meetings.

Literature Review Skill-Development Goals

Goal #1:

Potential Barriers:

Taking Action:

Literature Review Skill-Development Goals

Goal #2:

Potential Barriers:

Taking Action:

Research Ethics Skill-Development Goals

Goal #1:

Potential Barriers:

Taking Action:

Research Ethics Skill-Development Goals

Goal #2:

Potential Barriers:

Taking Action:

Methodology Skill-Development Goals

Goal #1:

Potential Barriers:

Taking Action:

Methodology Skill-Development Goals

Goal #2:

Potential Barriers:

Taking Action:

Analyses Skill-Development Goals

Goal #1:

Potential Barriers:

Taking Action:

Analyses Skill-Development Goals

Goal #2:

Potential Barriers:

Taking Action:

Discussion Skill-Development Goals

Goal #1:

Potential Barriers:

Taking Action:

Discussion Skill-Development Goals

Goal #2:

Potential Barriers:

Taking Action:

Professional Development Goals

Goal #1:

Potential Barriers:

Taking Action:

Professional Development Goals

Goal #2:

Potential Barriers:

Taking Action:

Mentor and Mentee Contract

“Better than a thousand days of diligent study is one day with a great teacher.”
– Japanese Proverb

We agree to the following terms for our mentor/mentee relationship:

Duration of mentorship: _____

Anticipated duration of project: _____

Frequency and type of meetings (e.g., lab meeting, one-on-one): _____

Preferred modes of communication (e.g., phone, email): _____

Number of hours per week mentee should spend working on project: _____

Major goals of mentee and mentor: _____

Mentee Printed Name and Signature

Date

Mentor Printed Name and Signature

Date

Mid-Semester Meeting with Research Mentor

As with any long-term project, taking a step back and reassessing your progress and feelings about the project is a must. Has your schedule changed since you first established your goals? What about your work ethic, motivation, goals, or even mentor? The mid-semester mark is a great opportunity to sit down with your research mentor (especially if you have not done so since your first meeting) and communicate with him or her about what you have been doing since the semester began. Whether or not you have been having regular meetings with your research mentor, now is a good time to contact them and let them know that you would like to schedule a meeting to specifically discuss your progress and feelings about the project.

Below is a list of discussion questions that might help your mentor better understand your experience. Be open and candid so that any concerns can be effectively handled.

- How do you feel about the project you have been given?
- What do you like the most so far?
- What do you find the most challenging? Can your mentor help with those challenges?
- Do you have any new project ideas or suggestions for your current one?
- Are you working with graduate students and/or other undergraduates? How is that going?
- What have you learned that you did not expect to learn?
- What aspects of the research are still unclear?
- How do you feel about the amount of contact you have with your research mentor?

Goal Reassessment. Take a few minutes to look back at your goals from the last few pages. Document your progress in the chart below.

Goal (in brief)	Progress Since Created	Next Steps

--	--	--

Are you finding it particularly difficult to achieve any of your goals? What barriers are standing in the way?

What can you consciously do to help you overcome these obstacles?

What can your research mentor do to help you overcome these obstacles?

Tips for Managing Your Time

- ✓ Create a visual schedule for yourself with blocks of time allotted to each of your responsibilities.
- ✓ Don't spread yourself too thin. Allow at least 30 minutes between time commitments.
- ✓ Try to avoid procrastinating.
- ✓ Learn how to say "No" when time commitments start to pile up.
- ✓ Prioritize. The small stuff can wait!

Mid-Semester Goals (Optional). Now that you are at the half-way point, are there any new short-term goals that you would like to create? Is there a methodological technique that you were recently exposed to that you would like to learn more about? Would you like to get feedback from a knowledgeable source regarding your résumé or CV? Record those new short-term goals on the space below, following the Goal, Potential Barriers, Taking Action format from earlier.

Celebrating Diversity in Your Research Lab!

In general, college is a hub for diversity. Your research colleagues or mentor may differ from you in any number of ways, including ethnicity, sexual orientation, spirituality, or geographic origin. This mentoring experience is a great opportunity to realize that variety really is the spice of life!



Final Meeting with Research Mentor

As your research experience comes to a close, schedule a final meeting with your research mentor. This last mentor-mentee meeting section of the SURE Workbook will walk you through sharing feedback with your adviser about the experience, assessing your goals from the semester, as well as identifying goals for the future. Whether you have two years remaining or are graduating in a few weeks, it is never too early (or late) to think about your future plans. Do not forget to consult the Resources page towards the end of the workbook to get some advice and ideas about how you can use the skills you gained during your research experience to make yourself a more marketable candidate for jobs and graduate school positions.

Sharing Feedback about the Experience. Below is a list of discussion points to encourage a candid dialogue about your thoughts and experiences from the past semester.

- Describe the most salient positives and negatives about the experience.
- Did the student's involvement in the research process live up to his or her expectations? Why or why not?
- What could have been done differently (e.g., allow students to choose the project they work on, more or fewer deadlines)?
- How involved did the student feel?
- Choose five adjectives to describe the experience as a whole.
- Did the student work with graduate students or post-docs? How was that experience?
- What did the student like the most about working in that particular lab?
- Are there any aspects of the research process that are still unclear?
- Does the student have any suggestions for future undergraduates who work in the lab?

Goals. Return to your goals list from Pages 7-18 and 21 (if new goals were added mid-semester). Consider each goal in turn.

- Was the goal accomplished?
- Is the student satisfied with their progress on this goal? If not, what can be done to change this?
- Did the student develop some skill as a result of setting this goal?
- Were other notable skills developed or achievements made that do not directly relate to a goal?

Consider your future plans.

What are your post-graduation plans?

How does this experience play into these plans?

How will the skills that you developed help you with your future plans?

Can your mentor help you with your future plans in any way?

Take a few minutes to jot down one or two future goals that you would like to achieve in the future. These goals can be as broad as increasing time management or as specific as getting into your first-choice graduate school. Do not forget to include details about important timelines and deadlines as well!

Goal #1

Potential Barriers

Taking Action

Goal #2

Potential Barriers

Taking Action

Literature Review

Whether you are just starting a new project, or joining an ongoing project, you can benefit from becoming familiar with the literature on your topic. As Aristotle put it, “He who sees things grow from the beginning will have the best view of them.” A literature review is important because it familiarizes you with what is already known about your topic. It can give you new ideas and inspiration. A literature review can also help you avoid mistakes others have made in the past. The purpose of this section is to guide you through the process of finding, reading, and summarizing the literature on your topic. If you have not yet decided on a specific research topic do not worry; conducting a literature review can help you to narrow down your topic. If you already know your specific project topic, you may find some revisions to your proposed study necessary as you learn more about research in this area.

Independently complete the following steps, keeping one primary research project in mind. You may find it helpful to refer to your institution’s Library’s website. Take time to discuss your responses with your research mentor(s).

Step 1: Brainstorm.

Brainstorm words and phrases that you could use to search for research on your topic. For example, if you are studying “rat laughter” you may also wish to search for the phrases “rodent laughter” or “rat emotions.” Come up with as many key words and phrases as you can.

Step 2: Locate Relevant Literature

General Tips:

- ✓ Use more than one search engine. Our favorites are PsycINFO and Google Scholar.
- ✓ Examine different sources: journal articles, books, book chapters, and the internet.
- ✓ Plan to make at least one trip to the library.
- ✓ Rely on primary sources (original articles); avoid popular press (e.g., *Psychology Today*).
- ✓ Keep detailed notes. Save PDFs with detailed titles so you can easily find them again.
- ✓ If you copy someone’s words, put them in quotation marks and write the source and page number.
- ✓ Find other relevant literature by examining the reference sections, and looking at who has cited that reference.
- ✓ Examine both research studies—which contain original data—and literature reviews—which review a large number of studies on a topic, but contain no original data.





Found a great article, but cannot access the PDF? Do not pay for the PDF!

Instead, try Google Scholar. You can set up your preferences on your computer to take you directly to the PDF if your library subscribes to that journal. Instructions: <https://scholar.google.com/> then click on “Settings” and “Library Links”

Find at least 3 sources and list them in APA format. Identify the type of source (e.g., journal article, book chapter, website). Is it a research study or a literature review?

1. _____

2. _____

3. _____

Caution! A popular procrastination strategy is to take detailed notes on every source related to your topic. This is not a realistic approach when you are limited on time. Instead, find a few articles, then ask your research mentor(s) if they can recommend additional literature relevant to your project.

Step 3: Evaluate Empirical Studies

Critically read each of your sources and take notes using the following questions as a guide (adapted from Maher, 1978). You will probably need to use your own paper.

Introduction

- Why is this study important?
- What are the research questions and hypotheses?

Method

- What is the method?
- Who are the participants? Were there biases in sampling? Was informed consent obtained?
- Are there confounds? Was a control group used? Was there random assignment?
- Were measures reliable and valid? Might there be order effects? Was inter-observer agreement assessed?
- Were participants and/or researchers blind to the conditions and/or predictions?
- Are alternative explanations ruled out?

- Are there any limits to the external validity?

Results

- Were appropriate statistical tests used?
- Do the effect sizes indicate the findings are of practical importance?
- Was the probability of making a Type I error considered?
- Are means and measures of variance reported?

Discussion

- Are alternative explanations considered?
- Are limitations discussed? How do these affect the generalizability of the findings?
- Were the authors able to reject the null hypothesis?

Step 4: Summarize and Organize

There are many strategies for summarizing and organizing a literature review. We recommend:

A) Write a preliminary outline

Think about what topics you want to cover, what order you want to cover them in, and how much space (number of lines, words, or pages) you want to devote to each section.

B) Next, create an annotated bibliography

An annotated bibliography contains all of your references, in APA format, followed by a short paragraph about each, usually summarizing the main findings, then linking in some way to your main ideas (i.e., current research project).

C) Finally, write the introduction for your project

While you do this, keep in mind your audience (e.g., will this be discussed at a lab meeting? Published in a poster presentation? Published in a research journal?)

How to Cite in APA Style:

— <http://www.apastyle.org/>

— APA Publication
Manual, 6th Ed.

— https://twitter.com/APA_Style



A Note of Caution: Avoiding Plagiarism

The Merriam-Webster Online Dictionary defines plagiarism as, “to steal and pass off (the ideas or words of another) as one's own” or “to use (another's production) without crediting the source.” Learn more about your institution's Academic Honesty Policy and how to avoid plagiarism. For example:

http://www.miami.edu/sa/index.php/policies_and_procedures/honor_code/

Additional Reading (Optional): Galvan, J. L. (2004). *Writing literature reviews: A guide for students of the social and behavioral sciences* (2nd ed.). Los Angeles: Pyrczak.



STAY ON TRACK!

Refer back to the Literature Review goals you created on Page 7. Are you on track to accomplishing them? Remember to track your progress in developing your skills in reviewing relevant literature.

Maher, B. A. (1978). A reader's, writer's, and reviewer's guide to assessing research reports in clinical psychology. *Journal of Consulting and Clinical Psychology*, 46, 835-838.

Why is a thorough literature review important?

"A month in the laboratory can often save an hour in the library."

-Frank H. Westheimer, Professor

Research Ethics

As a researcher, it is your responsibility to ensure the safety and well-being of your participants—whether they are humans or animals. The purpose of this section is to introduce you to the guidelines that must be followed for research with humans and animals.

Part 1. American Psychological Association (APA) Ethics Code

Visit www.apa.org/ethics/code/index.aspx and the APA Ethics Code (2010). There are five general principles. **Describe each one in your words, and explain how it is important for your research project:**

“Ethics and science need to shake hands.”

—Richard Clarke Cabot,
American physician



read
own

➤ *Beneficence and Non-Maleficance* _____

➤ *Fidelity and Responsibility* _____

➤ *Integrity* _____

➤ *Justice* _____

➤ *Respect for People’s Rights and Dignity* _____

Part 2. Ensuring Protection of Research Participants

Will you be working with human participants, animal participants, or both?

A) Human Participants. Your institution’s Institutional Review Board (IRB) must approve all research with human participants. Applications can be submitted online.

1. Most institutions require **training through the CITI Program (Collaborative Institutional Training Initiative)**: <https://www.citiprogram.org/>

All researchers working with human participants—including undergraduates—must complete this online training prior to starting. You will read some short excerpts, and then answer multiple-choice questions. If you do not receive a high enough score you are allowed to re-take the test. There are different tests,

depending upon which population you are working with (e.g., adults, minors, prisoners). All student researchers working with human participants should complete “Group 1” and “Conflict of Interest” modules. Additional sections should be completed for working with special populations. If you are unsure, ask your research mentor.

2. Have you obtained **IRB approval** to conduct your project?

→ **YES!** Great! If you were not involved in this process (e.g., it was completed by the time you started the project), make sure you understand the steps of an IRB application. Check your institution’s Research Website and go over the requirements with your mentor.

For example:

<http://uresearch.miami.edu/>

→ **No.** You will gain valuable skills and knowledge through completing this process. Start by learning about the application and the different parts of the application by going to your institution’s Research Website (see above) and go over the requirements.

Commonly Asked Questions

— *What is the IRB?*

Each institution has its own IRB, made up of five individuals, including faculty members from more than one department, one member of the community, and one nonscientist. All research with human participants is submitted to the IRB group, who reviews the proposal to ensure compliance with the APA Ethical Guidelines. You may be asked to make one or more revisions to your proposal.

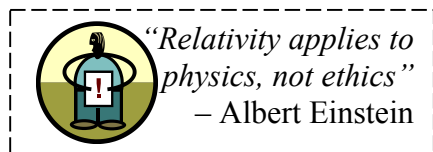
— *How long does it take to get IRB approval?*

Typically it takes about a month. The IRB usually meets a few times per semester, so the timing of approval will depend upon when you submit your proposal. For a schedule of meeting times and submission dates to be considered, visit your institution’s IRB website.

— *What do I need to submit for IRB approval?*

1. Application. Download the application from your institution’s website and complete all of the fields. Your research mentor will be the Principle Investigator (PI).
2. Consent form. Human participants are given information about the study so that they can decide whether or not they wish to participate. Ask your research mentor for some sample consent forms, so you can see what they look like.
3. Additional materials. If you are using a questionnaire, or any other materials to which the participants will be exposed (e.g., fliers advertising your study, phone script for recruitment, cover letter), then you will need to include these with your application.
4. Debriefing. After the experiment, the experimenter should answer any questions the participant has. The experimenter also describes the purpose of the study. Sometimes this is given in writing. If any deception was used, the participant must be informed at this point, as specified in the APA Guidelines: “[I]f scientific or humane values justify delaying or withholding this information, psychologists take reasonable steps to reduce the harm.”

B) Animal Participants. Your Institutional Animal Care and Use Committee (IACUC) must approve all research with animal subjects. Applications can be submitted online.



- ✓ There may be additional individual training for researchers who will handle the animals. Check with your PI.

Federal Guidelines. To learn more about animal research in the U.S., visit the AAALAC International (Association for Assessment and Accreditation of Laboratory Animal Care):

www.aaalac.org/resources/studentinfo.cfm

Understanding Animal Research: <http://www.understandinganimalresearch.org.uk/>

Three primary areas need to be considered when conducting research with animals. Discuss with your mentor:

1. *Justifying the study* – What is the scientific value of the study relative to the degree of risk to the subjects? If there is discomfort to the subjects, how will this be minimized? Can appetitive procedures (e.g., positive reinforcement) replace aversive procedures (e.g., punishment)? If examining animals in their natural habitat, how will you ensure that you are only minimally disturbing their habitat?
2. *Caring for the animals* – Is there a veterinarian caring for the animals you will be using? Will they need access to food or water during your experiment? What will be done with the animals when you are finished with your project?
3. *Using animals for education* – Are the animals used for teaching (e.g., in the classroom to illustrate specific behaviors)? Might it be possible to use fewer animals than what you plan to use? Could a simulation be used in place of a live procedure?

Commonly Asked Questions

— *What is the IACUC?*

This is a committee made up of professors from multiple disciplines—including non-sciences disciplines—as well as one member from outside the university.

— *Do I have to worry about catching or spreading diseases or illness to/from the animals with which I work?*

Depending upon the species you work with, there may be specialized procedures or clothing to wear to ensure your safety and the safety of the animals. Check with your PI.

— *Do I need to complete the Occupational Health and Safety (OHSP) Program?*

Yes, probably if you are routinely entering into facilities where animals are maintained.

— *How long does it take to get IACUC approval?*

Typically it takes about a month. The IACUC typically meets a few times per semester, so the timing of approval will depend on when you submit your research proposal.

Part 3. Plagiarism

The Merriam-Webster Online Dictionary defines plagiarism as, “to steal and pass off (the ideas or words of another) as one’s own” or “to use (another’s production) without crediting the source.”

Individuals at all levels of academia can plagiarize, both intentionally and unintentionally. However, this does not alleviate anyone of the responsibility to check sources and credit authors as deserved. A number of resources exist to help researchers understand and avoid plagiarism. It is up to you to inform yourself about plagiarism. Here are a few tips:

- ✓ When taking notes from a source, place quotation marks around any copied portions as well as a note to go back and paraphrase.
- ✓ When paraphrasing, do not look directly at the source. If you are unable to paraphrase, reread the source before you try to paraphrase again.
- ✓ Using your word processor’s thesaurus to find synonyms is not a sufficient paraphrasing strategy.
- ✓ If you are unsure about how to paraphrase an idea, ask your mentor.
- ✓ When you know you want to cite an idea but do not have the reference handy, make a note (we type “CITE” and highlight it).
- ✓ Avoid direct quotations as much as possible.

Additional Reading (Optional):

APA Ethics Office: <http://www.apa.org/ethics>

APA books on ethics:

- Ethical Conflicts in Psychology (www.apa.org/pubs/books/4312009.aspx) The 4th Edition of this classic book describes the fundamental ethical dilemmas embedded in the psychologist’s array of roles.
- Ethics Desk Reference for Psychologists (www.apa.org/pubs/books/4312011.aspx) This book is an easy-to-use pocket guide that aids psychologists in identifying and avoiding ethical dilemmas.
- Health Care Ethics for Psychologists (www.apa.org/pubs/books/4312002.aspx) This book explores the ethical questions encountered most often by practitioners in health care settings.

Resources for Understanding and Avoiding Plagiarism

- ✓ 6th Edition APA Manual, Chapter 6, “Crediting Sources”
- ✓ Your institution’s Academic Honesty Policy
- ✓ Your institution’s Library Website → Services for Undergraduate → Writing and Citing



STAY ON TRACK!

Refer back to the Research Ethics goals you created on Page 9. Are you on track to accomplishing them? Remember to track your progress in developing your knowledge of research ethics.

Methodology

Ivan Pavlov had three answers when he was asked what it takes to be a great scientist: (1) being systematic in the search for knowledge, (2) being modest in recognizing one's basic ignorance, and (3) passion. Specifically, Pavlov said, "Science calls for tremendous effort and great passion. Be passionate in your work and in your search for truth" (Babkin, 1949, p. 110). For scientists across all fields, a solid methodology is the foundation of any strong research project. A poor research design can jeopardize the integrity and validity of an entire project, and design errors cannot be undone after the fact. For these reasons, it is imperative to develop your skills in research methods. Of course, with a strong background in methods come other benefits such as enhanced critical thinking, problem solving, communication, and computer skills, as well as the ability to be a more informed consumer of information.

Independently complete this section, keeping one research project in mind. Some of the questions may not apply to your project, and that is okay! If you are unfamiliar with terms, refer to your research methods textbook. Check responses with your mentor(s).



- Is your research basic, applied, or both? Describe the potential benefits to society or humankind.

- Is your research qualitative, quantitative, or both?

- What are the research questions?

- What are the research predictions (include null and alternative/experimental)?

- Why is this study important?

- What are the independent variables (include levels) and dependent variables (include operational definitions)? Include scales of measurement (i.e., nominal, ordinal, interval, ratio).

“Research is formalized curiosity. It is poking and prying with a purpose.” - Zora Neale Hurston

- Describe any extraneous/confounding variables that need to be controlled or considered.

- What design(s) are you using (e.g., experiment, quasi-experiment, naturalistic observation, case study, survey, archival)?

- Is your experimental design between-subjects, within-subjects (i.e., repeated measures), mixed, or neither?

- Describe your participants/subjects (e.g., number, age, species, exclusion criteria).

- How are your participants/subjects selected (e.g., random, stratified, convenience, research pool) and assigned to conditions if applicable (e.g., random, matched, natural groups)?

- List your primary materials (e.g., software, equipment, testing environment).

- Briefly describe the data collection procedure for a participant/subject in your study.

- What is your role in your project's methodology?

- Based on what you know about your project, what improvements can you suggest for the design?

Surviving Repetitive Tasks

Repetitive tasks are crucial to the research process and must be performed accurately without sacrificing your sanity! Here are some tips:

- ✓ Listen to music, chew gum, or sip your favorite beverage
- ✓ Take frequent short breaks and work on more challenging tasks
- ✓ Ask others for tips and shortcuts
- ✓ Keep detailed notes (e.g., don't assume you'll remember something)
- ✓ Keep in mind your energy level and the time of day
- ✓ Set small goals and reward yourself when you accomplish them
- ✓ Keep track of your speed and accuracy and watch as they improve
- ✓ Make sure you know why this task is important



Additional questions to discuss with your mentor(s):

- Does this study have strong external validity (i.e., will your results be generalizable to your target population)?
- Why are you using this sample size? Why not larger or smaller? How do you know you have sufficient power?
- What are some limitations of my study (e.g., what may jeopardize the internal validity, concerns about experimenter bias)?
- Are there concerns about reliability?

Making connections (Optional):

- How would you answer your research question with a different design?
- How would changing your sample alter your study?
- Are there other dependent measure that would be interesting to look at?
- Identify one confounding variable and create a way to study it.
- If you alter the setting (e.g., laboratory or field), how would that change your study?

**STAY ON TRACK!**

Refer back to the Methodology goals you created on Page 11. Are you on track to accomplishing them? Remember to update your progress to chart your development of methodology skills.

Reference

Babkin, B. P. (1949). *Pavlov: A biography*. Toronto, Canada: The University of Chicago Press.

Analyses

The data have been collected and you are anxious to see if your research predictions will be supported. Now comes the hard part! Selecting the appropriate statistic to run on your data can be affected by everything from one participant dropping out of the study to the measurement scale that was decided upon months ago. Nonetheless, statistics are extremely important to psychologists and must be used correctly to validate the claims that we make. Mark Twain put it best, "There are lies, damned lies, and statistics." The purpose of this section is to familiarize you with various aspects of the data analysis process. If your project's data will not be ready for analysis during your semester, that is okay! You should still be able to talk about the statistics that *will* be used, and use your own predicted results to do the writing and visual representation exercises on the following page.



Independently complete this section, keeping one primary research project in mind. If you are unfamiliar with any terms, refer to your statistics textbook. Take time to check your responses with your research mentor(s).

- How is your project's raw data organized (e.g., spreadsheet, software program, videotapes)?

- Does the raw data need to be coded or transformed before it can be analyzed?

- Describe the statistical program/software that you are using to analyze your data.

- Are the statistics you are using parametric, non-parametric, or both? Why?

- For parametric statistics, are the tests be one-tailed or two-tailed?

- What is the p -value being used for your statistical tests, and why was it chosen?

- If results are statistically significant, is the effect size small, medium, or large? What does this tell you about the practical significance of your findings?

Using the sample below as a guide, fill in the chart to organize the statistic(s) for each research prediction. Provide as much detail as possible. Continue on another sheet of paper if needed.

Research Prediction	Analyze Data with Descriptive Statistics?	Analyze Data with Inferential Statistics?	Why?
<i>Mean scores for Group A will be higher than for B and C on the task.</i>	<i>Yes- Mean, median, mode, range, standard error, standard deviation</i>	<i>Yes- One-way ANOVA</i>	<i>Three levels of the independent variable; analyzing means.</i>

Writing Exercise. Practice reporting some of your results in APA format. Consult the APA Publication Manual, 6th Ed. wherever needed. Remember, to clearly communicate what you found, include (1) the statistical test used, (2) the result of the test in words, (3) the result of the test in numbers, and (4) a measure of effect size. For example:

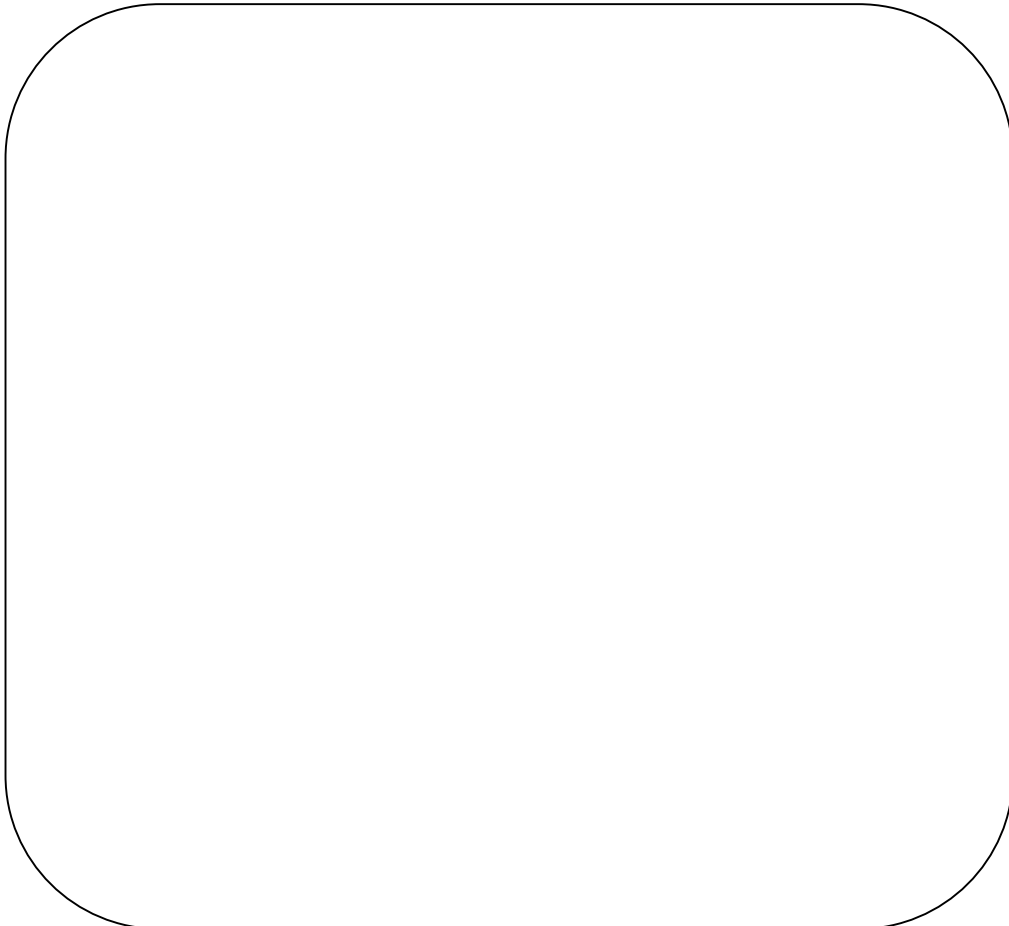
“A one-way ANOVA showed that mean scores on the spatial cognition task were significantly different across Groups A, B, and C, $F(2, 49) = 5.77, p = .002, \eta^2 = .53$.”

Keywords in Writing Results

The best way to become a clear mechanical writer is practice! Here are a few tips:

- ✓ A statistic with a p -value that is above the critical value is not “insignificant” because it is still telling you something important! However, it is written as “statistically non-significant.” A humorous site on this topic: <http://www.academiaobscura.com/still-not-significant/>
- ✓ Hypotheses are never “proven,” “true,” or “wrong.” They are either “supported” or “not supported” by your data.
- ✓ When a p -value hovers around significance (e.g., $p = .06$, if the critical value is $.05$), it is fair to say that there is a “trend” in the direction you predicted, but it is still statistically non-significant. This is often a good time to think about a possible Type II error!
- ✓ In the Results, “data” is followed by a plural verb, as in, “The data were collected in a lab-setting.”

Chart/Figure Exercise. Information is often better understood when presented visually. This could be a table, a bar or line graph, a scatterplot, a sketch showing differences in brain structures before and after a treatment, etc. Select one of your findings and create a visual representation. You may use the space provided or attach a separate page.



**STAY ON TRACK!**

Refer back to the Analyses goals you created on Page 13. Are you on track to accomplishing them? Remember to update your progress to chart your development of data analysis skills.

Discussion

The purpose of this section is to provide you with ideas for interpreting your findings, relating your findings back to your predictions, and critically examining the implications and limitations of your results. Focus on your hypotheses (re-state them generally) and the most interesting results. There are different ways to organize your discussion section. Discuss the results in a logical fashion, which usually involves going through them in the same order in which they were presented in the results section. The discussion section can be challenging to write, and may require several attempts. It is especially important to get feedback from your mentor(s).

Independently complete the following sections, keeping one primary research project in mind. You may need more space than what is provided here.

Summarize Your Findings. Open by providing a statement of support or nonsupport for your original hypotheses. Describe the major findings of the study. Avoid using any statistical jargon. Write your findings so that an educated layperson could understand them. Do your results support your hypotheses?

Common Problems with Discussion Sections

Make sure you:

- ✓ Skip discussing non-significant results
- ✓ Avoid causal language
- ✓ Do not equate statistical significance with effect size
- ✓ Only discuss data that are in your results section
- ✓ Go beyond regurgitating results; interpret
- ✓ Do not over-interpret your results
- ✓ Avoid engaging in unwarranted speculation
- ✓ Do not inflate the importance of your findings
- ✓ Remain on-topic and do not go on tangents
- ✓ Stick with conclusions supported by your data



Consider Implications. These are recommendations. Based on your findings, what advice would you give society? What do your results mean? Why are they important? Are they useful in some way? Are applications warranted? Are there theoretical implications? Are there methodological implications? Are there applied implications?

Address Limitations. All studies have limitations (e.g., small sample size, third-variable problem, internal or external validity, measurement validity, inter-observer agreement, fatigue effects, statistical issues). Think about the limitations of your project. What should the reader keep in mind? Are there reasons why the results did not turn out as expected?

Future Directions. Some of your limitations might lead to future research. What would be interesting to do next? Make suggestions for future research.

Conclusion. The “take-home” message. Leave the reader feeling that this is an important topic.



STAY ON TRACK! Refer back to the Discussion goals you created on Page 15. Are you on track to accomplishing them? Remember to track your progress in developing your skills in writing a complete discussion.

Reference

American Psychological Association (2010). *Publication manual of the American Psychological Association* (6th ed.). Washington, DC: American Psychological Association.

Professional Development

You are nearing the end of your research experience. Now what? Report your findings! This section details updating your résumé/CV, writing a personal statement, requesting references, and finding outlets for communicating your research results. A one-semester project has the possibility to springboard you into a career's worth of opportunities. This may be a great section to discuss with your research mentor and/or graduate students that you have formed strong working relationships with during your research experience.

Résumé/CV Updating. If you have been keeping up the mini-assignments in the Workbook, you should have a well-documented account of the work you have done. You deserve recognition! The best way to let potential employers or graduate school acceptance committees about your work is to detail it in your résumé or CV, so not forget to update it. There are significant differences in the formatting and content of a résumé and CV. Our brief description at right, while helpful, is not an exhaustive list of the differences.

Résumé vs. Curriculum Vita (CV)

- *Résumé*: Job market; emphasizes relevant work-related experiences; education and awards/honors condensed
- *CV*: Academia; highlights research experience, education/scholarships, and awards received from institution

with
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know
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or CV.

When updating your résumé or CV, remember:

- Be concise but informative
- Play up the significance of your presence in the laboratory
- Include your mentor's name (potential graduate advisers may be impressed to know that you did your research training under a faculty member with whose work they may be familiar)

Other aspects of your research experience worth noting in your résumé or CV:

- Was the research you worked on submitted or accepted for publication? Provide a proper citation and explain your role in the project.
- Did you receive any special honors for your work in the lab or in the department?
- Were you able to transform your work into a CURO or academic conference presentation? We will address this again later in the Workbook.

Haven't put together your résumé or CV yet?

1. Your institution's Career Center has samples of student résumés.
2. Most graduate students and faculty members have uploaded their CVs to your department's website.
3. Take a look at the Suggested Resources at the end of the Workbook to get an idea of other resources for developing your résumé or CV.



**Tips for
Writing
a**

Personal Statement. Graduate and professional school applications often require a statement of purpose in the form of a free-writing essay or answers to directed questions. Here are a few tips that we think are the most helpful. A longer list can be found on your institution's Career Center.

- ✓ Describe personal experiences or character qualities that set you apart from other applicants.
- ✓ Especially if your GRE, LSAT, or MCAT scores were not as high as you would have liked, emphasize the importance of having hands-on experience in your field (then discuss your time as a research assistant).
- ✓ Identify important characteristics of individuals in your field (e.g., leadership, creativity, critical thinking), and how you embody those characteristics.
- ✓ Discuss career and long-term goals. Show that you are thinking for the future and how acceptance into their program will help you reach those goals.
- ✓ Include a hook-line in the beginning to draw your reader in and make admissions committees remember you and *want* to keep reading about you.
- ✓ Be original in your thoughts and how you portray yourself.
- ✓ Proofread for grammar and spelling errors!
- ✓ Weave in examples to show that you are aware of the research being done in your field (or by the major professor or specific employer with whom you would like to work).

Requesting Reference Letters. Requesting letters of reference can be a sensitive subject even if you feel comfortable with your research mentors. We recommend that you follow three steps to ask your mentors if they are willing to write you strong reference letters.

Step 1: Prepare your CV/résumé, as well as detailed descriptions of your relevant lab and class experiences with your mentors. This Workbook is a great place to start for ideas. Also, if you worked closely with graduate students, ask them to write a brief, informal reference letter.

Step 2: Set up individual meetings with your mentors. During the meeting, describe your application plan. Provide your mentors with your prepared materials (described in Step 1). Ask them to email you if they feel they could write you strong letters of reference. Ask your mentors, “Can you write me strong recommendation letters or would it be better if I asked someone else?” This gives your mentors an “out” if they do not feel able. Also, be sure to mention that you will provide them with additional materials for writing your reference letters—such as instructions and envelopes (described in Step 3)—if they agree.

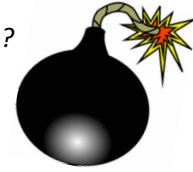
Step 3: If your mentor agrees to write on your behalf, the following are *crucial* to making the process go smoothly:

- Remember your mentor is taking time to do you a favor, so convey your appreciation
- Allow your mentor ample time to write. A good rule of thumb is *at least* 4-6 weeks.
- Create a personalized spreadsheet for your mentor. For each application that requires a letter, include: 1) specific reference instructions so that your mentor knows which areas (e.g., your research ability, leadership qualities, character) to focus on when writing, name of the school, name of the program, name of particular individuals with whom you’d like to work, 2) clear submission deadline dates, 3) the method of submission (e.g., specific website, through email)

Trouble Shooting

What if my mentor won't write me a letter of recommendation?

- Do not take it personally! Your mentor may have too much going on to commit to writing for you.
- No matter how curious you are, asking your mentor for the reason he or she refused is unprofessional.
- Reflect on potential reasons for the refusal. Did your mentor not know you well enough? Did you do the bare-minimum work? Did you not seem interested or invested in your project?



and the mailing or web add, and 4) notes about anything specific you would like your letter-writer to say in his/her letter about you..

- The clearer your application folder, the happier your mentor will be. Happy mentors write happy letters!

Communicating Your Findings. This is the final, and arguably most important, step in the research process. If researchers did not communicate their findings, we would be constantly repeating each others' work and science would be at a standstill. Below is a brief list of avenues for presenting your findings:

- A local undergraduate-focused convention or research meeting held in your department or at your institution, or even at a nearby institution
- Professional society's meeting or regional conference (e.g., Western Psychological Association) held in a city to which you could travel
- Consider asking your mentor if you can present your findings at the next lab meeting

Great references for conference posters:

- <http://www.apa.org/gradpsych/2011/01/poster.aspx>
- Ask graduate students for templates
- Posters hanging in your lab or in the building hallways

Many undergraduates find speaking in front of graduate students and faculty to be intimidating. As you prepare, remember:

- Practice makes perfect. Solicit friends and family to listen and ask questions about your talk.
- Predict the types of questions you could be asked about your project and prepare answers.
- Relax and do not forget to breathe! Everyone gets nervous!

- The only experts in the room with respect to your research project are you and your research team.
- Everyone who is listening is eager to hear what you have to say.
- Be honest. It is perfectly okay to admit when you do not know the answer to a question, or to preface unsure responses with, “I do not know, but my best guess would be...”

“There are only two types of speakers in the world. 1. The nervous and 2. Liars.”
-Mark Twain



STAY ON TRACK! Refer back to the Professional Development goals you created on Page 17. Are you on track to accomplishing them? Remember to track your progression in professional development skills.

Suggested Resources for Students and Mentors

For Students

Careers:

Basalla, S. E., & Debelius, M. (2007). *"So what are you going to do with that?" Finding careers outside academia*. Chicago, IL: The University of Chicago Press.

Landrum, R. E. (2009). *Finding jobs with a psychology bachelor's degree: Expert advice for launching your career*. Washington, DC: American Psychological Association.

Sternberg, R. J. (2006). *Career paths in psychology: Where your degree can take you* (2nd ed.). Washington, DC: American Psychological Association.

Graduate School:

American Psychological Association. (2007). *Getting in: A step-by-step plan for gaining admission to graduate school in psychology* (2nd ed.). Washington, DC: American Psychological Association.

American Psychological Association. (2016). *Graduate study in psychology, 2016 edition*. Washington, DC: American Psychological Association.

Asher, D. (2000). *Graduate admission essays: Write your way into the graduate school of your choice*. Berkeley, CA: Ten Speed Press.

Buskist, W., & Burke, C. (2007). *Preparing for graduate study in psychology: 101 questions and answers*. Malden, MA: Blackwell Publishing.

Kracen, A. C., & Wallace, I. J. (2008). *Applying to graduate school in psychology: Advice from successful students and prominent psychologists*. Washington, DC: American Psychological Association.

General:

Alley, M. (2003). *The craft of scientific presentations*. New York, NY: Springer-Verlag.

Landrum, R. E. (2008). *Undergraduate writing in psychology: Learning to tell the scientific story*. Washington, DC: American Psychological Association.

Reed, J. G., & Baxter, P. M. (2003). *Library use: Handbook for psychology* (3rd ed.). Washington, DC: American Psychological Association.

Silvia, P. K., Delaney, P. F., & Marcovitch, S. (2009). *What psychology majors could (and should) be doing: An informal guide to research experience and professional skills*. Washington, DC: American Psychological Association.

Williams-Nickelson, C., Prinstein, M. J., & Keilin, W. G. (2008). *Internships in psychology: The APAGS workbook for writing successful applications and finding the right fit* (2nd ed.). Washington, DC: American Psychological Association.

At your institution:

Undergraduate psychology adviser

Career Center

Library

Office of Undergraduate Research



For Mentors

Crisp, G., & Cruz, I. (2009). Mentoring college students. A critical review of the literature between 1990 and 2007. *Research in Higher Education, 50*, 525-545.

Dolan, E., & Johnson, D. (2009). Toward a holistic view of undergraduate research experiences: An exploratory study of impact on graduate/postdoctoral mentors. *Journal of Science Education and Technology, 18*, 487-500.

Forehand, R. L. (2008). The art and science of mentoring in psychology: A necessary practice to ensure our future. *American Psychologist, 63*, 744-755.

- Landau, J. D., Druen, P. B., & Arcuri, J. A. (2002). Methods for helping students to avoid plagiarism. *Teaching of Psychology, 29*, 112-115.
- Temple, L., Sibley, T. Q., & Orr, A. J. (Eds.) (2010). *How to mentor undergraduate researchers*. Washington, DC: Council on Undergraduate Research.
- Monte, A. (2001). Mentor expectations and student responsibilities in undergraduate research. *Council on Undergraduate Research Quarterly, 21*, 66-71.
- Shea, G. F. (2000). *Mentoring*. Menlo Park, CA: Crisp Publications.
- Shellito, C., Shea, K., Weissmann, G., Mueller-Solger, A., & Davis, W. (2001). Successful mentoring of undergraduate researchers: Tips for creating positive student research experiences. *Journal of College Science Teaching, 30*, 460-464.
- Wright, G. D. (2016). *The mentoring continuum: From graduate school through tenure*. Syracuse, NY: Syracuse University Press.
- Zachary, L. J. (2000). *The mentor's guide: Facilitating effective learning relationships*. San Francisco, CA: Jossey-Bass.

- 1 **Resources on the web:**
- 2
- 3 Association of American Colleges & Universities
- 4 <https://www.aacu.org>
- 5
- 6 Council on Undergraduate Research
- 7 www.cur.org
- 8
- 9 Psi Chi, The International Honor Society in Psychology
- 10 www.psichi.org
- 11
- 12 American Psychological Association
- 13 www.apa.org
- 14
- 15 Association for Psychological Science
- 16 <http://www.psychologicalscience.org/>
- 17

Answers to Self-Assessment Questions (Pg. 1)

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Literature Review

2. Peer-reviewed journal articles (d)—Peer-reviewed book chapters (a) are also highly reliable; popular science magazines (b) often have references to peer-reviewed journal sources at the end; because books written by Ph.D.s are often not peer-reviewed, they should be considered with caution; newspaper articles (e) and theses and dissertations (f) are the least reliable because they are not peer-reviewed.

3. There are five errors: (1) No hanging indent, (2) & is used to separate authors, (3) no quotation marks around journal article titles, (4) Only capitalize the first letter and letters appearing after punctuation marks in a journal article title, (5) “vol.” does not appear in an APA style citation.

Research Ethics

2. (a) While there is debate, it is always best to obtain participant consent for observational data that has been collected. (b) This is not ethical. Chantel is required to make sure that her participants read a consent form that is in their native language. Otherwise, there is a risk that individuals do not completely understand what will be asked of them in the experiment. (c) Publication decisions are made based on the level of contribution to the project, so Brian’s adviser did not behave ethically. Discussions about authorship between the research adviser and undergraduate should always happen before the project begins to avoid problems such as this one.

Methodology

1. T

2. T

3. F- One (gender, two levels)

4. T

5. F- Quasi-experiment, gender cannot be manipulated

6. T

7. T

8. F- see Question 7, Darrell’s study is most likely not assessing what he set out to look at.

Discussion

1. Darrell’s results support his hypothesis.

2. No, Darrell’s research design was not carefully done, resulting in numerous confounds. A study such as Darrell’s does not add to the literature due to its problems with internal validity and therefore cannot be considered relevant to the scientific community.

3. Darrell could consider removing as many confounds as possible and replicating the study if it is worthwhile.

4. Internal validity, no mention of screening participants, does not generalize well to all age groups.

5. Hypotheses are never proven; they are either supported or refuted.

6. No, there are too many flaws in his research design for him to be able to make such a claim