Inquiry-Based Research Experiences within the Psychology Curricula: A Students Perspective and Recommendations

Tess Guzman, Aliyah Meehan, Elizabeth Bissmeyer,
Lizz Schornak, and Taylor Wadian
University of Cincinnati Blue Ash College

A growing body of research finds that the inclusion of inquiry-based research experiences, in which students are provided with the opportunity to engage in the process of scientific inquiry by conducting and reporting the results of their own novel research projects, is highly effective at helping students within the natural sciences develop competencies in scientific inquiry and critical thinking, communication, and professionalism. Although research has demonstrated numerous ways in which students in the natural sciences benefit from taking part in the research process, few studies have examined whether the benefits of inquiry-based research experiences extend to students in the social sciences, such as psychology. The purpose of the present paper is to provide a first-hand description, from a group of sophomore level undergraduate students at a two-year regional university, of our experiences taking part in a series of psychology courses that integrated inquiry-based research experiences. Utilizing the APA (2013) guidelines for the undergraduate major as an overarching framework, we reflect upon how the courses, and the inquiry-based laboratory component specifically, provided us with important opportunities for growth and development in scientific reasoning, ethics, communication, and professionalism. Further, by comparing our own experiences with those reported in the extant research literature, we also provided suggestions for how educators in psychology or other disciplines can maximize the benefits of any inquiry-based research experience within their classrooms.

"*Hey, that psych major deal, that's great, it's important to have liberal arts… but realize you are going to be working at Chick-fil-A*" – Jeb Bush, 2015

As the statement above by then Presidential candidate Jeb Bush illustrates, many people believe that psychology is a relatively useless field to pursue for most undergraduate students. What this criticism ignores, however, is the fact that psychology majors acquire the skills that employers

are looking for in successful employees. Beyond acquiring a formal education in the content-knowledge of psychology (e.g., a working knowledge of psychology's content domains), the American Psychological Association (APA, 2013) states that undergraduate students majoring in psychology acquire foundational and baccalaureate competencies in (1) scientific inquiry and critical thinking (e.g., being able to design, conduct, and interpret psychological research), (2) ethical and socially responsible behavior (e.g., behaving ethically and treating others with civility), (3) communication (e.g., crafting clear and concise written communications to address specific audiences), and (4) professionalism (e.g., collaborating successfully on complex group projects). Serendipitously, a review of the research examining the top skills and characteristics employers are seeking in college-educated applicants include critical thinking, problem solving, scientific literacy, integrity, communication, teamwork, and professionalism (Coplin, 2012; Edwards & Smith, 1988; Landrum & Harrold, 2003); all skills that, according to the APA (2013) undergraduate students majoring in psychology acquire through their bachelorette degree program.

Although undergraduate students in psychology are undoubtedly provided with opportunities to develop foundational and baccalaureate competencies outlined by the APA (2013), research (e.g., Lopatto, 2010) suggests that such skills are directly and powerfully facilitated by requiring or otherwise providing students with the opportunity to take part in the research process. For example, research finds that the inclusion of inquiry-based research experiences, in which students engage in the process of scientific inquiry by conducting and reporting the results of their own novel research projects, are highly effective at helping students within the natural sciences (e.g., biology, chemistry and physics) develop competencies in scientific inquiry and critical thinking, communication, and teamwork (Auchincloss et al., 2014; American Association for the Advancement of Science, 1993; Weaver et al., 2008). Further, research suggests that the inclusion of such research experience also provide students with meaningful and memorable opportunities for them to learn about, apply, and model ethical and professional behavior within their discipline (Lopatto, 2010).

Although research has demonstrated numerous ways in which students in the natural sciences benefit from taking part in the research process, few studies have examined whether the benefits of inquiry-based research experiences extend to students in the social sciences, such as psychology. The purpose of the present paper is to provide a first-hand

description, from a group of sophomore level undergraduate students at a two-year regional university, of our experiences taking part in a series of psychology courses that integrated inquiry-based research experiences. In this summary, we will reflect upon how the courses, and the inquiry-based laboratory component specifically, provided us with important opportunities for growth across the four competency domains outlined by the APA (i.e., development in scientific inquiry and critical thinking, ethical and socially responsible behavior, communication, and professionalism). Further, we will compare our own experiences with the research literature to provide suggestions for how educators can maximize the benefits of any inquiry-based research experience.

Summary of Our Experience

The student authors of this paper were, at the time of the experience, sophomore level students enrolled in the pre-psychology program at UC Blue Ash College. The college is a small open-access two-year regional college within the broader University of Cincinnati system. The pre-psychology program at UC Blue Ash College is a transitional-oriented Associates degree program designed to provide freshmen- and sophomore-level students with the foundational knowledge and skills that will help them succeed in attaining a bachelor's degree in psychology from the University of Cincinnati.

As part of the curricula within the pre-psychology program, students are required to take a two-semester course sequence on research methods and statistics in psychology. The primary learning goal for the two-course sequence is to provide students with an understanding of basic and advanced concepts in research methods and statistics. To ensure that students in these courses receive first-hand experiences participating in the process of scientific inquiry, a one credit laboratory component is included in the course, which requires students to take part in an inquiry-based research experience. Inquiry-based research experiences include experiences encouraging students to collaboratively engage in the practices of scientific inquiry (e.g., asking questions, proposing hypotheses, designing studies to gather data, analyzing and reporting results) that, although facilitated by a professor, is student driven and focused on discovery and problem solving (Aditomo et al., 2014; Weaver et al., 2008). As a student-centered learning approach, inquiry-based research experiences put students in charge of learning, challenging them to make informed decisions

concerning the research questions pursue as well as the methodological and statistical approaches they employ (Auchincloss et al., 2014; Weaver et al., 2008). Because the approach is *inquiry*-based, students pursue research questions in which the outcome of the research is unknown, both to the student and the professor. However, unlike true research experiences, inquiry-based research experiences are not focused on contributing to the extant literature (Auchincloss et al., 2014). Instead, the experience is focused entirely on challenging students to take on the role of a researcher, thereby providing them opportunities to develop the skills and abilities needed in their post-baccalaureate careers.

In the research methods and statistics course sequence in the pre-psychology program, students work together in small groups to collaboratively conduct novel studies (e.g., examining humblebragging on social media). Specifically, in the first course in the research methods and statistics sequence, students are asked to design and conduct a correlational study examining the correlates of people's tendencies to humblebrag (i.e., brags masked either in humility or as a complaint; see Setzer et al., 2018) on social media. In the second course in the sequence, students further investigate the phenomenon of humblebragging by conducting an experimental study examining how specific aspects of humblebragging (e.g., characteristics of the bragger or the brag itself) may impact people's perceptions of the bragger. Although the professor provides students with the topic area (i.e., humblebragging) and directs the design of the research each semester (to ensure the design is aligned with learning objectives each semester), he encourages students to choose or generate their own variables to study, decide on their own research questions, and create their own hypotheses and materials. Consequently, as an inquiry-based research experience, students are responsible for creating and conducting an entire research project from start to finish.

Although students take an active role in designing and conducting the empirical research within each course in the sequence, it is important to note that the professor provides substantial support and guidance during each step of the process. In fact, he requires students to complete specific tasks (which he called "final paper feedback opportunities") every two weeks to ensure progress on the research and to provide students with feedback and suggestions at every stage of the research (and writing) process. In reflecting on the experience, these feedback opportunities were

hugely beneficial to students' success in completing the research project and writing the empirical research article.

Although this inquiry-based research experience is a unique experience for students, it is important to note that many degree programs include such experiences. For instance, inquiry-based research experiences have been used within STEM courses (and especially the natural sciences) for years, with a great deal of success (Furtak et al., 2012; Lopatto, 2010; Sundberg et al., 2005). Interestingly, however, although many psychology professors include inquiry-based research experiences within their research methods courses (Ball & Pelco, 2006), there appears to be a paucity of research examining the effectiveness of such experiences in fostering psychology students' academic and professional development. As described previously, according to the APA (2013), undergraduate students in psychology should acquire foundational and bachelorette competencies in (1) scientific inquiry and critical thinking (e.g., being able to design, conduct, and interpret psychological research), (2) ethical and socially responsible behavior (e.g., treating other with civility), (3) communication (e.g., craft clear and concise written communications to address specific audiences), and (4) professionalism (e.g., collaborating successfully on complex group projects) through the curricula. Despite this guidance, researchers have yet to examine whether psychology students' participation in inquiry-based research experiences, specifically, foster their development across the four skills-based learning objectives outlined by the APA (2013). In the following section, we will attempt to address this gap in the literature by summarizing empirical evidence in the STEM fields demonstrating how inquiry-based research experiences are uniquely suited to foster undergraduate students' development, specifically focusing on each of the four skills-based learning objectives outlined by the APA (2013). Further, we will also reflect on how our own experiences taking part in inquiry-based research within psychology compare to those described in the literature.

Scientific Inquiry and Critical Thinking

According to the APA (2013), undergraduate psychology students should, through their curriculum, develop foundational and baccalaureate level competencies in scientific inquiry and critical thinking through their bachelor's degree program. More specifically, the APA suggests that psychology students need to be able to (1) use scientific reasoning to interpret psychological phenomena, (2) demonstrate psychology

information literacy, (3) engage in innovative and integrative thinking and problem solving, (4) interpret, design, and conduct basic psychological research, and (5) incorporate sociocultural factors in scientific inquiry (e.g., identify under what conditions research findings can be appropriately generalized).

Although there is no research examining the extent to which inquiry-based research experiences within psychology help psychology students develop competencies in scientific inquiry and critical thinking, there is an extensive literature base examining the extent to which inquiry-based research experiences foster STEM students' skills and competencies in this domain. A review of this literature finds that inquiry-based research experiences are effective at promoting student development in scientific inquiry and critical thinking. For instance, an impressive volume of research suggests that students in STEM-related fields who are afforded opportunities to engage in inquiry-based research within their courses experience significant gains in their ability to (1) use scientific reasoning to interpret field-related phenomena, (2) demonstrate field-related information literacy, (3) engage in innovative and integrative thinking and problem solving, and (4) interpret, design, and conduct basic research within their field (Balgopal et al., 2017; Cooper et al., 2017; Das, 2013; Frisch et al., 2018; Gormally et al., 2009; Holmes & Beins, 2009; Sanft & Ziegler-Graham, 2018; Weaver et al., 2008; White et al., 2015).

In our own experiences within psychology, we found that the inquiry-based research experience within our classes helped us go beyond basic understanding of research by challenging us to develop competency in designing, conducting, and interpreting psychological research. Further, we found that writing an empirical research report was particularly useful because it challenged us to develop higher-level competencies in information literacy (e.g., using college library resources such as online databases to identify legitimate sources of information, reading and evaluating psychological research, interpreting statistical finding), engage in innovative and integrative thinking (e.g., describe problems operationally to study them empirically), and using scientific reasoning to interpret psychological phenomena (e.g., using theory to explain behavioral phenomena). In addition, in designing our studies and discussing ethical and logistical issues that emerged from our choices in sampling and recruitment, we were able to better understand and recognize how individual and sociocultural factors can influence the generalizability of research results.

Ethical and Socially Responsible Behavior

In addition to developing competency in scientific inquiry and critical thinking, the APA (2013) suggests that undergraduate psychology students must develop "ethically and socially responsible behaviors for professional and personal settings in a landscape that involves increasing diversity" (p 104). Specifically, students must learn the formal regulations that govern professional ethics in the discipline and adopt the underlying values that promote positive outcomes in personal and professional settings. The learning outcomes identified by the APA (2013) for ethically and socially responsible behavior include (1) applying ethical standards to evaluate psychological science and practice (e.g., identify violations of ethical standards in psychological contexts), (2) build and enhance interpersonal relationships (e.g., promote civility in self and others), and (3) adopting values that build community at local, national, and global events (e.g., exhibit respect for members of diverse groups with sensitivity to issues of power, privilege, and discrimination).

There is evidence to suggest that inquiry-based research experiences provide students meaningful and memorable opportunities to apply and model ethical and professional behavior within their discipline (Lopatto, 2010). For instance, because inquiry-based research experiences provide students with real opportunities to engage in collaborative research with their peers and professor, the experience helps students develop the skills to successfully work with others and ethically design and interpret scientific research studies (Balgopal et al., 2017; Doyle & Buckley, 2014; Stacey et al., 2015).

In our research methods and statistics courses, we found that the inquiry-based research experiences afforded us unique opportunities to evaluate and apply ethical standards for research in psychology while also challenging us to refine our skills in building and enhancing collaborative interpersonal relationships. While our prior courses often touched on ethical practices in psychological research, it was difficult to fully understand where ethical issues often arise and how to deal with them in practice. Through our participation in the inquiry-based research experience, we were provided opportunities to work through ethical issues in our own studies and discuss the potential ramifications of our decisions with our group members and our professor. In sum, the experience provided us with an opportunity to better understand and appreciate the

importance of ethical conduct in research so we can better and more wholly adhere to and adopt professional values within the discipline.

Communication

According to the APA (2013), an individual with a baccalaureate degree in psychology should be highly skilled in communicating complex information to a wide variety of audiences. For instance, students with a baccalaureate degree in psychology should be able to (1) craft clear and concise written and oral arguments that are based on evidence-based psychological concepts and theories, (2) present complex information to a wide range of audiences, (3) anticipate answers to questions about psychological content, and (4) utilize feedback to improve their communication and interaction skills (APA, 2013).

Although research evaluating these claims find that psychology students do in fact tend to experience significant gains in their communication skills (Kruger & Zechmeister, 2003), research has yet to systematically examine the extent to which inquiry-based research experiences within the curriculum uniquely contribute to these gains. However, existing research within the natural sciences suggests students' experiences with inquiry-based research foster significant gains in (1) technical writing abilities, (2) teamwork and collaboration, and (3) sharing information with others (Carr, 2013; Erkens & Bodemer, 2019; Gilardi & Lozza, 2009; Li et al., 2013; Sanft & Ziegler-Graham, 2018; Szucs et al., 2017; White et al., 2015). For instance, a study by Sanft & Ziegler-Graham (2018) found that students involved in a project-based math practicum significantly improved their ability to work well with their peers as well as convey different ideas and information through written and oral formats.

In our own experience, we found that there were three aspects of the inquiry-based research experience that directly improved our communication skills. These included (1) reading and evaluating the published literature, (2) writing an APA style research report, and (3) being required to work in small groups. Although it is clear that reading and writing research can drastically improve communication skills, we found it interesting that the small group work also helped improve our communication skills. Consistent with research highlighting the benefits of peer-mediated learning (Havnes, 2008), we believe that we learned a lot from one another by collaboratively writing empirical research reports. We often had to discuss and reflect on our own writing within our small groups

to improve the clarity of our ideas. Beyond providing us with a non-threatening environment to develop professional writing skills, the group work also required us to learn how to interact effectively with one-another. Several of us had to learn how to effectively navigate and resolve difficult interpersonal conflicts or issues that can emerge whenever a group of people are collaborating.

Professional Development

The final skills-based learning objective described by the APA (2013) is professional development. The APA Guidelines (2013) suggests that undergraduate students majoring in psychology should develop a meaningful professional direction for life after graduation, applying psychology-specific content and skills to the development of their own career paths. Further, through their curricula, undergraduate students majoring in psychology should develop project management skills, gain self-efficacy and self-regulation, and increase their capacity to work as part of a team. Although these outcomes are perhaps the most important skills students will need to acquire for success in their post-baccalaureate careers, research evidence demonstrates that psychology students acquire one or more of these outcomes from their baccalaureate education is mixed (APA, 2013).

Research examining the effectiveness of inquiry-based research experiences to foster students' professional development within the STEM fields reveals that STEM students who participate in research, particularly experiences structured using inquiry-based learning approaches, report that the experience helped them (1) learn how to work as part of a team, (2) develop project management skills, and (3) gain a better understanding of their future career goals and aspirations (Das, 2013; Frantz et al., 2006; Gormally et al., 2009; Kang & Keinonen, 2017; Li et al., 2013; Mraz & Craig, 2018; Roick & Ringeisen, 2018; Sanft & Ziegler-Graham, 2018). Additionally, research finds that students who are afforded opportunities to engaged in inquiry-based research experiences report significant gains in both self-efficacy and self-regulation (Frantz et al., 2006; Gormally et al., 2009).

Our own experiences are largely in line with the extant literature. Through the inquiry-based research experiences integrated into our classes, we learned how to effectively work as a part of a team. We all had to learn effective leadership strategies and project development skills to ensure the project was completed on time and that our work met or exceeded stated

requirements and other evaluative criteria. It is important to emphasize that through the process, we also had to learn how to identify and resolve potential conflicts by generating, applying, and evaluating potential solutions to problems (e.g., social loafing; Harkins, 1987) that develop when working in teams.

In reflecting on our experiences in the two-course sequence, we found that our active participation in the inquiry-based research experiences led us to take on a new role. Instead of being students, we had to take on the role of a professional researcher in our field. Consistent with prior research, the change in role led many of us to see ourselves as more than students. Through this experience, we started to see ourselves as future "academics" or "researchers." This phenomenon, known as *domain identification* (Osborne & Jones, 2011) has been found to be associated with a wide range of positive outcomes academically and professionally. For instance, identifying as an "academic" tends to increase undergraduate students' motivations to succeed in school, leading to marked improvement in their academic performance (Osborne & Jones, 2011; Voelkl, 1997). In context of identifying as a "scientist" or "researcher," students who participate in inquiry-based research experiences build confidence in their skills and aptitude for research through the experience–and therefore take on a scientific identity (Davies, 2016) – are more likely to develop career goals and aspirations oriented toward science (Marz-Craig et al., 2018). Further, this appears to be particularly true among students who are typically underrepresented in the sciences (Chemers et al., 2011).

In our own experiences, we found that the inquiry-based research experiences provided in our courses meaningfully impacted our conceptions of self and helped us develop the professional skills that, we hope, will make us successful in our chosen careers. By specifically conducting research analyses using IBM's SPSS (the leading statistical software in the field; Blanca et al., 2018) and writing results and conclusions based on the data, we felt like true researchers and academics. In previous psychology courses, we simply learned what the research process typically looks like but did not actually participate in scientific research. However, in our research methods and statistics courses, the inquiry-based research experiences allowed us to take on the role of a researcher and academic–potentially changing our conceptions of who we are and what we can achieve.

Recommendations

      Based on our review of the literature, and our own experiences taking part in two courses that integrated inquiry-based research experiences, we have created a list of recommendations and suggestions for faculty interested in integrating inquiry-based research experiences into their own courses. We have organized these recommendations into two categories, which include logistical recommendations and motivational recommendations. The logistical recommendations focus on practical matters that we believe faculty should consider when attempting to integrate inquiry-based learning experiences in their classrooms. The motivational recommendations, on the other hand, focus on interpersonal and motivational behaviors of our professor that, although not unique to inquiry-based research experiences, were especially impactful on our development during the experience.

Logistical/Practical Recommendations

1. Make the experience required, and worth a meaningful portion of the grade.

      Research finds that when students have clear goals for course success, such as knowing which assignments of the course contribute to a majority of the final grade, they tend to engage in the course more and prioritize those assignments and tasks more (Schlenker et al., 2013). Consequently, to ensure students engage in the experience and put forth sufficient effort, the inquiry-based research experience needs to significantly contribute to the students' grade. In our classes, activities and assignments related to the inquiry-based research experience contributed to roughly forty- to fifty percent of our grade (depending on the semester). In our experience, the points in the course dedicated to the inquiry-based research experience led us to believe that the experience was important and meaningful component of the course. Had the project been worth less points, many of us may not have dedicated as much effort and time to the assignment, and therefore not gained as much from the experience.

2. Put students in charge.

      A core component of inquiry-based learning and the inquiry-based research experience is challenging students to take an active role in their own education (Frisch et al., 2018). Students need to be given the autonomy and personal agency to make decisions about their research projects,

regardless of positive or negative outcomes. This means that students should be able to decide on their own research topic and/or create their own research question. Placing students in charge encourages active learning which improves critical thinking (White et al., 2015), and yields positive psychological and behavioral outcomes (Detlor et al., 2012).

3. Make students work in small groups but ensure individual accountability.

In our experience, we found that although working in small groups was challenging at times, the challenge of working as a team forced us to develop skills in communication and professionalism. For instance, we had to learn how to collaboratively and effectively communicate and work with individuals with a diverse (and sometimes disparate) range of skills and perspectives in a professional manner as well as develop strategies to contend with any potential problems and/or conflicts that arose. Through working in a small group, we realized the importance of accurately self-assessing our own and others' skills and abilities so we could efficiently complete our assignments, whatever they were.

Although we believe that it is important for students to learn how to work together as part of a group, it is important to note that individual contributions need to be acknowledged in the process. There is a rich literature within social psychology documenting the ills of group work and how it can lead to counterproductive behaviors from individuals such as social loafing (i.e., the tendency for individuals to exert less effort to achieve a goal when they work as part of a group; Harkins, 1987). Consequently, we are thankful that our professor utilized his knowledge of social psychological literature to inhibit such behaviors. In this course, our professor required us to evaluate our own contributions, as well as group members contributions, to the project so that grades reflected each group member's personal contributions to the project.

4. Require students to write an empirical research report.

We believe that writing an empirical research report using APA style was one of the most important parts of our inquiry-based research experiences in our classes. All aspects of our inquiry-based research experience, in each class, was structured around developing this ability to write an APA style empirical paper. Beyond improving our communication skills, generally, and ability to employ APA writing style to construct

arguments clearly and concisely based on evidence-based psychological concepts and theories, specifically, the process of writing the paper forced us to develop a large range of skills related to scientific inquiry and critical thinking (e.g., employ scientific reasoning to interpret psychological phenomena, practice psychology information literacy, and engage in integrative and innovative thinking). Further, the fact that we had to write the paper (and conduct the underlying research study) as part of a team encouraged us to develop several important professional development skills (e.g., exhibit self-efficacy and self-regulation, refine or otherwise develop project-management skills, interact effectively with others, and work collaboratively as part of a team).

5. Provide guidance and lots of constructive feedback.

To ease the process of writing our own empirical research report, our professor provided us with numerous opportunities to receive feedback. Research has shown the importance of feedback on student learning (Daniel et al., 2015; Goddard, 2003; Wisniewski et al., 2020).   Professor feedback on student assignments leads to increased cognitive skills and understanding of course content (Wisniewski et al., 2020). Our professor split the paper into many smaller sections, such that we were given the opportunity to develop a draft of each section at a time. The major sections of an empirical research report (introduction, methods & participants, results, discussion, and conclusion) were accomplished through an outlining process. These specific outlines served as guidance for our academic writing and were then converted into drafts. After submitting these drafts for review, we were given feedback with constructive suggestions for revision. This feedback was supportive and encouraging, enabling us to be confident in our research and writing abilities. Because we did not have other concrete experiences writing APA style scientific papers, the feedback opportunities gave us a much-needed chance to see where we needed to improve.

6. Require students to create and present an oral presentation of their research.

In reviewing the APA (2013) learning outcomes related to communication, we believe that it is important that professors designing courses that include an inquiry-based research experience should require students to create and present some form of oral presentation as part of

the experience. According to the APA (2013) guidelines, one major learning outcome (i.e., learning objective 4.2) details the need for students to be able to "exhibit effective presentation skills for different purposes" (p 108). To be successful in their post-baccalaureate career, psychology students need to be afforded opportunities to learn how to create and deliver effective and compelling oral presentations or arguments summarizing complex information within a set time limit and crafted appropriately depending on the intended audience.

Unfortunately, students are often nervous and unsure of how to competently present their research (Hill & Walkington, 2016). Consequently, students need to be provided with opportunities to build self-efficacious beliefs concerning their presentation and communication skills. Considering that prior research demonstrates that the more experience students receive creating and presenting research, the more they build self-efficacious beliefs that they can competently present research (Helm & Bailey, 2013), we highly recommend that professors require students to create and present some form of oral presentation as part of the inquiry-based research experience.

7. Highlight ethical dilemmas when they emerge.

It is important that the professor or educators highlight and discuss ethical dilemmas when they emerge in the research process (Rosnow, 1990). For instance, when we were first designing our studies, we routinely discussed various ethical dilemmas in the research process such as anonymity, confidentiality, informed consent, and debriefing. For example, although many of us included informed consent forms that stated participants responses would be completely anonymous in our rough draft, our professor noted that this statement was not entirely accurate. After a great deal of discussion, we realized that many of our studies, for various reasons, could only guarantee confidentiality, not anonymity. This realization made many of us better appreciate the nuances of the research process when it comes to the ethics of human subjects research. Another example that stands out in our minds involves some discussions we had as a class when we were tasked with analyzing data. While we were conducting analyses, our professor made sure to show us how results could be influenced by manipulating researcher degrees of freedom, a practice called "p-hacking" (Friese & Frankenbach, 2020) as well as ethical issues with

HARKing (i.e., hypothesizing after the results are known; Kerr, 1998), and explained how and why we should avoid such practices in our own research.

Given our own experiences, and the research evidence demonstrating the utility of routinely discussing ethical dilemmas in research (Rosnow, 1990), we believe that it is important for professors hoping to include an inquiry-based research experience in their own class to use the experience as an opportunity to focus on and discuss the importance of research ethics in their classrooms. We believe such practices really helped us to not only become familiar with some of the formal regulations that govern professional ethics in psychology but also better understand why these regulations are important.

Motivational/Interpersonal Recommendations

1. Emphasize and reward ethical and professional behavior.

Our professor included an assessment of professionalism within our inquiry-based research experience (and the course) to direct and enhance professional and ethical conduct among students. Categories of assessment included teamwork and leadership, personal responsibility, integrity and honesty, and respect and civility. Although we did not discuss this aspect previously, we believe that his emphasis on professionalism–both during class meetings and in the gradebook–was a major factor that facilitated our development in ethical behavior and professionalism. Although professionalism is important, grading or evaluating professional conduct is challenging (Epstein & Hundert, 2002). We believe that our professor's focus on professionalism, and the grading rubric he used to assess professionalism, were highly effective in motivating and moderating professional conduct. From the student perspective, the rubric clearly outlined the kinds of professional behaviors we were expected to demonstrate, and how our behaviors throughout the semester would impact our grades. Those hoping to integrate some inquiry-based research experiences in their courses should attempt to provide students with feedback on their professional conduct at multiple points throughout the semester. For instance, beyond providing students with a final grade, faculty should provide feedback on their students' professional conduct at least once before midterms so students can be made aware of any issues in their behavior/performance and subsequently provided with suggestions on how to improve.

2. Foster domain identification through reinforcement.

Throughout each stage of the research process, our professor purposely and actively commented on and praised our development as future researchers. By identifying us as "future researchers" and continually praising our aptitude for research, we began to see ourselves as researchers–thereby demonstrating a phenomenon, described previously, known as *domain identification* (Osborne & Jones, 2011). Prior to taking his courses, none of us viewed ourselves as potential researchers. As undergraduates, the idea of creating professional, scientific research was daunting. Although our previous courses had taught us about research, they had not taught us what it is like to be a researcher or allowed us to take on the role of a researcher. Because of this, and the prevalence of traditional gender norms within society stating that women cannot be "scientists" (Van der Vleuten et al., 2018), many of us believed that a career in research was beyond our capabilities. However, through taking part in the inquiry-based research experience and hearing our professor's comments about our aptitude for research, our conceptions of the self and views about our attitudes have changed. We (i.e., the first three authors of this paper) now see ourselves as women who could be capable future researchers.

3. Clearly demonstrate you are invested in your student's future.

Although this suggestion is not specific to inquiry-based research experience, we have found that our professors explicit statements concerning his investment in our future academic and career success led to mutual feelings of respect and empowerment. It was clear that our future success and well-being were important to our professor as he would purposely and consistently ask us what our career aspirations are and offered to meet with us individually to discuss our academic and professional goals. For example, Wilson (2006) found that a professor's positive attitude towards students positively related to student motivation and course appreciation. Hence, a caring and encouraging professor can increase academic and professional motivation and development.

Conclusions

The purpose of the present paper was to highlight the importance of integrating inquiry-based research experiences within the college curricula, broadly, and within the field of psychology, specifically, by reflecting on our own experiences with inquiry-based research in a research

methods and statistics course at a small regional school in Ohio. Utilizing the APA (2013) guidelines for the undergraduate major, we described how inquiry-based research experiences integrated into a psychology course helped us develop foundational and baccalaureate competencies in scientific reasoning and critical thinking, ethical and socially responsible behavior, communication, and professionalism. By comparing our own experiences with those reported in the extant research literature, we also provided suggestions for how educators in psychology or other disciplines can maximize the benefits of any inquiry-based research experience within their classrooms. Although we included supportive research evidence to substantiate our claims, it is important to note that much of the published research is not specifically focused on the APA (2013) guidelines. Most of the extant research examines the benefits of inquiry-based research experiences integrated into classes within the natural sciences. Consequently, more research is needed to specifically examine the extent to which inquiry-based research experiences facilitate gains in the four competencies outlined by the APA (2013) among psychology students.

References

Aditomo, A., Goodyear, P., Bliuc, A., & Ellis, R. A. (2013). Inquiry-based learning in higher education: Principal forms, educational objectives, and disciplinary variations. *Studies in Higher Education (Dorchester-on-Thames), 38*(9), 1239-1258. https://doi.org/10.1080/03075079.2011.616584

American Association for the Advancement of Science, Washington, DC. (1993). *Benchmarks for Science Literacy,* Oxford University Press.

American Psychological Association. (2013). *APA guidelines for the undergraduate psychology major: Version 2.0*. https://www.apa.org/ed/precollege/about/psymajor-guidelines.pdf

Auchincloss, L. C., Laursen, S. L., Branchaw, J. L., Eagan, K., Graham, M., Hanauer, D. I., Lawrie, G., McLinn, C. M., Pelaez, N., Rowland, S., Towns, M., Trautmann, N. M.,   Varma-Nelson, P., Weston, T. J., Dolan, E. L. (2014). Assessment of course-based undergraduate research experiences: A meeting report. *CBE Life Sciences Education, 13*(1), 29-40. https://doi.org/10.1187/cbe.14-01-0004

Ball, C. T., & Pelco, L. E. (2006). Teaching research methods to undergraduate psychology students using an active cooperative

learning approach. *International Journal of Teaching and Learning in Higher Education, 17*(2), 147-154.

Balgopal, M. M., Casper, A. M. A., Atadero, R. A., & Rambo-Hernandez, K. E. (2017). Responses to different types of inquiry prompts: College students' discourse, performance, and perceptions of group work in an engineering class. *International Journal of Science Education*, *39*(12), 1625–1647. https://doi.org/10.1080/09500693.2017.1346847

Blanca, M. J., Alarcón, R., & Bono, R. (2018). Current practices in data analysis procedures in psychology: What has changed?. *Frontiers in Psychology, 9*, 2558. https://doi.org/10.3389/fpsyg.2018.02558

Carr, J. M. (2013). Using a collaborative critiquing technique to develop chemistry students' technical writing skills. *Journal of Chemical Education, 90*(6), 751-754. https://doi.org/10.1021/ed2007982

Chemers, M. M., Zurbriggen, E. L., Syed, M., Goza, B. K., & Bearman, S. (2011). The role of efficacy and identity in science career commitment among underrepresented minority students. *Journal of Social Issues, 67*(3), 469–491. https://doi.org/10.1111/j.1540-4560.2011.01710.xt

Cooper, T., Bailey, B., Briggs, K., & Holliday, J. (2017). Assessing student openness to inquiry-based learning in precalculus. *PRIMUS: Problems, Resources, and Issues in Mathematics Undergraduate Studies*, *27*(7), 736–753. https://doi.org/10.1080/10511970.2016.1183155

Coplin, W. D. (2012). *10 things employers want you to learn in college, revised: The skills you need to succeed*. Berkeley, Calif: Ten Speed Press.

Das, K. (2013). From inquiry-based learning to student research in an undergraduate mathematics program. *PRIMUS: Problems, Resources, and Issues in Mathematics Undergraduate Studies*, *23*(9), 829–836. https://doi.org/10.1080/10511970.2013.824528

Daniel, F., Gaze, C. M., & Braasch, J. L. G. (2015). Writing cover letters that address instructor feedback improves final papers in a research methods course. *Teaching of Psychology, 42*(1), 64–68. https://doi.org/10.1177/0098628314562680

Davies, P. (2016). Apprenticeship in science research: Whom does it serve? *Cultural Studies of Science Education, 1*(1), 991–997. https://doi.org/10.1007/s11422-015-9661-0

Detlor, B., Booker, L., Serenko, A., & Julien, H. (2012). Student perceptions of information literacy instruction: The importance of active learning. *Education for Information, 29*(2), 147–161. https://doi.org/10.3233/EFI-2012-0924

Doyle, E., & Buckley, P. (2014). Research ethics in teaching and learning. *Innovations in Education and Teaching International*, *51*(2), 153–163. https://doi.org/10.1080/14703297.2013.774137

Edwards, J., & Smith, K. (1988). *What skills and knowledge do potential employers value in baccalaureate psychologists?* In P. J. Woods (Ed.), *Is psychology for them? A guide to undergraduate advising* (pp. 102–111). American Psychological Association. https://doi.org/10.1037/10556-025

Epstein, R. M., & Hundert, E. M. (2002). Defining and assessing professional competence. *JAMA: Journal of the American Medical Association, 287*(2), 226–235. https://doi-org/10.1001/jama.287.2.226

Erkens, M., & Bodemer, D. (2019). Improving collaborative learning: Guiding knowledge exchange through the provision of information about learning partners and learning contents. *Computers & Education*, *128*, 452–472. https://doi.org/10.1016/j.compedu.2018.10.009

Frantz, K. J., DeHaan, R. L., Demetrikopoulos, M. K., & Carruth, L. L. (2006). Routes to research for novice undergraduate neuroscientists. *CBE—Life Sciences Education, 5*(2), 175-187. https://doi.org/10.1187/cbe.05-09-0119

Friese, M., & Frankenbach, J. (2020). p-Hacking and publication bias interact to distort meta-analytic effect size estimates. *Psychological Methods*, *25*(4), 456–471. https://doi.org/10.1037/met0000246

Frisch, J. K., Jackson, P. C., & Murray, M. C. (2018). Transforming undergraduate biology learning with inquiry-based instruction. *Journal of Computing in Higher Education*, *30*(2), 211–236. https://doi.org/10.1007/s12528-017-9155-z

Furtak, E. M., Seidel, T., Iverson, H., & Briggs, D. C. (2012). Experimental and quasi-experimental studies of inquiry-based science teaching: A meta-analysis. *Review of Educational Research, 82*(3), 300-329. https://doi.org/10.3102/0034654312457206

Gilardi, S., & Lozza, E. (2009). Inquiry-based learning and undergraduates' professional identity development: Assessment of a field research-based course. *Innovative Higher Education, 34*(4), 245-256. https://doi.org/10.1007/s10755-009-9109-0

Goddard, P. (2003). Implementing and evaluating a writing course for psychology majors. *Teaching of Psychology, 30*(1), 25–29. https://doi.org/10.1207/S15328023TOP3001_04

Gormally, C., Brickman, P., Hallar, B., & Armstrong, N. (2009). Effects of Inquiry-based Learning on Students' Science Literacy Skills and Confidence. *International Journal for the Scholarship of Teaching and Learning, 3*(2), 16. https://doi.org/10.20429/ijsotl.2009.030216

Harkins, S. G. (1987). Social loafing and social facilitation. *Journal of Experimental Social Psychology, 23*(1), 1-18. https://doi.org/10.1016/0022-1031(87)90022-9

Havnes, A. (2008). Peer-mediated learning beyond the curriculum. *Studies in Higher Education, 33*(2), 193-204. https://doi.org/10.1080/03075070801916344

Helm, H. W. Jr., & Bailey, K. G. D. (2013). Perceived benefits of presenting undergraduate research at a professional conference. *North American Journal of Psychology*, *15*(3), 527–536.

Hill, J. & Walkington, H. (2016). Developing graduate attributes through participation in undergraduate research conferences, *Journal of Geography in Higher Education*, *40*(2), 222-237. https://doi.org/10.1080/03098265.2016.1140128

Holmes, J. D. & Beins, B. C. (2009). Psychology is a Science: At Least Some Students Think So. *Teaching of Psychology*, *36*, 5–11. https://doi.org/10.1080/00986280802529350

Kang, J., & Keinonen, T. (2017). The effect of inquiry-based learning experiences on adolescents' science-related career aspiration in the Finnish context. *International Journal of Science Education*, *39*(12), 1669–1689. https://doi.org/10.1080/09500693.2017.1350790

Kerr, N. L. (1998). HARKing: Hypothesizing after the results are known. *Personality and Social Psychology Review, 2*(3), 196-217. https://doi.org/10.1207/s15327957pspr0203_4

Kruger, D. J., & Zechmeister, E. B. (2001). A skills-experience inventory for the undergraduate psychology major. *Teaching of Psychology, 28*(4), 249-253. https://doi.org/10.1207/S15328023TOP2804_02

Landrum, R. E., & Harrold, R. (2003). What employers want from psychology graduates. *Teaching of Psychology, 30*(2), 131-133. https://doi.org/10.1207/S15328023TOP3002_11

Li, J., Li, Q. L., Li, J., Chen, M. L., Xie, H. F., Li, Y. P., & Chen, X. (2013). Comparison of three problem-based learning conditions (real

patients, digital and paper) with lecture-based learning in a dermatology course: A prospective randomized study from China. *Medical Teacher*, *35*(2), e963–e970. https://doi.org/10.3109/0142159X.2012.719651

Lopatto, D. (2010). Undergraduate research as a high-impact student experience. *Peer Review: Emerging Trends and Key Debates in Undergraduate Education, 12*(2), 27-30.

Mraz-Craig, J. A., Daniel, K. L., Bucklin, C. J., Mishra, C., Ali, L., & Clase, K. L. (2018). Student Identities in Authentic Course-Based Undergraduate Research Experience. *Journal of College Science Teaching, 48*(1), 68-75. https://doi.org/10.2307/26491348

Osborne, J. W., & Jones, B. D. (2011). Identification with academics and motivation to achieve in school: How the structure of the self influences academic outcomes. *Educational Psychology Review, 23*(1), 131-158. https://doi.org/10.1007/s10648-011-9151-1

Roick, J., & Ringeisen, T. (2018). Students' math performance in higher education: Examining the role of self-regulated learning and self-efficacy. *Learning and Individual Differences*, *65*, 148–158. https://doi.org/10.1016/j.lindif.2018.05.018

Rosnow, R. L. (1990). Teaching research ethics through role-play and discussion. *Teaching of Psychology, 17*(3), 179–181. https://doi.org/10.1207/s15328023top1703_10

Sanft, R., & Ziegler-Graham, K. (2018). Mathematics practicum at St Olaf College: Project-based learning through academic civic engagement. *PRIMUS: Problems, Resources, and Issues in Mathematics Undergraduate Studies, 28*(4), 335–349. https://doi.org/10.1080/10511970.2016.1249319

Schlenker, B. R., Schlenker, P. A., & Schlenker, K. A. (2013). Antecedents of academic engagement and the implications for college grades. *Learning and Individual Differences, 27*, 75–81. https://doi.org/10.1016/j.lindif.2013.06.014

Sezer, O., Gino, F., & Norton, M. I. (2018). Humblebragging: A distinct—and ineffective—self-presentation strategy. *Journal of Personality and Social Psychology, 114*(1), 52–74. https://doi.org/10.1037/pspi0000108

Stacey, G., Oxley, R., & Aubeeluck, A. (2015). Combining lived experience with the facilitation of enquiry-based learning: A 'trigger' for

transformative learning. *Journal of Psychiatric and Mental Health Nursing*, *22*(7), 522–528. https://doi.org/10.1111/jpm.12228

Sundberg, M. D., Armstrong, J. E., & Wischusen, E. W. (2005). Reappraisal of the Status of Introductory Biology Laboratory Education in U.S. Colleges & Universities. *The American Biology Teacher, 67*(9), 525-529.

Szucs, K. A., Benson, J. D., & Haneman, B. (2017). Using a guided journal club as a teaching strategy to enhance learning skills for evidence-based practice. *Occupational Therapy in Health Care*, *31*(2), 143–149. https://doi.org/10.1080/07380577.2016.1278296

Van der Vleuten, M., Steinmetz, S., & van de Werfhorst, H. (2018). Gender norms and STEM: The importance of friends for stopping leakage from the STEM pipeline. *Educational Research and Evaluation, 24*(6–7), 417–436. https://doi.org/10.1080/13803611.2019.1589525

Voelkl, K. E. (1997). Identification with school. *American Journal of Education, 105*(3), 294- 318. https://doi.org/10.1086/444158

Weaver, G., Russell, C. & Wink, D. (2008). Inquiry-based and research-based laboratory pedagogies in undergraduate science. *Nature Chemical Biology, 4***,** 577–580. https://doi.org/10.1038/nchembio1008-577

White, P. J., Larson, I., Styles, K., Yuriev, E., Evans, D. R., Short, J. L., Rangachari, P. K., Malone, D. T., Davie, B., Naidu, S., & Eise, N. (2015). Using active learning strategies to shift student attitudes and behaviours about learning and teaching in a research intensive educational context. *Pharmacy Education: An International Journal of Pharmaceutical Education*, *15*(1), 162–172.

Wilson, J. H. (2006). Predicting student attitudes and grades from perceptions of instructors' attitudes. *Teaching of Psychology, 33*(2), 91-95. https://doi.org/10.1207/s15328023top3302_2

Wisniewski, B., Zierer, K., & Hattie, J. (2020). The power of feedback revisited: A meta-analysis of educational feedback research. *Frontiers in Psychology, 10*. https://doi.org/10.3389/fpsyg.2019.03087