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TOPICAL ARTICLES

Psychology Is a Science: At Least Some Students Think So

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The American Psychological Association's (2007) curricular guidelines recommend that students develop both an understanding of how psychologists do research and an appreciation for why scientific thinking is necessary. We surveyed a large sample of psychology majors on specific interests, as well as individual difference variables relevant to scientific thinking. Our results suggest that over time, students' knowledge of scientific thinking increased, whereas their tendency to see psychology as a science did not. Further, students reported greater interest in practitioner activities than scientific ones, and these divergent interests were associated with differential ways of thinking and of viewing the field of psychology. We discuss some implications for conceptualizing undergraduate instruction given that some student characteristics are more malleable than others.

The American Psychological Association (APA) Task Force on Undergraduate Psychology Major Competencies (APA, 2002) explicitly identified an understanding of research methods and a respect for scientific thinking in their list of critical learning goals for undergraduate psychology. Nonetheless, teachers of psychology often express concern about psychology students' lack of interest in statistics and research methods. Indeed, it is common to hear instructors complain that students simply do not appreciate the importance of understanding how psychologists know what they know. We share these concerns and have ourselves lamented many students' lack of interest in research. Like others, we value empirical methods for understanding human behavior and are constantly on the lookout for more effective ways to illustrate their importance. However, we have observed that even what seem to be the most interesting (to us) illustrations of the importance of research using the media and other sources often do little to change some students' opinions about research. We have observed that students often believe either that (a) systematic observation is unnecessary for understanding human behavior or is at least inferior to personal and anecdotal experience, or (b) studying summaries of research findings is useful, but it is unnecessary to examine methodology.

One question concerns the degree to which psychology students see psychology as a scientific discipline. Friedrich (1996) noted that most undergraduate psychology classes include an emphasis on empirical research, but educators seldom evaluate the degree to which students develop true appreciation for the relevance of science to the study of human behavior. Gardner and Dalsing (1986) found that students come to college with many misconceptions about the field of psychology and that, for many students, these misconceptions remain even after taking several psychology courses. Gardner and Dalsing speculated that students likely learn many false beliefs about psychology from parents and the media. Because the beliefs are part of the "conventional wisdom" (p. 34), they are resistant to change even in the face of specific contradictory information based on research. Given this background, it is unclear to what degree beginning college students choosing psychology as a major are truly aware that they are electing to study a science at all. Some researchers (e.g., Berthold, Hakala, & Goff, 2003) have noted that it is important for students not only to learn

about research methods, but also to appreciate that psychology is a scientific discipline. Friedrich (1996) recommended that instructors convey to students that psychology is in fact a science and suggested that the tendency to view psychology as a scientific discipline should increase with course work and training. However, few researchers have investigated how students' views of the field and professional interests change as they progress through their psychology course work.

Such observations led us to a meta-examination that transcended the effectiveness of specific examples and teaching strategies. Rather than looking for new ways to teach research methods, we sought to better understand why many undeniably excellent teaching ideas are effective for teaching students concrete methods but not for changing their opinions concerning the necessity of systematic research. Many authors (e.g., McGovern, Furumoto, Halpern, Kimble, & McKeachie, 1991) have advocated for a strong research focus as part of undergraduate curricula. Although this advocacy is clearly warranted, approaches often appear to be rooted in the assumption that students are blank slates and that good instruction in research methods will not only show students how to do research, but will also convince them that scientific thinking and analysis are important for understanding human behavior. Seldom addressed are the personal characteristics and perspectives students bring with them to their course work that may influence their openness to scientific thinking.

Our concern was less about getting students to understand how psychologists do research than determining why so many students are not interested in understanding how psychologists do research and do not see it as relevant to their study of human behavior. Our goal was to explore the interests and views that psychology students bring with them and develop as they progress through their degree program. We began with the existing framework of the scientist-practitioner model and elaborated by adding further individual difference variables in pursuit of a more comprehensive perspective.

The scientist-practitioner model emerged at the Boulder Conference in 1949 as a framework for training clinical psychologists (Baker & Benjamin, 2000). A primary assumption of the model is that students of psychology can become active and informed consumers of research, even if they never become producers of research. The advantage of this approach was in recognizing that many, if not most, psychologist trainees will never become researchers and that ignoring this fact during training might be counterproductive. The developers of the scientist-practitioner model advocated a sort of pedagogical compromise by suggesting that students receive training to actively and critically apply empirical research findings in their professional activities. Doing so would still require an adequate grasp of empirical techniques, but would make explicit the relevance of research across the spectrum of psychological careers.

One can conceptualize undergraduate psychology training in a similar way. Many psychology majors wish to become counselors and therapists or to pursue other applied fields, but might have little interest in the science of psychology. Malin and Timmreck (1979) reported work in the clinical and counseling fields as by far the most popular career goal among the psychology majors they surveyed, and there is little to suggest that this pattern has changed over the past three decades. Further, students considering what is important for psychology majors to learn prioritize helping people far above scientific principles and evaluating research (McGovern & Hawks, 1986). An ongoing struggle (since the Boulder model first emerged) has been finding ways to get students to appreciate the importance of understanding research methods if they do not ultimately want to do research. Based on past research (e.g., Manning, Zachar, Ray, & LoBello, 2006), we suspected that the typical undergraduate psychology major has much greater interest in practitioner activities than in scientific ones. Instructors seeking to get these students interested in research would encounter the same tribulations faced by anyone attempting to motivate students toward a goal that holds little interest and little perceived value.

The idea that students studying psychology may have vast differences in their personal and professional orientations is not new. Zachar and Leong (1992) found that students with greater scientist interests tended to have an objectivist orientation and tended to "endorse impersonal causality and emphasize behavioral contents, elementarism, physicalism, and quantitative analysis" (p. 670); in contrast, students with greater practitioner interests had a subjectivist orientation and tended to "score high on belief in personal will, emphasize experiential contents, are holistic and nonphysicalistic, and endorse qualitative analysis" (p. 670).

Importantly, Zachar and Leong (1992) also used Holland's (1966) framework for describing vocational interests and found that scientist interests were positively associated with the investigative code and negatively associated with the social code. Practitioner interests showed the exact opposite relation,

being associated negatively with investigative and positively with social. The researchers concluded that the Boulder model for training students to be scientist-practitioners is unrealistic because students' interests and views of psychology are strongly influenced by personality and that a scientific approach is inherently inconsistent with the personalities of many psychology students. Zachar and Leong (1992) doubted that education could change this pattern, given the stability of personality traits. They argued that trying to force students with practitioner orientations to be scientists "makes as much sense as trying to convert an introvert into an extrovert" (p. 676). In fact, subsequent research suggested that psychology majors' interest in scientist activities actually declined after taking a research methods course (Manning et al., 2006).

Following up on their earlier research, Zachar and Leong (2000) surveyed their participants 10 years after the original study. At the time of the initial study, the participants had been doctoral students in clinical, counseling, and experimental programs; by the time of the longitudinal follow-up they had completed their graduate work, and Zachar and Leong surveyed them about their professional activities. The investigators reported that scientist and practitioner interests were negatively correlated both when the participants had enrolled in graduate school and also 10 years later. They also found that both types of interests predicted similar interests and professional activities 10 years later. Further, of various professional activities, clinical and counseling psychologists reported the least interest in statistics and research. Zachar and Leong (2000) concluded that despite stated objectives, most graduate students in their sample who were trained under the Boulder model were not scientist-practitioners.

Hypotheses

Whereas previous researchers have studied the views of graduate students, we extended such work by applying the scientist-practitioner framework to better understand the interests and motives of undergraduate students. Based on our objectives and on past research, we proposed several hypotheses. First, we predicted that psychology majors overall would report greater interest in practitioner than in scientist activities. Second, based on Zachar and Leong's (1992) assertion that scientist and practitioner interests reflect personality characteristics, we expected that mean scientist and practitioner interest levels would remain stable across levels of the curriculum. Third, we expected that scientific literacy would increase as students completed more psychology course work. Finally, based on Friedrich's (1996) report, we expected that students who had completed more course work in psychology would have a greater tendency to view psychology as a scientific discipline than students who had completed fewer courses.

Method

Participants

The sample consisted of 201 students at a private liberal arts college in the northeastern United States, of whom 147 (73%) were women and 54 (27%) were men. Participants were psychology majors from courses at four levels of our research curriculum starting at the introductory level with General Psychology Laboratory ($n = 68$), followed by Statistics ($n = 29$), then Research Methods ($n = 44$), and finally Research Team ($n = 60$), which is a three-semester requirement for psychology majors. Students completed the surveys at the beginning of the semester before they had completed any curricular work for that semester. This timing guaranteed that first-year students would have had the least possible exposure to psychology as a science.

Instruments

Scientist-practitioner interests. The Scientist-Practitioner Inventory (Leong & Zachar, 1991) contains 21 items designed to assess scientist interests (e.g., Designing an experiment to study a psychological process) and 21 items to assess practitioner interests (e.g., Conducting a psychotherapy session with an individual client) of psychology students. Respondents rated their interest in each of 42 professional activities on a 5-point scale ranging from 1 (*very low interest*) to 5 (*very high interest*). Leong and Zachar (1991) reported an alpha coefficient of .91 for the Scientist subscale and .94 for the Practitioner subscale in a sample of undergraduate psychology majors; the alphas for the current sample were .91 for the Scientist subscale and .88 for the Practitioner scale.

Views of psychology as a science. The Psychology as Science scale (Friedrich, 1996) contains 15 items measuring the degree to which respondents view psychology as a science. Respondents rate items such as, "Research conducted in controlled laboratory settings

is essential for understanding everyday behavior" on a 7-point scale ranging from 1 = (*strongly disagree*) to 7 (*strongly agree*). Friedrich (1996) reported a coefficient alpha of .71 for a sample of undergraduate psychology majors. The alpha for the current sample was .72.

Need for cognition. The Need for Cognition Scale (Cacioppo, Petty, & Kao, 1984) assesses the "tendency to engage in and enjoy effortful cognitive endeavors" (p. 306). The scale contains 18 items (e.g., "I would prefer complex to simple problems"; "I only think as hard as I have to") that respondents rate on a 9-point scale ranging from 1 (*very strongly disagree*) to 9 (*very strongly agree*). The authors reported an alpha coefficient of .86; the alpha for the current sample was .88.

Scientific literacy. A test of scientific literacy (Carrier, 2001) tested participants' understanding of the scientific process. The test contains 24 true–false items such as, "A scientific law will not change because it has been proven true." This instrument has unknown psychometric properties but has a high degree of face validity.

Results

Students reported significantly higher levels of interest in practitioner activities than in scientist activities across all four curriculum levels. For the sample as a whole, a paired-samples t test indicated that the mean for practitioner interests ($M = 74.97$, $SD = 12.71$) was significantly greater than the mean for scientist interests ($M = 57.19$, $SD = 14.39$), $t(200) = -13.37$, $p < .001$, $r = .55$. Leong and Zachar (1991) found that scientist and practitioner interests were positively correlated among undergraduates but negatively correlated among psychology graduate students. The correlation coefficients between the two scales for our sample were .19, .14, .10, and −.11 for students at the General Psychology, Statistics, Research Methods, and Research Team levels, respectively. The coefficient for students at the Research Team level differed significantly from the coefficient for those at the General Psychology level, Fisher's$z = 1.7$, $p < .05$, one-tailed. There were no mean differences across the four levels on either of the interest scales, but the shift in correlations may reflect a refinement of interests as students progress through the curriculum. Consistent with past findings, the trend was for the coefficients to shift from positive to negative as students became more advanced. Our students in advanced research courses were similar to graduate students in their pattern of scientist and practitioner interests.

There were significant differences across the curricular levels on scientific literacy, with levels significantly higher among students at the Research Team level than among those at the General Psychology level, $F(3, 197) = 2.88$, $p < .05$, $\eta^2 = .04$. Overall, the total number of psychology courses taken correlated positively with scientific literacy, $r(198) = .17$, $p < .05$. Importantly, scientific literacy is also the only scale we administered that represented factual knowledge about the process of science rather than an attitude or personality construct. Further, scientific literacy did not correlate significantly with scientific interest or Psychology as Science scores at any level of the curriculum.

Importantly, scientific interests across the entire sample were positively correlated with need for cognition, $r(196) = .49$, $p < .001$, and Psychology as Science scores, $r(197) = .53$, $p < .001$. Neither of these latter two variables correlated significantly with practitioner interests. Our prediction that students would increasingly come to see psychology as a science as they progressed through the psychology curriculum received no support. There were no mean differences in scores on the Psychology as Science scale across the four research curriculum levels. Further, the zero-order correlation between Psychology as Science scores and the total number of psychology courses taken was nonsignificant, $r(198) = .09$, $p = .19$.

Discussion

Our findings support Zachar and Leong's (1992) contention that students' interests concerning professional activities in psychology are relatively stable and reflect personality traits. Scientific interest did not correlate with scientific literacy at any level. That is, there was no association between an understanding of the process of scientific inquiry and self-reported interest in scientific activities. One might expect this finding given that scientific literacy reflects factual knowledge that one can learn over time regardless of one's personal views, whereas scientific interest is an individual difference variable that is far more subjective. This finding is consistent with Friedrich's (1996) concern that, although it is easy to assess students' knowledge of research design, doing so provides few data to indicate

that students appreciate the relevance of such activities to the field of psychology. Our data suggest that it is possible for students to grasp the principles of research procedures without valuing these procedures as a necessary mode of understanding human behavior. Clearly, efforts to change knowledge are likely to be more fruitful than efforts to change individual personality characteristics that determine how students look at the world. The most brilliant teaching demonstration to illustrate a research concept may be effective for teaching basic methods, but instructors need to devote more effort to strategies that might also increase student appreciation for, if not enjoyment of, research.

With regard to the association between scientist and practitioner interests, our results refine those reported by Leong and Zachar (1991). They found that scientist and practitioner interests were positively correlated among undergraduates but negatively correlated among graduate students. Leong and Zachar speculated that many students come to college knowing few details about psychology as a discipline but with an interest in the field in general. They suggested that the association between scientist and practitioner interests shifts as students learn more about the field and develop more concrete interests in specific pursuits. Our data corroborated this pattern with greater specificity, revealing a gradual trend from positive to negative correlations as students completed more psychology course work. Consistent with Leong and Zachar's findings, the correlation between the scales for students at the introductory level was positive and significant. Although the correlation was of lesser magnitude than that reported by Leong and Zachar for a sample of psychology majors enrolled in introductory psychology, this change could be attributable to the increased presence of psychology courses at the high school level. Although the possibility is clearly speculative and requires further study, it might be that the refinement of interests alluded to by Leong and Zachar is now more likely to begin before students arrive at college. The pattern is clear, however: As students take more psychology courses throughout their undergraduate and graduate years, their interests tend to become more polarized and they become interested either in scientific or applied activities—but generally not both. Further, Leong and Zachar's work suggests that students who find that they are better suited to practitioner pursuits often come to increasingly dislike scientific and statistical pursuits.

In our study, students' reported interests were also consistent with how they viewed their chosen field of study. Students who had higher scientific interests tended to see psychology as a science, but students with high practitioner interests had no consistent tendency to do so. In other words, the students who were interested in scientific activities were the ones who reliably saw psychology as a science. Further, self-reported need for cognition was strongly correlated with scientist interests but uncorrelated with practitioner interests. Perhaps those students who were not interested in science developed their interest in psychology before they were familiar enough with the field to know that scientific study is an integral component; alternatively, perhaps they simply maintained established beliefs that personal experience is the best source of knowledge despite training in the scientific method. Some students certainly maintained strong practitioner interests while viewing psychology as a scientific discipline, but these students appeared to be in the minority. However, the nonsignificant correlations between practitioner interests on the one hand and need for cognition and seeing psychology as a science on the other might in fact be reason for encouragement. They demonstrated that practitioner interests are not antithetical to a scientific perspective, only that the two might not be inherently connected.

The APA's (2007) learning guidelines for undergraduate psychology programs include recommendations that students both understand research methodology and apply critical and scientific thinking in examining psychological issues. The first of these goals concerns factual knowledge (i.e., how science is done), but the second is likely to be more affected by motivational influences based on whether students view scientific inquiry as important. It appears that a large proportion of students fail to see the necessity of the scientific method beyond the requirements of their academic course work.

For instructors, a critical objective is getting students to understand both how research is done (where all the accumulated psychological knowledge comes from) and why empirical observation is necessary. The data suggest that instructors are generally more effective at the former and that the difficulty in accomplishing the latter might in part reflect the "what's going to be on the test" mentality that so many educators abhor. In our program, our concern is how to reach those students who are indifferent to research because they do not see psychology as a science and do not believe that empirical methods are necessary to an understanding of human behavior. Our thinking is consistent with the expectancy-value model of motivation, which asserts that a person must believe that he or she can achieve a particular goal and that goal must have perceived value for motivation toward the goal to be effective

(Feather, 1982). In the context reported here, we suspect that both an interest in science and a perception that science is valuable to psychology are necessary components of motivating students to engage in the hard work of empirical inquiry (whatever form it may take). If either component is absent, motivation seems unlikely.

It is important to examine the appropriateness of the scientific-practitioner model for psychology instruction. Although its developers intended it as a guide for graduate clinical training, many undergraduate instructors and departments apply the philosophy, perhaps without being fully aware of it. The scientist-practitioner model acknowledges that many or even most students of psychology will not become empirical researchers but encourages all students to become effective consumers of research. It implicitly assumes that everyone can and should be proficient at both the scientific and applied areas of psychology. In particular, it ignores the reality that students and professionals will not voluntarily read and critique research if they do not enjoy these endeavors and do not deem them necessary. This expectation is akin to expecting a pacifist to volunteer for military combat duty. The pacifist, based on external demand, might at times perform such duties, but likely will never be highly motivated to perform them effectively or voluntarily. Zachar and Leong (1992) argued that scientist and practitioner interests are rooted in personality and represent fundamentally different ways of looking at the world. Assuming that academic psychologists wish to maintain their values concerning the necessity of science in psychology (a stance that we strongly advocate), they need to do a much better job of separating the scientific study of human behavior from the nonscientific. If instructors continue to insist that all students of psychology have a firm grounding in the empirical backdrop of psychology, they need to find new ways to demonstrate to students that psychology is truly a science.

Implications for Teaching Goals and Strategies

To help students appreciate the relevance of science in psychology regardless of their specific career goals, we suggest that psychology instructors pursue two lofty objectives. First, we suggest that instructors more fully integrate research methods into all topical areas. Students (and sometimes instructors) compartmentalize research as a particular content area that is separate from the rest of the discipline and that students can study or ignore in isolation. This pattern manifests itself in some introductory classes where instructors cover research methods early in the course and subsequently neglect such material. Perlman and McCann (2005) reported that the vast majority of psychology departments offer a formal research course, but that in most other courses a research focus is tangential and many courses with research opportunities are electives. Instructors should demonstrate to students that scientific observation is a process integral to all areas of psychology. Textbook authors have sometimes attempted to emphasize this point, but descriptions of featured studies often appear on alternately colored pages to which students may pay little attention. As educators, we should work toward developing new activities that encourage students to identify problems and pitfalls with various ways of knowing about human behavior. However, any such strategies should take into consideration the ways of thinking that students acquire long before they enter our classrooms. Our data showed no increased tendency for students to see science as necessary to psychology as they completed more courses. It is therefore not clear that increasing research demands would help students to see the field as a science. Clearly it is not enough to simply demand more of the same without taking into consideration students' expectations and motivations. We suggest working toward an identity shift whereby both students and instructors would consider it incongruous to call oneself a student of psychology while professing a lack of interest in, awareness of, or concern with the ways that psychologists know what they know and where it becomes paradoxical for students to elect the psychology major because they "hate math and science."

Our second suggestion is consistent with that of Zachar and Leong (2000), who recommended teaching practitioners about the philosophy of science so that they better appreciate it. Zachar and Leong provided compelling evidence that most practitioners of psychology are not going to be consumers of research and suggested, for example, that practitioners learn how to test hypotheses when working with clients. This practice, they stated, would show students that there can be multiple solutions in addition to the one consistent with the practitioner's expert insight. We believe that taking such an approach with psychology students has the potential to help them develop the habit of thinking like scientists in their professional activities, a laudable goal regardless of students' ultimate occupational aspirations.

Fortunately there are some strategies already in the literature that instructors might use to promote these objectives. For example, one group of researchers

(Miller, Wozniak, Rust, Miller, & Slezak, 1996) found that requiring students to write essays that directly contradicted their inaccurate beliefs about psychology promoted a shift toward beliefs more consistent with scientific findings. In other words, students assigned the task of advocating attitudes consistent with psychological research adjusted their attitudes in the direction of the scientific findings. This approach might also be effective for teaching appreciation for research in general. A student assigned the task of advocating the importance of research in psychology, even if such advocacy contradicts his or her initial attitudes, might come to better appreciate science as a consequence of having publicly argued its merits. It is incumbent on all faculty, regardless of the courses they teach, to explore new pedagogical strategies to promote science appreciation among undergraduate students. Brewer et al. (1993) declared, "The fundamental goal of education in psychology, from which all the others follow, is to teach students to think as scientists about behavior" (p. 169). To this declaration we would add the caveat that there is a difference between teaching students how to think like scientists and teaching them that thinking like scientists matters.

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Notes

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