

Why Engage Undergraduates in Empirical Research

This chapter is based on a panel discussion held at the 72nd Annual Convention of the Rocky Mountain Psychological Association, Park City, Utah, on April 5, 2002 and subsequently published in the *Journal of Psychological Inquiry*, 8, 59-67. Additional material has been added from interviews with distinguished teachers of psychology that were also published in the *Journal of Psychological Inquiry*. The citations of the original interviews published in *JPI* are provided.

Members of the Panel included:

Jane S. Halonen *University of West Florida*
Charles L. Brewer *Furman University*
Paul A. Bell *Colorado State University*
Richard L Miller *U. of Nebraska at Kearney*

With questions and comments from members of the audience including:

Bernard C. Beins *Ithaca College*
William Wozniak *U of Nebraska at Kearney*
Marty Fallshore *Central Washington Univ*
Susan Becker *Mesa State College*
Robert Rycek *Univ of Nebraska at Kearney*

Additional comments provided by:

Wilbert J. McKeachie *Univ of Michigan*
J. Psych. Inquiry, 4, 42-51
Elizabeth Loftus *U. California Irvine*
J. Psych. Inquiry, 10, 61-67
Robert Cialdini *Arizona State University*
J. Psych. Inquiry, 11, 101-108
Bill Buskist *Auburn University*
J. Psych. Inquiry, 12, 38-47
Margaret Matlin *SUNY Geneseo*
J. Psych. Inquiry, 6, 53-59
Richard M. Suinn *Colorado State Univ.*
J. Psych. Inquiry, 5, 75-82
Robin Anderson *St. Ambrose Univ.*
J. Psych. Inquiry, 9, 123-132
Drew Appleby *IUPUI*
J. Psych. Inquiry, in press

Why is Undergraduate Research Important?

Halonen: Undergraduate research. I have to go with a personal story. I was the quintessential undergraduate who wanted to help people. I saw no relevance of research to helping. You have probably seen one or two of these kinds of folks in your classes. That was me. Fortunately, the faculty that I worked with in my undergraduate program were much smarter than I and said: "Jane, at least pretend that you like research if you are serious about graduate school." So I did, and I was able to do some research, but I never caught fire with it. Now, I have since because I have had the good fortune of finding content areas that are interesting. But I think that kind of represents the challenge of training 25 or maybe even 30 years ago. That research was seen as the preserve of graduate students and their very important faculty. And undergrads, unless you were in an honors program or you were proven "good material", you really didn't have access to undergraduate opportunities.

I think it's critically important because it really is the way students end up catching fire. If they get those opportunities to design, build, run... there's nothing more exciting than having an undergraduate run an *F* test that's significant and watching them understand what that means. Things are so much better now. Research institutions are now holding symposiums on undergraduate research. Across the land there's recognition that this is where our scholars will come from. And I simply think that we are doing a better job of helping students get excited about research as powerful problem solving. So I think that is why this is an important topic for us to take on.

Brewer: Unlike Jane, I never wanted to help people. I was fortunate to attend an undergraduate institution of which you have never heard—a small liberal arts college in Conway, Arkansas called Hendrix College. Intellectually, I caught fire when I took General Psychology in my sophomore year with Professor John P. Anderson. I got the clear message that psychology is a science and, if you want to become a psychologist, you must first be a scientist. I probably imprinted on Dr. Anderson, because I still follow his example. In fact, I conducted three independent research projects as an undergraduate, so research was not new to me when I got to graduate school. In

recent years, more undergraduates are involved in meaningful research. Large research universities are now recognizing that our students from good liberal arts college have a real leg up when they get to graduate school. Our students have learned that, all other things being equal, which they never are, three things will distinguish them from other applicants. They are research, research, and research. Undergraduates who want to get admitted to good graduate programs should do research.

I tell students in my Experimental and Statistical Methods course that learning to do research is like learning to drive a car. You can read every book that has ever been written on how to drive an automobile, but you don't learn how to drive one until you actually drive one. Learning to do research is the same. You don't learn how to do research until you do research. Conducting meaningful research is one of the most important things undergraduate psychology majors can do. Why? Often students fail to relate things they learn in separate content courses, so they never see that courses are related to one another. Students finally see how all the separate pieces fit together when they start conducting research. So, I say, do more research!

Miller: Like Jane, I started out wanting to help people. I spent the summer between my freshman and sophomore year at the University of Washington on a WICHE scholarship in social work, which placed me in agencies, several agencies, none of which seemed to know what they were doing. I saw people trying to apply knowledge that just wasn't there. So, the thing that spurred me to research was the desire to actually know what one should do. It was years later that I realized that research was contingent and transient as well, but at the time the motivation was that we needed answers. We were doing things that we didn't understand.

After that summer, I did my first undergraduate research project at the beginning of my sophomore year and a second project in my junior year. The first project was published some years later, when I was flying for the U. S. Navy. My professor needed a publication for tenure. He thought that this was a great project that we had done. He ended up publishing it in a journal. I have never claimed that research project on my resume, because it was so awful. But, the value of it was that I got hooked. The idea that I could ask a question and would be the first person in the world who would know the answer and could then share that answer with everyone else. That was fascinating to me and I think it is fascinating for many undergraduates. Do research because you can

set the question. You can find out what's going on. It's exciting. It's lifelong. Yes, it will get you into graduate school. Yes, it is a valuable in terms of learning methodological skills and research ethics. But all that aside, it's just an exciting endeavor in and of itself.

Halonen: Did the people who taught you research skills talk to you about research as a means to an end or as an exciting endeavor?

Loftus: Having undergraduates work in the lab and be a part of the whole research program is certainly essential for my program, and me but I think it is also wonderful for the students. For instance, if a student is just there for a quarter or two, at least they can learn something about how research is done. When you just read journal articles and only see the finished product, you don't realize how messy research actually is; how many decisions you have to make to clean it up along the way. It reminds me of sausage. You see the final product, but if you knew how it was actually made you'd have a totally different perspective. Maybe that's not a good analogy, but I think what is most valuable to me are those students who end up getting thoroughly immersed in the lab as an undergraduate. They do that most often when they are working on an honors project or they have something that requires them to be there for an extensive amount of time, perhaps a year or maybe even more. What I enjoy most is to see students, who worked a little bit on an extension of a study, changing a few but critical things and doing the study themselves. They feel a kind of ownership of the study, especially if it leads to publications or to graduate school. Having that research experience makes students more desirable when they apply to a graduate program. That's why undergraduate research really is a two way street; it is basically helpful for everyone when it goes well.

Miller: When I went to school, there were no other undergraduates at our institution that did an empirical research project. Years later it became a regular part of their program, but at that time it wasn't done. I'm old, guys, and the saurus brothers, both stego- and bronto- and I were in school together. Undergraduate research was not normative.

Bell: Unlike Dr. Miller, I'm not old, and I don't know so much that I wanted to help people as much as I wanted to change society. I suppose that helping people was a part of that, but I'm an Aquarius, and I just thought that I could promote societal change. The reason I know about Dr. Brewer's Hendrix College in Conway, Arkansas, is because I went to a sort of

sister school called Southwestern University in Georgetown, Texas. People have started to hear about Southwestern because they have started doing research there. When I was a student there were two faculty members in the Psychology Department and that was it. Neither one of them did research so the students didn't do research. That was a real problem. My advisor told me I should go down the road to the University of Texas and take a course in Experimental Psychology if I wanted to go to graduate school. I never did that, but I still got into graduate school. That was thirty years ago. All of the graduate students were doing research and we regularly used undergraduates as assistants in our research. Undergraduate involvement was pretty limited to just being an assistant who helped collect the data. They didn't even get into the informative stages of the experiment; they didn't help with the analysis. They got a footnote in a journal article that got published, but they didn't get an authorship or a conference presentation.

Today, the standard, at least at Colorado State, is that undergraduates should be involved in the informative stages if at all possible, understanding the data, and getting their names on the publication. I think that is probably a really good model. As coordinator of our Applied Social Psychology graduate program, I can assure you that if an undergraduate wants to get into a graduate program other than a PsyD program at a professional school, they really do need to be participating in research. You can have great GRE scores and a great GPA and say that this is really what you want to do, but the competition will be people who maybe don't have quite as high a GPA or GRE, but have actually done what you say that you want to do. They have done research in an area that is of interest to them and they are appreciated if their research skills are a good match to the graduate program that they are trying to get into. Since I have tenure I can say that the one place that you really do not need research experience is a PsyD program at a professional school. However, to get into a PsyD program in a graduate department at a regular university typically requires that you be familiar with research fundamentals and preferably have research experience.

Cialdini: My experience with research as an undergrad was interesting in that it led to my first publication and maybe the most prestigious publication of my life in *Science* (Ressler, Cialdini, & Ghoca, 1968). It came as a result of an observation that I made in a laboratory class I was doing. I was doing mostly animal behavior. I was taking a laboratory class in animal behavior and one of our

tasks was to classically condition earthworms. And the way we did it was to put earthworms on a Plexiglas plate that had a little motor underneath that would vibrate the plate. We also had a bright light. Now if you know anything about earthworms, they recoil from bright light. So we would turn on the motor, "bzzzzz", the thing would vibrate; then turn on the light and the worm would cringe. It would recoil. Then we would do it again. Vibrate the plate; turn on the light. Vibrate the plate; turn on the light. And then we asked if we just turn on the motor, will it cringe as a result of classical conditioning, like Pavlov's dogs salivated to the sound of the bell? Well my earthworm wasn't working out. It wasn't conditioning. It was a stupid earthworm. It wasn't picking up on the contingency, on the connection, the association. So, I was torturing this thing with this light. Finally, I gave up and I took the worm and put it back in a bucket, and I got a different earthworm. I brought it back to this plate that the previous earthworm had been on, and I put it on there. And you know earthworms are flaccid little spaghetti like things. This earthworm did a summersault in the air and tried to get off of this plate. And I thought, what was that? And it did the same thing again. It literally jumped off the plate. I looked at the plate. And what had happened was that the first earthworm had exuded this white kind of slimy substance. If you have ever put a worm on a hook that's what happens. A white kind of coating that comes off of it. And it was contact with that substance that caused the second earthworm to be so reactive. Well, I called the instructor and explained what had happened; then I said, "Watch this". And the same thing happened; this worm jumped. He looked at it and he said "We've located an alarm pheromone in earthworms that no one knows about. This is a signal that species send to one another to warn them against dangerous settings." They lay down what is essentially a toxic substance to other earthworms who when they touch it, get out of it. It is not that they know to get out of it. They find it aversive. And they find it so aversive that they get out of that setting. Maybe it's where a bird or some predator has stressed another earthworm. They get out of there. So we did a series of studies sending earthworms down tubes and on to plates where we had shocked other earthworms. When they touched it, they continued ahead if it was a control condition without the pheromone. If it was an experimental condition with the pheromone, they turned around and went back in the little Plexiglas tube. That study was published in *Science*. It was my first publication, and so it was downhill from there!

Matlin: I think it's a great way to help students understand whether they want to go in the direction

of psychology, just as some of the people who have been interviewed in *JPI* have noted. I also think it's important because students can say, "Oh, the things we read about in our textbook aren't just something that someone made up. Somebody actually had to design a study, collect the data, interpret the data, write the article, and send it in for review." Students who have involved themselves in research can understand this process so much more clearly.

Structuring the Curriculum to Promote Undergraduate Research

Miller: We have been looking at placement of our graduates recently and we find that for admission to a PhD program, undergraduate research experience, particularly if it leads to publication of that research in the *Psi Chi Journal* or other journal is a better predictor of success than GPA. It's not so much that it is a better predictor of getting accepted, but it's a much better predictor of getting support, e.g., fellowships, assistantships, and scholarships.

Why don't we talk about how to structure the undergraduate curriculum so as to promote undergraduate research? When I went to school there was no formal program and it was the occasional student who said I'd like to do this and the professor said ok that will be all right. That would be the minimalist's view of a program. What are some other ways?

Brewer: I know how we do it at Furman. We consider undergraduate research as programmatic research. In my Experimental and Statistical Methods course, students conduct a full-fledged research project that involves data collection and analysis as well as reporting the entire project in appropriate APA style and format. For the second project in this course, each student submits a proposal for an experiment of his or her very own. When preparing their proposals, students will have covered analysis of variance and related matters. This proposed experiment is one that students may actually conduct in a later content course, such as Social, Learning, or Memory and Cognition. Faculty members are eager to provide advice and guidance, because these proposals may become students' actual experiments in these advanced content courses. My students often appear in later courses with their proposed projects in their briefcases. Experiments in these courses are often expanded into Independent Research projects for which students receive four hours of credit. So, a productive and diligent undergraduate may get hooked on a particular area of research and produce

two or three posters and maybe an oral presentation or two. Students who are especially assiduous may have a publication or two "in press" by the time they get to graduate school. If students develop this kind of programmatic research, they are much more likely to (a) become engaged with the science of psychology and (b) to do something that is truly productive in expanding our knowledge. That's the way we do it, and this approach has served our students very well indeed.

Wozniak: How much detail do you expect in that proposal?

Brewer: Good proposals are similar to proposals for master's degree theses. They include a review of the pertinent literature and theories, specific hypotheses, design, method, data analysis, and interpretation. These are fairly sophisticated projects for undergraduates.

Halonen: I would echo that the developmental nature of what you are doing is important. I think that it is probably also important to add that our approach reflects the context of James Madison University. We have a huge department, 43 people, and the undergraduate contingent is probably 30 or 31 of those. We have adopted the framework of novice to expert so that students in the freshman and sophomore years can have the kind of data collection experiences, similar to what you were talking about, at one level. Then they can join a research team where they can experience greater independence and even then, we really try to assemble teams that cut across programs. We have faculty who are very concentrated on research programs and, based on the number of projects they supervise, they may get course release time.

Our undergraduate director writes a newsletter in which he advertises research opportunities, so students will contact professors about their interests. The culture really drives home the importance of this, and again, this is open to all students not just honor students. Then we also have a group that does just honors work or will do special lab research as their capstone requirement.

We support this in a way that I see happening all over the country, which is to have scholarship days in which you have posters or presentations to give students practice with what the professional side is like. Sometimes that leads to regional or national conferences, and that is pretty exciting. I would share the latest version of our research experiment, which I am really excited about. In the fall, we are going to

have a psychology learning community at JMU. Out of the 500 people that want to be psychology majors in the incoming class, please God don't let them all come, we are going to pull out 25 students who have good math scores, work with them, put them right into a methods class, not an intro class. They will also be taking a college success class where they will be learning specific strategies. We are going to be selecting the community for diversity and creativity. We are anticipating that this will jump-start the number of students who catch fire about research.

Miller: Is this a residential community?

Halonen: Yep. They will be living together, taking the college success class, the methods class that has statistics integrated first semester, same thing second semester, taught by the same person, who's research is in student achievement and motivation. So that becomes his lab for the kind of research that he's going to do. We are just really excited about what this may be able to do.

Bell: We are looking at 1000 psychology majors out of 20,000 undergraduates, which is a relatively large percentage of the campus. We only have about 29 full time faculty, so I'm envious.

Halonen: Some days I'd give you a couple.

Bell: We'll trade! Our honors program does require Senior theses, so we do get our honors students involved in research early on. Most of them become undergraduate teaching assistants for Frank Vattano in their freshman and sophomore year, and do research right after that. I shudder to think about 1,000 students, many of whom don't have math skills, trying to conduct research. I think that may be a disservice to research. I think that the psych major is such a flexible thing that gets you into so many different kinds of careers that, I'm not sure that getting everyone into research is the right thing professionally. Adjustments should be made for someone who should really not go that way.

Halonen: Like helping people?

Bell: Yeah, like helping people. Or at least create a placebo for people who want help. I'm not sure that we should put everyone in research. In our program in the department we have almost 30 faculty, add about 100 graduate students to this, 80 of whom are probably active on campus doing an internship, or other stuff. If you think about 1,000 majors and eighty graduates with 30 faculty, that's more than 10 undergraduates per graduate student, so

even if you use a model that pairs up undergraduate students with a graduate student, the numbers make it very difficult to create a quality educational experience. Nevertheless. It is a good model and we have faculty who take about 10 undergraduates per semester and put them on a research team. They meet at least once a week, if not more often, and talk about various projects that they are designing. They talk about things like how to get in the door and get students involved, very much involved, in the data collection, and the write up, and get their names out on publications. Faculty at our institution are rewarded for teaching undergraduate courses and for supervising graduates who are doing the research; few undergraduates are directly supervised in research by faculty. I can tell you this, if we get an applicant for our graduate program and they are from the University of Nebraska at Kearney or Furman, we know the kinds of experiences they have and they will go up in the rankings. There is no question about that. We know what kind of background they have and we know they are going to do well.

Brewer: On a much smaller scale, Ithaca College uses research teams. Perhaps Barney Beins will comment on this approach.

Beins: It's the ideal curriculum. Our Psychology majors start out with a course in general experimental, which is intro with a two-hour weekly lab. Then they do statistics and research methods, after which they do three semesters of research in a team setting with the same professor. We have each wave of students serve as a mentor to those students coming in for the next semester. A lot of students take the option of doing a fourth and fifth semester on research. So in the end, students have to take eight quantitative or empirical courses as part of their major and it starts with the first semester and works it's way up. Then they can do others if they want. It's marvelous. Students who are marginal in the first semester of research, by the time they get to the third semester are wonderfully confident. Paul, I agree that you don't want to direct them all to research. They can use their skills in other ways when they get out of that.

Fallshore: How do you handle transfer students?

Beins: Actually, it works out wonderfully. The students come in as freshmen majors since they are usually done with all of their general studies requirements. We have typically three-hour courses, and they need 42 credits for the major. A non-transfer student is typically done with all but about one or two courses by the first semester of their junior year.

They go at it whole-heartedly. If someone comes in his or her junior year, they can take almost all psychology courses and can do it. Even though it's packed, it works very well.

Buskist: We have a program at Auburn where students can take one of two courses and get credit for becoming a research assistant. So, whenever I have research that's appropriate at that level, I always solicit undergraduate help. If they do the work that they were "hired" to do, they are always put on as a co-author on the finished product. In fact, I have several publications with undergraduates.

Appleby: I teach a capstone class in which my students do three assignments. They write a scholarly paper that traces the history of psychology pioneers and theories and the methods of research. In another assignment they have to create a professional planning portfolio, and I teach this class during the fall of each year, and in the portfolio in which they have to search and discover three graduate programs that would be appropriate. They actually have to fill out the applications for each program, write a personal statement, get three people to sign a paper indicating they will write you a strong letter of recommendation, and lastly, provide me with evidence that they have the necessary skills needed to take the GRE. The third thing they do is a collaborative research project. For the last four years we have been doing collaborative assessment projects. So last year, for example, we had an external review of our department. Although our undergraduate program was reviewed very highly by these people, one of the things they suggested that we do is take the student learning outcomes (SLOs) of our department, and find out where are they being taught in the curriculum. So we did a syllabus audit of all fifteen of my students. Each one of them was assigned to go out and get five syllabi. Then we came up with a set of criteria that would allow each of them to go through the syllabi and identify assignments that hooked up to these SLO's. For example, in what class do you learn how to write in APA style, or develop your oral presentation skills? Where is career related material? Where is that taught? Then we went one step further and did it developmentally with Bloom's Taxonomy. Bloom, an educational psychologist, identified six kinds of skills that you need in order to be fully educated about a topic. For example, you have to be able to remember information about it, but you also have to be able to understand it. As you well know, you can memorize something but not really understand it. Memorizing things lets you answer the "who, when, and where" questions, but it's the why and how

questions that require some comprehension. You also have to comprehend something before you can actually apply it to solving a problem. Higher up are things like analysis, where you break a whole into its smaller components and figure out how they fit together: like psychoanalysis—the id, the ego, and the superego. Then there's synthesis, the creative process where you put together things that you hadn't thought were related, into new and creative wholes. Finally, there's evaluation, which is using a standardized set of criteria to judge the actual worth of something. So for example, when evaluating the worth of a psychological test you would use reliability, validity, and standardization as criteria.

Departmental Resources Needed to Support Undergraduate Research

Beins: The panel has described several different models that all seem to work. Say something about the level of resource commitment on the part of the department. How do you manage that, because it's not cheap?

Miller: It's not cheap, that's true. Part of what makes it manageable for us is that we are teaching the labs in our area of interest. In any given semester that we teach a lab, we might have two sections of with 7 or 8 people in it, so we might be teaching 16 students. So we are not engaging 24 to 48 students in research. I don't know how you do that. Still, even for us it's a cost because we do not get rewarded as faculty for that time. In fact, the workload credit we get for labs is less than one for a one-hour lab course. So, yeah, you definitely take it out of your hide.

Wozniak: One aspect that makes the task manageable has to do with overlap between teaching and scholarship. The faculty member can reap benefits in terms of developing their own area of research while mentoring undergraduate student research. Out of those labs come not only student publications, but also a number of faculty co-authored publications. In order to do research at an undergraduate institution, the lab courses provide a real advantage.

Buskist: Remember that institutions provide opportunities, but it's up to the individual to realize those opportunities. I tell graduate students that whether you go to Harvard or BYU doesn't matter. What matters is that you take advantage of whatever opportunities become available while you are there. I think that American universities provide incredibly powerful opportunities to become educated. And

what I mean by that is that you become a better thinker and better at solving life's problems, whether financial, personal, physical, or psychological. The other thing that I think it means is that you should have developed some sense of humanity and have as one of your life's priority a desire to help others who need it.

Working with the IRB

Bell: I have a question for those who do this intense undergraduate research. At our institution, one of the real crises that we are facing is the IRB. Our human research committee is taking six months sometimes to approve a study that has gotten federal funding provided. Sometimes, for undergraduates, it takes an entire semester to get it through the committee. What do we do?

Miller: I'm the director of the IRB at UNK and Bob Rycek is the deputy director of our IRB, and at the University of Nebraska at Lincoln, they did the same thing. They put the head of the IRB in the Psychology Department because it is so labor intensive in psychology, particularly if you are doing undergraduate research. Most of the undergraduate protocols come as exempt by federal guidelines, and we turn them around in a day, not only within our department, but also across the university. The federally funded stuff takes a month. We have never had anything take six months.

Rycek: One goal in our department is to have a human subjects committee prior to submission to the IRB. Student research is first reviewed by the faculty member, then by a "gang of four" faculty who comprise our committee and then it is sent to the IRB. The review process within the department takes a few days but then the IRB can approve very quickly and few protocols come back to us for revision, unlike the protocols from some departments whose faculty are less conscientious. In those cases, the process can drag on for several weeks, with most of the time spent in having the student revise the protocol.

Halonen: How do you train the faculty who are on this review board?

Miller: There is training available on the NIH web site, which is rather good. All our IRB members have gone through that self-paced training. It's all there you just click through, read, and respond. It's a good thing to do. It really gives you guidelines as to how you should treat various kinds of cases. I would recommend that. We also provide a training session

for all newly hired faculty. In addition, I have from time to time provided a training session for all of the students in a research methods course, especially for those courses outside of our department.

Wozniak: We go through the IRB for the projects in our experimental psychology class. We have our human subject pool coordinator who is an advanced undergraduate student, come in and talk about all of the problems that are tied nicely into the chapter on ethics. So students get trained as well as faculty early on.

Halonen: We are about to have an IRB meltdown on our campus because the IRB has defined any data gathering exercise as research. That includes classroom assessment.

Miller: There are federal guidelines that say it shouldn't. In fact, the federal guidelines suggest that if you do something in class as an exercise, and it turns into data, that is the only case in which you can file a protocol after the fact. You don't have to file ahead of time for that.

Halonen: Well, this is a challenge when you have an IRB chair who has figured out that this is a neat way to build an empire, and bragging about how the turnaround time is really good. We get things back in three weeks. Three weeks! In terms of student projects, that just kills student. It's bad, and that's just part of it. I mean one of the challenges is that this is a person who considers himself to be trained in psychology and goes beyond giving the thumbs up or the thumbs down, he gives advice on methodology, design, spelling, and grammar. So, OK now we know why it is taking three weeks.

Miller: It is tempting as an IRB director to give advice on methodology. It's not necessary, although, if you go to the NIH website, one of the things they suggest is don't waste people's time. I sometimes provide methodological suggestions as a postscript. It is not part of the requirement to re-file. It is just "here is a suggestion." We had a protocol recently from the biology department that was examining the effectiveness of St. John's Wort. The researcher was looking at stress reduction. Their initial testing, to create a baseline, was planned for the middle of a participant's menstrual cycle. Then they were going to do re-test five weeks later and see whether the depression had lessened after St. John's Wort. I suggested that: "if you are going to test in the middle of a menstrual cycle, you might want to re-test in the middle of a menstrual cycle." They took that advice.

Bell: At our institution, if you wanted to do that type of research you would have to have a ten page consent form.

Miller: Well, this one was three, given all of the possible side effects. Ever try to get through a school board or state agency? Three months is heaven, sometimes “ever” is heaven. Getting into the public schools, unless you are in an education program and are perhaps teaching at the school already, and you want to do this and you know the principal, it is very difficult. State agencies and public schools have cumbersome approval processes.

Helping Students to Become Excited About Research

Halonen: One of the reasons I asked you, Rick, earlier about whether somebody taught you to be excited or did you learn from experience to be excited is that I do think that has become a kind of paradigm shift that has happened. I see the most successful researchers, the people who do the best teams, are individuals who really help students get past their fear about research, the stage, I love this stage. It's like "all the important stuff has already been found, so how can you possibly ask me to come up with a new idea?" I'm sure that is a predictable developmental stage. I think that a researcher who has the fire can open the door, get them excited that they will be the first person in the universe to have that answer. To have someone say that to an undergraduate, I think would ignite the process.

Becker: Given that all of them want to do something regarding schizophrenia or depression, how do you keep that interest and excitement and still try and challenge them to do a research project on ordinary college students. How do you do that?

Halonen: Well, you find schizophrenic college students. Seriously, when students come and talk with me about ideas and they propose a grant idea that at least says that they have caught fire, and I want to reinforce that it is great that they have caught fire? I then ask them to just think about some of the practical issues involved. I try to turn it into a problem that they can reason their way through and usually they will come up with, oh yeah, I guess I only have eight weeks left in the semester, and I guess I won't be curing schizophrenia in that time. I think it harkens back to understanding developmentally that it's appropriate for them to come with a huge idea. Then it becomes your job to say, “Great, ok now how might there be a glimmer

that would fit into this little window that we've got? Is there something that would work in that little window? Is there something about college students and this population that you are interested in looking at? Is there any way that we can do a simulation?” I think it becomes a mentor's challenge to preserve the excitement within realistic parameters so they aren't completely frustrated.

Miller: We use the traditional system at UNK that requires students to take a course in statistics and a course in experimental psychology in their sophomore year. However, our approach to experimental psychology is a little different. Bill Wozniak, for example, often sets up several research projects, that are group projects, but not canned projects. In fact, the projects tend to be cutting edge. It's very risky because he has no idea what the data is going to look like and if the study is going to work. Students get very frustrated when they put in lots of effort and “O gosh, why didn't we find what we thought we were going to find. I thought that was the point. You hypothesize and you have findings that support the hypothesis?” They learn early on about an important aspect of research, that it is not just confirmation of your ideas.

In the junior and senior year, all of our mainstream courses, whether it's memory and cognition, biopsychology, social psychology, or physiological psychology, have an optional lab connected to the course. Students need to take two of these prior to graduation but they are allowed to choose the area depending on their interests. So if they are interested in biopsychology and physiological psychology, those are the two labs they take. In those labs, they will do either an independent or a team research project. Teams usually are limited to two or maybe three people. The actual project and team composition is selected based on interest. So they've gotten the group experience in experimental, and two independent studies in their areas of interest. After that, if they are still interested, and we still have some that are, they'll do an independent study or a lab apprenticeship.

In our lab courses, we will often start out just talking about possibilities without actually designing a study. I try to guide the students to topics in which there are a lot of unanswered questions. It becomes a little more manageable if you start out with the topics that you know have unanswerable questions and there is as available methodology.

McKeachie: I think involving undergraduates in research is great. Doing the research and just writing

it up is usually the most popular part of my course. Students get a good kick out of it, and can then see in print what they've done. You know, I still get a kick out of seeing my stuff in print. I think that's very reinforcing, even though I'm not a strong behaviorist. It's not like working for a grade; it's recognition that you did something well, and it gives you a sense that you're worth something; it's self-efficacy.

Brewer: I've heard the expressions "catching fire" and "excitement" a lot in our discussion. Let me tell you that I have had very few clever ideas in four decades of teaching, but this is one. On the first day of my Experimental and Statistical Methods course when I talk briefly about their data-collection experiment and their proposals, I take in a stack of reprints from professional journals. The stack is about six inches high. Each reprint has at least one co-author who started out in this very class. I then flip through the stack of reprints and mention the journal in which the article was published, the article's title, and the names of student co-authors who recently graduated or who are still in our program. My present students will recognize certain of these former students and may even know some of the co-authors. Then, I ask in my most excited way: "Which of you will have reprints in this stack three or four years from now?" I answer my own question by saying that I hope every one of the students will have a reprint in my stack for future classes. Knowing certain of these former students who published articles in professional journals, the present students begin to think, "If they can do it, so can I." Students leave that first class meeting a little intimidated but energized beyond belief. They all are thinking about winning a Nobel Prize. You can't imagine what a motivator that first lecture is.

Buskist: I think you have to be an interesting person. There has to be something about you as a teacher that draws students to you. It may be because you make class fun and interesting. It may be that you challenge students to think in a way they never have thought before. Or, it may be that you're just friendly and students find you approachable. For any of these reasons, or some combination of them, when it comes time for undergraduates to engage in a research experience they think about you. I think that if you're just up there dispassionately lecturing about psychology, then you won't turn anyone on to psychology. If you really want to have an impact, you've got to let the better aspects of your personality shine through.

Miller: One additional point is how to provide ongoing motivation beyond the initial stage. I find

that students are usually very excited at the beginning of a project, the idea stage. There are a couple of little points at which faculty need to intervene. One may need to intervene as data collection drags on, and students become frustrated that a number of subjects don't show up for their appointments. You are going to need to be there to sort of re-motivate at that point. The other point is when you complete the project, and you didn't find anything, students react with much more disappointment at that than most faculty members do. Most faculty members are used to that in their research. The trick is to make the null results as exciting as the question was when they started out.

Rewarding Faculty who Promote Undergraduate Research

Halonen: I think that it is important to figure out who the people are who will be the igniters, the ones who love to research, the ones that are publishing, the ones who find that thrill. Next, look at ways to create incentives, perhaps by using re-assigned time. If a faculty member is supervising a research team and the research team is productive, attach something important prestige wise, salary wise, and computer wise, something to it that designates that this is an important value. Yes, that can create some turmoil, but the key is that if you can get departments to agree this is an important goal for undergraduates, and then it is reasonable to take the next step and allocate some of our resources toward that. The challenge, I think, is trying to figure out a system that is equitable. I have some faculty that have seventeen research teams running at one time and others that say they are stressed if they are doing one project.

Brewer: I have two quick reactions. First, a commitment to undergraduate research is central to our program, and we don't hire people who do not share this commitment. Over a period of years, then, we get a cadre of people who join your faculty because they want to conduct collaborative research with undergraduates. Second, Furman has a banking system whereby faculty members get teaching credit for supervising students' projects in a formal course called Independent Research. For example, after I supervise four such projects in whatever period of time, I get my teaching load reduced by one four-hour course. We believe that supervising four Independent Research projects is about as demanding in time and effort as is teaching one four-hour course.

Miller: I don't think any of my faculty are involved in undergraduate research for financial reasons. But, the university did set up a way of recognizing and

rewarding people involved with undergraduate research. We have a research-mentoring award. We have a student research day in about three weeks that will involve 300 student poster presentations across all disciplines. In a way it is an accumulation. Some of these will be presenting posters based on papers that they have read at a conference earlier in the year. Others perhaps will only present here. At that time, a faculty member from each undergraduate college will be recognized with the mentor award, which includes money, a certificate, and a handshake from our Vice Chancellor for Academic Affairs. It's a model that some might want to take back to their school as a way of saying that undergraduate research is important it's worth promoting and worth rewarding.

Showcasing Undergraduate Student Research

Anderson: I think that a critical part of students doing research is communicating it. That is very important. They can discover that research is a community effort, that science is a community of people thinking about things in different ways and transmitting their ideas and findings to others. Students can go to undergraduate research conferences to present their work. That is the best part—that is the icing on the cake! The students come out of it, and they are just so high. They see themselves differently. They feel so great about what they did. They are so happy. They are so pleased. They see their research as something a little bit more valuable than they had before. They know that this research is not fabulous or earth shattering, but they have nearly all come out of the experience of presenting their work feeling quite good about their products and their role. I have a requirement now in my classes that students must present their research. We just got the letter that Julie Stopulos' manuscript (Stopulos, 2004) was accepted for publication in *JPI*, which was quite an arduous process. I am really impressed at the reviewers' comments, and I want them to keep up those standards. Julie sent me all "yippee" emails. She was just so happy, and I told other students at Ambrose, and they were all excited for her! Some said, "We want to do that, too!" That excitement is very important. I think that presentations and publications are an absolutely critical element in the research process. I even appeal to the sense of their resumes. Build your resumes even if you never go into psychology. Students are able to have a product of their own that they stand behind and can survive!

Buskist: Undergraduates can enter the scholarly arena in several different ways, and I think one of the best ways is through the programs that Psi Chi

promotes—its conferences and its undergraduate research journal and through the *Journal of Psychological Inquiry*. These opportunities provide a supportive, nurturing experience for students. If you start playing with the big dogs too soon, and you don't have thick enough skin, you're going to be completely discouraged. These folks can be nasty, even heartless, sometimes. We don't need to expose undergraduates to that. We don't even need to expose some assistant professors to that.

Ware: How about handling those rejections or even the necessity for revision? Students, for example, can be very discouraged by getting back a review that says, "More work is needed." How about yourself?

McKeachie: Well sure, it's frustrating, especially if it's a research proposal, and it's pretty good. Personally, I sometimes think that the reviewers didn't understand at all what was important, but most of the time the suggestions are good, and if it's outright rejected then there's always another journal. Usually, if it's rejected, I think sure, this isn't earth shaking. Most of the things I publish aren't earth shaking. I think some people would be interested, so I'll send it to a journal that doesn't have such strict standards. You find a lot of publications that—if you just stuck to the really important journals—probably wouldn't get published at all.

Rycek: In addition to the regional conferences that Psi Chi supports, we have a series of undergraduate research conferences that are really good avenues for undergraduates to get to see what other undergraduates are doing, for instance, the Great Plains Students' Psychology Convention.

Miller: One of the differences between that kind of a conference and a regional conference is that at some of the student conferences, the presentations are judged. At the Great Plains convention, there will be at least two faculty members in the back filling out a sheet that provides the presenter with feedback about what was good and what could be improved. There are also awards given in each session. The best paper and the second best paper from that session will get a certificate. So there is immediate recognition. Students have that, and the feedback, which is very valuable. Thus, someone other than the faculty advisor will have read or listened to the students' presentation and provided useful suggestions.

Beins: I tried to count the number of undergraduate research conferences in psychology. I know I missed quite a few, but I counted more than 25, and that does not include local university events.

Brewer: Allow me to add one final point about conferences. Furman students seem to be reassured by the label “student research conferences.” Knowing that all presenters will be students makes such conferences a lot less threatening, even though Furman students are not easily threatened. Student research conferences can be a good warm-up for a professional conference at the regional or national level. Hence, your students may benefit from presenting first at a conference for their peers.

The Benefits of Undergraduate Research

Appleby: You basically just have to make them aware of the advantages of becoming involved in research. I think most undergraduates, before they understand how important it is to do research, just think it’s something difficult and time consuming. Why not just get your degree as soon as possible? It helps if you can make them aware of the fact that the person with whom they do research is going to be able to write them a very strong letter of recommendation. Another thing is that research actually helps, and you don’t just wake up and do research. You have to have a reason to do it; you have to have some sort of a question. Then it becomes a really interesting process, where you can investigate something that you’re very interested in. So, it’s got some external rewards to it, it’s got some internal rewards to it, and just simply learning the process of doing research is going to make you a more critical thinker, rather than just a memorizer and a responder. It’s going to make you evaluate, etc. Those are the three things that I try to impress upon my students. And when they learn how important it is, then they start trying to figure out, “how can I get involved, where can I do this, how can I do this?” I act as a “people broker” in my department and I pay close attention to what my students are good at and what my colleagues are looking for. And I try to match them up and things like that.

Cialdini: I think it’s very valuable even for those undergraduates who don’t go on to graduate study in psychology. In my presentation earlier at this conference, I was lamenting the extent to which the people in the Keep America Beautiful organization and the Petrified Forest administration, to whom I was showing our experimental results, were not willing to take the counsel of those data but were instead responding to another form of data, which was essentially self-report. They weren’t getting the vital difference between self-reports on the one hand and a controlled experiment on the other. The more undergraduates that we can infuse with a recognition

of the distinction between simply asking people what is going on and testing what is going on in a controlled fashion, the better off the society is in general. So, I am a great advocate of expanding the message of psychological science beyond the graduate level community in which we frequently work.

Buskist: I think the most important advantage is not about the research but about the faculty member becoming more aware of how undergraduates function. Not every faculty member is going to be sensitive to what undergraduates do because, quite frankly, a lot of faculty will turn an undergraduate over to a graduate student to supervise and never again see him or her. What I like to do is involve the undergraduates in all the lab meetings and conversations and let them know that I expect them to pitch in and contribute to the project. That helps me to get a feel for where their head is and it gives me an opportunity to tune in to what undergraduates are thinking so that I am able to relate to them a little better. A second advantage is that it introduces them to the scholarly aspects of academia, and I think that’s the best way to get introduced to scholarship. They get their hands a little dirty and the longer those students stay with you, the dirtier they get their hands, the more they like it, and the more influence you can have on them.

Anderson: Whether they appear to have potential to do original research or not, I think there’s room in the research process for everybody to be involved and to learn something. One thing you learn doing research is that you can’t do it by yourself. Well, maybe you could, but it would be lonely, and it would be frustrating. I think it would be awfully difficult to do it well. So you need many people and people are at different levels. If someone wants to code data or collate the questionnaires, that would be great. Last year some students were coding their data and discovered that one of their questionnaires was missing a page. Fortunately, we had collected enough data on other issues that we could still address some interesting issues. But the students were disappointed. If we had someone coordinating the stimulus materials, it would have been a tremendous help. Following receipt of tenure, I said my plan for the next five years was to get students actively involved in research and for them to be models for one another. At St. Ambrose, I teach four classes each semester, which is a lot of class work. I really don’t have time to have my own ongoing research. I also don’t have the facilities. So what I try to do is get students involved in research in a variety of different ways. I’m still experimenting with all the

different approaches. Some approaches have been more successful than others, and sometimes it depends on the semester, the student, and the topic. I try to get students involved in research and try to do it in a visible way. I make it very clear in the classes, sometimes even the intro classes. But sometimes I have to push a bit, and I say, "Come on guys." Once they get into the process, a few students describe it as a considerable amount of work and never want to do it again. I think it is important to learn what you don't like; you learn something about yourself. For example, when I got involved in clinical research as an undergraduate I realized that I didn't want to do that. I think that was really important for me and probably for any potential clients that I might have had. You have to find yourself. But when exposed to the research process, some students really show great initiative, drive, promise, and skills. Those people I push a lot harder and try to get other students in on their projects. At past research conferences, I've found that a majority of the research fits very clearly into the area of social psychology and much of the other research is very closely related or relevant to social psych. Social psychology covers much ground, and it works well with undergraduates, although I usually let my students' interest drive the research topic. If they pick something that I'm totally clueless about, I let them know. If they really want to do it, I'll do my best to learn about that topic. Usually students pick topics that are interesting to me, and it's a nice opportunity to learn something new. Their interest really drives much of what I do.

Brewer: Appropriate undergraduate research is an integral facet of education in psychology. Learning how to do good research is like learning how to drive a car. You can read every book that has ever been published on how to drive a car, but you don't learn to drive a car until you drive a car. Similarly, you can read all the books on research methods and statistical analysis, but you learn how to do research when you do research. I discovered early in my career that the research you do is very different from research reports in published articles, and I try to convey this difference to my students. Research that you read about sounds sterile. Most articles are written in the same format. Readers get the impression that researchers simply go through the lock-step procedures from one step to the next to the next, and so on. Authors seldom tell readers how many times

their procedure failed and they had to start over, or that they lost all their data in a computer crash. Until you conduct research, you don't understand what research entails, because you will not get the full story by reading published articles in psychology journals. Research is just not like that. One person (I think it was Joe McGuigan in his textbook titled *Experimental Psychology: Methods of Research*) said that doing research does not involve the ties, tails, and evening gowns that you read about in journals; instead, doing research is more like dirty blue jeans and sneakers. That is a good way to highlight the difference.

Suinn: There are a variety of benefits for continuing to involve undergraduates in research activities. One, there's a benefit for the faculty. The faculty get the benefit of seeing a question pursued for which the faculty want a scientific answer, and you can't always do that yourself. So that's a benefit for the faculty. The faculty get the benefit of seeing one of their students engaged in a real challenge and standing back and saying, "Look! I've laid the foundation for you. Now let's see what you can accomplish." Two, from the student's perspective, there are some payoffs. The student, as I said earlier, becomes a peer with the faculty person, because now you are working together. And you also have the satisfaction of going through a series of questions, designing something, finding out the answer, and experiencing the satisfaction of saying "I did that in a systematic fashion." Even if the research doesn't lead to a final answer, it might lead you to a new direction. Three, for the discipline of psychology, [research with undergraduates] may bring a new perspective. Having looked at an issue of the *Journal of Psychological Inquiry*, I read an interesting article by an undergraduate about whether the first impression of a faculty person is a lasting impression despite negative data to the contrary [see Cooper, Bott, & Wallace, 1999]. I think that's an interesting question that someone else might never have raised. So, for psychology as a discipline, undergraduates doing research can provide a different perspective and, therefore, new information and new conclusions. Finally, there is a benefit for society. Because you do the research and learn the scientific method, you acquire more sophisticated thinking skills. As you become members of your neighborhood, or society, or community, you are now a better person in that environment.