

PHARMACY PRACTICE INSIGHTS

Research Experiences and Research-Related Coursework in the Education of Doctors of Pharmacy

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A study assessed coursework and experiential activities of students to determine the role of research in Doctor of Pharmacy education. Questionnaires were sent to all 78 (at that time) colleges and schools of pharmacy in the United States. Responses were received from 60 (76.9%), of which 57 were used, representing 139 Pharm.D. program types (entry-level, post-B.S., track-in, nontraditional). Most programs required coursework in research methodology, statistics, and drug information and literature evaluation, with research methodology required least. Although 41.0% of programs provided students the opportunity to conduct research as an elective, only 12.9% required an extensive project with data collection, analysis, and write-up. Another 6.5% required a project proposal only. Most colleges of pharmacy now offer the Pharm.D. degree, and the role of the pharmacist has also changed. Pharmacists must be able to disseminate evidence-based knowledge about drug products and drug therapy and use scientific knowledge and scholarly principles to solve problems.

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“To study the phenomenon of disease without books is to sail an uncharted sea, while to study books without patients is to not go to sea at all.”

Sir William Osler

Advancement of pharmacy depends on pharmacists' ability to provide thorough, cost-effective pharmaceutical care to patients. To enhance the likelihood that this will occur, pharmacists should be able to solve problems systematically and evaluate the literature, both of

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which require analytic skills. The essence of research is to define a problem, gather data systematically, interpret the data, and report results. Whether conducting the project or reading results of others for application to practice, pharmacists can benefit from understanding the process.

Reasons for providing research orientation in professional pharmacy curricula are many. Some graduates of Pharm.D. programs go on to careers in academia or research. Furthermore, the ever-increasing sophistication of clinical pharmacy practice requires pharmacists to interpret and use recently published research findings and communicate this information to other health professionals.¹ It is our belief that all pharmacists can benefit from basic application of the scientific method in solving everyday problems.

Professional organizations have addressed the issue of research in pharmacy. For example, the American Society of Health-System Pharmacists issued the following statement²: “Pharmacists in

organized health-care settings have a professional obligation to participate actively in and increase pharmacy-related and drug-related research efforts." A core mission philosophy of the American College of Clinical Pharmacy is to "provide leadership, education, advocacy, and resources enabling clinical pharmacists to achieve excellence in practice and research."

The issue of research in colleges and schools of pharmacy (hereafter referred to as colleges) and pharmacy education was addressed in part in the early 1990s when the American Association of Colleges of Pharmacy formed a commission to evaluate standards of pharmaceutical education and make recommendations regarding curricular changes to enhance the progression of pharmaceutical care. One of the commission's three position papers stated that "part of the mission of pharmacy education is responsibility for generating and disseminating new knowledge about drugs, drug products, drug therapy, and drug use through the conduct of basic and applied research."³ In another position paper the commission stated that "pharmacy education is responsible for preparing students to function as professionals and informed citizens in an ever changing health care system."⁴

We believe that research skills can enhance the professional vitality of pharmacists and help ensure that these professionals are capable of dealing with changes in science and practice. Colleges of pharmacy in a number of countries outside the United States appear to have similar beliefs, as they have required research projects for the professional degree pharmacy candidates for many years, even at the Bachelor degree level.

The American Council on Pharmaceutical Education (ACPE) accreditation standards⁵ do not specifically address or recommend research training for Pharm.D. programs or allude to such courses as research methodology. Biostatistics, drug information, and literature evaluation are suggested as course offerings. These study areas are certainly important components of the research process, but do not provide structural training or practical experience in conducting research. Consistent with the quotation from Osler, we believe that to study research-related coursework without actual application may be of limited value if the profession is committed to promoting new research in pharmacy. Obviously, costs are associated with such educational opportunities.

A study was performed approximately 10 years ago to determine the existing role of research in

Pharm.D. education.¹ The results revealed considerable variation among different programs with regard to courses and experiences, but showed consensus among respondents that introduction to research principles should be part of the curricula. However, respondents varied as to their thoughts on how extensive that introduction should be. Only about half the colleges required a course in research methodology. Less than half required some type of formal research, and these projects were often not given a letter grade.

Two recent studies examined attitudes toward required research-related coursework and evaluative (research) projects at a college of pharmacy.^{6, 7} Both faculty and graduates were generally positive about the value of the experience and agreed that it should be part of the training of all Pharm.D. candidates.

Much has changed in the years since the earlier survey was conducted. Many more colleges offer entry-level and other Pharm.D. programs, and the mission of pharmacists has evolved with greater emphasis on providing pharmaceutical care. Knowledge of the current status of research-related efforts in colleges of pharmacy would be of value in understanding the preparation of new pharmacists for roles that require greater understanding of the literature and research processes.

We evaluated the current role of research in Pharm.D. programs in the United States and compared the results with those found earlier.¹ The primary objective was to describe the nature and extent of research-related coursework and experiences in colleges providing entry-level, post-B.S., track-in, and nontraditional Pharm.D. degrees. However, since all colleges of pharmacy are moving toward offering the Pharm.D. as the entry-level degree, greater emphasis was placed on results from these programs in several areas.

Methods

This survey used a questionnaire patterned after the one used earlier.¹ It was mailed in February 1997 to all (at that time) 78 colleges of pharmacy in the United States, excluding Puerto Rico. These institutions were identified from *The Roster of Faculty and Professional Staff* of the American Association of Colleges of Pharmacy.⁸ The questionnaire was addressed to heads of pharmacy practice or administrative department, or the person who appeared to be most appropriate. It requested information in five areas:

1. Doctor of Pharmacy degree(s) awarded by the institution, including types of programs offered and approximate number of students graduating "this year" from entry-level, post-B.S., track-in (i.e., students can choose at some point to finish with a B.S. or track-in to the Pharm.D. program), and non-traditional (i.e., programs for pharmacists already in practice) Pharm.D. programs. This information was requested to determine the size of programs that required research experience. Respondents were asked to indicate zero graduates if the program was available but no students were expected to graduate this year.
2. Formal research-related coursework; that is, whether three specific courses or coursework areas—research methodology, statistics, and drug information/literature evaluation (DI/LE)—were required or optional, number of credit hours assigned to each, year taught (for entry-level programs only), and whether or not they were combined with other courses. Respondents were asked to estimate the number of credit hours assigned to the topic (e.g., statistics) when it was part of another course. Quarter credit hours were converted to semester credit hours for analysis, with one quarter hour equaling two-thirds of a semester hour.
3. Student-conducted research, including whether project experiences were required, optional, or not available; type of grade (letter, pass/fail, not graded); requirement for, and faculty status of, student project advisors; and extent of project requirements (protocol only or extensive project). A research project was defined in the questionnaire as "posing research questions and devising methods to obtain suitable solutions, with or without actual data collection and analysis." Respondents were told that "review papers on therapeutic or other topics should not be considered research, nor should simple service as an assistant to a faculty member on one of his or her projects." Later in the questionnaire respondents were able to differentiate between projects requiring data collection, analysis, and write-up with or without the requirement of formal presentation (extensive project) and those that did not (protocol only) in terms of their college's requirements.
4. Other research-related courses or activities,

such as whether the college offered as elective or required other courses or activities related to research.

5. Perceptions of student-conducted research. This open-ended section requested comments on the value of having students in Pharm.D. programs conduct research projects. Respondents were also asked to comment on foreseeable changes in the curriculum related to research offerings in their institution.

The questionnaire was pretested by faculty members and revised slightly before mailing. Follow-up mailings, e-mail reminders, and personal calls were made to enhance response. Descriptive analyses (mean, SD, frequency count) were used to describe the data collected. Comparison with the earlier study¹ primarily involved discussing percentages of colleges or programs offering various coursework and research opportunities.

Results

Of the 78 questionnaires mailed, 60 (76.9%) were returned. Of the 60 respondents, 3 were excluded from analysis because no Pharm.D. programs were currently offered at the colleges, yielding a total of 57 (70.5%) usable questionnaires representing 139 types of Pharm.D. programs. It is possible that nonresponders offered no Pharm.D. program, since 13 eligible colleges were in that category as of fall of 1997. One college's Pharm.D. curriculum had a problem-based learning format. This college required research methodology, statistics, and DI/LE delivered as four 8-hour active learning events but did not require a student project for graduation. The format did not lend itself to reporting the number of credit hours, so results of these sections were excluded from analysis.

Professional Degree

Forty-one colleges (71.9%) offered the Pharm.D. as an entry-level degree. Of these, 21 were not graduating any students this year, 19 were expecting 5–175 graduates (mean \pm SD 77.4 ± 50.9 , median 65); 1 respondent did not state the number of expected graduates. Thirty-eight institutions (66.7%) offered the post-B.S. Pharm.D. degree: 31 were expecting 1–60 graduates (8.7 ± 10.3 , 6), 2 did not state the number expected, and 5 were graduating no students this year. The track-in Pharm.D. degree

Table 1. Pharm.D. Program Research-Related Coursework

	Number (%) of Programs with Requirements				Totals (139)
	Type of Pharm.D Programs (no.)				
	Entry-level (41)	Post-B.S. (38)	Track-in (33)	Nontraditional (27)	
Research methodology required	22 (53.7)	22 (57.9)	18 (54.5)	14 (51.9)	76 (54.7)
Research methodology available-elective	5 (12.2)	0 (0)	1 (3.0)	1 (3.7)	7 (5.0)
Do not require or offer research methodology	10 (24.4)	7 (18.4)	5 (15.2)	5 (18.5)	27 (19.4)
Did not respond to question	4 (9.7)	9 (23.7)	9 (27.1)	7 (25.9)	29 (20.9)
Statistics required	38 (92.7)	25 (65.8)	21 (63.6)	17 (62.9)	101 (72.7)
Statistics available-elective	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Do not require or offer statistics	0 (0)	3 (7.9)	2 (6.1)	3 (11.1)	8 (5.8)
Did not respond to question	3 (7.3)	10 (26.3)	10 (30.3)	7 (25.9)	30 (21.6)
Required DI/LE	40 (97.6)	27 (71.1)	26 (78.8)	19 (70.4)	112 (80.6)
DI/LE available-elective	0 (0)	1 (2.6)	1 (3.0)	0 (0)	2 (1.4)
Do not require or offer DI/LE	0 (0)	3 (7.9)	1 (3.0)	1 (3.7)	5 (3.6)
Did not respond to question	1 (2.4)	7 (18.4)	5 (18.2)	7 (25.9)	20 (14.4)
Require all three research-related courses	22 (53.7)	18 (47.3)	14 (42.4)	10 (37.0)	64 (46.0%)

DI/LE = drug information/literature evaluation.

was offered by 33 colleges (57.9%), of which 21 were anticipating 3–72 graduates this year (23.1 ± 20 , 17), the rest none. The nontraditional Pharm.D. degree was offered by 27 (47.3%) institutions. Eleven programs were expecting between 2 and 90 graduates (21.8 ± 25.6 , 12) this year, the rest none. Sixteen colleges had all four program types, 6 had three types, 22 had two types, and 13 had one type.

Formal Research-Related Coursework

Table 1 shows the availability of research methodology, statistics, and DI/LE coursework in Pharm.D. programs. The average \pm SD number of credit hours in research methodology required in entry-level programs was 2.4 ± 1.8 . Instruction in research methodology was offered most often in the second or third year of entry-level programs (68.0%) and was combined with other courses in 54.2% of respondents' institutions. When required by the program, the average \pm SD number of credit hours in post-B.S., track-in, and nontraditional courses was 1.9 ± 0.9 , 2.0 ± 0.7 , and 2.4 ± 1.1 , respectively. Coursework was integrated into other courses in 66.7%, 60.0%, and 66.7% of programs, respectively.

The average \pm SD number of credit hours in statistics in entry-level programs was 2.5 ± 1.4 . Most (68.6%) of these programs offered statistics in the first or second year of pharmacy school. One college required that it be taken as a prepharmacy course. Instruction in statistics was integrated into other coursework in 54.5% of

programs. The average \pm SD number of credit hours in post-B.S., track-in, and nontraditional programs was 2.4 ± 0.7 , 2.3 ± 1.0 , and 2.5 ± 1.2 , respectively. The subject was combined with other courses in 34.8%, 42.9%, and 66.7% of programs, respectively.

The average \pm SD number of credit hours in DI/LE in entry-level programs was 2.4 ± 1.1 . The course was most often offered in the third year of entry-level programs (43.2%) and was combined with other courses in 41.2%. The average \pm SD number of credit hours in post-B.S., track-in, and nontraditional programs was 2.0 ± 0.9 , 2.1 ± 0.8 , and 2.1 ± 1.0 , respectively. Coursework was integrated with other topics in 28.6%, 30.0%, and 33.3% of programs, respectively.

The six entry-level programs that required extensive projects required an average of 1.3 credit hours of research methodology (range 0.5–2 hrs), 2.0 hours of statistics (range 1–4 hrs), and 2.2 hours of DI/LE (range 2–3 hrs).

Student-Conducted Research

Twenty-seven (19.4%) program types required research experience (with or without requirements for data collection) for graduation. Table 2 shows the number of programs that required, offered as elective, or had no opportunities for research projects for students, as well as credits given and approach to grading of required projects. Only one college offering more than one program type had different requirements. It required a project for entry-level candidates and offered the opportunity to

Table 2. Availability of Research Project Experiences by Pharm.D. Program Type

Program (no.)	Number (%) of Programs with Projects			Credit Hours ^a for Required Projects		Grading Status of Required Projects	
	Required	Elective	None	Mean	SD	Letter (%)	Pass/Fail (%)
Entry-level (41)	10 (24.3)	18 (43.9)	13 (31.7)	2.6 ^b	1.8	80.0	20.0
Post-B.S. (38)	9 (23.7)	15 (39.5)	14 (36.8)	2.6 ^c	1.7	55.6	44.4
Track-in (33)	4 (12.1)	18 (54.5)	11 (33.3)	1.4	1.1	25.1	74.9
Nontraditional (27)	4 (14.8)	6 (22.2)	17 (63.0)	2.1	0.9	50.1	49.9
Totals	27 (19.4)	57 (41.0)	55 (39.6)				

^aSemester hours. Quarter hours were converted to semester hours with one quarter-hour = 2/3 semester hour.

^bOne entry-level program did not list the number of credit hours required of the research project.

^cTwo post-B.S. programs did not list the number of credit hours required of the research project.

Table 3. Extensiveness of Required Student-Conducted Research Projects (number of programs requiring specific description type)

	Entry-level (n=10)	Post-B.S. (n=9)	Track-in (n=4)	Nontraditional (n=4)	Totals no. (%)
Student is required to develop a written proposal, however, actual data collection and analysis are not necessary. ^a	4	2	2	1	9 (33.3)
Student is required to develop a proposal, collect and analyze data, and prepare a written report. ^b	4	1	0	1	6 (22.2)
Student is required to develop a proposal, collect and analyze data, prepare a written report, and present findings at college level or beyond. ^b	2	6	2	2	12 (44.4)

^aIn the 1988 study, this category would not have been considered a research project.

^bThese are termed extensive projects throughout the paper.

conduct a project as an elective for students in nontraditional programs. All other colleges offering more than one program had the same project stipulations (required or elective) for each Pharm.D. program type.

Eighteen programs (12.9% overall) requiring research projects stipulated extensive projects in which data must be collected and analyzed and results written up (Table 3). Twelve also required formal presentation of the results. Post-B.S. programs had the greatest tendency to require data collection and write-up of results. Nine (6.5% overall) programs required projects in which students only had to develop a written proposal; actual data collection and analysis were not required.

Of the six entry-level programs requiring extensive projects with data collection, analysis, and write-up, five reported they were planning to graduate an average of 67.2 (range 55–86) students. One program did not have a graduating class. The four programs that offered the entry-level Pharm.D. degree and required proposal-only projects were not expecting graduates this year. The average \pm SD graduating

class of post-B.S. programs that required extensive projects and were graduating students this year was 6.1 ± 2.2 (range 4–11 students). For track-in programs that required projects with or without data collection and analysis, figures were 24.8 ± 28.8 (range 3–62 students). Of the four nontraditional programs requiring research projects with or without data collection and analysis, two were not expecting any graduates this year, one expected 12 graduates, and one did not state the number of expected graduates.

An average of 1.4–2.6 credit hours was assigned for all required project types. For the 15 programs requiring extensive projects and reporting credit hours, 3 assigned zero credit hours, 1 assigned 1 hour, 1 assigned 2 hours, 7 assigned 3 hours, and 3 assigned 4 hours (average 2.4 hrs). Three programs did not report the hours. This average was down from an average of approximately five credits in 1988.¹ Slightly more than half (59.3%) of programs requiring an extensive project or project proposal graded the project on a letter scale. A higher percentage (80%) of entry-level programs requiring projects graded them on a letter scale.

Table 4. Percentage of Programs Accepting the Particular Study Type for Required Student-Conducted Research

Study Type	Entry-level (n=41)	Post-B.S. (n=38)	Track-in (n=33)	Nontraditional (n=27)
Clinical science research	100.0	100.0	100.0	88.9
Basic science research	100.0	88.9	80.9	77.8
Survey	100.0	77.8	95.2	100
Drug use evaluation	80.0	66.7	71.4	66.7
Other	30.0	11.1	0	11.1

Advisors for required Pharm.D. projects were mainly internal and external (preceptor-type) pharmacy faculty, although seven (25.9%) colleges allowed nonpharmacy university faculty to serve as advisors. Five programs (18.5%) at two colleges did not require students to have formal advisors on projects. Three of these programs (all at one college) did not require data collection.

Four areas of research content were described in the questionnaire. All colleges that required or offered elective student-conducted research allowed projects in all areas to an equal degree. Some allowed other types of research (Table 4).

Other Research-Related Courses or Activities

Thirteen Pharm.D. programs at seven colleges required additional research coursework. Requirements ranged from attending research seminars to submitting professional posters, doing review papers, and completing courses in research proposal development. Other colleges offered additional research courses as electives, many of which were research clerkships.

Comments on Student-Conducted Research

Comments were provided by respondents from 30 (52.6%) colleges regarding the utility of having Pharm.D. students conduct research as elective or required components of the curriculum, and/or on anticipated changes in coursework or experiential nature of student research. Five respondents suggested that research projects are not really necessary for most Pharm.D. students, but may be valuable for selected ones. This seemed to be borne out by the fact that many programs offered such projects as electives. Several respondents commented on the value of research in the development of students. One thought that advanced research training is best left for fellowship programs. Three respondents commented on time constraints involved with a project for faculty and students. Five suggested that the size of

their programs precluded a research requirement (two schools had recently dropped back requirements considerably due to increase in class size).

No respondents suggested that their colleges would be instituting a newly required research project in the near future, and no colleges that currently required projects mentioned plans to change their programs. One college was in the process of making changes designed to help reduce the load on certain faculty involved in advising students on projects and was considering moving coursework to the first professional year to give students an earlier start. The general consensus was that research-related courses or coursework were essential and should be a minimal requirement of Pharm.D. programs.

Discussion

Since the first comprehensive study of research requirements in Pharm.D. programs,¹ much variation still exists among programs as to the extent of research-related courses and research experience. In the original study, results were segregated by colleges that offered only the post-B.S. degree versus those that offered the entry-level degree, either alone or with a post-B.S. degree. Results from the current study are presented by program type in most cases. Only three colleges in this study offered the post-B.S. degree alone. Thus, for discussion purposes, only programs offering entry-level degrees are compared with the original study.

Research methodology coursework was required in only 53.7% of programs, approximately the same (50%) as that in 1988 (for those reviewing the original study, figures for statistics and research methodology are reversed in Table 2 of the report). Now DI/LE is required in more entry-level programs (97.6% vs 77.8%). Requirements for statistics are down slightly from 100% to 92.7% of entry-level programs (again, data in Table 2 of the original are reversed for statistics and research methodology). Requirements for all coursework across programs are

increasingly consistent, but are far from uniform. Of particular interest is the less than 100% requirement for coursework in statistics and DI/LE, since both areas are mentioned in the new ACPE guidelines⁵ as well as those in place at the time of the original study.¹

Differences in these requirements continue to exist among types of Pharm.D. programs. The frequency of required research methodology coursework was similar among all types, but statistics and DI/LE were required far more in entry-level Pharm.D. programs. This may be due to the fact that most students in programs other than entry-level (and many track-in) already have a B.S. degree in pharmacy and a number of them may have taken statistics and DI/LE. Another possible reason for not requiring these areas of study might be the limited amount of time available in such programs, although post-B.S. programs typically have up to a year for coursework. These differences raise the question of whether all Pharm.D. graduates are receiving sufficient education in statistics and DI/LE to meet ACPE requirements.

One might anticipate some variation among types of programs in requiring research experience. A higher percentage of entry-level and post-B.S. programs required these experiences compared with track-in and nontraditional programs. Of potential importance in terms of consistency of outcomes for a given college, all but one college placed the same stipulations on its graduates no matter the type of Pharm.D. program offered. That is, if a project were required or elective in any program at a college, the same situation was found for all Pharm.D. programs offered.

Fewer entry-level programs required an extensive research project (data collection, analysis, write-up with or without presentation) compared with 1988 (14.6% vs 22.2%). In the earlier study 81.8% of colleges offered and 42.4% required a formal research project. Results from this study showed that only half of colleges (60.4% of programs) offered and only 28.1% (19.4% of programs) required one to be conducted, and when required, in less than half (44.4%) of programs was it necessary that the project be extensive (data collection and analysis).

The decreased percentage of colleges and programs requiring or offering research projects may be due to the increased number offering entry-level and other Pharm.D. program types (vs post-B.S.) and the consequent increase in

numbers of students graduating with the Pharm.D. degree. The obvious implication of increases in class size relative to requiring projects is greater workload for the faculty. As one respondent commented, "Increase in class size has posed many barriers to the formal research project, such as available resources, advisors, projects, and time to conduct and complete the project." Another stated that formal research and advanced training are best left for fellowship programs, and another that research projects are difficult to monitor when faculty are spread throughout the state. These comments are strikingly similar to those in the 1988 report.

Most respondents who provided comments in the current study believed that research projects are valuable for selected students. This feeling is probably reflected in the number of programs (57/139, 41.0%) offering research an elective. Knowledge of how many students take advantage of these electives and how in-depth the projects are would be helpful in evaluating their potential impact on the profession. Some respondents believed that research-related courses and projects are invaluable to students. One pointed out, "The more that students become knowledgeable and conversant with clinical research the better. It is essential for evidence based pharmacotherapy." According to another, "We believe the research experience provides an opportunity to assess students' ability to integrate didactic materials with practical experiences. Their understanding of statistics and research design are applied in this project. Their defense prepares them for future presentations."

Lack of uniformity in requirements for research-related courses and experience leads inevitably to questions regarding the extent of such experience that Pharm.D. programs should offer and whether it is suitable that graduates from different programs have vastly different related preparation. Similar to the situation in 1988, accreditation standards for colleges of pharmacy suggest only research-related curricular core content areas in biostatistics and drug information and literature evaluation. The guidelines further suggest that for advanced pharmacy practice, students should be exposed to experiences that enhance abilities in solving problems and systematically evaluating drug use as well as help incorporate "knowledge and skills in the searching, analysis and interpretation of drug information." Whereas these requirements all indicate the need for research-related skills, they

fall short of recommending the actual application/experiential opportunities. It is interesting to note that a number of colleges in other countries require research for students studying for their first professional degree, both M.S. and B.S.

When data collection and analysis are part of the project, much time and effort are expended by students and by faculty members or other individuals providing advice. Thus opportunity costs are associated with requiring projects. Opportunity costs relate to time taken away from clerkships, studies, or other activities for students, and many other ways time might be spent by advisors. Obviously, in larger programs or programs with large student to faculty ratios the impact on faculty time of a required formal project can be great. Time constraints definitely affect the decision to require students to perform research. However, benefits for faculty and students such as publications and presentations can accrue, in addition to benefits associated with better student understanding of research processes and potentially enhanced likelihood of conducting future research.^{6, 7}

The five entry-level programs that required extensive projects and were graduating students in 1997 had class sizes ranging from 55–86. All of these programs required projects where students collected and analyzed data and prepared a written report. One program also required presentation of findings. Thus, programs of moderate size are able to accommodate extensive research projects for students. Colleges with larger classes might contemplate a recommendation to have students work in groups on projects.⁷ Another approach to reduce the workload for advisors is more extensive use of faculty from other colleges in a university, allowed by 25.9% of respondents in this study for required projects, or volunteers.

Today's pharmacists must be able to solve

problems in a systematic way and deal with the increasing sophistication of pharmacotherapy. We believe that it is vital that they be equipped with sound analytical skills to accomplish this, and that Pharm.D. curricula should develop skills in these areas. Accreditation standards should, at a minimum, have basic requirements in these areas to provide a degree of uniformity for graduates. Perhaps it is even time for a commitment to a stronger future for the profession through the development of research skills in all Pharm.D. graduates.

There are limitations to this study. We did not have 100% response, and some respondents did not answer all the questions. Nonetheless, the results give pharmacy educators valuable information pertaining to research-related coursework and research experience in Pharm.D. programs across the country.

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