RESEARCH

An Investigation of Teaching and Learning Programs in Pharmacy Education

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Objective. To investigate published, peer-reviewed literature on pharmacy teaching and learning development programs and to synthesize existing data, examine reported efficacy and identify future areas for research.

Methods. Medline and ERIC databases were searched for studies on teaching development programs published between 2001 and 2015.

Results. Nineteen publications were included, representing 21 programs. Twenty programs were resident teaching programs, one program described faculty development. The majority of programs spanned one year and delivered instruction on teaching methodologies and assessment measures. All except one program included experiential components. Thirteen publications presented outcomes data; most measured satisfaction and self-perceived improvement.

Conclusion. Published literature on teacher development in pharmacy is focused more on training residents than on developing faculty members. Although programs are considered important and highly valued by program directors and participants, little data substantiates that these programs improve teaching. Future research could focus on measurement of program outcomes and documentation of teaching development for existing faculty members.

Keywords: Teaching and learning, faculty development, teaching certificate programs, residency teaching programs

INTRODUCTION

Standards from the Accreditation Council for Pharmacy Education (ACPE) are holding pharmacy schools accountable to a higher standard of teaching effectiveness than in the past.¹ While previous standards addressed curriculum and assessment, the level of detail was not as explicit. The new standards address curricular quality, content mapping, diverse student learning needs, and outcomes based teaching and learning methods.¹ In addition, they also call for valid, reliable, formative and summative assessments to measure student knowledge and performance.¹ These are all things that require knowledge of learning theory, instructional design, and educational assessment. It was noted at the ACPE Consensus Conference in 2013 that most faculty members in higher education are not trained as teachers.² This will require that educational institutions have professional development programs that assist faculty members in writing

clear learning objectives, connecting learning outcomes to course assignments, and developing assessment tools that test higher-order intellectual skills.²

The need for increased levels of teaching expertise is well-defined and not limited to pharmacy education. Numerous teaching and learning workshops and development programs have been created and offered in medical education, spanning over two decades.³ A faculty shortage in dental education prompted Columbia University's College of Dental Medicine to establish a joint DDS and PhD program in education.⁴ The American Association of Colleges of Nursing stated that the basic doctoral degree in nursing does not prepare the graduate for a faculty role and recommends additional preparation in the science of pedagogy.⁵ Finally, the increasing need for teaching expertise in the health professions is exhibited by the expansion of a unique master's degree in health professions education (MSHPEd). The MSHPEd has become more popular in the last decade with more than one hundred programs offered internationally, thirty-two of which are in the United States.^{6,7} Clearly, health sciences faculty members, including disciplines beyond pharmacy, are experts in their field, but may lack pedagogical knowledge and skills.

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Despite the need for faculty development, we could find no recognized standards in academic pharmacy for faculty development in teaching. An American College of Clinical Pharmacy (ACCP) white paper published in 2008 suggested a structure consisting of orientation, mentoring, and ongoing development.⁸ It identified ways to design programs including timelines, types of content and activities to consider, and necessary professional, clinical, and research skills.⁸ More recently, Lancaster et al described the current landscape for faculty development programs in higher education and made recommendations for the implementation of new programs.⁹ They pointed to several existing models to support faculty teaching development and recommended institutions make informed decisions about which plan would be most successful. A model for preparing graduate students for faculty teaching and service roles has also been suggested and emphasizes the importance of experiential learning.¹⁰

Postgraduate pharmacy education has seen a large increase in teaching development programs for residents and fellows in the past decade.¹¹⁻¹³ These programs were created in part to prepare educators prior to an academic appointment. They were also meant to combat the faculty shortage that existed in pharmacy education by creating experienced residents who could quickly transition into a faculty position after completion of their program.¹¹ The American Society of Health-System Pharmacists (ASHP) accreditation standards for postgraduate year one (PGY1) pharmacy residency programs was published in 2012 and identified seven guiding principles to serve as the basis for evaluating residency programs for accreditation, including educational and training outcomes.¹⁴ An ACCP task force published standards in 2013 to guide program development in pharmacy postgraduate programs.¹⁵ These standards were created in response to variability in the purpose, content, and structure of existing teaching and learning programs in pharmacy residencies.^{12,16} They emphasized basic pedagogical knowledge, expression of a teaching philosophy, teaching experience in several varied teaching environments, and feedback through coaching and mentoring.¹⁵ Most recently, recommendations to guide teaching and learning curricula for postgraduate pharmacy experiences were published by the American Association of Colleges of Pharmacy (AACP) Pharmacy Practice Section's Task Force on Student Engagement and Involvement.¹⁷ They addressed items such as program content, teaching modalities, assessment, and program resources.¹⁷

The efficacy of development efforts in the science of teaching and learning in pharmacy is not clear. The purpose of this research was to investigate published,

peer-reviewed literature on teaching and learning development programs for faculty members and residents and examine what has been done and how effective these efforts have been. We could find no published reports that summarize the current literature on teaching development initiatives in pharmacy and synthesize current work to identify trends that could benefit the entire academic profession. This paper is the first to comprehensively summarize published efforts and (1) synthesize existing data on the scope and nature of teaching development programs in pharmacy, (2) examine the efficacy of these programs, and (3) identify future areas for research in teaching development in pharmacy. Results of this investigation will help inform teaching development initiatives and proper allocation of resources, and create a platform on which to expand teaching and learning programs for academic pharmacists.

METHODS

A modification of the PICO (population, intervention, comparison, outcome) framework, PIO, was used to develop the initial search criteria.¹⁸ Search terms included the phrases "pharmacy faculty," "pharmacy residents," "professional development," "teaching," "workshop," and "certificate." Results of this initial search in Medline were used to refine search terms and Medical Subject Headings (MeSH) and verify appropriate scope of the research question.

Publications were included if they reported on teaching and learning initiatives for postgraduate pharmacy residents and fellows, and/or pharmacy faculty members. Only peer reviewed manuscripts that described details about the programs were eligible. Abstracts or poster presentations were not included because of the limited details provided on program design and efficacy. The timeframe included studies published between 2001 and 2015. These dates were chosen based on the availability of research published during this timeframe and multiple references that articulated the Romanelli paper from 2001 as the first.¹⁹ The search was limited to programs offered in the United States and published in the English language.

Three approaches were used to locate publications. These approaches were developed after referencing systematic reviews of teaching and learning development programs in the medical education literature.^{3,20} First, Medline was used to search for relevant research using MeSH terms (certification, teaching, and education) combined with (pharmacy, faculty, "internship and residency," and graduate education pharmacy). In addition to the MeSH terms, free-text words were used in the literature search (pharmacy resident, pharmacy faculty,

workshop, teaching seminar, and certificate program). We also used ERIC to identify any literature that may have been published in the education literature as opposed to the pharmacy literature.

The literature search resulted in 53 manuscripts. Because not all papers were specifically about education programs for teaching and learning, the titles of these manuscripts were filtered for teaching and learning programs for pharmacy faculty members and residents. This resulted in 18 publications for abstract review. Twelve were excluded because they did not meet inclusion criteria, leaving six for full text review.²¹⁻²⁵ Second, all of the references of each eligible article were searched to find additional publications that met the criteria. This resulted in five more publications.²⁶⁻³⁰ Finally, manual searches were performed in the *American Journal of Pharmaceutical Education* and *Currents in Pharmacy Teaching and Learning*, a nonindexed journal, using the search terms described above, which resulted in eight additional papers.³¹⁻³⁸ In total, 19 papers focused on 21 programs designed to improve teaching effectiveness for pharmacy residents or faculty members met the inclusion criteria.

A data collection form was created in Excel to track criteria and assure consistency. Criteria for data abstraction were modeled after the data collection form and criteria used by Best Evidence Medical Education (BEME).²⁰ To collect data on the scope and nature of the programs and examine their reported efficacy, five variables were collected: (1) program learning outcomes, (2) target population, (3) program characteristics, (4) evaluation methods, and (5) impact of the intervention. Data surrounding the program learning outcomes looked at whether there was a stated objective and if it was based on a theoretical framework or literature review. Target population was the audience who participated in the

program. Program characteristics included content, program type (ie, workshop, longitudinal course, mentorship), and teaching methodologies.

Evaluation methods tracked programmatic assessment techniques and impact of the intervention, which were usually data tracking program utility or long-term influence. Impact was measured using a modified version of Kirkpatrick's 4-level evaluation of educational outcomes (Table 1).³⁹ If data were collected on the potential impact of the program on participant career choice in academia, we categorized that as level 3, a change in behavior. The data from any papers that were follow-up evaluations of previously published programs were combined with the original paper for purposes of data classification and quantification. The outcomes data was gathered using both papers to ensure a comprehensive assessment. The primary author abstracted the data independently. The second author reviewed the results and any differences were discussed until consensus of opinion between both authors was obtained.

RESULTS

A summary of the data examined for this manuscript is reported in Table 2. Nineteen publications were reviewed, which represented 21 distinct programs.^{19,21-38} Twenty of the 21 programs were residency teaching programs. Only one pertained solely to faculty development.³¹ Of the 20 residency programs, two described follow-up evaluations on programs that had previously been described in the literature.^{24,35} Four papers described two distinct teaching and learning programs within the same paper.^{22,27,32,36} Two of these described new programs developed for postgraduate year 2 (PGY2) residents and provided information on their existing PGY1 program in the process.^{22,32} The other two papers described

Table 1. Kirkpatrick's Four Levels of Impact³⁹

Level 1	Reaction	Covers participants' views on the learning experience, its organization, presentation, content, teaching methods, and aspects of the instructional organization, materials, quality of instruction (ie, "happiness data").
Level 2a	Change in attitudes	Outcomes here relate to changes in the attitudes or perceptions among participant groups towards teaching and learning.
Level 2b	Modification of knowledge or skills	For knowledge, this relates to the acquisition of concepts, procedures and principles; for skills, this relates to the acquisition of thinking/problem solving, psychomotor, and social skills.
Level 3	Behavioral change	Documents the transfer of learning to the workplace or willingness of learners to apply new knowledge and skills.
Level 4a	Change in the system/organizational practice	Refers to wider changes in the organization, attributable to the educational program.
Level 4b	Change among the participants' students, residents, and colleagues	Refers to improvement in student or resident learning/performance as a direct result of the educational intervention.

Table 2. Summary of Publications that met Inclusion Criteria

Ref #	Primary Author	Institution	Goal/ Outcomes ^c	Program Type	Program Length	Audience	Certificate	Instructional Methods	Experiential Component
19	Romanelli et al	University of Kentucky ^a	4	Longitudinal	1 yr	PGY1, PGY2	Y	Didactic component, coaching/mentorship	Y
21	Nappi	Medical University of South Carolina	2, 4	Longitudinal	1 yr	PGY1, PGY2	Y	Didactic component, coaching/mentorship, role playing, film/audio tapes, small group sessions	Y
22	Medina et al	University of Oklahoma	2	Longitudinal (PGY2)	1 yr	PGY2	Y	Coaching/mentorship, role playing, written materials/readings	Y
23	Gettig et al	Purdue University, ^b Butler University ^b	N/A	Longitudinal (PGY1)	1 yr	PGY1	Y	Didactic component, coaching/mentorship	Y
24	Gonzalvo et al	Purdue University, ^b Butler University ^b	2, 4	Longitudinal	1 yr	PGY1, PGY2, Fellows, Faculty	Y	Didactic component, coaching/mentorship, written materials/readings	Y
25	Kirdahy et al	University of Florida College of Pharmacy	N/A	Longitudinal	1 yr	PGY1, PGY2, Fellows, Faculty	Y	Didactic component, coaching/mentorship, written materials/readings	Y
26	Sylvia	Massachusetts College of Pharmacy	1, 4	Longitudinal	1 yr	PGY1	N	Coaching/mentorship	Y
27	Slazak et al	University of Buffalo	N/A	Longitudinal	1 yr	PGY1, PGY2	Y	Didactic, coaching/mentorship, written materials/readings, small group sessions, case-based teaching	Y
28	Castellani et al	University of Arizona	1, 4 1, 2	Rotation Longitudinal	4 wk 1 yr	PGY1, PGY2 PGY1, PGY2, Fellows, Faculty	N Y	Coaching/mentorship Didactic component	Y Y
29	Taylor et al	University of Florida College of Pharmacy	2, 4	Longitudinal	1 yr	N/A	Y	Didactic component, coaching/mentorship	Y
30	Guillema et al	Loma Linda University	4	Longitudinal	1 yr	PGY1	Y	N/A	Y
31	Stein et al	Pacific University	2	Workshop	6 hrs	Faculty	N	Didactic component, coaching/mentorship, role playing, film/audio tapes, small group sessions	Y

(Continued)

Table 2. (Continued)

Ref #	Primary Author	Institution	Goal/ Outcomes ^c	Program Type	Program Length	Audience	Certificate	Instructional Methods	Experiential Component
32	Ray et al	University of Tennessee College of Pharmacy	4	Longitudinal (PGY2)	24 mo	PGY1, PGY2	N	Didactic component, coaching/mentorship	Y
33	Lis et al	University of Wisconsin, VA Medical Center	N/A	Longitudinal (PGY1)	1 yr	PGY1	N/A	Didactic component, coaching/mentorship	Y
34	Johnson et al	Shenandoah University	2	Longitudinal	5 wk	PGY1	N	Didactic component, coaching/mentorship, small group sessions	Y
35	Romanelli et al	University of Kentucky ^a	1	Longitudinal	1 yr	PGY1, PGY2, Faculty	Y	Didactic component, coaching/mentorship	Y
36	Fox et al	Shenandoah University	2, 4	Rotation	6 wk	PGY1	N	Didactic component, small group sessions, coaching/mentorship, Written materials/readings	Y
37	Garrison et al	Albany College of Pharmacy and Health Sciences	3	Longitudinal	1 yr	N/A	Y	Didactic component, written materials/readings, coaching/mentorship	Y
38	Wahl et al	University of Wisconsin-Madison	N/A	Longitudinal	1 yr	PGY1	N	Didactic component, written materials/readings, coaching/mentorship	Y
			1	Longitudinal	1 yr	PGY1	Y	Didactic component, written materials/readings, coaching/mentorship	Y

PGY1 (Postgraduate year 1), PGY2 (Postgraduate year 2), N/A (data not reported in publication)

^aUniversity of Kentucky program was represented by two distinct publications

^bIndiana Pharmacy Teaching Certificate (IPTeC) program was represented by two distinct publications

^cIf program goals and/or objectives were mentioned in the test, they were categorized into four groups: (1) Introduction to academia, (2) Improve teaching skills, (3) Increase confidence in teaching, (4) Prepare for academic employment

teaching rotations and provided information about their existing longitudinal programs throughout the paper.^{27,36} Unless otherwise noted, our evaluations are based on the 21 programs.

Stein et al was the only program to focus solely on faculty development.³¹ Ten of the 20 residency teaching programs were for PGY1 residents,^{22,25,26,30,32-34,36-38} one was for PGY2 residents only,²² and seven included both PGY1 and PGY2 residents.^{19,21,23,24,27,28,32,35} Two programs did not specify the audience.^{29,36} Three of the seven programs for PGY1 and PGY2 residents also allowed fellows, faculty members, or preceptors to participate.^{23,24,28,35}

Fifteen of the 21 programs (71%) listed goals or objectives for their programs.^{19,21-24,26-32,34-36,38} The most common program goals were to prepare participants for an academic position after program completion (60%) and to improve teaching skills (60%). Exposure to academia (33%), improving student feedback and evaluation (21%), and improving lecture skills (29%) were other goals and objectives revealed. Ranking low on the list were development of personal, professional, leadership, and scholarship skills with scores of 14% each, improving small group teaching (14%), and increasing confidence in teaching abilities (7%).

Stein et al, the only program in the published literature that solely focused on faculty development, created a 6-hour workshop directed at the busy faculty member schedule.³¹ The remaining programs were conducted as part of a resident training program. Most (80%) of these postgraduate programs were longitudinal and spanned the entire year.^{19,21-24,26-30,32,34,35,37,38} One program spanned both years of a PGY1 and PGY2 residency.³² Four programs (20%) were designated as academic rotations and taught over the course of 4-6 weeks.^{25,27,33,36} More than half of the programs offered a certificate of completion (65%).^{19,21-23,26-29,34-36,38}

Twenty programs contained both a didactic and experiential component and one program focused on just didactic methods. This one program was a discussion based seminar series and did not include a formal experiential component for the residents.²⁶ Didactic methods taught knowledge development while the experiential component helped participants apply their knowledge in various teaching situations. The majority of programs (81%) delivered formal didactic instruction in the form of workshops or seminars.^{19,21-24,26-29,31-38} The longitudinal 1-year programs typically offered 1-2 hour seminars every month for most months of the year. Seven programs indicated they front-loaded the seminars so residents could finish the didactic portion of the program in the fall and use the spring to apply

their knowledge and skills during the experiential component.^{21,22,24,28,34,37,38}

Programs designed as 4-6 week teaching rotations had participants immersed in daily teaching experiences.^{25,27,33,36} Stein et al had faculty members use their newly acquired knowledge and skills to present a lecture to a panel of peers.³¹ Of the 20 programs that had experiential components, common activities included having the participants give a lecture (85%), facilitate a small group discussion or laboratory section (85%), precept a pharmacy student on an practice experience (60%), or develop teaching material (55%) (Table 3). The longer or more advanced experiences had residents take on an entire elective course to plan, coordinate, teach, and evaluate.^{22,32} The development of teaching philosophies (40%)^{19,22,23,26,32,34,35,37,38} and portfolios (50%)^{19,22,23,26,29,32,34-36,37,38} were also common experiential components.

Fifteen programs specifically listed the content they covered in the didactic portion of their programs (Table 3). The most common seminar topics included instruction on teaching methodologies (80%),^{19,21-24,26,31,32,34,35,37,38} grading and assessment (67%),^{19,21-24,27,29,33-35,37,38} teaching large lectures (53%),^{21,23,24,26,27,29,31,33,34} facilitating small groups (47%),^{19,21,23,27,29,33-35} and writing examination questions (47%).^{19,21,22,27,32,34} Sixteen other topics were listed and ranged from strategies (ie, how to develop courses and syllabi, how to use technology) to skill and knowledge development (ie, student-teacher relationship, student motivation). Several programs used the opportunity to discuss academic life, student-teacher relationships, motivation, and tips on how to interview for a job.

Thirteen papers, representing 12 programs, conducted an evaluation of some type and collected outcomes data (Table 4).^{21,23,24,26-28,30,31,33-35,37,38} The remaining six papers represented different levels of program description.^{19,22,25,29,32} The 12 programs that collected data used surveys to solicit participants' views.^{21,23,24,26-28,31,33-35,37,38} This was usually done as a single posttest after program completion. Three programs did pretesting and posttesting of participants to measure changes from baseline.^{28,31,33} One program administered a delayed posttest long after program completion to collect participant perceptions of their pre/postprogram knowledge and confidence.³⁴ Eight of the 12 programs presented Kirkpatrick's scale level 1 data on participant satisfaction and reactions to the program.^{21,23,24,26-28,33-35,37} In all cases, participants were satisfied with their program and valued their experiences. Seven programs collected level 2A data on participant attitudes and confidence in teaching.^{21,28,31,33-35,38}

In general, the majority of participants gained confidence in their teaching abilities and felt they were better

Table 3. Instructional Content of Reviewed Programs

	No. Programs (%)
Experiential Components ^a	
Teach a large lecture ^{19,21-25,27-32,34-36}	17 (85)
Facilitate a small group discussion ^{19,21-25,27-30,32-36,38}	17 (85)
Precept pharmacy students ^{19,21-24,27,29,30,32,34-36}	12 (60)
Develop teaching material ^{21-23,31-38}	11 (55)
Grade student work ^{21-23,25,27,32-34,36}	10 (50)
Create teaching philosophy and/or portfolio ^{19,22,23,26,29,32,34-38}	10 (50)
Give student feedback ^{21,22,25,27,32-34,36}	8 (40)
Write examination questions/create assessments ^{19,21,22,32-37}	8 (40)
Write learning objectives ^{21,22,27,32,34,37}	6 (30)
Write a manuscript/scholarship involvement ^{21,25,30,32,36}	5 (25)
Write a syllabus ^{22,27,30,32}	5 (25)
Attend committee meetings ^{27,30,32,36}	4 (20)
Coordinate/develop a course ^{22,32}	2 (10)
Content of Seminar Topics ^b	
Teaching methodologies ^{19,21-24,26,31,32,34,35,37,38}	12 (80)
Grading/assessment ^{19,21-24,27,29,33-35,37,38}	10 (67)
Teaching a large lecture ^{21,23,24,26,27,29,31,33,34}	8 (53)
Facilitating small groups ^{19,21,23,27,29,33-35}	7 (47)
Writing examination questions ^{19,21,22,27,32,34}	7 (47)
Writing objectives ^{22-24,32,34,38}	6 (40)
Writing a teaching philosophy ^{26,27,29,34,37,38}	6 (40)
Giving academic career advice ^{21,23,24,27,29,34}	5 (33)
Creating a portfolio ^{19,23,24,27,29,35,38}	5 (33)
Developing teaching materials ^{22-24,32,38}	5 (33)
Developing a course ^{21,27,29,34}	4 (27)
Developing a syllabus ^{19,27,32,34,35}	4 (27)
Conducting research/scholarship ^{19,21,22,38}	4 (27)
Incivilities ^{19,22,26,35,38}	4 (27)
Using technology ^{23,24,34,38}	3 (20)
Distance education ^{22,29,34}	3 (20)
Student motivation ^{22-24,37}	3 (20)
Using rubrics ^{22,27}	2 (13)
Interviewing for a job ^{21,27}	2 (13)
Experiential education ^{26,38}	2 (13)
Student-teacher relationship ^{23,24}	1 (7)

^aBased on the 20 programs that had experiential components; Sylvia et al was excluded as the program was discussion based

^bBased on the 15 programs that listed program content^{19,21-24,26,27,29,31-35,36,37}

teachers. Only one program collected level 2b data on changes in knowledge.²⁶ Self-reported knowledge of teaching improved, however this was not verified by an objective assessment. Nine programs collected level 3 data on changes in participants behavior, which we classified as either teaching behaviors or future academic employment.^{21,23,26,27,30,31,34,35} Eight programs collected employment data after program completion.^{21,23,26,27,30,34,35,38} The mean percent of graduates who subsequently went on to get a faculty position directly after their PGY1 residency was 34%; however, this was highly variable for each program. Two programs had

>50% of their graduates retaining faculty positions,^{26,27} while three other programs had <20%.^{21,23,38}

Stein et al was the only program that measured changes in participant teaching behaviors before and after the program.³¹ This was conducted by a panel of trained peers who measured changes in participant's teaching skills and behaviors during a lecture presentation before and after the 6-hour workshop. Participant scores increased in all three domains (planning, classroom environment, instruction) after the six hours of workshop.³¹ No programs collected level 4a or 4b outcomes.

Table 4. Self-Reported Efficacy of Reviewed Programs

Ref #	Primary Author	Response Rate (%)	No. Respondents	Study Design	Data Collection Tool	Data Sources	Impact Level	Results
21	Nappi	N/A	155	Posttest given annually at program completion	Survey	Participants	1	Most useful seminars: writing examination questions, creating assessments, preparing for a lecture, facilitating and precepting students
							2a	Participants felt they were prepared to be effective role models and to provide feedback to students; gained confidence in abilities for small group and clinical teaching.
							3	13% subsequently accepted faculty positions within two years.
23	Gettig et al	85	53	Posttest	Survey	Participants	1	47% agreed that program completion helped them obtain their current job, 53% disagreed; 80% would recommend the program to other residents or fellows, and 94% would “do it all over again.”
							3	7.5% were in faculty positions one year after program completion.
24	Gonzalvo et al	96	48	delayed posttest	Survey	Participants	1	Participants highly valued the lecture activities and precepting; most valuable seminars: getting feedback to improve teaching, preparing objectives, evaluating student achievement and precepting students. Showed preference for either a 2-day conference or a combination on onsite and online seminars for the didactic component; 86% of participants agreed program completion was highly important.
26	Sylvia	74	14	Posttest	Survey	Participants	1	Participants were satisfied with most aspects of the program.
							2b	Self-reported knowledge improved in all 13 areas measured.
							3	52% subsequently accepted full time or adjunct faculty positions.
27	Slazak et al	N/A	7	Posttest	Survey	Participants	1	Most valuable aspects of program: learning time management and how to communicate as a preceptor; found experience to be valuable.
							3	71% subsequently accepted faculty position
28	Castellani et al	100	11 (pretest) 10 (posttest)	Pretest, Posttest	Survey	Participants	1	Most valued seminars: precepting students, pharmacy education, and clinical performance assessment; 80% agreed the program should continue to be offered.
							2a	Participants’ confidence increased significantly in 24 of 30 abilities assessed at program completion.

(Continued)

Table 4. (Continued)

Ref #	Primary Author	Response Rate (%)	No. Respondents	Study Design	Data Collection Tool	Data Sources	Impact Level	Results
30	Guillema et al	N/A	3	N/A	N/A	N/A	3	One of three (33%) residents who completed the program is in a faculty position
31	Stein et al	100	12	Pretest, Posttest	10-item assessment tool, two surveys	Trained peer evaluators, participants	2a	Attitudes and self-perceived teaching efficacy significantly improved in six of 14 areas; self-perceived presentation skills significantly increased in three of 19 areas.
33	Lis et al	Resident: Pre: 54 Post: 59	22	Pretest, Posttest	Survey	Participants, Faculty	3 1	Teaching behaviors significantly improved in seven of 10 areas assessed by panelist evaluators. Most valuable aspects of program: receiving feedback from students and preceptors and teaching topics of professional interest; most valued teaching experiences: facilitating large and small group discussions and interacting one-on-one with students.
34	Johnson et al	68	25	Delayed posttest	Survey	Participants	2a 1	Self-efficacy significantly improved in all 17 teaching-related areas. However these levels were still significantly lower than pharmacy practice faculty confidence levels in 10 of the 17 areas; 61.5% reported increased interest in pursuing faculty positions vs 15.4% who were less likely to pursue them. Most beneficial aspects of the program: lecturing, small group facilitation, precepting students; 94% agreed teaching program was beneficial in their current careers.
35	Romanelli et al	100 ^a	10 ^a 23 ^b	Posttest ^a Delayed Posttest ^b	Survey	Participants	2a 3 2a	Increased self-efficacy and confidence after program completion. 47% subsequently accepted faculty positions. Self-perceived effectiveness as a teacher increased after program completion, ^a confidence in teaching abilities increased significantly in 13 of 19 areas. ^b
37	Garrison et al	92 92	12 ^c 11 ^d	Posttest	Survey	Participants	3 1	32% of participants had faculty jobs (seven clinical track, two tenure track, one instructor, four adjunct faculty, two preceptors). ^b Majority felt the content was appropriate, felt it prepared them for the experiential portion and were satisfied overall; only 50% liked the asynchronous, self-paced learning environment.

(Continued)

Table 4. (Continued)

Ref #	Primary Author	Response Rate (%)	No. Respondents	Study Design	Data Collection Tool	Data Sources	Impact Level	Results
38	Wahl et al	51	95	Delayed posttest	Survey	Participants	2a	70% of respondents felt moderately to highly confident in their overall teaching abilities to precept, write objectives, lecture, and provide student feedback.
							3	Fifteen (15.8%) respondents had primary or secondary faculty positions.

DISCUSSION

This research provides a detailed account of the scope and nature of teaching and learning programs published in the pharmacy literature, and the effectiveness of these programs in improving teaching. The conclusions of this article are based on the premise that the published literature is an accurate representation of all available programs. The lack of published literature on teaching and learning programs for faculty members does not necessarily represent the true availability of these programs.

In addition to the paucity of literature on faculty development programs, the number of published papers from residency programs represents a small number of the actual teaching and learning programs available for residents.¹⁶ Another important consideration is that the quantitative data we compiled reflects whether our measurement criteria were mentioned in each of the manuscripts. Less robust descriptions or program details not described in the manuscripts could have an impact on some of our data and conclusions.

Multiple papers have been published describing teacher development programs for postgraduate pharmacy residents with the intent to create future academicians. This reflects a strong desire to prepare graduates to begin faculty positions with teaching experience. Surprisingly, we could only find one paper that described a program specifically for pharmacy faculty development that articulated gains in knowledge and teaching behaviors as an outcome of the program. This may reflect either a lack of faculty development efforts in relation to resident development, or it may simply reflect a lack of scholarship in this area. It is our hope that this important finding will encourage pharmacy leaders to emphasize the academy's focus on the scholarship of teacher training. Findings from this research can also identify how well we are integrating, developing, and monitoring core teaching and learning knowledge in our professional development programs.

Program format referred to the total length of the program as well as the organization of the didactic and experiential teaching opportunities. The most common program format was longitudinal, spanning an entire year. Although the commonality of this format suggests time and repetition are valuable components, this was not measured, nor did it reveal any differences in participant satisfaction within their programs. Stein et al managed to demonstrate positive outcomes in knowledge and teaching behaviors in just one day.³¹ The commonality of the longitudinal format was most likely an effect of the current program design in postgraduate residencies. However, other considerations probably impacted this such

as placement of didactic material prior to the experiential portion to better sequence and scaffold residents' learning experience.

Participants were usually required to attend multiple seminars that provided didactic instruction on teaching. These occurred at different periods of time—some programs frontloaded in the first weeks of the residency, but most occurred monthly for the duration of the program. Other variations of this format had participants complete all of the instructional seminars and didactic components in the first half of the residency year, prior to engaging in supervised teaching experiences during the second half of the residency year.

The variability in program format was likely a result of factors such as faculty availability, resident schedule, timing and availability of teaching experiences, and ease of program administration. Purposeful timing of the didactic experiences in relation to the experiential component to allow time for preparation could have also impacted program design. Many programs offered more than one teaching experience to residents. There may have been purposeful integration or scaffolding of these experiences to enhance the residents' learning. Finally, some programs had their residents complete research projects or teaching portfolios. Programs may have been formatted to facilitate completion of these projects. The efficacy of these formats has not been evaluated to see if one design is better at instilling knowledge and skills than the other.

Programs designed as 4-6 week education rotations tried to immerse residents in a full-time teaching experience.^{25,27,33,36} This format fits with the typical rotational resident schedule and provides dedicated time for teacher development that doesn't compete with usual patient care responsibilities of the resident. However, this program format is not proven in the literature to be superior to other formats.

As Lancaster et al identified in their research, more examination is needed to explore the outcomes of faculty development programs.⁹ Future research should investigate whether program format influences outcomes such as participant preference and satisfaction, increases teaching skills or knowledge retention, and whether there is a significant resource difference that would make one program preferential to another. In addition, faculty members can make informed decisions about which teaching development format would be most appropriate and successful for them and their institution.

Program content refers to the topics and types of didactic and experiential methods of the program. Since we did not have access to actual program seminar material, assumptions about the content had to be made based on

the listed titles given in the publications. This may not be a true representation of the breadth and depth of topic coverage in these programs and more emphasis on teaching theory, instructional design, and learning assessment may have occurred.

All of the programs offered some type of didactic instruction to the participants. There were no data to suggest any topic was more important to teacher development than the others. None of the papers indicated how these topics were approached from a theoretical standpoint and the depth of topic coverage was not included in the research (ie, sample lesson plans). The lack of content depth presented in the publications made it unclear to what degree participants learned educational theory (ie, adult learning theory or constructivism), or if they were simply introduced to common teaching practices (ie, teaching in a large lecture environment). Areas of study in K-12 professional development include instructional methods, social and psychological foundations, field experience, and pedagogical strategies.⁴⁰ There are commonalities between these content areas and the programs we evaluated, which is reassuring. However, higher education professional development programs could focus more on social and psychological foundations of teaching. Examples of this could include stages of development, adult learning theory, or motivation.

All of the programs (except for Sylvia²⁶) had an experiential portion where participants practiced what they learned through planned teaching sessions. Some programs determined the type and number of essential experiences, such as large classroom teaching, small group facilitation or oversight of pharmacy students in introductory or advanced practice experiences. Other programs varied depending on available resources and teaching opportunities. Teaching at clinical sites (ie, continuing education programs or clinical presentations) were not usually mentioned in the descriptions of the teaching and learning programs. However it is likely that residents were also doing these as part of their training. Programs with many residents are challenged to place all participants in multiple varied experiences. Affiliated schools of pharmacy may have limited room in their curriculum to give teaching opportunities away to nonfaculty members. Future studies should look at program efficacy data in relation to the experiential teaching components of these programs.

The effectiveness of the programs was measured using Kirkpatrick's learning evaluation model. Specifically, we were looking for changes in attitudes, knowledge or teaching behaviors as a result of the teaching and learning programs. A little more than half the papers collected data on participant opinions about their respective programs. It

is fair to say that generally, participants in the teaching and learning programs enjoyed their experiences and felt the programs were valuable. However, there is little data to substantiate that programs made them better teachers. Some of the programs tried to measure changes in attitudes or knowledge, but they were done through self-evaluation and represented participants' opinions. The validity of these measures in light of the high rate of participant satisfaction with their programs could be questioned. None of the resident teaching programs measured level 4a or 4b changes in organizational practices and student learning outcomes.

Stein et al measured changes in teaching behaviors, reaching level 3 on Kirkpatrick's pyramid.³¹ Participants were evaluated by trained panelists who assessed their pre/postworkshop lecture skills.³¹ Their program's evaluation tool measured three domains: (1) planning and preparation, such as content knowledge, coherent instruction, and assessment; (2) classroom environment such as respect and rapport; and (3) instruction, such as communicating with students, questioning and discussion techniques, and responsiveness. After a 6-hour workshop, faculty participants demonstrated significant improvements in the three domains. Self-perceived effectiveness also increased as did their perception of the efficacy of certain teaching methods. The authors demonstrated improvements in teaching using minimal resources such as faculty time. Questions that still remain include whether these increases in teaching skills ultimately improve student learning. Another question is whether other teacher development topics, such as assessment or learning theory, would lend themselves to this 6-hour format and replicate the same positive results. Finally, this approach was effective with experienced teachers, but may not yield the same results with new teachers or residents.

The papers that described teaching certificate programs for residents cited the pharmacy faculty shortage as one of the reasons for program development. Nappi et al commented that their program had limited success recruiting their residents into academic positions (13% of residents subsequently accepted faculty positions).²¹ Gettig et al also had a low percentage of their graduates end up in faculty positions (7.5% were in a faculty job one year after program completion).²³ Timing of data collection may have had an impact on these results since many of their program graduates were involved in postgraduate year 2 (PGY2) residencies one year later, and measurement two years after program completion may have resulted in higher numbers of faculty positions.²³ Alternatively, some programs had much higher rates of success (Sylvia et al 52%, Slazak et al 71%).^{26,27}

From our data collection and evaluation, we calculated the mean percent of graduates who subsequently went on to get a faculty position at 34%. Interestingly, Ratka et al surveyed 122 graduates of pharmacy teaching skills development programs and found 36% had academic appointments.⁴¹ Pharmacy residents who pursue faculty positions are more likely to have experienced typical teaching activities during their residency (ie, precepting pharmacy students or giving a lecture) than their nonfaculty peers.⁴² However, it is not clear if the program itself or residents' original disposition toward teaching was responsible for this. Because there is not much published on career or skills progression of residents after completion of their program, little is known about the efficacy of their training programs in producing better teachers, or how the variability of programs impacts teacher development.

After thorough evaluation of the published literature on pharmacy teaching programs, and considering white papers and guidelines for faculty and resident development in teaching, we recommend six areas for future research. (1) better evaluation of teaching and learning programs; (2) investigation into longevity of development efforts; (3) evaluation of program format and resources; (4) better measures of program quality; (5) impact of resident teaching programs on academic career choices; and (6) faculty development program research.

Program efficacy must be associated with better teaching ability. It should also be associated with positive student outcomes such as motivation and engagement (indirect measures) and grades (direct measures). Outcomes data is necessary to justify how resources should be used to develop residents and faculty members into better teachers. Several programs mentioned that data such as faculty and student evaluations of the resident's teaching were collected.^{19,23,27,32,34-36} These measures of teaching must become part of the discussion and used as evidence of program efficacy. Future research should concentrate less on program design and more on program outcomes.

More needs to be known about the effects of teacher development programs over time. This kind of information can help create standards for continuing education and development. Johnson et al found that although graduates of their teaching certificate program felt they had learned a lot, they were much less confident in their teaching practice several years out.³⁴ Almost all the studies measured immediate results of their programs. Even delayed posttests asked participants about their immediate impressions. Since confidence is influenced by external factors, such as environment, it makes sense that residents initially felt confident at the conclusion of their teaching experience. However, if teaching was not part of

their postresidency career environment, one would expect a decrease in confidence in knowledge and skills. Ideally, the increase in confidence that participants felt would be a sustained effect, not just a byproduct of their direct experiences. If confidence is part of program development efforts, environment and challenges need to be considered.

Evaluations of the traditional program models are necessary to determine the best uses of resources. Gonzalvo et al changed the didactic portion of their program from a monthly seminar series to a 2-day conference.²⁴ Garrison et al changed their live, synchronous seminars to an online, asynchronous format.³⁷ Taylor et al made use of videotaped lectures when logistics of face-to-face seminars became a challenge.²⁹ Cost-benefit analysis of these models will help institutions make resource decisions. In addition, teaching preparation programs require significant resources such as multiple, varied teaching experiences for participants, and faculty mentors who can provide feedback. Gonzalvo et al commented that as their program grew, there were fewer resources available to support the number of participants involved.²⁴ This need was also addressed by a 2002 AACP task force that recommended residency teaching programs partner with schools of pharmacy in order to strengthen their programs and offer appropriate teaching experiences for residents.⁴³ Future research should focus on cost effective methods that provide maximal benefit of available resources and format.

The 2013 Residency Teaching Guidelines and the recommendations by Wright et al will likely impact minimum standards for quality teaching experiences for residents.^{15,17} They defined standards for both essential content and assessment of resident growth and development.¹² We also suggest looking to the education profession as a leader in this regard. To ensure pharmacy teaching certificate programs are not simply job preparation programs, but true teaching and learning development programs, education curricula should be consulted as the gold standard in teaching and used to help programs develop and grow over time.

More robust investigations are necessary to determine whether these programs create academicians and help to fill the faculty shortage. Almost all the papers on resident teaching programs cited the pharmacy shortage as a reason to prepare residents for academic positions. However, the result of these claims are highly variable. Better measurements of efficacy in this regard as well as prospective study design should be used to examine the impact of the programs on career choice. If the programs are not fulfilling this need, there may be alternative ways to encourage residents to pursue faculty positions.

Finally, there is a need for more research on teacher development programs for faculty members. Little published literature exists on programs to develop pharmacy faculty members in existing positions. If the lack of published literature on teaching programs for faculty members represents the availability of these programs, more development efforts are needed. However, we believe there is evidence of the existence of these programs, despite the lack of published data. Education, as a discipline, is promoted by some national pharmacy organizations. The mission statement of AACP centers on advancing pharmacy education.⁴⁴ Faculty development is an important part of the role and is supported in many ways, including faculty special interest groups and through programming at annual meetings. The association also supports faculty development in teaching. They offer an annual teaching and learning certificate program and support networking through their education practice research and network group.⁴⁵ Some schools have developed teaching and learning centers to facilitate faculty development in teaching.⁴⁶ The academy would benefit greatly from knowledge of how these programs are addressing new and existing faculty needs.

CONCLUSION

Pharmacy faculty members find themselves having to master two professions: one as a pharmacist and one as an educator. Published literature on teacher development in pharmacy is focused more on training residents than developing faculty members. Although programs are considered important and highly valued by both program directors and participants, little data substantiates that these programs improve teaching behaviors. As ACPE continues to increase the standards for knowledge and skills necessary in pedagogy, instructional design, and assessment of student learning, the gap between current teaching practices and the expertise needed to advance pharmacy education will continue to grow. More information is needed to create effective faculty development programs in teaching. Future research should focus on measurement of program outcomes and documentation of teaching development for existing faculty members.

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