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Self-assessed proficiency and application of various skills learned during postgraduate pharmacy teaching skills development programs

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Abstract

The purpose of this study was to identify teaching skills commonly taught during the postgraduate pharmacy teaching skills development programs, to describe trainees' perceived teaching proficiency, and the extent to which the learned teaching skills are applied in trainees' current positions. An online survey was developed for pharmacists who completed postgraduate teaching skills development programs. The survey included demographic and program queries as well as questions on 23 teaching skills. Participants self-assessed their proficiency in and application of their learned teaching skills. The online survey resulted in 122 qualified responses. After training, the perceived proficiency in nearly all 23 teaching skills was high; however, the scores for application of teaching skills were significantly lower. A majority (91.7%) of survey respondents were engaged in experiential education. There is wide variability among the postgraduate pharmacy teaching skills development programs. Though the trainees perceived their proficiency in teaching skills to be high, the acquired teaching skills were underused.

In 2006, the American Academy of Colleges of Pharmacy (AACCP) member institutions reported 427 faculty vacancies and estimated that the demand for new faculty positions could exceed 1200 by 2016.¹ Postgraduate pharmacy education programs, including residencies and fellowships, are a source of future pharmacy faculty.² Although postgraduate pharmacy education programs (e.g., residencies, fellowships) prepare the pharmacy graduate for clinical activities or research, they do not always prepare the graduate for a full-time faculty position associated with extensive teaching responsibilities.^{2,3} Consequently, graduates, not feeling prepared to handle a faculty position, may not seek employment in academic pharmacy or, if they do, may not be successful, which may lead to disappointment and frustration.^{3,4}

A 2002 AACCP task force identified that residency training programs inherently lack formal instruction on educational process, which limits their ability to develop the residents' teaching

skills. Thus, the task force recommended that the academy work with all residency programs to provide opportunities for residents to develop teaching skills.² Furthermore, because most residency-trained practitioners serve as preceptors who provide experiential education to pharmacy students, it was recommended that postgraduate pharmacy education incorporate formal training in educational processes for all residents.² In addition, the task force called on AACP to work with its member institutions to develop innovative models of residency education that provide intensive training in didactic and experiential teaching and assessment of learning and research to prepare residents for faculty positions.²

The current American Society of Health-System Pharmacists (ASHP) residency accreditation standards for postgraduate year one (PGY1) and postgraduate year two (PGY2) programs address the development of teaching skills, but to different degrees. In PGY1, the residency program must provide medication and practice-related education/training. In PGY2, the residency program must demonstrate excellence in the provision of training or educational activities for health care professionals and health care professionals in training, and may also include elective training on skills required to function in an academic setting. This outcome allows the resident to develop more advanced pedagogical skills and explore in depth the roles of a faculty member.

Despite the AACP task forces' recommendations and ASHP residency accreditation standards, there are few publications on postgraduate pharmacy teaching skills development programs. In the literature, these programs are commonly referred to as “teaching certificate programs” as a formalized component of postgraduate training. Moreover, all published reports are limited to the description of a single postgraduate pharmacy teaching skills development program.⁵⁻¹⁰ Romanelli et al. recognized that many residents were engaged in didactic and/or experiential education in some capacity, but did so with little or no orientation or training on how to perform these responsibilities.⁵ Of greater concern are the residents engaged in teaching efforts who have not received formal evaluation and feedback.⁵ Moreover, formal evaluations of residents' overall performance in their programs often overlooked the preceptorship and teaching aspects of their duties. These data highlight the need for a more formalized approach to the task of “teaching residents to teach.”⁵ Based on their findings and the belief that successful graduates of pharmacy residency programs should be prepared to enter a variety of clinical practice settings, including positions in academia, Romanelli et al. developed the Scholarship of Teaching and Learning Certificate Program at their institution.⁵ Additional programs at other Colleges/Schools of Pharmacy have been created with appropriate adaptations.⁶⁻⁹ Although considerable variability in educational content and delivery exists between these programs, assessments of these programs suggest that they improve residents' confidence and perception of their teaching abilities.^{6,7,9,10} Whether these effects persist as the individuals assume their professional teaching role remains to be determined. It is unclear whether the content of these programs matches the initial career path of the trainees or the extent to which the trainees apply the learned teaching skills in their current professional positions.

The present study was undertaken to further characterize how teaching skills programs are delivered, their content, and the trainees' perception of the extent to which they use in their current position the teaching skills taught during postgraduate training. This research was based on results collected using an online, convenient, nationwide survey designed for pharmacists who completed a postgraduate program on development of teaching skills. The objectives of the present study were to: (1) identify teaching skills that were common components of the postgraduate pharmacy teaching skills development programs, (2) identify trainees' perceived post-training proficiency in specific teaching skills, (3) characterize the extent to which the skills learned during the postgraduate teaching skills development programs are applied in trainees' current professional position, and (4) correlate the self-assessed proficiency with application of the learned teaching skills.

Methods

Study participants

The methods used in this research study underwent exempt review and received approval from the Institutional Review Board at each investigator's institution: University of Florida, Butler University, University of Arkansas for Medical Sciences, Shenandoah University, and Texas A&M Health Science Center. To be eligible to take part in this study, practicing pharmacists had to complete at least a PGY1 residency program, as well as a postgraduate pharmacy teaching skills development program between June 2003 and June 2007. Each pharmacy professional who received an emailed invitation to participate in the survey maintained full autonomy to consent for this study. Participation in this study was voluntary and self-selecting; completion of the online survey constituted informed consent.

Selection of study participants

Members registered with several large national pharmacy professional organizations were targeted. Potential participants for this study were recruited via mailing lists from three professional organizations: ASHP, American College of Clinical Pharmacy (ACCP), and the American Pharmacists Association (APhA). An invitation to participate in the nationwide online survey was distributed via several blast emails and posted at national meetings hosted by ACCP, ASHP, and APhA. The survey was available online for a two-month period. Eligible participants were identified by a sampling process based on verification of respondents' compliance with the inclusion criteria (as described previously). This process of data quality control also helped to eliminate duplicate and/or incomplete responses.

The survey instrument: design, development, content, and validation

To collect information needed to accomplish goals for this study, an Internet-based, nationwide survey was found to be the most appropriate method (e.g., simple, realistic, one-time, no follow-up) with respect to balancing resources and quality. A new online survey was developed and two websites for its management were created. The first informational website (<http://www.teachingcertsurvey.com>) was created using an open source product called Joomla to provide information regarding the survey and display the results of the survey to any participant

who was interested. The second website (<http://teachingcertsurvey.com/aacp/index.php?sid=11268&lang=en>), created using the open source product LimeSurvey, was used to house the survey and facilitate electronic data collection. The informational and survey websites were tested by the investigators for readability, ease of administration, and validity (described later). An email invitation to participate in this study was sent with a link to the survey. Potential participants needed to first access the informational website and then elect to go to the second website to access the survey and respond to it. A comprehensive list of 23 teaching skills (competencies) was developed for this survey (Table 1). The content of the survey included demographic information, current employment and appointment affiliation, questions to determine which of the 23 teaching skills comprised the individual's postgraduate pharmacy teaching skills development program, and the duration, delivery methods, and content of the training. Most of the questions required responses based on a five-point Likert scale. Participants provided subjective reports by ranking their perceived level of proficiency in 23 teaching competencies after completion of the postgraduate teaching skills development programs. Using the same scale, survey respondents were asked to assess the extent to which they apply their learned teaching skills in their current professional position. All responses collected electronically were maintained within the survey website program and an Excel spreadsheet was created from the information gathered. Each participant's response was assigned a code. The collected data included demographic information and rankings of self-assessed proficiency in 23 teaching skills and the application of these learned skills. Investigators verified the information in the database for completeness and compliance with survey criteria. Incompliant, incomplete, and/or duplicate responses were removed. Respondents were contacted by email if clarifications or verifications were necessary.

The team of five investigators, academic pharmacy professionals from different colleges/schools of pharmacy—both clinical and basic science faculty members experienced with classroom, experiential, and postgraduate pharmacy education—developed the list of 23 teaching skills and questions for this survey. Subsequently, the survey was pretested and validated by the investigators. Moreover, an assessment expert from a university unrelated to the investigators performed an additional evaluation and validation of this survey. Analysis and assessment of collected responses from the validation process showed that the survey measured what it intended to measure and the results of the survey had the appearance of truth and reality (i.e., face validity). Moreover, this survey had content validity because it had adequate sample representativeness, was established by content experts, and survey questions fulfilled many specific details related to postgraduate pharmacy teaching skills development programs. Because determination of survey validity is a continuous process, future studies using this survey are needed to generate additional data for a more complete validation of this survey.

Table 1. Skills included in the postgraduate pharmacy teaching skills development program survey

Skill No	Teaching Skills
1	Writing learning objective
2	Aligning content and objectives
3	Syllabus preparation
4	Organizing lecture content
5	Handout preparation
6	Lecture delivery
7	Use of AV technology
8	Writing exam questions
9	Performing student grading
10	Assessing exam statistics
11	Writing case studies
12	Active teaching methods
13	Engaging students in learning
14	Identifying different learning types
15	Assessing student performance
16	Providing constructive feedback
17	Precepting students
18	Developing teaching philosophies
19	Developing teaching portfolios
20	Team teaching
21	Integrating course material
22	Writing useful assessments
23	Self-assessing teaching effectiveness
24	Other _____

Data analysis

Data were analyzed using descriptive and inferential statistics. Nominal data was reported as percentages, whereas ordinal data was reported both as percentages and as mean \pm standard deviation. The correlation between perceived level of proficiency and the extent of application for 23 surveyed teaching competencies was reported using a Pearson product-moment correlation coefficient (PMCC). A PMCC value of 1 implies that a linear equation describes the relationship perfectly; a value of 0 implies that there is no linear correlation between the variables. Because ordinal data is generally nonparametric in nature, a correlation analysis using a nonparametric Spearman's rho was also conducted and the results compared with the PMCC analysis. All the statistical tests were conducted at the 0.05 level of significance (2-sided). The statistical analyses were conducted using SPSS version 16.0 (SPSS Inc., Chicago, IL).

Results

Characteristics of study participants

The characteristics of survey participants are presented in Table 2. A total of 213 respondents completed the survey between March 11, 2008 and May 7, 2008. There were 122 (57%) qualified responses. Respondents who did not meet eligibility criteria ($n = 91$) included those who provided insufficient data for complete interpretation ($n = 35$), those still participating in the training program as a survey respondent ($n = 30$), those who completed the training more than five years ago or did not participate in a teaching skills development program during their postgraduate training ($n = 23$), and duplicate respondents ($n = 3$). Participants of this survey

Table 2. Demographics of survey participants (N = 122)

Characteristics	Number
Total responses	213
Qualified responses	122 (57% of total)
No of institutions administering teaching skills development programs	44
Respondents with PharmD degree	78 (64%)
Received training during PGY1	78 (64%)
Received training during PGY2	39 (32%)
Received training during fellowship	4
No answer	4
Currently have academic appointment	44 (36%)
Tenure-track	10
Nontenure track	13
Clinical track	21
Basic science	0
Currently have nonacademic appointment	78 (64%)
Hospital	62
Community	8
Industry	2
Government	1
Other	5
Currently involved with teaching	121 (99%)
With >50% teaching commitment	19
With <50% teaching commitment	75

represented postgraduate pharmacy teaching skills development programs from 44 academic institutions, a majority of which were accredited colleges/schools of pharmacy (Appendix 1). All respondents had a Doctor of Pharmacy Degree (PharmD); 36% of participants had an additional degree. Among the eligible respondents, 78 (64%) received postgraduate training on teaching skills development during a PGY1 residency program and 39 (32%) during a PGY2 program. Of the eligible respondents, 44 (36%) currently held academic appointments and 78 (64%) held nonacademic positions. Among those with academic appointments, 34 (77%) held nontenure or clinical track appointments, and 10 (23%) were on tenure-track appointments. No respondents held research or basic science track appointments. The majority, 62 (79%) respondents without academic appointments, practiced in the hospital setting. At the time of the survey, 121 (99%) of survey respondents reported involvement in teaching, although 75 (62%) had less than 50% teaching commitment in their current position.

Composite characteristics of the postgraduate pharmacy teaching skills development programs
 Composite description of the characteristics of the postgraduate pharmacy teaching skills development programs, based on 122 qualified respondents, in terms of delivery methods, content, format for practice of taught skills, evaluation, duration of training, and formal names, is shown in Table 3. The predominant delivery method for postgraduate pharmacy teaching skills development programs was seminar (57%), and the other methods were: workshop (20%), elective course (11%), week-long orientation (4%), and other (8%). The most common topics, reported by more than 80% of respondents, taught in the various postgraduate pharmacy teaching skills development programs, included writing learning objectives, active teaching methods,

Table 3. Composite features of the postgraduate pharmacy teaching skills development programs

Characteristics	% Responses
Delivery method	
Seminar series	57
Workshop	20
Elective course	11
Week-long orientation	4
Other	8
Content (teaching skills)	
Writing learning objectives	84
Active teaching methods	84
Engaging students in learning	84
Delivering a lecture	82
Writing exam questions	76
Providing constructive feedback	73
Organizing lecture content	68
Precepting students on rotation	66
Identifying different learning styles	65
Use of audio-visual technology	65
Developing a teaching philosophy	62
Assessing student performance	62
Self assessment of teaching effectiveness	61
Handout preparation	61
Aligning content with objectives	60
Developing a teaching portfolio	57
Performing student grading	56
Syllabus preparation	52
Writing case studies	35
Writing useful assessments	35
Integrating course material	34
Team teaching	26
Assessing exam statistics	17
Format for practice of taught skills	
Precepting students on rotations	77
Small group facilitation (laboratory)	75
Large group facilitation (classroom)	70
Distance teaching	16
Other	3
Evaluation of teaching	
Teaching evaluated overall	78
Teaching portfolio evaluated	50 (N/A 22%)
Live or recorded opportunities evaluated	59 (N/A 22%)
Duration	7 ± 5.2 mo (mean ± SD)
Formal name	

Most common name: *Teaching Certificate Program*

Other names: *Teaching and Learning Certificate Program, Academic Preparation Program, Postgraduate Teaching Course, Teaching Enhancement Program, Teaching Program Workshop, Ability-Based Teaching Workshop Series*

engaging students in learning, and delivery of lecture. Other teaching skills included writing exam questions (76%), providing constructive feedback (73%), and syllabus preparation (52%). Skills addressed to a much lesser extent included: writing case studies (35%), writing useful assessments (35%), integrating course material (34%), team teaching (26%), and assessing exam statistics (17%). The most common modes of practicing the taught skills included: precepting students (77%); small group facilitation (i.e., practice laboratories) (75%); and large group facilitation (i.e., classroom instruction) (70%). Overall, 78% of respondents reported that their acquired teaching skills were evaluated during their postgraduate training. The reported duration of postgraduate pharmacy teaching skills development programs had tremendous variability and ranged from 2 hours to 24 months (7 ± 5.2 months; mean \pm SD). This variability is not unexpected given there are no standards to define the content and delivery of such programs.

Self-assessed proficiencies in various teaching skills after completion of the postgraduate pharmacy teaching skills development programs

Table 4 shows the profile of responses of perceived proficiencies in the 23 surveyed teaching skills after completion of the postgraduate pharmacy teaching skills development programs. Survey respondents overwhelmingly self-assessed their proficiencies in the acquired teaching skills between 3 (neutral) and 4 (high) on the Likert scale for all skills but three: assessing exam statistics (2.43 ± 1.28), team teaching (2.95 ± 1.46), and development of teaching portfolios (2.98 ± 1.36). The overall perceived effectiveness of postgraduate pharmacy teaching skills development programs was high (3.86 ± 0.72), which suggests a high degree of confidence by the trainees in their teaching abilities at the completion of program. The distribution profile of the Likert scale scores showed that score of 4 was selected by the majority of respondents for 22 of 23 skills and a score of 3 for just one skill—assessing exam statistics (Table 4).

Teaching activities performed by trainees after completion of the postgraduate pharmacy teaching skills development programs

An overwhelming majority (91.7%) of respondents reported that their current teaching activities involved precepting (Table 5). The other teaching activities currently performed by survey respondents included classroom lecture presentation (56.2%), giving in-service presentations or invited lectures (50.4%), small group facilitation (45.8%), and providing continuing education (38%). A majority of respondents reported that they provided experiential education regardless of whether they held academic appointment. In contrast, only 35% of respondents without an academic appointment engaged in classroom lectures, whereas 93% of respondents with an academic appointment engaged in this type of teaching. Laboratory instruction was performed by 13.2% respondents.

Application of learned teaching skills in current professional position

The extent to which the respondents applied teaching skills acquired during the postgraduate pharmacy teaching skills development programs in their current positions is presented in Table 6. For nine of the 23 skills, the average Likert score was below 3 (“neutral”), and for “assessing exam statistics” the score was less than 2 (“low”). The distribution of scores varied among the 23 skills (Table 6). Five teaching skills were marked as “not applicable” by at least 25% of

Table 4. Perceived proficiencies in various teaching skills after completion of the postgraduate pharmacy teaching skills development programs (N = 122)

Teaching skill	% Responses						Average score (mean ± SD)
	N/A	1	2	3	4	5	
Writing learning objective	2.5	—	4.1	16.4	64.8	12.3	3.78 ± 0.89
Aligning content and objectives	3.3	—	3.3	18.0	63.1	12.3	3.75 ± 0.95
Syllabus preparation	7.4	2.5	13.1	33.6	37.7	5.7	3.09 ± 1.22
Organizing lecture content	4.9	—	1.6	15.6	65.6	12.3	3.74 ± 1.04
Handout preparation	4.1	—	—	13.1	67.2	15.6	3.86 ± 0.96
Lecture delivery	2.5	—	1.6	15.6	65.6	12.3	3.74 ± 1.04
Use of AV technology	1.6	—	2.5	13.1	60.7	22.1	3.98 ± 0.85
Writing exam questions	4.1	0.8	9.0	36.1	43.4	6.6	3.34 ± 1.04
Performing student grading	6.6	0.8	7.4	28.7	46.7	9.8	3.38 ± 1.19
Assessing exam statistics	13.1	5.7	26.2	37.7	13.9	3.3	2.43 ± 1.28
Writing case studies	12.3	4.1	9.0	27.0	37.7	9.8	3.03 ± 1.46
Active teaching methods	—	1.6	8.2	27.0	45.1	18.0	3.70 ± 0.92
Engaging students in learning	0.8	1.6	4.1	22.1	52.5	18.9	3.80 ± 0.91
Identifying different learning types	4.1	3.3	13.9	30.3	40.2	8.2	3.24 ± 1.15
Assessing student performance	3.3	0.8	6.6	22.1	54.1	13.1	3.62 ± 1.04
Providing constructive feedback	2.5	0.8	5.7	18.0	56.6	16.4	3.75 ± 0.99
Precepting students	3.3	1.6	2.5	9.8	51.6	31.1	3.98 ± 1.09
Developing teaching philosophies	6.6	1.6	10.7	32.8	39.3	9.0	3.24 ± 1.21
Developing teaching portfolios	9.8	3.3	15.6	31.1	31.1	9.0	2.98 ± 1.36
Team teaching	12.3	4.1	12.3	29.5	31.1	10.7	2.95 ± 1.46
Integrating course material	9.0	1.6	8.2	33.6	38.5	9.0	3.18 ± 1.30
Writing useful assessments	7.4	1.6	7.4	36.1	41.8	5.7	3.20 ± 1.19
Self-assessing teaching effectiveness	4.9	2.5	7.4	37.7	41.0	6.6	3.27 ± 1.11
Overall perceived proficiency in acquired teaching skills							3.86 ± 0.72

Likert Scale: N/A = not applicable; 1 = very low; 2 = low; 3 = neutral; 4 = high; 5 = very high.

respondents: syllabus preparation by 27.9%, assessing exam statistics by 34.4%, developing teaching portfolios by 25.4%, team teaching by 27.0%, and integration of course material by 25.4%.

Correlation between perceived competencies in acquired teaching skills and application of these skills in current position

The results of correlation analysis between perceived competencies in teaching skills just after completion of the postgraduate training and the extent to which those learned skills were applied in respondents' current positions are shown in Table 7. The PMCC and the corresponding p-value were used to report the extent of correlation. The PMCC values were 0.500 or above for five teaching skills: developing teaching portfolios (0.617), identifying different learning types (0.557), self-assessing teaching effectiveness (0.546), writing exam questions (0.534), and writing learning objectives (0.502). For all other taught skills, the correlations coefficient varied from 0.243 to 0.475. For each of the 23 skills, the differences between perceived competency and the application of the teaching skills were significant, with p-values ranging from 0.007 to less than 0.001.

Table 5. Teaching activities performed by pharmacy professionals after completion of the postgraduate pharmacy teaching skills development program (N = 121)

Teaching activity	% Responses
Precepting	91.7
Classroom lectures	56.2
In-service	50.4
Invited lectures	50.4
Small group facilitation	45.8
Providing continuing education	38.0
Ground rounds	27.3
Providing seminars	19.8
Large group facilitation	14.0
Laboratory instruction	13.2
Other: department of education facilitation; online lectures; resource to colleagues, nurses, students, residents	2.7

Table 6. Extent of application of learned teaching skills in current professional positions (N = 122)

Teaching skill	% Responses						Average score (mean ± SD)
	N/A	1	2	3	4	5	
Writing learning objective	16.4	5.7	4.9	13.1	45.9	13.9	3.12 ± 1.65
Aligning content and objectives	17.2	5.7	5.7	12.3	42.6	16.4	3.11 ± 1.70
Syllabus preparation	27.9	5.7	8.2	18.9	23.8	15.6	2.52 ± 1.85
Organizing lecture content	14.8	4.9	4.9	9.8	44.3	21.3	3.29 ± 1.66
Handout preparation	12.3	3.3	3.5	13.1	45.9	23.0	3.47 ± 1.55
Lecture delivery	13.1	3.3	4.9	7.4	44.3	27.0	3.49 ± 1.61
Use of AV technology	9.8	1.6	2.5	12.3	43.4	30.3	3.72 ± 1.43
Writing exam questions	23.0	7.4	9.0	18.9	28.7	13.1	2.63 ± 1.76
Performing student grading	15.6	4.9	6.6	14.8	39.3	18.9	3.15 ± 1.66
Assessing exam statistics	34.4	11.5	10.7	21.3	13.1	9.0	1.95 ± 1.74
Writing case studies	24.6	6.6	8.2	18.0	26.2	16.4	2.65 ± 1.83
Active teaching methods	10.7	3.3	7.4	12.3	41.8	24.6	3.49 ± 1.52
Engaging students in learning	5.7	0.8	4.9	7.4	55.7	25.4	3.86 ± 1.17
Identifying different learning types	12.3	4.9	8.2	19.7	42.6	12.3	3.13 ± 1.50
Assessing student performance	11.5	2.5	4.9	14.8	44.3	22.1	3.45 ± 1.51
Providing constructive feedback	8.2	0.8	6.6	10.7	47.5	26.2	3.70 ± 1.35
Precepting students	9.0	—	2.5	5.7	45.1	37.7	3.92 ± 1.39
Developing teaching philosophies	17.2	6.6	13.1	19.7	27.0	16.4	2.83 ± 1.68
Developing teaching portfolios	25.4	9.8	12.3	20.5	18.9	13.1	2.38 ± 1.76
Team teaching	27.0	6.6	10.7	22.1	19.7	13.9	2.34 ± 1.79
Integrating course material	25.4	5.7	8.2	19.7	31.1	17.2	2.60 ± 1.80
Writing useful assessments	19.7	4.1	8.2	19.7	31.1	17.2	2.91 ± 1.73
Self-assessing teaching effectiveness	16.4	4.1	5.7	24.6	32.8	16.4	3.03 ± 1.63

Likert Scale: N/A = not applicable; 1 = very low; 2 = low; 3 = neutral; 4 = high; 5 = very high.

Table 7. Comparison of perceived proficiency in teaching skills after completion of the training and the extent of skills application in current positions

Teaching skill	Likert scale score		Extent applied (mean ± SD)	PMCC (<i>p</i> -value)	
	Rank	Perceived competency (mean ± SD)			Rank
Writing learning objective	6	3.78 ± 0.89	12	3.12 ± 1.65	0.502 (< 0.001)
Aligning content and objectives	7	3.75 ± 0.95	13	3.11 ± 1.70	0.328 (< 0.001)
Syllabus preparation	19	3.09 ± 1.22	20	2.52 ± 1.85	0.379 (< 0.001)
Organizing lecture content	9	3.74 ± 1.04	9	3.29 ± 1.66	0.269 (0.003)
Handout preparation	4	3.86 ± 0.96	7	3.47 ± 1.55	0.267 (0.003)
Lecture delivery	3	3.91 ± 0.90	6	3.49 ± 1.61	0.259 (0.004)
Use of AV technology	1	3.98 ± 0.85	3	3.72 ± 1.43	0.243 (0.007)
Writing exam questions	13	3.34 ± 1.04	18	2.63 ± 1.76	0.534 (< 0.001)
Performing student grading	12	3.38 ± 1.19	10	3.15 ± 1.66	0.366 (< 0.001)
Assessing exam statistics	23	2.43 ± 1.28	23	1.95 ± 1.74	0.390 (< 0.001)
Writing case studies	20	3.03 ± 1.46	17	2.65 ± 1.83	0.395 (< 0.001)
Active teaching methods	10	3.70 ± 0.92	5	3.49 ± 1.52	0.278 (0.002)
Engaging students in learning	5	3.80 ± 0.91	2	3.86 ± 1.17	0.272 (0.002)
Identifying different learning types	15	3.24 ± 1.15	11	3.13 ± 1.50	0.557 (< 0.001)
Assessing student performance	11	3.62 ± 1.04	8	3.45 ± 1.51	0.419 (< 0.001)
Providing constructive feedback	8	3.75 ± 0.99	4	3.70 ± 1/35	0.310 (0.001)
Precepting students	2	3.98 ± 1.09	1	3.92 ± 1.39	0.338 (< 0.001)
Developing teaching philosophies	16	3.24 ± 1.21	16	2.83 ± 1.68	0.475 (< 0.001)
Developing teaching portfolios	21	2.98 ± 1.36	21	2.38 ± 1.76	0.617 (< 0.001)
Team teaching	22	2.95 ± 1.46	22	2.34 ± 1.79	0.429 (< 0.001)
Integrating course material	18	3.18 ± 1.30	19	2.60 ± 1.80	0.326 (< 0.001)
Writing useful assessments	17	3.20 ± 1.19	15	2.91 ± 1.73	0.263 (0.003)
Self-assessing teaching effectiveness	17	3.27 ± 1.11	14	3.03 ± 1.63	0.546 (< 0.001)

Discussion

This research project used data provided by pharmacists from across the country who have completed postgraduate pharmacy teaching skills development programs between 2003 and 2007. We looked to assess the impact such programs have on the trainees' perceived proficiency in 23 teaching skills, and characterized the extent to which the skills learned in such programs are applied in these trainees' current professional positions. In contrast to other studies of individual pharmacy postgraduate programs,^{6,7,9,10} our results are based on information recall and subjective assessments from respondents who completed postgraduate pharmacy teaching skills development programs administered by 44 different academic pharmacy institutions. Therefore, our data describe characteristics of postgraduate pharmacy teaching skills development programs in general rather than associated with one specific program. To our knowledge, this is the first study that used subjective assessments from pharmacy graduates who completed various postgraduate pharmacy teaching skills development programs. The results from this research project demonstrate: (1) wide variability among the postgraduate pharmacy teaching skills development programs, (2) high self-assessed proficiency in learned skills, and (3) low extent of application of newly acquired teaching competencies in professional positions.

In this study, we observed a wide variability in the content of the postgraduate pharmacy teaching skills development programs. In addition, we found significant diversity in the delivery mode of the postgraduate teaching skills training. The survey responses clearly show that there is little consistency in the structure, content, and delivery across postgraduate pharmacy teaching skills development programs. The variability in program content may be related to the diversity in methods used to deliver the training. Given the number of programs represented in the survey responses, this finding was not unexpected. However, this study represents the recollection of program participants, and in order to fully assess the variability in topic content across programs, a national survey of these programs is needed. Despite the variability in characteristics of the postgraduate pharmacy teaching skills development programs, these programs have consistently been shown to improve trainees' confidence and proficiency in their teaching skills. Our data agree with previous studies performed independently on four different postgraduate pharmacy teaching skills development programs^{6,7,9,10} in that we observed a high degree of perceived proficiency in almost all of the 23 surveyed teaching skills. This finding further documents the beneficial impact of formal teaching skills development programs on postgraduate pharmacy trainees.

Before initiating their teaching skills development program in 1999, Romanelli et al. recognized that residents at their institution lacked formal instruction on how to teach, and they likewise lacked formal evaluation and feedback when engaged in teaching.⁵ They also observed that residents often served in some capacity as preceptors of students, yet they did not always receive instruction in how to carry out this responsibility, and formal evaluations of their performance often did not address this responsibility.⁵ In 2002, a seminar series on teaching skills development was administered by a single institution to residents from eight Boston area residency programs. Assessment of this program involved a small survey (n = 14) that revealed that during the year of residency in which the program was delivered, 71.5% of participants provided experiential education and 57% provided didactic instruction.¹⁰ A national survey of pharmacists who completed an accredited residency between 2003 and 2006, conducted by McNatty and colleagues,³ showed that the majority (77%) of respondents completed only PGY1 training. During this residency training, 57% of all respondents lectured in a professional school (e.g., pharmacy, nursing, or medicine), yet only 30% received formal training in teaching and learning.³ Similarly, 79% of the respondents who completed PGY2 training lectured in a professional school, yet still only 38% received formal training.³ These data suggest that as of 2006, most residents still receive little or no formal instruction on how to teach. Most respondents who completed the PGY1 training did not serve as a primary preceptor, and less than half of those who went on to complete PGY2 training did.³ Formal evaluation or feedback was not reported in this study. Although our study did not determine the extent to which trainees engaged in teaching or precepting without formal training, our results indicate that during their postgraduate training, 90% of respondents practiced the skills they learned through facilitation of large groups (i.e., classroom instruction) and/or precepting. Moreover, 78% reported that their efforts received formal evaluation and feedback. This suggests that the implementation of postgraduate pharmacy teaching skills development programs nationwide may have heightened

the awareness for the need of formal evaluation and feedback of trainees' teaching and precepting efforts.

There is a consensus that postgraduate pharmacy teaching skills development programs improve trainees' perception of teaching abilities. To date, it is unknown whether the enhanced perception of learned teaching skills persists after completion of the postgraduate training programs. Although our survey respondents indicated a high proficiency in acquired teaching skills, the extent to which they perceived application of these skills in their current position was significantly lower. In our study, the application of all learned teaching competencies to professional practice was scored as "low" or "not applicable." The reason for this finding is unclear although it could possibly be related to the fact that only 36% of respondents were in academic appointments compared with a practice-based position.

The data from our study suggest that postgraduate pharmacy teaching skills development programs are focused heavily on didactic skills, yet the majority of our respondents took positions without academic appointments and do not provide classroom instruction. A high percentage (91.7%) of our respondents reported serving as preceptors of students in their current professional positions and rated their precepting skills highly (3.98 ± 1.09). Other studies also indicated that a large proportion of pharmacists who complete PGY1 residencies precept students.³ Similar to our findings, in a survey of graduates from their program, Gettig and Sheenan⁸ found that a majority of respondents were not employed as faculty members and a high percentage (83%) served as preceptors in their current positions. However, in contrast to our study, a high percentage (75%) of trainees from their program provided classroom instruction.

Future postgraduate pharmacy teaching skills development programs should be designed with the understanding that many pharmacists complete only PGY1 training and a large proportion of PGY1-trained pharmacists precept students. McNatty and colleagues³ suggested that teaching skills development programming offered in PGY1 focus on skills needed for delivery of experiential education, whereas PGY2 programs focus on skills involved in delivery of didactic education (i.e., lecture preparation, objective writing). It is clear that postgraduate pharmacy teaching skills development programs increase trainees' perceived proficiency in teaching. However, our findings show that graduates of these programs feel that the skills they learned are underused. The findings of this study also demonstrate the need for a more standardized approach to providing training on teaching skills development during postgraduate pharmacy education. The variability in content and delivery of postgraduate pharmacy teaching skills development programs may be reduced or even eliminated by implementation of appropriate standards and guidelines. The standardized guidelines for postgraduate teaching skills development programs should complement the PGY1 and PGY2 accreditation standards established by the ASHP.¹¹

Limitations of this study are worth noting. In our survey, we assessed 23 teaching skills; however, there are broader areas of teaching that were not addressed in our study. The total number of graduates from the nation's postgraduate pharmacy teaching skills development

training programs has never been reported; therefore, estimation of the response rate in our study cannot be established. At the time of our study, no repository that catalogs postgraduate education programs that offer postgraduate pharmacy teaching skills development programs was available. A complete compilation of these programs may be a challenge to put together. Postgraduate education programs that do not offer postgraduate pharmacy teaching skills development programs may on occasion choose to outsource delivery of such programs so that their interested students can receive training. In turn, the institution to which the program is outsourced may provide service for many postgraduate training programs. Moreover, even in postgraduate training programs that offer teaching skills development programs, participation by all of their trainees may not be mandatory. Lastly, individuals who engage in multiple years of postgraduate training may participate in multiple teaching skills development programs from different institutions. To minimize the limitations inherent in our response rate, we enlisted help from three of the largest pharmacy professional organizations to reach as many eligible practitioners as possible.

This study surveyed the perceptions and recollections of program participants rather than the program providers, and thus another limitation of this study is that the data cannot be used to completely describe the individual characteristics of each program. However, our goal was to obtain a comprehensive description of multiple postgraduate pharmacy teaching skills development programs from the perspective of the trainees (i.e., respondents to our survey). The number of years in practice since completion of the postgraduate training may have had an influence on the recall of information and perception. The survey did not address the influence of skill enhancement from on-the-job training (such as new faculty orientation sessions and teaching experiences) obtained after completing postgraduate training. In addition, there may have been some differences in how survey questions were interpreted and/or understood that may have influenced responses (e.g., program delivery may or may not have been interpreted as including both classroom and practice training). Furthermore, the ability to assess statistical measures including true response rate, probability, generalizability, and nonresponse bias was limited because of lack of data on the nationwide number of postgraduate pharmacy teaching skills development programs and the number of their graduates. Moreover, full survey validity (face and content) was difficult to establish within a single study because the determination of validity is a continuous process.¹²

It is important to recognize the critical role of effective and applicable teaching skills in academic pharmacy. Development of teaching skills should be a longitudinal process that usually starts during postgraduate education. Postgraduate pharmacy teaching skills development programs may not have to be limited to residency training but could also encompass fellowship and postdoctoral training programs. The process of improving teaching skills should be ongoing and accessible throughout the professional career. Accreditation standards and a recent White Paper by the ACCP indicated that improvement of teaching abilities should be an essential element in development of pharmacy faculty.^{11,13} Effective teaching skills, learned and applied, are necessary to achieve satisfactory educational outcomes in colleges/schools of pharmacy.

Conclusions

After completion of the teaching skills development programs, the trainees' perceived proficiency generally was high for all 23 surveyed teaching skills. However, the data suggest that skills learned during the postgraduate pharmacy education were underused by the trainees in their professional positions. The results showed that there was wide variability in content and delivery of postgraduate pharmacy teaching skills development programs. Moreover, most of the training was focused on didactic skills, but an overwhelming majority of our respondents delivered primarily experiential education in their current professional positions. Future consideration should be given to increased standardization of postgraduate pharmacy teaching skills for both the experiential and academic setting to more adequately meet the professional needs of future pharmacists.

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Appendix. Institutions where survey respondents attended postgraduate pharmacy teaching skills development programs

Butler University
 Drake University
 Duquesne University
 Ferris State University
 Massachusetts College of Pharmacy and Health Science
 Mayo School of Health Sciences (Rochester, Minnesota)
 Medical University of South Carolina
 Midwestern University College of Pharmacy (Chicago, Illinois)
 Midwestern University College of Pharmacy (Glendale, Arizona)
 Nova Southeastern University
 Purdue University
 School of Pharmacy, University of Puerto Rico and the VA Caribbean Healthcare System
 Saint Louis College of Pharmacy/Barnes-Jewish Hospital, Washington University Medical Center
 South Carolina College of Pharmacy
 Texas A&M Health Science Center

Texas Tech University Health Science Center
The Ohio State University
The State University at Buffalo School of Pharmacy and Pharmaceutical Sciences
The University of Arizona
The University of Georgia
The University of Kansas
The University of New Mexico
The University of Tennessee
The University of Oklahoma
University of Arkansas for Medical Sciences
University of California, San Francisco
University of Colorado Denver
University of Florida
University of Illinois at Chicago
University of Kentucky
University of Maryland
University of Michigan
University of Minnesota
University of Missouri-Kansas City
University of Southern California
University of South Florida
University of Southern Nevada
University of Texas at Austin
University of the Sciences in Philadelphia
University of Washington
University of Wisconsin-Madison
Virginia Commonwealth University
Wayne State University
Wilkes University
