Assessment of pharmacy technician learning preferences and implications for training

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Purpose. To assess pharmacy technician learning preferences using the VARK tool and through self-identification.

Methods. The VARK (visual, aural, read/write, kinesthetic) questionnaire was incorporated into a larger survey, which was distributed during live staff meetings and a continuing education session held by the Ohio Pharmacists Association attended by 204 pharmacy technicians across various practice settings.

Results. A 90% response rate was achieved. Most respondents (78.8%) self-identified a single predominant learning preference, with 60.3% indicating a preference for kinesthetic learning methods. In contrast, after assessment with the VARK questionnaire 37.9% of survey participants were categorized as having a quadmodal learning style incorporating all VARK modalities. With regard to the Pharmacy Technician Certification Exam, a large majority of participants (96.2% of those providing a response) indicated that they had taken the exam in the past, with 17 participants (9.3% of those providing a response) indicating more than 1 attempt to pass the exam. Furthermore, experiential (on-the-job) training was identified by a large majority of survey respondents (79.3%) as the preferred way to learn new information.

Conclusion. Learning preferences of pharmacy technicians vary amongst individuals, with many found to have multiple learning preferences through VARK questionnaire assessment. Incorporating experiential training and establishing learning preferences of pharmacy technicians may aid in development of accredited training programs that cater to the needs of pharmacy technicians.

Keywords: advancement, learning, pharmacy, technician, training

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As pharmacists have shifted from primarily distributive functions to expanded clinical roles, the need for advancement of pharmacy technicians to fill those pharmacist-specific roles has become more apparent. There have been several changes in the education, training, and regulatory requirements for pharmacy technicians. To address the shift in requirements, in 2013 the Pharmacy Technician Certification Board (PTCB) announced that candidates for initial certification must complete a pharmacy technician education program accredited by the American Society of Health-System Pharmacists (ASHP) and Accreditation Council for Pharmacy Education.[1,2] Furthermore, participants in 2017 the Pharmacy Technician Stakeholder Consensus Conference agreed that a nationally accredited education program should be required of individuals seeking entry-level pharmacy technician positions and emphasized the need for innovation and flexibility in technician education.[3] Most recently, PTCB expanded flexibility for implementation of the 2020 accredited education requirement stating that candidates for the exam must either compete a PTCB-recognized education/training program or have a minimum of 500 hours of work experience as a pharmacy technician.[4] Determining how

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technicians prefer to learn is an innovative way to understand the accommodations that may be necessary to facilitate development of accredited pharmacy technician education programs in the future.

The US Bureau of Labor and Statistics has predicted a 12% (faster-than-average) increase in pharmacy technician job growth by 2026, translating to 48,000 more pharmacy technicians, likely a result of expanded scope of practice for pharmacists.[5] Unfortunately, poor salaries (averaging around $30,000 per year), lack of advancement opportunities, and insufficient staffing create difficulty in recruiting and retaining pharmacy technicians who are qualified to take on more advanced roles.[6] Additionally, turnover rates of greater than 13% make it substantially more challenging to hire and retain experienced pharmacy technicians.[7] To improve retention, it has been proposed that more formal training programs be created to facilitate success in the Pharmacy Technician Certification Exam (PTCE). Furthermore, these programs would also allow the possibility for technicians to take on expanded duties such as tech-check-tech, medication history documentation, vaccine or point-of-care test administration, and accepting verbal and transfer prescriptions.[8,9]

Because of both regulatory updates and expanded opportunities, as well as the imminent need to hire qualified technicians, many pharmacy practice sites are burdened with creating their own informal on-the-job training programs, which are difficult to reproduce and maintain.[10] Development of standardized training programs, lacking in number currently, creates a larger pool of technicians equipped to pass the exam while justifying career ladders, compensation increases, and deployment of pharmacy technicians in innovative ways.

ASHP offered guidance for establishing an accredited pharmacy technician education program[11]; however, there is little literature on how learning preferences of the potential graduates should be considered in the development of an accredited program. Because the target audience for pharmacy technician training programs includes a wide array of people, ranging from high school graduates to nontraditional students, it would benefit accredited training programs as well as employers looking to offer on-the-job training to consider customization of education to cater to a variety of individuals. The expected diversity of the pharmacy technician workforce, in combination with the didactic and experiential training required for accredited training programs of high caliber, creates a unique opportunity to comprehensively understand the learning preferences for communication of information necessary to ensure student success. Recognizing variation in learning preferences may help select how course material is delivered, ultimately leading to increased student interest and success in the programs.[12]

An assessment of learning styles is important prior to beginning any educational activity and offers a way to understand student needs.[13] Many tools have been proposed for this purpose, one of which is the VARK questionnaire (VARK Learn Limited, Christchurch, New Zealand), selected for the assessment described here given its validation and previous use in a wide variety of students, including health professional students.[14] The VARK tool presents specific real-life scenarios to determine how the learner might react in certain situations.[13] The learner is classified into the following categories: visual (V), aural (A), read/write (R), and kinesthetic (K) (Table 1). Understanding the learning style preferences of pharmacy technicians may offer insight to health systems, community-based practices, and academic institutions involved in deciding how to best carry out the training and education in the curriculum proposed by ASHP. As there have been no studies to address how pharmacy technicians prefer to learn, this research is novel and can be widely applied to different pharmacy practices, including hospitals and community pharmacies, across the United States.

The primary objective of the assessment described here was to assess pharmacy technician learning preferences using the VARK tool and through self-identification. The purpose of comparing the 2 learning preference assessments was to better understand how technicians learn, both for training purposes and for passing the PTCE.

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Table 1. VARK: A Guide to Learning Styles[10]

VARK Learning Preference	Matching Self-Identified Learning Preference	Learning Modality
Visual (V)	I learn best by seeing.	Formatting, space, charts, diagrams, maps, plans
Aural (A)	I learn best by hearing.	Discussion, stories, guest speakers, chatting
Read/write (R)	I learn best by reading/writing.	Lists, notes, text (print or online)
Kinesthetic (K)	I learn best by doing.	Senses, practical application, examples, cases, trial and error

Methods

Target audience. The intended audience was pharmacy technicians in a wide variety of practice settings. Assessments were accomplished through 2 study phases. Phase 1 of the study was conducted at a large academic medical center, which includes various satellite pharmacies, a specialty community pharmacy, investigational drug services, and multiple outpatient oncology infusion centers and employs over 150 pharmacy technicians. Phase 2 was conducted at a pharmacy technician continuing education conference hosted by Ohio Pharmacists Association in May 2017, with approximately 100 pharmacy technicians in attendance. To be eligible for inclusion in the descriptive cross-sectional research study, conducted from November 2016 through May 2017, pharmacy technicians must have been at least 18 years of age and (1) were employed at the academic medical center or were in attendance at the Pharmacy Technician Learning Session and (2) agreed to in-person survey participation.

Selection of VARK tool. Various tools for evaluation of learning preferences were reviewed. The study team selected the VARK questionnaire due to the number and relatability of the questions asked. The tool is composed of 16 multiple-choice questions, of which multiple responses may be chosen from among 4 possible answers (Appendix A). Each option corresponds with a sensory learning preference. The preference for which the number of responses is highest is assigned as the participant's learning preference. Because multiple options could be selected, varying combinations of learning preferences could be obtained. This validated, freely available, and easy-to-administer tool provides a profile of participant learning preferences that can be readily understood, and it was previously used in assessment of pharmacy, medical, and nursing students.[12,14,15]

Additional survey questions. The study team felt that a major barrier to pharmacy technician retention was success on the PTCE and wanted to determine potential causes; therefore, the remainder of the survey questions related to self-reported experiences with the PTCE, in addition to self-perceived learning style preferences, previous pharmacy experience, workplace setting, and demographics (Appendix B).

Copyright permission was granted for inclusion of VARK items in the larger survey for research and educational purposes only. The study and consent procedures were reviewed and approved by the institutional review board. Research was conducted according to the principles of the Declaration of Helsinki, seventh revision.

Pilot testing of the survey. All survey materials, including the verbal introduction, consent form, and survey were pilot tested with 3 pharmacy technicians prior to administration to the sample group; no changes were made after the pilot testing period, as it was determined that the questions were easily understood and the survey length was appropriate. The results for the pilot testing participants were not included in the final analysis.

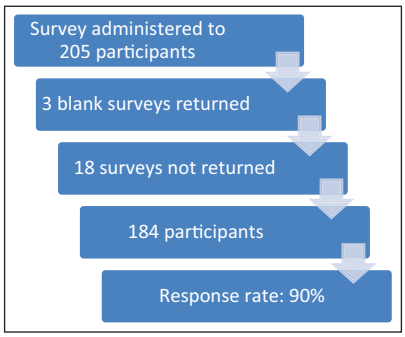
Survey administration. Pharmacy technicians in the health system were offered the opportunity to participate in the survey during various staff meetings. The purpose of the study was explained in all instances, and participants could decline to participate by returning the blank survey or by not returning the survey. Surveys were individually numbered and anonymously collected at the end of each session. The target number of participants was determined from the convenience sample of 205 surveys administered.

Statistical analysis. VARK questionnaire data were collected by the study team in Microsoft Excel (Microsoft Corporation, Redmond, WA) and sent to the VARK questionnaire data analytics team for assignment of learning preferences. Percentages were used to characterize participants. The remainder of the analyses were conducted using R3.3.0 software (R Project for Statistical Computing, Vienna, Austria; www.r-project.org). While categorical data were presented as counts and frequencies, scores for individual VARK components were expressed as means with standard deviations.[14] A 2-sided Fisher exact test was used to determine differences when comparing the VARK-assigned learning preference to the individually reported learning preference. A P value of <0.05 was regarded as statistically significant and set a priori. The potential differences in the scores for individual VARK modalities among various gender groups, age, pharmacy practice setting, duration as pharmacy technician, and education groups were evaluated via 1-way analysis of variance, with a significance level of $P < 0.05$ set a priori.

Results

The overall response rate was 90%. Out of 205 surveys administered, 184 were included in the analysis; 3 were returned blank, with the remainder

Figure 1. Survey sample formation and response rate.



not returned (Figure 1). The majority of the participants were female (73.4%, *n* = 135), had some college education (85.9%, *n* = 158), and/or worked in a hospital setting, and almost half (43.5%, *n* = 80) had more than 10 years of experience. Over a quarter of participants (26.6%, *n* = 49) worked in a unique pharmacy practice setting (eg, ambulatory care, specialty pharmacy, long term care) or were currently working outside the field of pharmacy. A full description of the respondents is provided in Table 2.

Self-reported learning preference. A survey respondent's self-identified learning preference was assigned based on the response to question 1 in the supplemental survey questions, which asked participants to describe their learning preference as listening, doing, seeing, or reading/writing. These answers were matched with the VARK-assigned preference as described in Table 1. For example, if a participant answered "I learn best by doing," the matching VARK modality was kinesthetic. Most respondents (78.8%, *n* = 145) self-identified one predominant learning preference, with 15.2% (*n* = 28) identifying 2 learning preferences and the remainder (4.4%, *n* = 8) identifying 3 or 4 learning preferences. A majority of participants (60.3%, *n* = 111) reported a unimodal kinesthetic preference, with 7.6% (*n* = 14) reporting a unimodal visual preference (Table 3).

Table 2. Demographics and Learning Experiences of Surveyed Pharmacy Technicians (*n* = 184)

Characteristic	No. (%)
Ways to learn new skills	
Classroom lecture	46 (25.0)
Experiential training	145 (79.3)
Group activities	31 (16.9)
Online	27 (14.7)
Self-study	50 (27.1)
Simulation lab	69 (37.5)
Other	3 (1.6)
Completion of a technician program	
No	46 (25.0)
Yes	90 (49.0)
No response	48 (26.0)
Accredited training program (*n* = 90)	
No	11 (12.2)
Yes	30 (33.3)
Unsure	22 (24.4)
No response	27 (30.0)
Gender	
Male	43 (23.4)
Female	135 (73.4)
No response	6 (3.2)
Age range, y	
18–20	3 (1.6)
21–29	37 (20.1)
30–39	36 (19.6)
40–49	29 (15.8)
50–59	41 (22.3)
≥60	31 (16.8)
No response	7 (3.8)
Highest education level	
High school or equivalent	22 (12.0)
Some college but no degree	66 (35.9)
Associate's degree	30 (16.3)
Bachelor's degree	49 (26.6)
Graduate or doctoral degree	13 (7.1)
No response	4 (2.2)

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Table 2. Demographics and Learning Experiences of Surveyed Pharmacy Technicians (n = 184)

Characteristic	No. (%)
Employment status	
Full time	142 (77.2)
Part time	30 (16.3)
Currently not working	10 (5.4)
No response	2 (1.1)
Duration of employment as a pharmacy technician, y	
<1	15 (8.2)
>1 to 3	42 (31.0)
>3 to 5	13 (7.1)
>5 to 10	32 (17.4)
>10	80 (43.5)
No response	2 missing
Current pharmacy setting	
Community	26 (14.1)
Hospital	105 (57.1)
Other	49 (26.6)
No response	4 (2.2)

VARK questionnaire. The results from the VARK questionnaire (Table 4) provided additional insight into the learning preferences of pharmacy technicians. Out of all learning preferences identified, the quadmodal "VARK" style was most prevalent (39.7% of survey respondents, n = 73), a prevalence significantly higher than was reflected in the self-reported data. In contrast, the unimodal learning style "K" (kinesthetic) that predominated in the self-reported data was much less prevalent in the questionnaire data (60.3% vs 17.9% of respondents).

Modal distribution. With regard to modal distribution (ie, how many learning preferences were identified by an individual), the self-reported data indicated that the unimodal categorization covered most survey participants, but the proportion significantly decreased in the VARK questionnaire data (78.8% vs 56.5%, P < 0.0001). The most prevalent VARK learning preference categorization was multimodal (43.5% of respondents), with reading/writing having the highest mean item score (6.17). The lowest rated learning styles were visual and aural, with mean scores of 4.46 and 4.59, respectively (Table 5). Relative to the self-reported data, the VARK questionnaire results showed an increase in the proportion of respondents categorized as having a quadmodal learning preference (from 2.2% [n =4] to 39.7% [n = 73], P < 0.000001); the percentage of respondents categorized in the bimodal category also increased (from 3.8% [n = 7] to 15.2% [n = 28], P < 0.001).

Learning preference matching. Two approaches were used to match the self-reported learning styles with the corresponding VARK-identified learning preferences: "strict matching" (ie, self-reported and VARK questionnaire data both indicated the same preference) and "loose matching" (ie, the corresponding styles were either identical or had identical elements). As an example of the latter matching approach, if a learner self-identified as having a unimodal kinesthetic (K) preference and the VARK questionnaire data indicated a bimodal aural and kinesthetic ("AK") preference, then the preference was considered matched; if the learner self-identified as unimodal A and the questionnaire identified him or her as having a multimodal visual, read/write, and kinesthetic ("VRK") style, then loose matching did not apply. Overall, self-reported and VARK questionnaire data were matched for 25 of 184 participants (13.6%) by the strict matching method (ie, the participant and the questionnaire identified the exact same learning preference). For 123 of 184 respondents (66.8%), self-reported and VARK data were loosely matched, indicating that the majority of participants self-identified at least 1 learning preference corresponding to at least a VARK modality.

Association between learning preferences and age. The results of assessment with the VARK tool showed that while V and K item scores did not differ significantly by age (P values of 0.37 and 0.88, respectively), there are statistically significant differences in A and R item scores among different age groups (Table 6). The mean A score tended to increase with age, and the mean R scores in the higher age ranges (ie, >39 years) were significantly higher than that in the 18- to 29-year-old age group.

Association between learning preferences and pharmacy practice setting. Assessment with the VARK tool indicated statistically significant differences in A and R item scores among technicians practicing in different settings (Table 7). The mean A and R scores for survey respondents working in community and "other" practice settings were higher than the corresponding scores for those working in the hospital setting. Additionally, V scores tended to be higher for survey participants working in community settings than for those working in hospital and other settings.

Table 3. Self-Reported Learning Preferences of Surveyed Pharmacy Technicians[a]

Unimodal (*n* = 145, 78.8%)	Bimodal (*n* = 28, 15.2%)	Trimodal (*n* = 4, 2.2%)	Quadmodal (*n* = 4, 2.2%)
V: 14 (7.6)	AK: 2 (1.1)	VAK: 2 (1.1)	VARK: 4 (2.2)
A: 7 (3.8)	RK: 9 (4.9)	VRK: 2 (1.1)	
R: 13 (7.1)	VA: 2 (1.1)		
K: 111 (60.3)	VK: 13 (7.1)		
	VR: 2 (1.1)		

Abbreviations: V, visual; A, aural; R, read/write; K, kinesthetic.
[a]All data are number (percentage) of survey participants.

Table 4. Learning Preferences of Pharmacy Technicians per VARK Questionnaire Assessment[a]

Unimodal (*n* = 104, 56.5%)	Bimodal (*n* = 7, 3.8%)	Quadmodal
V: 28 (15.2)	RK: 2 (1.1)	VARK: 73 (39.7)
A: 15 (8.2)	VK: 3 (1.6)	
R: 28 (15.2)	VR: 2 (1.1)	
K: 33 (17.9)		

Abbreviations: V, visual; A, aural; R, read/write; K, kinesthetic.
[a]All data are number (percentage) of survey participants (*n* = 184).

Table 5. VARK Categorization of Surveyed Pharmacy Technicians (*n* = 184)

VARK Category	Score, Mean (SD)
V score	4.46 (2.59)
A score	4.59 (2.91)
R score	6.17 (3.31)
K score	6.01 (2.95)

Abbreviations: V, visual; A, aural; R, read/write; K, kinesthetic.

Association between learning preference and duration of work as pharmacy technician. There were significant differences in R scores by years of work as a pharmacy technician (Table 9). The mean R score for those with more than 10 years of experience was much higher than mean scores for those with less than 1 year of experience and those with 5 to 10 years of experience.

(Surprisingly and contrary to the research team's initial expectations, no significant between-group differences in learning preferences by gender or education level were found.)

PTCE results. A large majority of the survey participants (96.2%) had taken the PTCE in the past, with 17 (9.3%) participants reporting more than 1 attempt to pass the exam. In preparing for the exam, respondents most frequently used some sort of review book, followed by on-the job training, with only 64 participants (35.8%) completing a formal education training program. The exam domains cited as most troublesome were pharmacy law and regulations and pharmacy calculations (Table 8).

Discussion

Our study parallels other studies using the VARK questionnaire, with respondents identifying with multiple learning preferences in contrast to self-identification of learning preference being predominantly unimodal.[15-18] This finding was interesting, because it was thought that since many nontraditional learners with various levels of prior education were included in our study, the results might differ from those of studies involving traditional students.

Although the rate of strict matching of VARK-identified learning preferences and pharmacy technicians' self-reported learning styles was low, the rate of loose matching was much higher. One reason for this difference could be based on human instinct to choose just one answer for a survey question, although the survey allowed for multiple selections. Differences may also have originated if respodents had the wrong perception of how they learn best. When loose matching was applied, the self-identified learning preference was included as one of the VARK-assigned styles over 66% of the time. Technicians likely have an understanding of their primary learning preference and recognize that the VARK tool could offer additional insight for additional modes of learning that may have been previously unidentified.

Given that the predominant learning preferences identified by the VARK tool were multimodal, with the reading/writing modality receiving the highest item score among all VARK modalities, training programs should consider including a reading/writing component as foundational material while still catering to a variety of preferences for the target pharmacy technician learners. Differences were found among participant age, pharmacy practice setting, and duration of work as a pharmacy technician in relation to the VARK-identified learning preferences.

Learning style questionnaires, like the VARK questionnaire, can be used to identify the favored learning preferences of students. Specifically with regard to pharmacy technicians, such tools could be useful in identifying secondary or tertiary learning styles. These instruments can also aid students in choosing appropriate study methods and may empower them to ask for an

Table 6. Association of VARK Scores and Age[a]

	18–29 y[b] (*n* = 40)	30–39 y (*n* = 36)	40–49 y (*n* = 29)	50–59 y (*n* = 41)	>59 y (*n* = 31)	*P* Value[c]
V score	3.88 (2.40)	4.19 (3.13)	4.97 (2.74)	4.61 (2.01)	4.84 (2.71)	0.37
A score	3.40 (2.59)	4.53 (2.82)	4.28 (2.89)	5.29 (2.78)	5.58 (3.04)	0.009
R score	4.35 (2.56)	6.94 (3.55)	6.65 (3.50)	6.20 (3.33)	6.90 (2.93)	0.002
K score	6.1 (2.73)	6.22 (3.16)	5.76 (2.50)	5.66 (2.84)	6.23 (3.32)	0.88

Abbreviations: V, visual; A, aural; R, read/write; K, kinesthetic.
[a]All data are mean (standard deviation).
[b]Only 3 participants were in the 18–20 group, so the 18–20 group and the >20–29 group were combined.
[c]By one-way analysis of variance. The significance level was 0.05.

Table 7. Association of VARK Scores and Pharmacy Technician Practice Setting

	Hospital (*n* = 105)	Community (*n* = 26)	Other (*n* = 49)	*P* Value[b]
V score	4.28 (2.56)	5.58 (2.48)	4.41 (2.67)	0.053
A score	3.91 (2.64)	6.15 (2.88)	5.27 (3.03)	0.009
R score	5.63 (3.27)	7.23 (2.96)	6.84 (3.49)	0.050
K score	6.15 (2.84)	6.04 (2.55)	5.73 (3.43)	0.87

Abbreviations: V, visual; A, aural; R, read/write; K, kinesthetic.
[a]All data are mean (standard deviation).
[b]Calculated by one-way analysis of variance. The significance level was $P < 0.05$.

alternative method of teaching or material delivery. Given that the VARK questionnaire identified multiple learning preferences for many respondents, it could be used as a tool to help students better understand secondary learning preferences, as many respondents only self-identified one way.

Training. Almost half of technicians surveyed indicated that they had completed a formal training program, with only about one-third completing an accredited program. The high number of technicians not completing a formal training program, along with the nonaccredited status of some programs, supports the need to standardize national requirements for pharmacy technicians in terms of both licensure and training. As the pharmacy profession continues to evolve the roles of pharmacists and technicians alike, we must continue to evolve education methods. At present, many technicians are trained via in-house didactic education, supervised on-the-job training, and a competency-based examination.[10]

One solution proposed at the Pharmacy Technician Stakeholder Consensus Conference was that pharmacy technician training programs be accredited, meaning that 160 experiential hours would be required prior to graduation in accordance with current standards.[3,11] Didactic teaching in many current technician training programs consists of lectures using PowerPoint presentations (Microsoft Corporation), practical classes, and small group discussions. These approaches would not necessarily cater to the majority (self-identified) kinesthetic learner population identified in our study, but use of these methods is supported by our finding of a high number of individuals who identified with the VARK read/write modality as a secondary learning methodology. Moving forward in alignment with the findings of this study, it will be important for training programs to incorporate a hands-on approach to accommodate learners in the pharmacy setting. Ideal programs, as suggested by ASHP, would incorporate a variety of teaching methodologies, including reading/writing activities, demonstration activities, and lectures, to cater to all learning preferences. Given that the read/write and kinesthetic modalities were the highest-scored items on the VARK questionnaire, pharmacy technician training programs could consider providing students with reading activities or recorded lectures for note taking, coupled with more frequent hands-on demonstration of skills, while still incorporating multimodal teaching methods for those who do not identify with read/write and kinesthetic methods. Additionally, pharmacy technicians could complete some type of learning styles assessment (eg, the VARK questionnaire) at the beginning of their training to determine their preferences for communication of material. Likely they

will be able to identify learning preferences that could supplement their self-identified preferences.

The study results emphasize the need to incorporate experiential (on-the-job) training into current programs, given that it was identified by 79.3% of surveyed technicians as the preferred way to learn new information. When examining the results from the supplemental questionnaire as well as the learning preferences, both VARK-assigned and self-reported, experiential training was identified as the way that technicians prefer to learn new skills, aligning with the curriculum for accreditation of pharmacy technician training programs proposed by ASHP.[11] The study results further support a proposal to dedicate a large number of training hours to experiential learning, which has been anecdotally highly scrutinized.

Limitations. The research was a single-center study with a convenience sample, and a large number of pharmacy technician respondents were working in the hospital setting. The lack of variety in the practice settings of the survey participants, as well as a state requirement at the time of the study that pharmacy technicians be "qualified" rather than certified, registered, or licensed may limit the generalizability of the results. Requirements for the PTCB certification exam have become more stringent but not necessarily requiring an accredited training program, but a training program that is approved by PTCB.[4] Additionally, our study focused on pharmacy technicians' experiences with the PTCE and did not consider any alternative certification exam, such as the Exam for the Certification of Pharmacy Technicians (ExCPT). The length of the questionnaire may have impacted the rate of response, as it took around 30 minutes to complete the questionnaire in its entirety.

Even with these limitations, the data presented here provide insights that may be used in teaching pharmacy technicians. Multiple ways of communicating material should be incorporated into any type of training for pharmacy technicians due to the multiple modalities through which they learn. Future studies should be conducted to see if applying multimodal teaching approaches in pharmacy technician exam preparation, education, and onboarding is effective.

Table 8. Additional Results of Pharmacy Technician Survey

Question Topic	No. (%)
PTCE completion (*n* = 182)	
Yes	175 (96.2)
No	3 (1.6)
Alternative exam	4 (2.2)
Attempts to pass PTCE (*n* = 181)	
1	164 (90.6)
>1	17 (9.3)
Methods of preparation for PTCE (*n* = 181)	
Formal education training program	64 (35.8)
On-the-job training	94 (52.5)
Review book	125 (69.8)
No preparation	7 (3.9)
Other	15 (8.4)
Most difficult PTCE domain (*n* = 168)	
Top 200 drugs	40 (22.3)
Pharmacy law and regulations	64 (35.8)
Pharmacy calculations	64 (35.8)

Abbreviation: PTCE, Pharmacy Technician Certification Exam.

Table 9. Association of VARK Scores and Duration of Work as Pharmacy Technician[a]

	<1 y (*n* = 15)	1–3 y (*n* = 42)	<3 to 5 y (*n* = 13)	<5 to 10 y (*n* = 32)	>10 y (*n* = 80)	*P* Value[b]
V score	3.8 (2.54)	4.86 (2.92)	4.38 (1.94)	4.03 (1.99)	4.6 (2.74)	0.55
A score	3.2 (1.78)	4.05 (2.87)	5.08 (2.25)	4.78 (3.28)	5.08 (2.95)	0.11
R score	4.53 (2.56)	6.02 (3.71)	5.85 (3.46)	5.31 (2.52)	6.94 (3.37)	0.035
K score	5.93 (2.89)	6.62 (3.23)	5.62 (2.47)	5.75 (2.79)	5.84 (2.98)	0.64

Abbreviations: V, visual; A, aural; R, read/write; K, kinesthetic.
[a]All data are mean (standard deviation).
[b]By one-way analysis of variance. The significance level was 0.05.

Conclusion

Learning preferences of pharmacy technicians vary amongst individuals, with many identifying with multiple learning preferences according to the VARK questionnaire. Pharmacy technicians participating in the study indicated that they learn best through multimodal learning, with many preferring a combination of read/write and kinesthetic methods. Further study is needed to determine if catering teaching methods to student learning preferences improves technician competency and certification examination pass rates.

Disclosures

The authors have declared no potential conflicts of interest.

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Appendix A—Sample of VARK questionnaire items[10]

1. **You are going to cook something special as a treat. You would:**
   a. Cook something you know without the need for instructions.
   b. Ask friends for suggestions.
   c. Look on the internet or in some cookbooks for ideas from the pictures.
   d. Use a good recipe.
2. **You have a problem with your heart. You would prefer that the doctor:**
   a. Gave you something to read to explain what was wrong.
   b. Used a plastic model to show what was wrong.
   c. Described what was wrong.
   d. Showed you a diagram of what was wrong.

Appendix B—Supplemental survey questions

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#_____

Pharmacy Technician Learning Preferences Survey

Instructions: Please complete the following questions to reflect your opinions as accurately as possible and to answer factual questions to the best of your ability.

1. How would you best describe your personal learning preference?
   - ☐ I learn best by listening
   - ☐ I learn best by seeing
   - ☐ I learn best by doing
   - ☐ I learn best by reading / writing

2. When learning a new skill or new information, how do you prefer information to be presented? (Select all that apply)
   - ☐ Classroom lectures
   - ☐ Experiential training (On the job training)
   - ☐ Group activities
   - ☐ Online (remotely using electronic communication)
   - ☐ Self- study (teaching yourself)
   - ☐ Simulation lab (situations similar to real life experience)
   - ☐ Other (please describe): _____

3. Have you completed a Pharmacy Technician Training program?
   ☐ Yes ☐ No
   a. If yes, what pharmacy technician training program did you attend?
   _____
   b. If yes, was the program ASHP/ACPE Accredited?
   ☐ Yes ☐ No ☐ I am unsure

4. Have you taken the PTCB (Pharmacy Technician Certification Board) Exam?
   ☐ Yes ☐ Yes, but I took an alternative certification exam (not PTCB) ☐ No
   a. If yes, how many times did you take the exam before passing?
   ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ I am still working toward passing
   b. If yes, how did you prepare for the exam? (Select all that apply)
   ☐ Formal Education Training Program ☐ Review book
   ☐ On the job training ☐ No preparation
   ☐ Other: Please specify: _____
   c. Rank from most difficult to least difficult each of the following portions of the exam. (1= most difficult, 3 = least difficult).
   ____ Top 200 Drugs
   ____Pharmacy Law and Regulations
   ____Pharmacy Calculations/Math
   ____Other: _____

5. Please indicate your gender: ☐ Male ☐ Female

6. Which category below includes your age in years?
   ☐ 18-20 ☐ > 20-29 ☐ > 29-39 ☐ > 39-49 ☐ > 49-59 ☐ > 59

7. What is the highest level of school you have completed or the highest degree you have received? (Choose one)
   - ☐ High school degree or equivalent (e.g. GED)
   - ☐ Some college but no degree
   - ☐ Associate degree
   - ☐ Bachelor's degree
   - ☐ Graduate or doctoral degree

8. Which of the following best describes your current employment status?
   - ☐ Full time, working 40 or more hours per week
   - ☐ Part time, working 1-39 hours per week
   - ☐ I am not currently working

9. How long have you been a pharmacy technician?
   ☐ <1 year ☐ 1-3 years ☐ > 3-5 years ☐ > 5-10 years ☐ > 10 years

10. Which of the following best describes your current pharmacy setting? (Choose one)
    - ☐ Academia
    - ☐ Ambulatory Care Clinic
    - ☐ Community Chain/ Grocery
    - ☐ Community Pharmacy, Independent
    - ☐ Government Agency
    - ☐ Home Health or Outpatient Infusion
    - ☐ Hospital
    - ☐ Mail Service Pharmacy
    - ☐ Managed Care Organization
    - ☐ Nursing Home/Long-term Care
    - ☐ Pharmaceutical Industry
    - ☐ Primary Care Clinic/Physician's Office
    - ☐ Professional Organization
    - ☐ Specialty Retail Pharmacy
    - ☐ Wholesaler
    - ☐ Unemployed
    - ☐ Other (please describe):_____

Comments: _____