

RESEARCH ARTICLE

# Self-assessment of competency and curriculum alignment among undergraduate pharmacy students and graduates in Iran

Amir Hossein Monsefi<sup>1</sup>, Hossein Ali Ebrahimi<sup>1</sup> , Aziz Kamran<sup>2</sup> 

<sup>1</sup> Department of Pharmaceutics, School of Pharmacy, Ardabil University of Medical Sciences, Ardabil, Iran

<sup>2</sup> Department of Community Medicine, School of Medicine, Ardabil University of Medical Sciences, Ardabil, Iran

## Keywords

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## Correspondence

Aziz Kamran  
School of Medicine  
Ardabil University of Medical Sciences  
Ardabil  
Iran  
a.kamran@arums.ac.ir

## Abstract

**Background:** Competency-based education is essential in pharmacy training globally, but aligning curricula with professional needs is challenging, especially in low- and middle-income countries. This study examines self-reported competencies among final-year pharmacy students and graduates at Ardabil School of Pharmacy and evaluates their relevance to professional practice. **Methods:** A cross-sectional survey of 185 final-year pharmacy students and graduates involved completing a self-assessment questionnaire on competencies in knowledge, skills, communication, and research, as well as their workplace relevance. Descriptive statistics, independent t-tests, and ANOVA were conducted, with effect sizes reported, following STROBE guidelines. **Results:** Relative to maximum scores, lower scores were observed in the knowledge, skills, and research domains, whereas communication competencies had the highest scores. No significant differences were found between students and graduates in most areas, although graduates reported slightly higher self-assessed research scores ( $t = 2.05$ ,  $p = 0.04$ , Cohen's  $d = 0.33$ ). Communication competencies were perceived as most relevant to the workplace, with no significant differences across GPA categories. **Conclusion:** Final-year pharmacy students and graduates perceived moderate competence across various domains, with communication skills deemed most relevant to practice. These findings, based on self-assessments from a single institution, reflect perceived rather than objectively measured readiness. Future multi-institutional studies with objective assessments are needed to comprehensively evaluate graduates' preparedness for professional practice.

## Introduction

The role of pharmacists has evolved substantially over recent decades. As frontline healthcare professionals involved in medication management and patient care, pharmacists are increasingly expected to contribute to optimising therapeutic outcomes, improving patient safety, and supporting public health initiatives (Abu Farha *et al.*, 2021). Simultaneously, advances in healthcare technologies, digital health systems, internet-based applications, innovative medical devices, and pharmaceutical services have transformed pharmacy practice and created new professional responsibilities and challenges. These developments

necessitate continuous adaptation of pharmacy education to ensure graduates are prepared for contemporary practice environments (Pires & Cavaco, 2019). Furthermore, lessons learned from the COVID-19 pandemic highlighted the importance of educational innovation and the integration of emerging models of care, including tele-pharmacy and remote healthcare services, into pharmacy curricula (Wathoni *et al.*, 2023). Therefore, evaluation of educational outcomes within pharmacy programmes is essential to determine whether graduates perceive adequate preparation for evolving professional roles

A curriculum is a structured plan for educational action that facilitates communication about the principles and key features of a programme. The design and organisation of curriculum content provide an understanding of the professional context within a specific country. The structured content and syllabus, implemented over a defined timeline, constitute the "*curriculum in action*," which represents the actual delivery of professional education—particularly in relation to the quality of healthcare education (Arakawa *et al.*, 2020).

Pharmacy education has increasingly adopted competency-based approaches to prepare graduates for complex healthcare environments. Pharmacy programmes are expected to develop a workforce capable of contributing across diverse settings, including community pharmacies, hospitals, industry, research, and academia (Meštrović *et al.*, 2022). The International Pharmaceutical Federation (FIP) advocates a needs-based approach to pharmacy education that aligns educational outcomes with population health needs and national priorities. This approach emphasises locally responsive, socially accountable, globally relevant, and quality-assured education to meet evolving healthcare demands (Etukakpan *et al.*, 2023). Continuous assessment and adaptation of educational systems are therefore required to ensure that graduates acquire competencies relevant to contemporary professional practice (Arakawa *et al.*, 2023; Garira, 2014).

Consequently, universities and pharmacy schools are expected not only to provide scientific and professional knowledge but also to ensure that graduates acquire competencies necessary for rational pharmacotherapy, patient-centred care, effective communication, critical thinking, decision-making, leadership, research, and lifelong learning (Farland *et al.*, 2018; Nunes-da-Cunha *et al.*, 2016). These competencies are increasingly recognised as essential components of pharmacy workforce development worldwide (Thamby & Subramani, 2014). Assessment of students' and graduates' perceptions of competency attainment and the perceived relevance of these competencies to workplace expectations can provide important information regarding the extent to which pharmacy education is perceived as responsive to professional requirements. However, self-assessment reflects perceived competence and preparedness rather than objective measurement of actual professional performance and should therefore be interpreted accordingly.

In Iran, pharmacy education is delivered through a six-year Doctor of Pharmacy (Pharm.D.) programme regulated by the Ministry of Health and Medical

Education. The revised national Pharm.D. curriculum, introduced in 2017 (1396 in the Iranian calendar), aimed to improve pharmaceutical education quality and prepare graduates for diverse professional roles, including community and hospital pharmacy practice, pharmaceutical industries, research, policymaking, and academia. The curriculum includes foundational sciences, specialised pharmaceutical courses, experiential training, and a research thesis (United Nations Development Programme, n.d.). The revised curriculum incorporated competency-related learning outcomes addressing areas such as pharmaceutical knowledge, professional skills, communication, research capability, and lifelong learning. Although these domains share conceptual similarities with international competency frameworks such as FIP and ACPE, the Iranian curriculum was developed according to national educational and healthcare priorities.

In this study, competency statements and learning outcomes from the 2017 national Pharm.D. curriculum were categorised into four domains: knowledge, professional skills, research competencies, and communication competencies. These domains were used as the conceptual basis for questionnaire development.

Consistent with international perspectives promoted by the International Pharmaceutical Federation (FIP) and the World Health Organization (WHO), pharmacy education should develop not only pharmaceutical knowledge but also competencies related to patient care, communication, decision-making, leadership, professional responsibility, and lifelong learning (Farland *et al.*, 2018). However, evidence from many low- and middle-income countries suggests that gaps may exist between educational programmes and the competencies required in real-world professional practice (Moezzi *et al.*, 2021). These challenges have strengthened calls for competency-based education and systematic evaluation of educational outcomes to ensure graduates are adequately prepared for evolving healthcare systems and workplace expectations.

Within Iran, previous studies evaluating earlier versions of the pharmacy curriculum have reported differences between the existing educational status and the desired educational status, with the desired status receiving higher ratings (Reshadatjoo *et al.*, 2019). Previous evidence has also suggested perceived gaps between pharmacy education and expanding pharmaceutical care responsibilities. Similar concerns have been reported in several developing countries, where pharmacy education continues to face challenges in responding to rapidly changing professional practice requirements (Abu Farha *et al.*, 2021).

Despite the implementation of the revised national Pharm.D. curriculum in Iran, evidence remains limited regarding how learners perceive competency attainment after exposure to the revised curriculum and whether these competencies are considered relevant to workplace expectations (Pires & Cavaco, 2019). Self-assessment has been widely used as an educational evaluation approach and may support reflective learning, professional development, and competency assessment. Both self-assessment and peer-assessment have been recognised as useful approaches for evaluating professional competencies (Brownie *et al.*, 2024). Nevertheless, evidence regarding perceived competency attainment and workplace relevance of competencies among learners exposed to the revised Iranian Pharm.D. curriculum remains limited, particularly at the institutional level.

Therefore, this study aimed to assess self-perceived competencies among final-year pharmacy students and pharmacy graduates and to evaluate the perceived workplace relevance of these competencies within the context of Ardabil School of Pharmacy, Iran. By focusing on a single pharmacy school, this study provides institution-specific evidence regarding learners' perceptions of competency attainment and the professional relevance of curriculum-based competencies, while acknowledging that findings should not be generalised to all pharmacy schools in Iran without further multicenter evaluation.

## Methods

### *Study design and participants*

This cross-sectional study was conducted to assess pharmacy learners' self-perceived competencies and the perceived workplace relevance of curriculum-based competencies. The study was carried out at the Ardabil School of Pharmacy (a province in the northwest of Iran). The school follows the national six-year Doctor of Pharmacy (Pharm.D.) curriculum regulated by the Iranian Ministry of Health and Medical Education (MOHME).

The study population included two groups: final-year Pharm.D. students and recent graduates of the Ardabil School of Pharmacy. A census sampling approach was used within the institution. All students enrolled in the final academic year of the Pharm.D. programme during the study period were invited to participate. Among the 55 eligible final-year students, 50 completed the questionnaire (response rate: 90.9%). For the graduate group, alumni who had graduated within the previous five years and whose contact information was available

through institutional alumni records maintained by the School of Pharmacy were invited to participate. A total of 142 graduates met the eligibility criteria and were invited to participate. Of these, 135 completed the questionnaire (response rate: 95.1%). All returned questionnaires were complete and eligible for analysis.

### *Data collection and measurements*

Data were collected using a structured questionnaire (Supplementary A). Final-year students completed the questionnaire during a scheduled session at the School of Pharmacy. For graduates, potential participants were first contacted by telephone and informed about the purpose of the study. The questionnaire link was then distributed electronically according to participants' preferred communication platforms, including Eitaa, Baleh, WhatsApp, and Telegram.

Participation was voluntary. Responses were recorded anonymously, and no identifying information was collected. The questionnaire was developed based on competency statements and learning outcomes described in the revised national Pharm.D. curriculum introduced in 2017 by the Iranian Ministry of Health and Medical Education. This curriculum specifies the expected competencies for pharmacy graduates across multiple areas of professional practice.

To ensure direct correspondence with the national curriculum, questionnaire items were derived from the essential competencies and learning outcomes explicitly described in the curriculum document. Competencies with similar conceptual content were grouped into four domains: knowledge, professional skills, research competencies, and communication competencies.

The final questionnaire consisted of 35 competency items, including 16 knowledge items, 13 professional skills items, 3 research competency items, and 3 communication competency items. Each item was mapped to a specific competency statement contained within the national curriculum and subsequently categorised according to its primary educational focus.

Participants rated their level of perceived competence for each item using a 5-point Likert scale ranging from 1 (very low competence) to 5 (very high competence).

To examine the perceived workplace relevance of curriculum-based competencies, participants were also asked to rate the relevance of each competency to real-world job requirements using a 10-point rating scale ranging from 1 (not relevant at all) to 10 (extremely relevant). Higher scores indicated greater perceived relevance to workplace practice.

### Validity, reliability, and bias control

Content validity was assessed through expert review involving 11 faculty members, including nine pharmacy faculty members and two experts in epidemiology and biostatistics. Experts evaluated the relevance, clarity, simplicity, and representativeness of each questionnaire item in relation to the competency expectations specified in the national Pharm.D. curriculum. All questionnaire items demonstrated acceptable content validity, with Content Validity Ratio (CVR) and Content Validity Index (CVI) values exceeding 0.80.

Prior to the main study, the questionnaire was pilot tested among 30 fifth-year pharmacy students and 20 pharmacy graduates who had completed the pre-2017 curriculum. The pilot study was conducted to evaluate item clarity, comprehensibility, and feasibility of administration. Minor wording revisions were made based on participant feedback. Internal consistency reliability was assessed using Cronbach's alpha coefficient.

For the perceived competence scale, the overall Cronbach's alpha coefficient was 0.80. Domain-specific reliability coefficients were 0.85 for knowledge, 0.78 for professional skills, 0.76 for research competencies, and 0.74 for communication competencies.

For the workplace relevance ratings, the overall Cronbach's alpha coefficient was 0.927. Domain-specific coefficients were 0.926 for knowledge, 0.883 for professional skills, 0.763 for research competencies, and 0.685 for communication competencies, indicating acceptable internal consistency across domains.

### Sample size justification

Because the study sought to include the entire accessible target population within the institution, no formal sample size calculation was performed. Therefore, the study should be interpreted as an institutional census rather than a sample-based survey. In total, 185 participants (50 final-year students and 135 graduates) were included in the analysis.

### Data analysis

Data were analysed using IBM SPSS Statistics software (IBM Corp., Armonk, NY, USA). Descriptive statistics, including means, standard deviations, frequencies, and percentages, were used to summarise participant characteristics and study variables.

Assumptions of normality and homogeneity of variances were assessed using the Shapiro-Wilk and Levene's tests, respectively. Independent-samples t-tests were used to compare self-assessed competency scores and perceived workplace relevance between final-year

students and graduates. When the assumption of equal variances was violated, Welch's t-test was applied. One-way analysis of variance (ANOVA) was conducted to examine differences across GPA categories, with Bonferroni post hoc tests performed when appropriate.

Effect sizes were reported using Cohen's *d* for t-tests and partial eta squared ( $\eta^2$ ) for ANOVA. Because competency domains had different maximum attainable scores, results were also interpreted relative to their maximum possible values to enable comparisons across domains. A two-tailed p-value < 0.05 was considered statistically significant.

### Ethical considerations

This study was conducted in accordance with the Declaration of Helsinki. The study was approved by the Ethics Committee of the Ardabil University of Medical Sciences (IR.ARUMS.REC.1402.367). Standards of research ethics were met. Participants provided written informed consent to participate in this study.

## Results

### Participant characteristics

A total of 185 participants were included in the study, of whom 114 (61.6%) were female and 71 (38.4%) were male. Among participants, 135 (73.0%) were pharmacy graduates and 50 (27.0%) were final-year pharmacy students. Regarding admission type, 100 participants (54.1%) had entered the programme through the daily (tuition-free) admission pathway, whereas 85 (45.9%) were tuition-paying students.

In terms of academic performance, the majority of participants (53.5%) had a grade point average (GPA) between 14 and 16, followed by 40.5% with GPA below 14 and 6.0% with GPA between 16 and 18 (Table I).

**Table I: Demographic characteristics of pharmacy students and graduates (n = 185)**

| Variable                     |                | Count | Percent (%) |
|------------------------------|----------------|-------|-------------|
| Gender                       | Male           | 71    | 38.4        |
|                              | Female         | 114   | 61.6        |
| Education                    | Graduate       | 135   | 73.0        |
|                              | Student        | 50    | 27.0        |
| Type of university admission | Daily (free)   | 100   | 54.1        |
|                              | Tuition-paying | 85    | 45.9        |
| Overall GPA                  | Below 14       | 75    | 40.5        |
|                              | 14 to 16       | 99    | 53.5        |
|                              | 16 to 18       | 11    | 6.0         |
| Total                        |                | 185   | 100         |

### Self-assessment scores and perceived workplace relevance

Participants reported mean self-assessment scores of  $37.29 \pm 7.7$  for knowledge (maximum score=80),  $28.3 \pm 4.8$  for skills (maximum score=65),  $10.5 \pm 1.89$  for communication (maximum score=15), and  $6.28 \pm 2.19$  for research (maximum score=15). The overall self-assessment score was  $82.4 \pm 12.34$  out of 175 (Table II). Relative to the maximum attainable score, self-

assessment scores corresponded to 46.6% for knowledge, 43.5% for skills, 41.8% for research, and 70.0% for communication.

Mean perceived workplace relevance scores were  $87.7 \pm 13.69$  for knowledge,  $66.27 \pm 10.01$  for skills,  $19.24 \pm 3.44$  for communication, and  $14.97 \pm 3.26$  for research (Table II). When expressed relative to the maximum attainable score, perceived workplace relevance corresponded to 54.8%, 50.9%, 64.1%, and 49.9%, respectively.

**Table II: Mean self-assessed competency scores and perceived workplace relevance of competencies among pharmacy students and graduates**

| Variable                      | Domain        | N   | Mean  | SD    | Max score |
|-------------------------------|---------------|-----|-------|-------|-----------|
| Self-assessment               | Knowledge     | 185 | 37.29 | 7.7   | 80        |
|                               | Skills        | 185 | 28.3  | 4.8   | 65        |
|                               | Communication | 185 | 10.5  | 1.89  | 15        |
|                               | Research      | 185 | 6.28  | 2.19  | 15        |
|                               | Total         | 185 | 82.4  | 12.34 | 175       |
| Perceived workplace relevance | Knowledge     | 185 | 87.7  | 13.69 | 160       |
|                               | Skills        | 185 | 66.27 | 10.01 | 130       |
|                               | Research      | 185 | 14.97 | 3.26  | 30        |
|                               | Communication | 185 | 19.24 | 3.44  | 30        |

### Comparison of self-assessment scores between graduates and students

Independent-samples *t*-tests showed no significant differences between graduates and students in knowledge ( $p=0.977$ ,  $d=-0.01$ ), skills ( $p=0.292$ ,  $d=-0.17$ ),

communication ( $p=0.350$ ,  $d=-0.16$ ), or total self-assessment scores ( $p=0.810$ ,  $d=-0.04$ ) (Table III). A significant difference was observed for self-assessed research competency scores, with higher scores among graduates than students ( $6.4 \pm 2.23$  vs.  $5.7 \pm 2.02$ ;  $p=0.040$ ,  $d=0.33$ ).

**Table III: Comparison of self-assessed competency scores between pharmacy students and graduates**

| Domain        | Group    | n   | Mean $\pm$ SD    | <i>p</i> -value | Cohen's <i>d</i> |
|---------------|----------|-----|------------------|-----------------|------------------|
| Knowledge     | Graduate | 135 | $37.2 \pm 7.62$  | 0.977           | -0.01            |
|               | Student  | 50  | $37.3 \pm 8.23$  |                 |                  |
| Skills        | Graduate | 135 | $28.06 \pm 4.64$ | 0.292           | -0.17            |
|               | Student  | 50  | $28.9 \pm 5.38$  |                 |                  |
| Communication | Graduate | 135 | $10.4 \pm 1.99$  | 0.350           | -0.16            |
|               | Student  | 50  | $10.7 \pm 1.57$  |                 |                  |
| Research      | Graduate | 135 | $6.4 \pm 2.23$   | 0.040           | 0.33             |
|               | Student  | 50  | $5.7 \pm 2.02$   |                 |                  |
| Total score   | Graduate | 135 | $82.3 \pm 12.24$ | 0.810           | -0.04            |
|               | Student  | 50  | $82.8 \pm 12.71$ |                 |                  |

Notes: Cohen's *d* calculated using pooled standard deviation. Positive values indicate higher perceived workplace relevance scores among graduates. Effect sizes ranged from negligible to small.

### Self-assessed competencies across GPA categories

One-way ANOVA showed no significant differences across GPA categories for knowledge ( $F(2,182)=0.20$ ,  $p=0.815$ ,  $\eta^2=0.002$ ), skills ( $F(2,182)=0.51$ ,  $p=0.604$ ,

$\eta^2=0.006$ ), communication ( $F(2,182)=2.93$ ,  $p=0.056$ ,  $\eta^2=0.031$ ), research ( $F(2,182)=1.91$ ,  $p=0.151$ ,  $\eta^2=0.021$ ), or total self-assessment scores ( $F(2,182)=0.89$ ,  $p=0.411$ ,  $\eta^2=0.010$ ) (Table IV). Although communication competencies approached

statistical significance, the observed effect size remained small. Post-hoc Bonferroni comparisons

showed no significant pairwise differences between GPA groups for any competency domain (all  $p > 0.05$ ).

**Table IV: Self-assessed competency scores across GPA categories**

| Domain        | GPA <14 (n=75)<br>Mean $\pm$ SD | GPA 14–16 (n=99)<br>Mean $\pm$ SD | GPA 16–18 (n=11)<br>Mean $\pm$ SD | F (df=2,182) | p-value | $\eta^2$ |
|---------------|---------------------------------|-----------------------------------|-----------------------------------|--------------|---------|----------|
| Knowledge     | 37.28 $\pm$ 7.63                | 37.14 $\pm$ 7.78                  | 38.73 $\pm$ 9.21                  | 0.20         | 0.815   | 0.002    |
| Skills        | 28.29 $\pm$ 4.99                | 28.17 $\pm$ 4.64                  | 29.73 $\pm$ 6.15                  | 0.51         | 0.604   | 0.006    |
| Communication | 10.24 $\pm$ 1.78                | 10.71 $\pm$ 1.94                  | 11.55 $\pm$ 1.75                  | 2.93         | 0.056   | 0.031    |
| Research      | 5.95 $\pm$ 2.07                 | 6.44 $\pm$ 2.14                   | 7.09 $\pm$ 3.24                   | 1.91         | 0.151   | 0.021    |
| Total score   | 81.76 $\pm$ 11.66               | 82.46 $\pm$ 12.24                 | 87.09 $\pm$ 17.33                 | 0.89         | 0.411   | 0.010    |

One-way ANOVA was used to compare self-assessed competency scores across GPA categories.  $\eta^2$  represents partial eta squared (effect size).

#### **Perceived workplace relevance between graduates and students**

No significant differences were observed between graduates and students in perceived workplace relevance of knowledge ( $p=0.949$ ,  $d=-0.01$ ), skills

( $p=0.144$ ,  $d=0.29$ ), or communication competencies ( $p=0.060$ ,  $d=0.32$ ) (Table V). A statistically significant difference was observed for perceived workplace relevance of research competencies, with higher workplace relevance scores among graduates than students ( $15.25 \pm 3.29$  vs.  $14.2 \pm 3.11$ ;  $p=0.046$ ,  $d=0.32$ ).

**Table V: Comparison of perceived workplace relevance scores between pharmacy students and graduates**

| Domain                  | Group    | n   | Mean $\pm$ SD     | p-value | Cohen's d |
|-------------------------|----------|-----|-------------------|---------|-----------|
| Knowledge relevance     | Graduate | 135 | 87.69 $\pm$ 13.81 | 0.949   | -0.01     |
|                         | Student  | 50  | 87.8 $\pm$ 13.48  |         |           |
| Skills relevance        | Graduate | 135 | 67.01 $\pm$ 9.19  | 0.144   | 0.29      |
|                         | Student  | 50  | 64.2 $\pm$ 11.82  |         |           |
| Research relevance      | Graduate | 135 | 15.25 $\pm$ 3.29  | 0.046   | 0.32      |
|                         | Student  | 50  | 14.2 $\pm$ 3.11   |         |           |
| Communication relevance | Graduate | 135 | 19.5 $\pm$ 3.43   | 0.060   | 0.32      |
|                         | Student  | 50  | 18.4 $\pm$ 3.38   |         |           |

Notes: Cohen's d calculated using pooled SD. Positive values indicate higher perceived workplace relevance among graduates

#### **Perceived relevance of competencies to workplace requirements across GPA categories**

One-way ANOVA tests were conducted to examine differences in perceived workplace relevance across GPA categories. No statistically significant differences were found for knowledge ( $F(2,182) = 1.61$ ,  $p = 0.204$ ,

$\eta^2 = 0.017$ ), skills ( $F(2,182) = 1.77$ ,  $p = 0.174$ ,  $\eta^2 = 0.019$ ), research ( $F(2,182) = 0.82$ ,  $p = 0.443$ ,  $\eta^2 = 0.009$ ), or communication ( $F(2,182) = 0.07$ ,  $p = 0.934$ ,  $\eta^2 = 0.001$ ). Effect sizes across all domains were small, indicating that GPA level was not meaningfully associated with perceived workplace relevance across competency domains. (Table VI).

**Table IV: Comparison of perceived workplace relevance of competencies across GPA categories**

| Domain        | GPA <14 (n=75)<br>Mean $\pm$ SD | GPA 14–16 (n=99)<br>Mean $\pm$ SD | GPA 16–18 (n=11)<br>Mean $\pm$ SD | F (df=2,182) | p-value | $\eta^2$ |
|---------------|---------------------------------|-----------------------------------|-----------------------------------|--------------|---------|----------|
| Knowledge     | 88.04 $\pm$ 14.50               | 86.76 $\pm$ 12.98                 | 94.45 $\pm$ 13.46                 | 1.61         | 0.204   | 0.017    |
| Skills        | 67.45 $\pm$ 10.35               | 65.05 $\pm$ 9.97                  | 69.27 $\pm$ 6.51                  | 1.77         | 0.174   | 0.019    |
| Research      | 15.11 $\pm$ 3.45                | 14.76 $\pm$ 3.23                  | 16.00 $\pm$ 2.05                  | 0.82         | 0.443   | 0.009    |
| Communication | 19.21 $\pm$ 3.29                | 19.30 $\pm$ 3.60                  | 18.91 $\pm$ 3.36                  | 0.07         | 0.934   | 0.001    |

One-way ANOVA was used to compare perceived workplace relevance scores across GPA categories.  $\eta^2$  indicates partial eta squared (effect size).

## Discussion

In this study, self-assessed ministerial expected competencies and their perceived workplace relevance were examined among final-year pharmacy students and graduates of Ardabil School of Pharmacy. Overall, participants reported moderate levels of perceived competence across the four competency domains. Relative to the maximum attainable scores, perceived competence was lower in the knowledge, skills, and particularly research domains, whereas communication competencies received comparatively higher ratings. Similarly, participants perceived the relevance of these competencies to workplace requirements as being at approximately moderate levels across all domains. Because the study relied on self-assessment, these findings should be interpreted as participants' perceptions of their preparedness rather than objective measures of professional competence or direct evidence of curriculum effectiveness.

The present findings indicating comparatively lower perceived competence in the domains of knowledge, skills, and particularly research are consistent with several reports on pharmacy education in Iran. In recent years, scholars have emphasised the need to revise the Doctor of Pharmacy (PharmD) curriculum and move from a predominantly traditional, content-centred approach toward competency-based education. Although curricular revisions have been implemented, previous studies suggest that a gap may still exist between academic training and current professional needs, and some graduates may not feel fully prepared for emerging roles within the healthcare system. These previous observations provide a possible context for understanding the moderate levels of perceived competence observed in the present study (Moezzi *et al.*, 2021; Nezhad *et al.*, 2024).

Evidence from national studies also indicates that pharmacy education in Iran remains largely focused on discipline-based and basic science instruction, with relatively limited opportunities for developing professional skills, clinical decision-making, and patient-centred care competencies (Nezhad *et al.*, 2024). These characteristics have been proposed in previous studies as possible contributors to lower competency development and may provide context for the comparatively lower perceived scores observed in the present study.

The relatively lower ratings in the research domain are also noteworthy. Although completion of a thesis is a formal component of the PharmD programme in Iran, previous studies suggest that structured training in research methods and practical engagement in research activities throughout the curriculum may receive limited

emphasis. As a result, students and graduates may have fewer opportunities to actively participate in research and evidence generation, which could influence their perceptions of their research competence. This observation is consistent with the lower self-assessment scores for research competencies in the present study (Nezhad *et al.*, 2024).

In contrast, communication competencies received comparatively higher ratings than the other domains. Previous Iranian studies have reported that educational interventions, including patient counselling, pharmaceutical care training, scenario-based learning, and virtual education, can improve students' confidence and preparedness for patient-centred services (Naser *et al.*, 2021). Likewise, studies addressing professionalism and role modelling in pharmacy education have emphasised communication, professional responsibility, and effective interaction with patients as important educational outcomes (Khabaz Mafinejad *et al.*, 2022; Kholghipour *et al.*, 2018). Although the present study cannot determine which educational experiences contributed to these findings, the relatively higher communication scores are broadly consistent with these previous observations.

Our findings are also broadly consistent with several international studies evaluating pharmacy students' perceptions of professional competence. Doloresco and colleagues (2019) reported uncertainty among pharmacy students regarding self-assessment of interprofessional competencies. Similarly, Abeyaratne and colleagues (2022) found that students rated their knowledge and skills at modest levels and observed no significant association between self-assessment accuracy and subsequent academic performance. Echeverri and colleagues (2021) demonstrated improvements in attitudes and awareness related to cultural competence following curricular implementation, whereas comparatively lower scores remained in knowledge, skills, and behavioural domains. Mort and Hansen (2010) also reported discrepancies between students' perceived and actual communication competencies, noting that students with lower academic achievement were more likely to overestimate their abilities, whereas higher-performing students tended to underestimate them.

Other studies have reported somewhat higher levels of perceived competence among pharmacy students. Naughton and Friesner (2012) found that students generally evaluated their scientific competencies slightly above average and identified limited agreement between perceived and objectively measured competence across several scientific domains. Similarly, Westerholm and colleagues (2023) reported that pharmacy students perceived their competencies as

good or very good in most professional domains, although lower confidence remained in clinically applied pharmacotherapy tasks. Comparable patterns have also been described among pharmacy students in Finland (Pitkä *et al.*, 2018) and the United States (Atayee *et al.*, 2016). Differences across studies should be interpreted cautiously because competency frameworks, educational systems, assessment methods, and learning environments vary substantially between countries.

Variability in self-assessment findings across studies may also reflect differences in educational and assessment approaches. Bartlett and colleagues (2023) demonstrated that students' perceptions of self-reflection, self-assessment, and peer assessment are influenced by learning styles, the quality of feedback, and the perceived authenticity of assessment activities (Bartlett *et al.*, 2023). Similarly, Nisly and colleagues (2020) reported that discrepancies between students' self-assessments and faculty evaluations decreased as metacognitive abilities developed during training. Together, these findings suggest that structured opportunities for reflection and constructive feedback may support more accurate self-evaluation during professional education.

Previous evidence further indicates that self-assessment can provide valuable information regarding selected professional competencies, particularly when interpreted alongside complementary assessment methods such as faculty evaluation, peer assessment, or objective performance measures (Lempicki *et al.*, 2021). Nevertheless, self-assessment reflects perceived rather than actual competence and should therefore be interpreted with appropriate caution. Accordingly, the findings of the present study should not be considered direct evidence of participants' professional ability but rather an indication of how students and graduates perceive their preparedness for practice. Given the importance of self-assessment in lifelong learning and continuing professional development, these perceptions remain educationally meaningful because they may help identify domains in which learners feel less prepared (Motycka *et al.*, 2010).

Another notable finding was the absence of statistically significant differences between final-year students and graduates across most competency domains, with the exception of research, where graduates reported slightly higher perceived competence. Although the magnitude of this difference was modest, it may reflect additional exposure to research activities or workplace experiences following graduation. However, because professional experience was not directly measured in the present study, this interpretation should be considered speculative.

The relatively modest self-assessment levels reported in this study are also consistent with the findings of Lingow, who observed that pharmacy students often rated their competencies lower than evaluations provided by peers and instructors (Lingow *et al.*, 2023). In the Brim study, differences were also reported between self-assigned and instructor-assigned competency scores across multiple pharmacy practice settings. In that study, students with lower practical readiness sometimes overestimated their clinical abilities (Brim-Dauterman & Rao, 2024). Collectively, these findings reinforce the importance of interpreting self-assessment as one component of competency evaluation rather than a substitute for objective assessment.

Overall, the findings of the present study indicate that pharmacy students and recent graduates perceive different levels of preparedness across competency domains, with comparatively lower perceived competence in research-related competencies. Because these findings were based exclusively on self-assessment, they should be interpreted as perceptions of preparedness rather than objective indicators of competency attainment. Future educational strategies that integrate structured self-assessment with formative feedback from faculty members, peers, and objective competency assessments may facilitate more comprehensive evaluation of learners' professional development while helping educators identify areas in which students perceive the greatest need for support (Brownie *et al.*, 2024). Although self-assessment does not provide an objective measure of professional competence, it remains an important educational tool because it promotes reflective practice, self-directed learning, and lifelong professional development. Therefore, perceived competence should be interpreted as complementary to, rather than a replacement for, objective competency assessment.

### Limitations

Several limitations should be considered when interpreting the findings. First, the study relied on self-reported assessments, which may be influenced by response bias and reflect perceived rather than actual competence. Second, the study was conducted at a single institution (Ardabil School of Pharmacy), limiting the generalizability of the findings. Third, the cross-sectional design prevents conclusions about causal relationships or changes in competencies over time. In addition, graduate data were collected electronically, and no external faculty evaluations or objective performance measures were included. Finally, graduates belonged to different cohorts with varying levels of professional experience, which may have influenced their perceptions of workplace

requirements and the perceived workplace relevance of the assessed competencies.

## Conclusion

This study found that final-year pharmacy students and graduates at Ardabil School of Pharmacy reported moderate levels of perceived competence across the knowledge, skills, communication, and research domains, together with moderate perceived workplace relevance of these curriculum-based competencies. When workplace relevance scores were standardised relative to the maximum attainable scores, communication competencies demonstrated the highest perceived workplace relevance. Because the study relied on self-assessment, the findings reflect participants' perceived preparedness rather than objectively measured competence.

No statistically significant differences were observed between students and graduates in most competency domains, although graduates reported slightly higher perceived research competency. In addition, GPA was not significantly associated with perceived competencies or perceived workplace relevance among graduates.

The findings identify research-related competencies as an area in which participants perceived comparatively lower preparedness and suggest opportunities for further strengthening curriculum implementation in this domain. As the study was conducted at a single institution and relied on self-reported data, the findings should be interpreted with appropriate caution and should not be generalised to all pharmacy schools in Iran. Future multi-institutional studies incorporating objective competency assessments alongside self-reported measures are warranted to provide a more comprehensive evaluation of pharmacy graduates' preparedness for contemporary professional practice.

## Conflict of interest

The authors declare no conflict of interest.

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