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RESEARCH ARTICLE

Pharmacy students need more career-aligned professional education: A cross-sectional study at a Chinese university

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Abstract

Background: The growing concern in China about the mismatch between pharmacy graduates' employment and their specialised training prompted this study, which investigated undergraduate pharmacy students' perceptions of employment. It focused on their views of the profession, self-awareness, and career outlook, while exploring links between education and employment to suggest potential adjustments to pharmacy education. **Methods:** A 23-item questionnaire evaluated undergraduate pharmacy students' perceptions of employment in three areas: profession, self-perception, and career awareness. A cross-sectional survey was conducted among first- to fourth-year students, using convenience sampling and distributing the questionnaire online and offline. Data were analysed using SPSS 26.0 to assess the alignment between professional education and employment readiness, as well as students' desire for career-oriented education in their curriculum. **Results:** Of the 520 distributed questionnaires, 473 were valid, resulting in a response rate of 90.96%. Initial findings showed that students need to improve their knowledge of the profession, self-awareness, and career insight. Over 80% were open to including career planning in their curriculum. Statistically significant differences in employment-related perceptions were observed across academic years, though the effect sizes were small. **Conclusion:** Undergraduate pharmacy education should better align with career demands, providing a foundation for future research on how to align education with students' career development needs.

Introduction

As a discipline integrating theory with practice, the quality of pharmacy education significantly influences students' employment competitiveness and career development prospects (Gavaza *et al*., 2025; Morley *et al*., 2025). To improve educational outcomes, various countries have developed distinctive training models. For example, in the United States, the Pharm.D. curriculum features standardised and systematic design, a progressive structure, a student-centred teaching approach, diverse pedagogical methods, and emphasises cultivating critical thinking and practical problem-solving abilities (Trovinger *et al*., 2025; Liu, 2025a). Japan's pharmacy education system employs a "*4+6*" dual-track training model to meet the pharmaceutical industry's demand for diversified talent, while also offering students greater career flexibility (Hu *et al*., 2025). Indian pharmacy education adopts a practice-theory-innovation cultivation pathway, which enables graduates to acquire solid professional knowledge (Hu *et al*., 2025). These international examples offer valuable insights for the reform of pharmacy education in China. China has a large-scale pharmacy education system, with nearly 20% of comprehensive universities offering pharmacy majors and a significant number of universities housing independent schools of pharmacy. Undergraduate pharmacy programmes in China are typically four years in duration (Zhu *et al*., 2024). China's pharmaceutical industry has experienced accelerated growth in recent years (Chang *et al.*, 2025). According to the China Pharmaceutical Statistical Yearbook, over the past decade, the industry achieved an average annual

growth rate of 8.5%, with chemical pharmaceuticals at 7.8% and biopharmaceuticals at 12.6%. This expansion corresponded to a 9.2% average annual increase in pharmacy-related jobs (National Healthcare Security Administration, 2024). Despite this strong industry demand, the number of university graduates in China continues to rise, reaching record highs of 4.99 million in 2023 and 5.12 million in 2024 (Jiang & Yang, 2024). The surge in graduate numbers and increasing job market competition have led students to place less emphasis on major alignment when seeking employment. Instead, they prioritise securing positions that facilitate personal growth and value fulfilment. Consequently, the correlation between graduates' fields of study and employment outcomes is weakening (Wang, 2019; Zhou, 2020). This misalignment is particularly evident among pharmacy graduates. The China Undergraduate Employment Report reveals a 65% career alignment rate nationally, with specific institutions reporting rates below 50% (MyCOS Institute *et al*., 2024). This indicates a clear disconnect between the talent demands of the pharmaceutical industry and the career pathways of pharmacy graduates.

Employment is not only vital for individual development but also crucial for social stability and the efficient allocation of human resources (Zhou, 2022). Consequently, a disconnect between professional education and labour market demands can lead to various social issues, including wasted educational resources and labour market imbalances (Zhu *et al*., 2025). However, traditional solutions, such as providing career guidance only before graduation, are often ineffective due to a lack of professional relevance and practicality (Guo *et al*., 2025).

Securing professionally-matched positions and achieving career success depends not only on subject mastery, but equally on rational career planning and quality employment education (Wang, 2012). However, existing educational models tend to prioritise theoretical knowledge over practical skills and vocational competence development (Chang *et al*., 2025; Luo, 2014). Therefore, it is of great practical significance to explore how to better align professional education with employment needs in order to enhance the employment outcomes of pharmacy students and foster development in both the pharmaceutical and educational sectors.

This study examines pharmacy students' career awareness through three dimensions: professional awareness, self-awareness, and career planning awareness. Professional awareness refers to students' understanding of their major, emotional identification with the field, and sense of professional belonging (Chen, 2025; Kay *et al*., 2018). Self-awareness involves recognition of one's interests, abilities, and values (Zhu & Zhou, 2025). Career planning awareness reflects students' preparedness and proactive planning for future career development (Li *et al*., 2025). Using this three-dimensional framework, we conducted a cross-sectional survey among undergraduate students at the School of Pharmacy, Yanbian University. We also assessed students' acceptance of integrating career guidance into the professional curriculum. By analysing differences in career perceptions across academic years, this study aims to provide a preliminary reference for optimising pharmacy education to better meet students' career development needs.

Methods

Study design and setting

This study employed a cross-sectional design to explore undergraduate pharmacy students' employment perceptions, focusing on three key dimensions: perception of the profession, self-perception and career awareness. The survey was conducted at the College of Pharmacy, Yanbian University, China, between September and December 2024. Participants included undergraduate students from freshman to senior year enrolled in the pharmacy programme at the college.

Instrument design

A 23-item questionnaire was developed to collect quantitative data on students' perceptions of employment, career prospects, and self-awareness (Table I). The design drew on the validated Self-Efficacy Scale for College Students' Career Decision Making (Cronbach's $\alpha = 0.9366$; test–retest reliability = 0.656) (Peng & Long, 2001; Levin *et al*., 2025), as well as relevant pharmacy education literature (Li, 2020; Liu, 2025b), and considering the unique characteristics of the pharmacy profession. The instrument included several open-ended questions to complement the quantitative data. It should be noted that the instrument was designed specifically for this study and did not undergo independent reliability or validity testing. As such, the research is positioned as exploratory, intended to offer preliminary insights into career-related perceptions among pharmacy students.

Table I: Questionnaire items (Only one choice permissible for each question)

	Item	Possible responses
Q1	Your gender:	A) Male; B) Female
Q2	Your academic year:	A) Freshman; B) Sophomore; C) Junior; D) Senior
Q3	Your major:	A) Pharmaceutical Sciences; B) Pharmacy; C) Pharmaceutics
Q4	How familiar were you with this major before applying?	A) Thoroughly familiar; B) Fairly familiar; C) Moderately familiar; D) Completely unfamiliar
Q5	What was the primary factor influencing your decision to select your current major?	A) Personal interest; B) Parental expectation; C) Good employment prospects; D) Programme reputation; E) Other
Q6	How would you describe your current perception of your major?	A) Somewhat like; B) Neutral; C) Somewhat dislike
Q7	Would you prefer to seek employment related to your major field?	A) Professionally aligned; B) Any job available; C) Focus on utilising strengths; D) Interest-driven
Q8	Are you willing to continue developing expertise in your major field after entering the workforce?	A) Actively learn; B) Learn based on job requirements; C) Unwilling
Q9	How would you assess the current job market situation?	A) Severe difficulty; B) Normal; C) Favorable; D) Uninformed
Q10	Do you have a clear understanding of the employment prospects for your major?	A) Fully understand; B) Partially understand; C) Neutral; D) Limited understanding; E) No understanding
Q11	What do you consider to be your most competitive strengths in the job search process?	A) Academic performance; B) Professional skills; C) Internship experience; D) Certifications
Q12	What do you consider to be the most critical skills or qualities you currently lack?	A) Problem-solving; B) Coordination; C) Stress tolerance; D) Practical experience; E) Professional knowledge; F) Other
Q13	Do you have a clear understanding of the career directions you should pursue?	A) Very clear; B) Uncertain; C) Unclear; D) Not considered
Q14	Do you have a well-defined career plan?	A) Established plan; B) No plan (uncertain how); C) No plan (unaware of concept)
Q15	When do you consider the optimal time for students to engage in career planning during university?	A) Freshman; B) Sophomore; C) Junior; D) Senior
Q16	When do you consider the optimal time to begin your job search?	A) One year before graduation; B) Six months before graduation; C) One month before graduation; D) Other
Q17	What is your primary post-graduation plan?	A) Select career first; B) Secure job first; C) Other
Q18	What is your primary career focus when seeking employment?	A) Government agencies; B) State-owned enterprises; C) Private enterprises; D) Public institutions; E) Entrepreneurship; F) Other
Q19	What factors do you prioritise most when making career decisions?	A) Development prospects; B) Salary; C) Major alignment; D) Job stability; E) Personal interests
Q20	Through which channels do you most prefer to access employment information?	A) School recommendations; B) Job websites; C) Career fairs; D) Media advertisements; E) Personal connections; F) Other
Q21	Which of the following aspects do you find most stressful in your career planning process?	A) Employer standards; B) Family expectations; C) Academic pressure; D) Peer comparison; E) Reality-ideal gap; F) Other
Q22	What are your perspectives on the college's career-aligned teaching model?	A) Highly practical; B) Moderately useful; C) Ineffective; D) Uncertain
Q23	In which areas would you most like the college to provide guidance?	A) Career planning; B) Job-seeking mindset; C) Job information; D) Interview skills; E) Entrepreneurship guidance; F) Other

Ethical approval

This study was reviewed and approved by the Science and Technology Ethics Committee of the Academic Council of Yanbian University (Approval No. YBUREC2024-001) on August 20, 2024. Prior to the study, an electronic informed consent notice was distributed to all potential participants through class-based WeChat groups. The notice clearly outlined the research purpose, content, procedures, and data usage. Implied consent was adopted, meaning that participants who voluntarily agreed to participate after reviewing the study information could complete and submit the questionnaire either online or in paper format. Those who did not agree were not required to take part. All data were collected based on participants' informed and voluntary consent.

Participants and sampling

Eligible participants consisted of all full-time undergraduate students at the School of Pharmacy, Yanbian University. Students on academic suspension or those otherwise unable to complete the

questionnaire independently were excluded. A total of 23 individuals were excluded on this basis, resulting in a final sample of 520 participants. Convenience sampling was used, and the questionnaire was administered electronically through class groups, supplemented by paper-based formats. All eligible students were invited to participate voluntarily without any additional sampling restrictions.

Data analysis

Data were analysed using SPSS 26.0. For categorical variables, distribution characteristics were described by frequency (n) and proportion (%). Chi-square tests were applied to compare differences in professional cognition, self-concept, and career planning among students of different grades. Given that nine independent multiple comparisons were conducted (six items for professional perception in Table II and three items for career planning in Table III), the Bonferroni correction was applied to control the Type I error rate, resulting in an adjusted significance level of $\alpha' = 0.05 / 9 = 0.0056$. All subsequent chi-square test results for group differences across academic years were judged for statistical significance strictly based on this Bonferroni-corrected threshold ($p < 0.0056$). Effect sizes were quantified using Cramer's V to assess the practical significance of differences, with values interpreted as follows: 0.1–0.3 (small), 0.3–0.5 (moderate), and ≥ 0.5 (large). As this was an exploratory study aimed at identifying preliminary characteristics of pharmacy students' career perceptions, the above statistical adjustments further support the reliability of the findings.

Results

A total of 520 questionnaires were distributed in this study, with 492 recovered. After excluding 19 responses due to completion times of less than 120 seconds or missing data exceeding 15%, 473 valid questionnaires were retained, yielding a valid response rate of 90.96%. Consistent with previous cross-sectional studies in pharmacy education, which typically use sample sizes ranging from 300 to 500 (Thanh-Thao *et al*., 2025), the present sample size (n=473) falls within this range and is sufficient to initially reflect the characteristics of the target group. As detailed in Figure 1, the sample consisted predominantly of females (378, 79.92%). And the participant distribution by academic year was as follows: 148 freshmen (31.29%), 120 sophomores (25.37%), 110 juniors (23.26%), and 95 seniors (20.08%). When students were grouped by grade, all expected frequencies in the chi-square tests were ≥5, satisfying the fundamental assumption for robust statistical comparison.

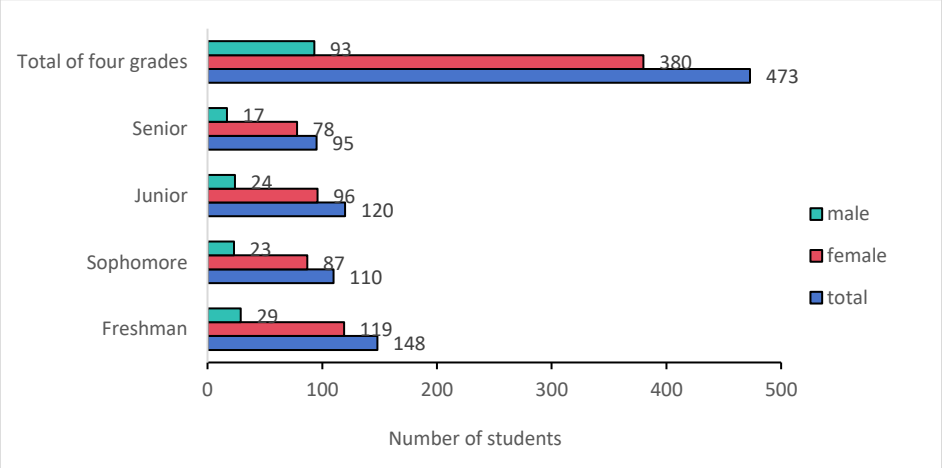


Figure 1: The compositions of the 473 participants

Professional perception dimension

Results for the professional perception dimension are presented in Table II. A significant proportion of students (40.59%) possessed comprehensive knowledge of the programme prior to enrollment, many (31.50%) chose based on confirmed interest, and nearly half (48.41%) developed a preference for the programme during their studies. Although 43.76% of participants were willing to pursue a career related to their major, the majority (55.60%) stated that their decision to pursue further specialised education would depend on future job requirements.

Table II: Pharmacy students' understanding of their major across different grades

Item	Possible responses	Frequency and proportion				Total	χ^2	*p*-value	Cramer's V
		Freshman	Sophomore	Junior	Senior				
How familiar were you with this major before applying?	A) Thoroughly familiar	9 (6.06%)	8 (6.67%)	20 (18.18%)	15 (15.79%)	52 (10.99%)	25.771	0.002*	0.135
	B) Fairly familiar	42 (28.28%)	28 (23.33%)	40 (36.36%)	30 (31.58%)	140 (29.60%)			
	C) Moderately familiar	82 (55.56%)	64 (53.33%)	40 (36.36%)	40 (42.11%)	226 (47.78%)			
	D) Completely unfamiliar	15 (10.10%)	20 (16.67%)	10 (9.09%)	10 (10.53%)	55 (11.63%)			
Total		148	120	110	95	473			
What was the primary factor influencing your decision to select your current major?	A) Personal interest	48 (32.32%)	36 (30.00%)	25 (22.73%)	40 (42.11%)	149 (31.50%)	112.088	<0.001*	0.281
	B) Parental expectation	21 (14.14%)	4 (3.33%)	45 (40.91%)	15 (15.79%)	85 (17.97%)			
	C) Good employment prospects	16 (11.11%)	16 (13.33%)	25 (22.73%)	20 (21.05%)	77 (16.28%)			
	D) Programme reputation	18 (12.12%)	4 (3.33%)	5 (4.55%)	5 (5.26%)	32 (6.77%)			
	E) Other	45 (30.30%)	60 (50.00%)	10 (9.09%)	15 (15.79%)	130 (27.48%)			
Total		148	120	110	95	473			
How would you describe your current perception of your major?	A) Somewhat like	70 (47.47%)	44 (36.67%)	65 (59.09%)	50 (52.63%)	229 (48.41%)	12.619	0.049	0.115
	B) Neutral	63 (42.42%)	60 (50.00%)	35 (31.82%)	35 (36.84%)	193 (40.80%)			
	C)Somewhat dislike	15 (10.10%)	16 (13.33%)	10 (9.09%)	10 (10.53%)	51 (10.78%)			
Total		148	120	110	95	473			
Would you prefer to seek employment related to your major field?	A) Professionally aligned	69 (46.46%)	48 (40.00%)	45 (40.91%)	45 (47.37%)	207 (43.76%)	23.793	0.005*	0.129
	B) Any job available	30 (20.20%)	32 (26.67%)	45 (40.91%)	25 (26.32%)	132 (27.91%)			
	C) Focus on utilising strengths	21 (14.14%)	24 (20.00%)	15 (13.64%)	15 (15.79%)	75 (15.86%)			
	D) Interest-driven	28 (19.19%)	16 (13.33%)	5 (4.55%)	10 (10.53%)	59 (12.47%)			
Total		148	120	110	95	473			
Are you willing to continue developing expertise in your major field after entering the workforce?	A) Actively learn	55 (37.37%)	28 (23.33%)	45 (40.91%)	40 (42.11%)	168 (35.52%)	13.687	0.033	0.120
	B) Learn based on job requirements	82 (55.56%)	76 (63.33%)	55 (50.00%)	50 (52.63%)	263 (55.60%)			
	C) Unwilling	11 (7.07%)	16 (13.33%)	10 (9.09%)	5 (5.26%)	42 (8.88%)			
Total		148	120	110	95	473			

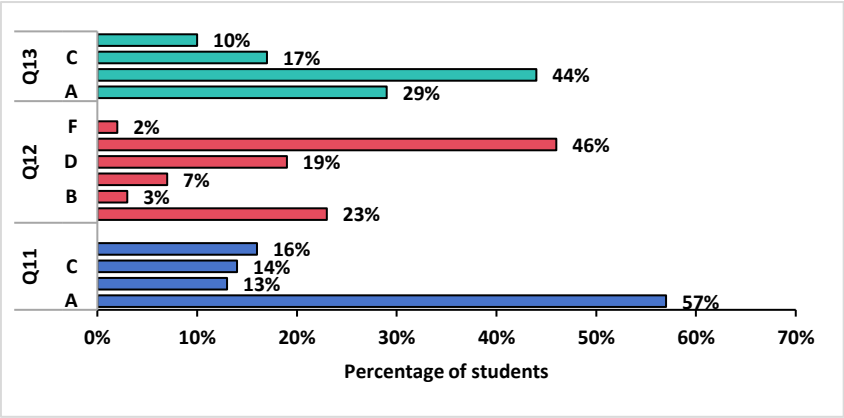
Item	Possible responses	Frequency and proportion				Total	χ^2	*p*-value	Cramer's V
		Freshman	Sophomore	Junior	Senior				
Do you have a clear understanding of the employment prospects for your major?	A) Very familiar	10 (7.07%)	8 (6.67%)	20 (18.18%)	35 (36.84%)	73 (15.43%)	101.858	<0.001*	0.268
	B) Somewhat familiar	45 (30.30%)	48 (40.00%)	40 (36.36%)	45 (47.37%)	178 (37.63%)			
	C) Moderately familiar	60 (40.40%)	40 (33.33%)	35 (31.82%)	10 (10.53%)	145 (30.66%)			
	D) Somewhat unfamiliar	25 (17.17%)	8 (6.67%)	15 (13.64%)	5 (5.26%)	53(12.21%)			
	E) Completely unfamiliar	7 (5.06%)	16 (13.33%)	0 (0.00%)	0 (0.00%)	23(4.86%)			
Total		148	120	110	95	473			

Note: Statistical significance was set at $p < 0.0056$, the Bonferroni-corrected threshold for nine independent chi-square comparisons (six in Table II, three in Table III). Cramer's V was used to quantify effect sizes, with $0.1 \le V < 0.3$ indicating a small effect, $0.3 \le V < 0.5$ indicating a moderate effect, and $0.5 \le V < 1$ indicating a large effect. *$p < 0.0056$ (Bonferroni-corrected).

Chi-square tests revealed statistically significant differences across academic years in students' pre-admission understanding of the pharmacy profession and their primary motivations for choosing the major ($p < 0.0056$, Bonferroni-corrected), with small effect sizes (Cramer's V = 0.135 and 0.281, respectively). Similarly, significant grade-related differences were observed in students' perceptions of pharmacy career prospects and their willingness to pursue pharmacy-related careers after graduation ($p < 0.0056$, Bonferroni-corrected), also with small effect sizes (Cramer's V = 0.268 and 0.129, respectively). These findings suggest that although statistically significant differences exist across academic years in the aforementioned dimensions, the small effect sizes indicate that these perceptions remain relatively stable among different grade levels.

Self-perception dimension

Students' self-assessment of their competencies is summarised in Figure 2. The majority (57%) considered academic performance their most competitive advantage in the job market, while 46% reported deficiencies in professional knowledge and skills. Notably, over 70% expressed uncertainty about their future career direction. These findings suggest that students' assessments of their strengths are relatively concentrated on academic performance, and there is some uncertainty regarding their future career development paths. Students' understanding of their major's development pathways warrants further investigation.



Q11 (What do you consider to be your most competitive strengths in the job search process): A=Academic performance; B=Professional skills; C=Internship experience; D=Certifications; Q12(What do you consider to be the most critical skills or qualities you currently lack): A=Problem-solving; B=Coordination; C=Stress tolerance; D=Practical experience; E=Professional knowledge; F=Other; Q13(Do you have a clear understanding of the career directions you should pursue): A=Very clear; B=Uncertain; C=Unclear; D=Not considered. Note: The percentages in the figure represent the proportion of students corresponding to each option.

Figure 2: Self-Perception assessment results of pharmacy students across academic years

Cognitive dimension of career planning

The survey assessed students' current career planning status (Figure 3). Results indicate that fewer than 30% of freshmen, sophomores, and juniors had developed career plans, while over two-thirds lacked practical planning knowledge; a small minority were unfamiliar with the concept itself. Seniors demonstrated greater engagement, with 63.16% having developed a plan. However, over one-third (36.84%) still lacked a structured approach, indicating a need for earlier and more systematic career planning support.

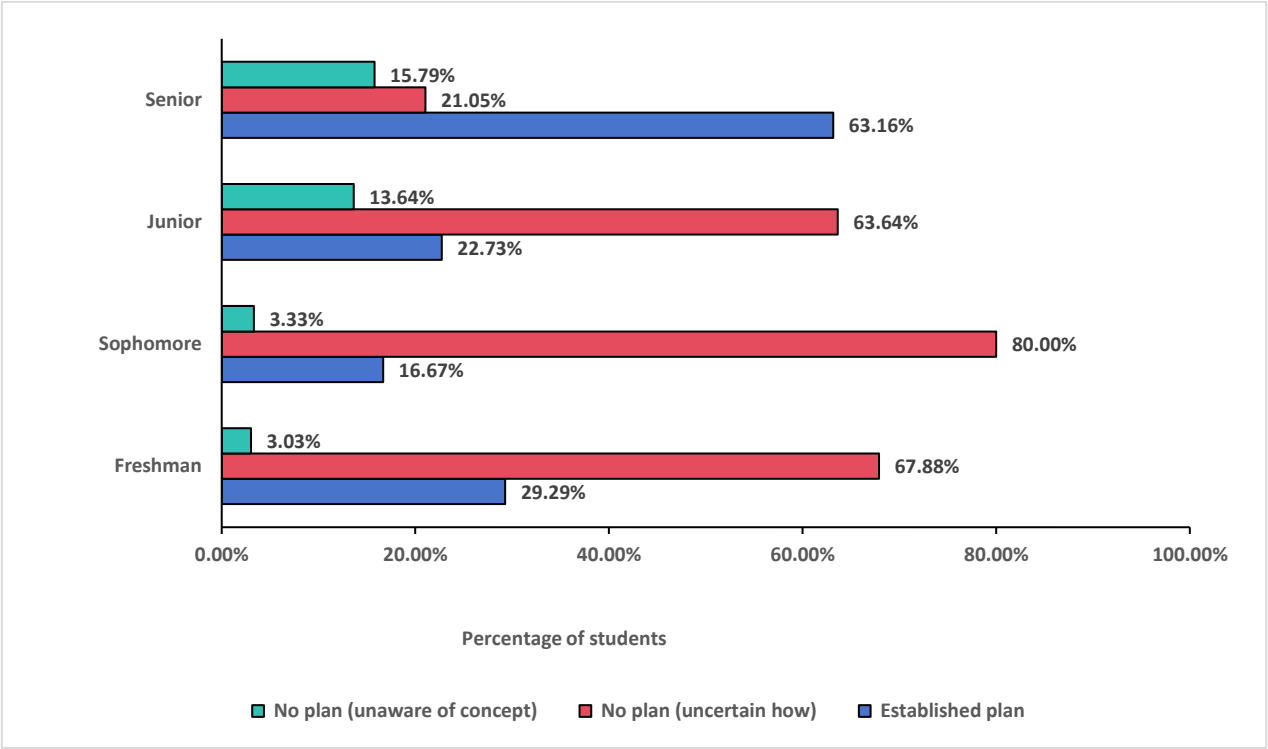


Figure 3: Differences in career planning engagement among pharmacy students across academic years

Survey results regarding participants' perceptions of career planning timing are presented in Table III. Nearly half of the students (48.63%) indicated that career planning should commence in the third year of college, while 43.13% believed job searching should start one year before graduation. However, a significant proportion (41.23%) preferred to "*secure employment first, then consider career direction*," a strategy that may increase the risk of working in fields unrelated to their academic training.

A chi-square test was performed to analyse survey responses by academic year (Table III). Statistically significant differences were detected across academic years for all three items at the Bonferroni-corrected threshold ($p < 0.0056$). However, the effect sizes for these comparisons were small (Cramer' s V = 0.190, 0.143, and 0.254, respectively). These findings indicate that students' perceptions of career planning differ by academic year. While the differences are statistically significant, their small magnitude suggests that these perceptions are relatively stable across years. Nevertheless, these results raise the possibility that early exposure to career planning knowledge could be associated with employment outcomes after graduation; however, this relationship warrants further investigation with longitudinal designs.

Table III: Career planning cognitions in pharmacy students by academic year.

Item	Possible responses	frequency and proportion				Total	χ^2	*p*-value	Cramer's V
		Freshman	Sophomore	Junior	Senior				
When do you consider the optimal time for students to engage in career planning during university?	A) Freshman	33 (22.22%)	20 (16.67%)	15 (13.64%)	10 (10.53%)	78 (16.49%)	51.093	<0.001*	0.190
	B) Sophomore	40 (27.27%)	24 (20.00%)	45(40.91%)	5(5.26%)	114 (24.10%)			
	C) Junior	65 (43.43%)	60 (50.00%)	40 (36.36%)	65 (68.42%)	230 (48.63%)			
	D) Senior	10 (7.07%)	16 (13.33%)	10 (9.09%)	15 (15.79%)	51 (10.78%)			
Total		148	120	110	95	473			
When do you consider the optimal time to begin your job search?	A) One year before graduation	64 (43.43%)	40 (33.33%)	60 (54.55%)	40 (42.11%)	204 (43.13%)	28.841	0.001*	0.143
	B) Six months before graduation	58 (39.39%)	60 (50.00%)	30 (27.27%)	40 (42.11%)	188 (39.75%)			
	C) One month before graduation	12 (8.08%)	16 (13.33%)	10 (9.09%)	15 (15.79%)	53 (11.21%)			
	D) Other	13 (9.09%)	4 (3.33%)	10 (9.09%)	0 (0%)	27 (5.71%)			
Total		148	120	110	95	473			
What is your primary post-graduation plan?	A) Select career first	82 (55.56%)	64 (53.33%)	45 (40.91%)	15 (15.79%)	206 (43.55%)	61.187	<0.001*	0.254
	B) Secure job first	52 (35.35%)	28 (23.33%)	50 (45.45%)	65 (68.42%)	195 (41.23%)			
	C) Other	14(9.09%)	28 (23.33%)	15 (13.64%)	15 (15.79%)	73 (15.22%)			
Total		148	120	110	95	473			

Note: Statistical significance was set at $p < 0.0056$, the Bonferroni-corrected threshold for nine independent chi-square comparisons (six in Table II, three in Table III). Cramer's V was used to quantify effect sizes, with $0.1 \leq V < 0.3$ indicating a small effect, $0.3 \leq V < 0.5$ indicating a moderate effect, and $0.5 \leq V < 1$ indicating a large effect. *$p < 0.0056$ (Bonferroni-corrected).

Students' willingness to integrate career guidance into their professional education

As shown in Figure 4, most participants (80.59%) reported that integrating career guidance into their professional education was beneficial for finding employment after graduation and could help them secure their desired job. This finding indicates that participants were generally open to this career guidance approach.

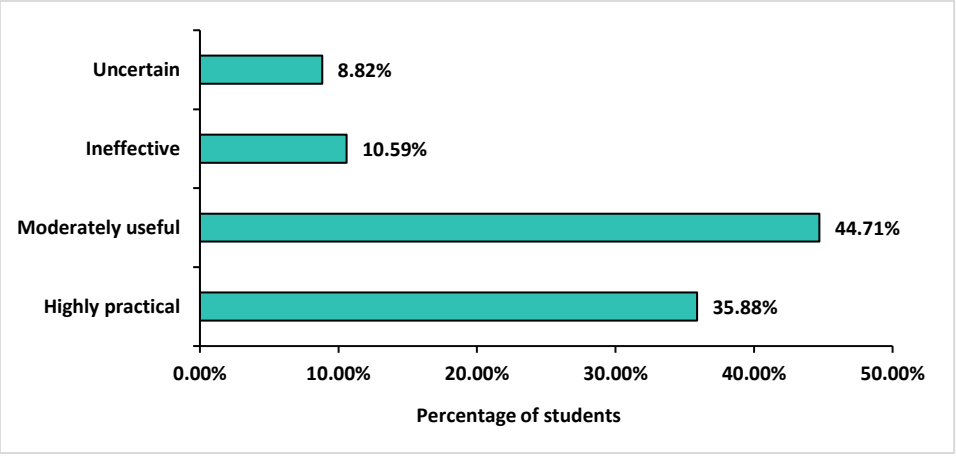


Figure 4: Students' attitudes toward the integration of career guidance in professional education

Discussion

Students' understanding of their profession significantly impacts their future career planning (Chen, 2025). These results indicate that while students possess some awareness of their profession's development prospects, there may be room for improvement in students' professional cognition (Table II). Previous studies suggest that universities can enhance students' cognition through staged, categorised, and layered professional and career education tailored to students' developmental patterns and needs across different grade levels (Wang, 2019). In light of these findings, further exploration is warranted regarding whether integrating emerging fields such as precision medicine, biopharmaceuticals, and drug regulatory science into the lower-year curriculum could help students better understand industry trends. Similarly, it remains to be examined whether providing upper-year students with real-world case studies and practical projects could facilitate their integration of theoretical knowledge with practical application. These directions warrant further investigation, particularly through longitudinal and interventional study designs.

Self-analysis and orientation constitute the initial phase of career planning, with self-knowledge serving as its foundation (Zhu & Zhou, 2025). However, the survey indicated that some students tend to either overestimate or underestimate their capabilities during this process, often focusing excessively on whether a career aligns with their personal preferences while neglecting the match between their actual competencies and professional requirements (Fig. 2). This observation raises the question of whether implementing systematic career planning courses starting from the first year and continuing throughout the undergraduate programme could help guide students in developing more rational employment perspectives. Course content could include modules such as vocational interest assessment, career goal setting, and development path planning. Research suggests that these components can support students in developing comprehensive self-awareness and clarifying career directions (Li *et al*., 2025).

The survey revealed differences in students' perceptions of their major, self-concept, and career dimensions across grade levels (Tables II & III). As academic progression increased, the proportion of students with defined career plans exhibited an upward trend. However, the survey also found that some students' awareness of the importance of career planning requires further enhancement, with some students reporting that they lacked the skills to formulate concrete plans. Notably, 36.84% of seniors indicated that they had not yet developed coherent career plans (Figure 3). This phenomenon may be associated with students' insufficient knowledge base regarding career planning. Career planning constitutes a continuous, systematic process for developing professional and life trajectories (Sun , 2025). A comprehensive career plan comprises three core elements: career orientation, goal setting, and pathway design (Kersh *et al*., 2022). Based on these principles, an issue worth exploring is whether students could be better supported in developing their career plans if universities consider implementing a Precision Tutorial System, wherein tutors are assigned at the start of the first year based on students' individual differences, characteristics, and needs to provide more targeted career guidance (Piao *et al*., 2022). If such a system were to be implemented, potential supporting activities could include: 1) Establishing industry mentorship programmes that connect students with sector experts for practical insights and guidance (Zhang , 2024); 2) Creating alumni mentorship networks to leverage the experience of distinguished graduates for resource sharing and career planning support (Kong, 2014). Whether such an integrated support system could effectively assist students in developing more comprehensive career plans warrants further investigation.

Finally, survey results indicated that over 80% of students held a positive attitude toward integrating career guidance into the professional curriculum (Fig. 4), suggesting broad acceptance of this innovative approach among participants. Previous studies have suggested that innovations in career guidance delivery may help students secure desirable employment related to their majors after graduation (Sun *et al*., 2025; Huang, 2025). Therefore, future research could further explore how to design and validate more targeted career guidance models.

Limitations

There are some limitations to consider. First, this study adopted a cross-sectional design, which only collected data at a single time point. This design precludes the establishment of causal relationships between variables and can only reveal correlations. Second, the study sample was exclusively drawn from the College of Pharmacy, Yanbian University, representing a single-institution sampling. As such, the sample may not be representative of pharmacy students in other universities across China, thereby limiting the generalisability of the study results. Third, the use of a self-reported questionnaire introduces potential biases, such as social desirability bias, where respondents may provide idealised answers, or subjective bias in self-assessment. Fourth, the questionnaire was self-developed based on existing

literature and professional characteristics, and it has not undergone formal reliability and validity verification. This may have introduced measurement uncertainty and affected the accuracy and reliability of the data. Additionally, the gender distribution among participants was unbalanced, and the study did not examine potential gender-based differences in professional perception, self-perception, or career planning. This oversight limits the comprehensiveness of the results and further constrains their generalisability. Finally, although most students expressed support for the employment-oriented educational model, its actual effectiveness has not yet been empirically verified.

Therefore, in future studies, we will expand the survey scope and sample size to include pharmacy students from multiple universities of different types and in different regions; adopt a longitudinal study design to establish causal relationships between variables; develop and validate standardised research instruments to reduce measurement errors; analyse the impact of gender differences on pharmacy students' career choices; implement specific pharmacy education reforms; and evaluate their effectiveness through long-term tracking.

Conclusion

This exploratory study, based on a survey of 473 undergraduate pharmacy students, preliminarily indicates certain gaps in students' professional awareness, self-awareness, and career planning. It also observes that most students hold a positive attitude toward integrating career guidance into professional curricula. These preliminary findings may provide a reference direction for how pharmacy education can better align with students' career development needs.

Based on cross-grade data comparisons, we speculate that arranging career education content in a phased manner—such as providing early career awareness guidance for lower-grade students—may be a potential direction to respond to students' practical needs, but this inference awaits direct verification through longitudinal studies. Furthermore, teaching improvement ideas such as integrating career planning modules into professional curricula also have value for further exploration; however, their general applicability and actual effectiveness still need to be verified by more studies involving larger sample sizes and participants from different institutions.

Conflict of interest

The authors declare no conflict of interest.

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