

ORIGINAL RESEARCH

Assessment of Entrepreneurial Leadership among Undergraduate Nursing Students: The Case from Thailand



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Abstract

Background: Entrepreneurial leadership is the becoming concept in health, social sciences, business, management, and education that can influence and direct the performance and achievement of either staff or organizations. Unfortunately, entrepreneurial leadership has received limited attention in healthcare fields, especially nursing.

Purpose: This cross-sectional study aimed to explore entrepreneurial leadership and examine its associated factors among undergraduate nursing students.

Methods: A cross-sectional study was conducted among 410 nursing students who were recruited using a simple random sampling strategy. The data were collected using an online self-reporting survey and analyzed using descriptive statistics, Chi-square test, Fisher's exact test, and multivariate logistic regression analysis.

Results: This study's results revealed that most nursing students generally have entrepreneurial leadership at a high level (Mean=4.04, SD=0.49). The factors significantly associated with entrepreneurial leadership among the undergraduate nursing students were the level of study year class and parental income ($p < 0.05$).

Conclusion: This study proposed critical factors influencing entrepreneurial leadership among nursing students and recommends that entrepreneurial characteristics and approaches be utilized to improve all educational aspects among undergraduate nursing students. Nursing students must learn, train, and practice entrepreneurial leadership for the development of professional skills, abilities and initiation of innovation.

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1. Introduction

Entrepreneurs are now widely acknowledged as the primary force behind economic development and prosperity in developing and developed countries (Hamdan et al., 2022). Entrepreneurship also involves many significant aspects, such as increased production, productivity, level of income, healthcare system improvements, education advancements, and technological developments (Kaya et al., 2017). Universities mainly produce young people and student entrepreneurs who can drive the economies of their countries (Salamzadeh et al., 2014). Education is crucial in creating a more entrepreneurial mindset in young people, since it enables people to improve their entrepreneurial skills and develop positive attitudes toward entrepreneurs, which benefits society more than just starting new businesses. Furthermore, entrepreneurship has been considered a practical solution to some societal problems, such as the rising rate of youth unemployment (Yang, 2017). According to the pieces of literature, students' decisions to become entrepreneurs are significantly influenced by their entrepreneurial behavior. In several countries, students are becoming more interested in entrepreneurship or are attempting to establish their businesses rather than working for others and are considering starting a new business as a planned career path (Kirby & Ibrahim, 2011; Suyudi et al., 2020).

Entrepreneurial leadership exists at the intersection of entrepreneurship and leadership. Entrepreneurship is the process through which people identify and pursue opportunities and put

useful thoughts into action. These roles need innovation, determination, and a willingness to take risks. Entrepreneurs have a strong sense of self-motivation, are persistent risk-takers, and are self-reliant (Barba-Sánchez et al., 2022). Leaders are often recognized for their constant learning behaviors that enable them to maintain and accomplish their goals (Villaluz & Hechanova, 2019). Leadership generally involves directing an organized group's actions toward achieving purposes. Passion, vision, concentration, and the capacity to motivate people are necessary for leadership (Kaya et al., 2017; Barth et al., 2007).

Entrepreneurial leadership is the influence and direction of team members' performance toward the achievement of organizational goals, which involves finding and capitalizing on entrepreneurial opportunities (Gupta et al., 2004; Renko et al., 2015). Entrepreneurship is a concept that is becoming increasingly relevant in the health and social care sectors, but the scope of its potential in nursing has not been well recognized until now (Boore & Porter, 2011). Education must develop flexible, innovative people with an entrepreneurial mindset who are capable of problem-solving (Salamzadeh et al., 2013). Nursing education incorporates administration and management and should ensure such skills. Nurses' leadership roles also constitute a chance to spread entrepreneurial culture in diverse sections of professional activity, such as intrapreneurship, social entrepreneurship, or even business entrepreneurship (Colichi & Jiménez, 2020). Nurses engage in social entrepreneurship when they want to promote social change in the workplace. Intrapreneurship refers to nurses who are motivated by the development of the company or organization with which they work. The autonomous practice of nurses, such as in clinics for treatment, home care, and private business, is classified as business entrepreneurship (Arnaert et al., 2018; Jofre et al., 2021). Nurses may have used entrepreneurship to improve the healthcare process and increase the nursing profession's recognition and social position (Copelli et al., 2017). Entrepreneurship plays an important role in modern nursing responsibilities and duties (Vannucci & Weinstein, 2017). Being an entrepreneur in nursing requires investing gradually in the development of a professional culture focused on entrepreneurial activities, particularly in the areas of knowledge, skills, and attitudes (Richter et al., 2019). With rapidly advancing medical and technological developments, as well as capital constraints in the face of nursing entrepreneurship, now is the time to focus on nursing entrepreneurship (Kirkman et al., 2018). Thus, the need to invest in scientific research on nursing entrepreneurship, particularly in the entrepreneurial leadership of nursing students, is highlighted (Copelli et al., 2017).

Since entrepreneurship has grown in significance recently, developing the skills, mindsets, and behaviors in adolescents that will enable them to seize opportunities is one of the most critical challenges confronting all economies. Personal competency, managerial competency, proactive competency, and technological competency are the four characteristics of entrepreneurial leadership among college students (Putsom et al., 2019). Interestingly, in many countries in recent years, there has been a substantial and increasing student interest in entrepreneurship (Kirby & Ibrahim, 2011). However, several empirical studies have been undertaken in some regions (for example, the United States, Canada, and the United Kingdom), whereas many other countries remain uninvestigated. Students' entrepreneurial leadership remained unanswered (Salamzadeh et al., 2014). Moreover, entrepreneurship topics have received limited attention in undergraduate healthcare curricula (Richter et al., 2019). Entrepreneurship topics have received little attention in undergraduate medical or health curricula, and no consensus exists on how to best effectively implement them into health training (Chan et al., 2021). Therefore, this study aimed to explore entrepreneurial leadership and examine factors associated with entrepreneurial leadership among undergraduate nursing students.

2. Methods

2.1 Research design

A cross-sectional study was employed to explore entrepreneurial leadership and examine its associated factors among undergraduate nursing students. This research design is the appropriate design to meet the purpose of this study.

2.2 Setting and samples

This study was conducted in a private university in Bangkok, Thailand, which provides education in healthcare fields, especially nursing sciences, either undergraduate or graduate level.

The samples of this study were the nursing students who were studying in the first to fourth year of the bachelor degree of nursing science (BNS) program during the 2020 academic year, able to communicate in Thai, and willing to participate in this research. The nursing students who were undergoing the exchange program, being on academic leave, and not enrolled in the 2020 academic year, were excluded from this study. The nursing students who were the samples of this study were approached by the main researcher through a personal meeting for their participation.

Simple random sampling was applied to recruit the participants from the study population of 539 nursing students in the faculty of nursing where this study took place. The sample size was calculated using the G*Power software (Faul et al., 2007) from the effect size of previous research, which was 0.30 (Li et al., 2020), with a 0.05 alpha level and 0.80 power. In anticipation of the missing data or responses, the researchers increased the sample size by approximately 30%. Therefore, the total sample size of this study was concluded at 410 nursing students.

2.3 Measurement and data collection

The entrepreneurial leadership of nursing student questionnaire in this study was the Thai version developed by the researchers that consisted of 36 items with a 5-point scale from 1 = "I do not agree at all" to 5 = "I completely agree." The total score ranged from 36 to 180, with higher scores indicated higher entrepreneurial leadership. The entrepreneurial leadership of nursing student scale was not found in previous studies in nursing students and the Thai context before. Therefore, the researchers had developed this questionnaire to explore and assess entrepreneurial leadership among nursing students by applying the methods for scale development of DeVellis (2017), which consists of eight steps: (1) clarifying the constructs; (2) developing a pool of items; (3) selecting the format of measurement; (4) reviewing the pool of items by the expert reviewers; (5) including validation items; (6) administering scale to the initial samples; (7) evaluating the scale; and (8) optimizing the scale. The questionnaire was also developed by applying the concept of entrepreneurial leadership (Putsom et al., 2019) which is composed of four components: personal competency (8-items), managerial competency (10-items), proactive competency (10-items), and technological competency (8-items). The survey questionnaire in this study had five sections: (1) demographic data of the participants (e.g., gender, age, study year class, Grade Point Average (GPA), parent income, stipends, part-time working); (2) personal competency; (3) managerial competency; (4) proactive competency and; (5) technological competency.

All research instruments in this study were validated by three experts in the fields of nursing management and education by determining the Index of Item Objective Congruence (IOCs). The content validity of the personal competency; managerial competency; proactive competency, and; technological competency questionnaires ranged between 0.80 and 1.00, which means that these questionnaires are highly valid. The instrument was tried out with 50 nursing students to come up with the reliability of the instrument. The reliability of the research instrument was performed by applying the Cronbach's alpha coefficient method. The Cronbach's alpha coefficient of the entrepreneurial leadership of nursing student questionnaire was 0.85.

The data collection was a self-reporting survey by applying a Google form distributed through QR code scanning and social media platforms, e.g., Line application, from October to November 2020. Prior to data collection, the nursing students who were the samples of this study were approached by the main researcher through a personal meeting. They were informed about the aims of this study, risks and benefits, and consent of the willingness for research participation.

2.4 Data analysis

Data were analyzed using Statistical Package for the Social Sciences or SPSS version 21 (SPSS, IL, USA). Descriptive statistics, i.e., frequency, percentage, mean and standard deviation, were conducted to analyze the demographic data (e.g., gender, age, study year class, Grade Point Average (GPA), parent income, stipends, part-time working), while the association between demographic data and entrepreneurial leadership was analyzed using Chi-square test, Fisher's exact test, and multivariate logistic regression at the setting of significance level at $p < 0.05$.

2.5 Ethical considerations

This study was conducted after approval of the ethical reviews from the ethical committee of Saint Louis College (Code: E.027/2563). Informed consent was obtained from all participants before participating in this study.

3. Results

3.1 Demographic characteristics of the respondents

A total of 410 distributed questionnaires were 100% returned to the researchers. As shown in Table 1, among 410 respondents, 97.8% were female. Most of them (63.3%) were aged between 20 to 24. Participants were almost equally distributed by study years. More than half (61.9%) got a high-grade point average (GPA) above 3.00. The parent income of half of the participants (49.3%) was 15,001-30,001. More than 40% of students get paid by their parents 4,000-6,000 Baht per month. Some of them (8.3%) worked part-time jobs

Table 1. Demographic data of the participants (n=410)

Demographic characteristics	Frequency (f)	Percentage (%)
Gender		
Male	9	2.2
Female	410	97.8
Age (years)		
15-19	123	30.0
20-24	260	63.4
25-29	18	4.4
Above 30	9	2.2
Study year class		
First-year	110	26.8
Second-year	101	24.6
Third-year	99	24.2
Fourth-year	100	24.4
Grade Point Average- GPA (Score 0-4)		
2.01-2.49	15	3.7
2.50-2.99	141	34.4
3.00-3.49	210	51.2
Above 3.50	44	10.7
Parent income (Baht/month)		
≤ 15,000	126	30.7
15,001-30,001	202	49.3
30,001-45,000	47	11.5
> 45,001	35	8.5
Get paid by parents (Baht/month)		
≤ 4,000	84	20.5
4,001 – 6,000	169	41.2
6,001 – 8,000	59	14.4
8,001 – 10,000	58	14.2
> 10,001	40	9.8
Part-time working		
No	376	91.7
Yes	34	8.3
Part-time jobs		
Restaurant workers	5	15.2
Convenience store staffs	2	6.1
Online sales	10	30.3
Bakers/Baristas	2	6.1
Others	14	42.4

3.2 Overall scores of entrepreneurial leadership components

The overall mean score for entrepreneur leadership components was 4.04 (SD=0.49), which was in the high-level category. Technological competency had the highest average score at 4.15 (SD=0.53), followed by managerial competency, personal competency, and proactive competency with a score of 4.06 (SD=0.52), 4.02 (SD=0.59), and 3.94 (SD=0.57), respectively, as shown in Table 2. Table 3 presented detailed scores of each entrepreneurial leadership component.

Table 2. Overall scores of entrepreneurial leadership components (n=410)

Entrepreneur leadership components	Mean	SD
Personal competency	4.02	0.53
Managerial competency	4.06	0.52
Proactive competency	3.94	0.59
Technological competency	4.15	0.57
All components	4.04	0.49

Table 3. Agreement scores of each entrepreneurial leadership component (n=410)

Components	Mean	SD
Personal competency		
I explore an opportunity for business	3.44	1.11
I make a good decision when encountering problems	3.97	0.71
I have the knowledge to deal with a problem	3.88	0.74
I set up the goal based on my knowledge and understanding	4.14	0.70
I always cheer up myself	4.22	0.70
I control myself to be disciplined to achieve the goal	4.18	0.73
I control my emotions/feelings when faced with anxiety, worry, or distress	4.07	0.75
I accept my feeling when solving problems	4.23	0.70
I explore the opportunity for business	3.44	1.11
Managerial competency		
I have a good view of myself and others	4.12	0.67
I use all intellectual skills in various tasks	4.09	0.69
I monitor and perceive myself well	4.13	0.71
I am optimistic	4.15	0.77
I help others with their capacity building	3.82	0.77
I act right	4.02	0.81
I can control myself	4.26	0.68
I can stand all problems	4.26	0.70
I am resilient to dynamic situations	4.19	0.73
I have specialized skills	3.56	0.85
Proactive competency		
I am open to all opportunities for changes	4.11	0.66
I seek all opportunities to achieve my goals	4.05	0.71
I can be flexible in all situations	4.07	0.74
I can adapt myself to all changes nowadays	4.15	0.70
If I run a business, I can make it grow with innovations	3.90	0.78
I am creative in innovations	3.61	0.87
If I run a business, I can make use of innovations	3.85	0.82
I have a business advantage when I am innovative	3.84	0.83
If I have a business, I can do business more easily when there is innovation	3.90	0.82
I easily develop a working system when there is innovation	3.94	0.78
Technological competency		
I can use the necessary technology	4.27	0.72
I can use technology for my business in the future	4.18	0.71
I have various knowledge of technology	3.90	0.78
I make use of technology to develop myself	4.11	0.73
I can be flexible when there is a new technology	4.13	0.74
I use technology in business development for future success	4.11	0.72
I use technology for communication	4.40	0.71
I make use of technology to solve problems	4.10	0.71

3.3 Factors associated with the total score of all four entrepreneurial leadership components

A Chi-square and Fisher's exact test were used to determine the significant factors associated with the agreement of the statement for entrepreneur leadership components. Based on an overall mean score of all entrepreneur leadership components, participants who chose options 4 and 5 scores were classified as agreeing, whereas those choosing options 1, 2, or 3 scores were classified as disagreeing in the statement. Two factors, including the level of study year class and parental income, showed a significant association with agreement of entrepreneur leadership components as shown in Table 4.

Table 4. Association with agreement on entrepreneurial leadership components among nursing students -univariate analysis

Characteristics	Level of agreement (%)		p-value	
	Agree	Disagree		
Gender ^a	Male	55.6	44.4	0.908
	Female	53.6	46.4	
Age group (years) ^b	15-19	53.7	46.3	0.407
	20-24	52.7	47.3	
	25-29	72.2	27.8	
	Above 30	44.4	55.6	
Study year class ^a	First-year	54.6	45.5	0.009*
	Second-year	59.4	40.6	
	Third-year	39.4	60.6	
	Fourth-year	61.0	39.0	
GPA (score 0-4) ^a	2.01-2.49	41.2	58.8	0.258
	2.50-2.99	50.7	49.3	
	3.00-3.49	54.3	45.8	
	Above 3.50	65.9	34.2	
Parent income ^a (Baht/month)	≤15,000	43.7	56.4	0.035*
	15,001-30,001	57.9	42.1	
	30,001-45,000	63.8	36.2	
	>45,001	51.4	48.6	
Get paid by parents ^a (Baht/month)	≤4,000	50.0	50.0	0.630
	4,001 – 6,000	52.7	47.3	
	6,001 – 8,000	62.7	37.3	
	8,001 – 10,000	51.7	48.3	
	>10,001	55.0	45.0	
Part-time working ^a	No	54.3	45.7	0.420
	Yes	47.1	52.9	

^aChi-square was used to test for significant differences between component statement agreement

^bFisher's exact test was used to test for significant differences between component statement agreement

*Significant difference ($p < 0.05$)

The results from a multivariate logistic regression analysis presented that students who were 25-29 years old, studying in a third-year class, had a high GPA of more than 3.50, and their parents' income was more than 15,000 baht per month, were significantly associated with the agreement on entrepreneur leadership components as shown in Table 5.

4. Discussion

This study aimed to investigate entrepreneurial leadership and its associated factors in the context of nursing students at college. The key findings revealed that the participating nursing students agreed with the entrepreneurial leadership components with an average score of 4.04, which was considered a high level of agreement. Furthermore, the highest score was found in the

technological component, with an average of 4.15. The factors associated with entrepreneurial leadership were the level of study year class and parental income ($p < 0.05$).

Table 5. Association with agreement on entrepreneurial leadership components among nursing students - multivariate analysis

Characteristics	OR	SE	95% CI	p-value
Gender				
Male (reference)	1.00			
Female	0.92	0.67	0.22 - 3.84	0.913
Age groups (years)				
15-19 (reference)	1.00			
20-24	1.40	0.50	0.69 - 2.83	0.349
25-29	4.07	2.54	1.20 - 13.85	0.025*
Above 30	0.64	0.51	0.14 - 3.02	0.577
Study year class				
Year 1 (reference)	1.00			
Year 2	1.13	0.41	0.56 - 2.29	0.724
Year 3	0.40	0.17	0.17 - 0.93	0.033*
Year 4	0.95	0.42	0.40 - 2.25	0.914
GPA				
2.01-2.49 (reference)	1.00			
2.50-2.99	1.48	0.81	0.50 - 4.35	0.480
3.00-3.49	1.78	0.96	0.62 - 5.15	0.287
Above 3.50	3.36	2.13	0.97 - 11.63	0.056
Parent income (Baht/month)				
≤ 15,000 (reference)	1.00			
15,001-30,001	1.93	0.48	1.18 - 3.14	0.009*
30,001-45,000	2.58	0.97	1.24 - 5.39	0.012*
>45,001	1.60	0.65	0.72 - 3.56	0.251
Get paid by parents (Baht/month)				
≤ 4,000 (reference)				
4,001 - 6,000	1.09	0.31	0.62 - 1.90	0.775
6,001 - 8,000	1.53	0.58	0.73 - 3.21	0.259
8,001 - 10,000	1.18	0.45	0.56 - 2.47	0.669
>10,001	1.11	0.46	0.49 - 2.52	0.801
Part-time working				
Yes (reference)	1.00			
No	1.33	0.53	0.61 - 2.90	0.478

*Significant level ($p < 0.05$)

This research is one of few studies assessing the entrepreneurial leadership component among nursing students in Thailand. Entrepreneurial leadership is seen as one of leadership behavior that inspires subordinates by creating a vision, wins subordinates' commitment, and is dedicated to discovering and creating strategic value (Pu et al., 2022). Nurses can develop entrepreneurial leadership for their working and critical thinking skills. A number of research has found a positive impact of entrepreneurial leadership on work behavior, idea exploration (Bagheri & Akbari, 2018), effective commitment, and tacit knowledge sharing (Pu et al., 2022), which all skills are crucial for nurses.

The findings also showed that technological competency in the entrepreneurial leadership components received the highest score. Compared to the other studies, our findings are consistent with the previous results. Prior research on the performance of medical students' entrepreneurship education revealed that entrepreneurial leadership components in the form of technological competency are the most frequently found in students (Long et al., 2021). Another study in Thailand also confirms the importance of technological skills as hard skills for entrepreneurial leadership among nurses (Udomluck, 2021). Technological competence refers to an entrepreneurial leader's ability to use diverse technologies. Student innovation, economic success, and organizational competitiveness all benefit from technological competency.

Furthermore, the healthcare industry is becoming more reliant on electronic communication and technology. Technologically competent students have been identified as critical to nursing education success, which is consistent with the previous studies (Ahmed & Harrison, 2021). Technological competencies are different from other competencies because they change over time. Technological competency promotes innovation, profitability, and successful business operations (Putsom et al., 2019; Edwards & O'Connor, 2011).

The findings from the multivariate analysis revealed that three variables, including the level of study year class, age group, and family income, have a significant relationship with the agreement of entrepreneur leadership components. This study found that study year class was associated with the proportion of agreement on entrepreneur leadership components, especially for students in the third-year class who have a lower association on the agreement on entrepreneur leadership components when compared with the first- and second-year students. Our findings, however, were in contrast with previous research. A study from Brazil indicated that students in more advanced years perceived higher scores on the enterprising tendency test, particularly in the creative score (Soder et al., 2021). In our study, the score was higher among junior students. One explanation could be the intention to have a nursing career among senior nursing students. Since students are at a higher education level, their intentions and interests for suitable academic development will enable them to precisely seek specialized knowledge, which will finally benefit their future careers (Arifin & Gunawan, 2020). Nursing students in the third- and fourth-year are now nearly point of graduation and preparing for their professional practice as nurses. Literature indicates that nursing students have an obvious direction in their future nursing careers. Most nursing students have seen themselves working in clinical practice areas following their graduation and being registered nurses in their future careers. This shows the intention of nursing students to pursue their career path as nurses (McKenna & Brooks, 2018).

The findings of this study for the age group were significant with the agreement of entrepreneur leadership components. Previous research, however, revealed that the relationship between age and entrepreneurial success is complex and subject to the influences of multiple contingency factors, such as life stage and gender. Age has a weak linear relationship with entrepreneurial leadership (Navarro et al., 2022; Zhao et al., 2021). Likewise, it was discovered in Indonesia that age does not influence entrepreneurial leadership (Gunawan & Cahayani, 2022). Furthermore, family income has an association with entrepreneurial leadership, which is consistent with the previous study among medical students in Malaysia (Devi et al., 2020)

Another factor that may influence perceived attitude toward entrepreneurial leadership is the level of student performance or GPA, although it is not statistically significant in the models. According to a study of secondary school students, students with high GPAs have more positive attitudes toward entrepreneurship. This is because the students are motivated and eager to learn new subjects (Pihie et al., 2018). However, another study has shown a negative relationship between a higher GPA and an intention to entrepreneurship (Sun et al., 2020). A study from Italy also suggests that students who have previous low grades are more likely to start or pay attention to self-employed. New generations are willing to take high risks, which is one of the key components of entrepreneurial traits. Furthermore, creative students are mostly in lower GPA groups (Israr & Saleem, 2018). In our case, other factors, such as cultural and economic context, may influence the attitude and views of students toward entrepreneurial behaviors, which is needed for further study.

There are positive relations between parent income and entrepreneurial leadership. The behavior that students observe and learn from their parents significantly impacts their development. Parental role models are particularly important since children are highly exposed to their parent's behavior. Students from entrepreneurial households develop the need and desire to achieve independence from their parents, resulting in an increased tendency to pursue self-employment or an entrepreneurial mindset. This association was examined following previous research (Chlosta et al., 2012; Vladasel et al., 2021).

5. Implications and limitations

The findings of this study have some implications for nursing student leaders. The findings can help nursing student leaders recognize their critical roles in leading the innovation process in healthcare organizations, as well as develop procedures that provide nursing students with more opportunities for creative thinking, generating new ideas, and taking risks to put those ideas into

action. Entrepreneurship entails a significant learning process that fosters nursing students' ability to think outside the box in a broader health context and to challenge the existing nursing culture and role. The nursing culture can be changed to be more receptive to entrepreneurship by introducing entrepreneurial activities at the educational level, which can have a positive effect on nurse entrepreneurs' fear of making mistakes and resistance to change. More research is thus required to comprehend the impact of entrepreneurship on nursing students and entrepreneurial nurses in clinical practice.

This study has several limitations that should be addressed in future studies. First, this study concentrated on entrepreneurial leadership among nursing students in a single setting in Thailand. Future research should evaluate Thai nursing students in a variety of areas. Second, the authors focused on the impact of entrepreneurial leadership rather than the simultaneous influence of other leadership styles among nursing students. Third, because this study is a cross-sectional design, generalizable interpretations cannot be provided. Future experimental and longitudinal research should demonstrate the causality of the relationships discovered in this study. Further research should include evaluations of these variables from the perspectives of peers and teachers to provide a more comprehensive view of entrepreneurial leadership in nursing students.

6. Conclusion

Entrepreneurial leadership has been recognized as a strategy to influence performance, skills, and competency among individuals and has been widely studied in the nursing field. The four characteristics of entrepreneurial leadership were examined in this study, including personal competency, managerial competency, proactive competency, and technological competency. This study proposed critical factors influencing entrepreneurial leadership among nursing students, including the level of study year class, age group, and family income. Entrepreneurial characteristics and approaches may be utilized to improve all aspects of education among nursing students in institutional settings by influencing individual behaviors and task performance. Furthermore, students must learn and practice entrepreneurial leadership behaviors to develop their professional abilities and ease the process of student innovation. Identifying strategies for developing entrepreneurial leadership skills in nursing students would be highly valuable for future research. We also recommend more studies on nursing students' technological competency and approaches to implementing new health technologies. Additionally, policymakers, researchers, and higher education authorities should advocate necessary policies to develop students' entrepreneurial features and continue to strengthen their competencies to reach their future professional goals.

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Author contribution

Conceptualization, CS, NW, SP, AL, WS, NS, TK, NH, SM, and PP; methodology, CS, SS, and P.P1.; software, SS, and P.P1.; validation, CS, NW, SP, AL, WS, NS, TK, NH, SM, and PP; formal analysis, SS, and P.P1.; investigation, CS, NW, SP, AL, WS, NS, TK, NH, SM, and PP; writing—original draft preparation, CS, SS, and P.P1.; writing—review and editing, CS, SS, and P.P1.; visualization, SS, and P.P1.; supervision, CS; project administration, CS.

Conflict of interest

The authors declare that there is no conflict of interest for each author.

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