

## Original Article

# Self-directed learning ability and its relationship with perceived perioperative competence in the senior undergraduate surgical technology students: A cross-sectional study

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## Abstract

**Background & Objective:** Self-directed learning (SDL) as an effective strategy in surgical technology students can significantly help to improve their skills and clinical competence. The present study aimed to determine SDL ability and its relationship with Perceived Perioperative Competence in senior undergraduate surgical technology students.

**Materials & Methods:** The present descriptive study was conducted based on a cross-sectional design. This research included 207 final-year surgical technology students via the census method. Data collection tools included a demographic characteristics form, the Self-Directed Learning Instrument (SDLI) developed by Su-Fen Cheng (2010), and the Perceived Perioperative Competence scale. After collecting the data, they were analyzed in SPSS version software (version 20).

**Results:** The mean SDL and clinical competence scores were reported as  $73.8 \pm 8.9$  (intermediate level) and  $107.2 \pm 17.3$  (intermediate level), respectively. Among various dimensions of perceived clinical competence, interaction with colleagues had the highest value ( $3.4 \pm 0.6$ ). Among the dimensions of SDL, interpersonal communication obtained the highest value ( $3.8 \pm 0.4$ ). To investigate the relationship between SDL and clinical competence, Kendall's Tau and Spearman's correlation coefficients were obtained at 0.601 and 0.794, respectively, pointing to the significant positive relationship between the two variables ( $P < 0.001$ ).

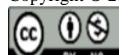
**Conclusion:** As evidenced by the obtained results, the SDL ability predicts the clinical competence of surgical technology students; therefore, revising the curricula of surgical technology students at the BS level and paying attention to the principle of student-centeredness in the education process, along with conducting training courses on SDL principles, can improve students' clinical competence.

**Keywords:** Clinical Competence, Self-directed Learning, Operating Room, Students

## Introduction

Clinical competence is one of the requirements of nursing in clinical environments. Competency is an essential component of nursing care which plays an important role in the quality of services provided by nurses. Competence is a set of knowledge, skills, attitudes, values, and abilities that increase efficiency and effectiveness in professional work environments (1).

Evaluation of clinical competence is important not only to ensure the safety and quality of care but also to identify the areas that need improvement and determine the educational needs of nurses (2, 3). The assessment of the clinical competence of employees in all departments of hospitals is essential to ensure the quality and safety of care. Among hospital departments, the operating room



department is of great importance due to invasive procedures and the critical role of surgical nurses in the quality of services (4). The operating room is one of the most complex work environments in health care, which requires a high level of technology, knowledge, and competence in effective coordination and management. Consequently, it is necessary to strengthen the necessary knowledge and skills of students and operating room experts in the operating room environment (5).

Today, the operating room environment requires staff who can work independently at a competent level, while staff and managers express concern about the performance of new graduates. Therefore, the first work challenge, to ensure that students have high levels of competence, is presented when they are about to graduate (6). Graduates of operating room technology are important members of the health team who work in close contact with surgeons and anesthetists in order to provide patients with optimal care. This field is dependent on practical and clinical skills so that the first mistake in surgery can be the last one, causing life-altering injuries or even death (7, 8). One of the main current issues is the unfavorable clinical competence of nurses, especially in the operating room departments, which has caused problems in providing services. It is evident that nurses without the necessary skills can endanger the health of society. In a study conducted by Rashidi et al. on operating room technicians, they concluded that the clinical competence of most participants was not in favorable condition (5). Among the effective factors in clinical competence, we can refer to experience, environment, use of opportunities, motivation, theoretical knowledge, personal characteristics, and emotional intelligence (10).

Self-directed learning is another factor that can play a major role in creating clinical competence in doctors and nurses and is one of the main elements of problem-solving ability (9). The concept of self-directed learning, which originated from adult education and has received the attention of educational and organizational environments due to its advantages, is a necessary skill for education and work in the 21st century. Self-directed learning has a wide conceptual meaning ranging from self-taught learning, independent learning, non-traditional learning, open learning, cooperative learning, self-teaching, and self-regulating learning to self-planning learning (10). Among the characteristics of self-directed learning are self-control, self-management, as well as motivation for learning, and problem-solving, in order to achieve the best learning results (11). Therefore,

the concept of "lifelong learning" has been considered one of the keys to education in the 21st century, which requires implementation strategies. Furthermore, students expect that after graduation and in their professional life as therapists, they will learn self-directed learning by recognizing their weaknesses in knowledge and problem-solving. The achievement of these goals requires strengthening self-directed learning skills (12, 13). Therefore, self-directed learning is recognized as an essential learning ability.

Nonetheless, the level of self-directed learning ability varies from country to country. Nursing students in Italy and Nepal have their self-directed learning ability as high (14, 15), while nursing students in South Korea and the United Kingdom have evaluated their ability as average (16, 17). Among domestic studies, we can refer to the study by Sohrabi et al., which reported that nursing students were highly prepared for self-directed learning (18). Considering the concept of self-directed learning, especially the concepts of being independent, responsible, and goal-oriented, it is assumed that there is a positive relationship and correlation between this construct and clinical competence. Moreover, the literature review did not retrieve any study on the relationship between self-directed learning as a new strategy in medical education and the clinical competence of operating room students. The discipline of the operating room in almost all universities/faculties of medical sciences in the country is presented with a serious problem of shortage of faculty members as a result of the shortage of graduates from post-graduate studies (19). Therefore, self-directed learning as an effective strategy for students can help improve their skills and clinical competence. In light of the aforementioned issues, the present study aimed to determine the relationship between self-directed learning ability and clinical competence in final-year surgical technology students in East Azarbaijan universities.

## Materials & Methods

### Design and setting

This descriptive study was conducted based on a correlational cross-sectional design. The statistical population in this research were final-year surgical technology students in medical sciences universities in East Azarbaijan province (Tabriz University of Medical Sciences, Maragheh University of Medical Sciences, Tabriz Azad University, and Sarab Azad University).

This study was carried out from February 2020 to October 2022.

### **Participants and sampling**

The participants were selected via the census method. The surgical technology students who were willing to participate in the study and were studying in the seventh and eighth semesters entered the study. Partially completed questionnaires incompletely (less than 90% of the items) or those with similar answers were excluded from the study. Out of a total of 215 final-year surgical technology undergraduate students, 209 cases (response rate: 97.2%) participated in the present study. Two partially completed questionnaires were excluded, and finally, 207 cases (95.8%) constituted the final samples of this study. To implement this study, after approving the proposal and obtaining the code of ethics from the Medical Education Research Center of Tabriz University of Medical Sciences, Perceived Perioperative Competence scale and Self-Directed Learning Instrument (SDLI) were completed by the studied students after obtaining informed consent.

### **Tools/Instruments**

First part: The tool used to collect information in this research consisted of three parts. The first part of the questionnaire is related to the personal and social characteristics of the surgical technology students. Individual and social characteristics of students include age, gender, marital status, and grade point average.

The second part: The second instrument was The Self-Directed Learning Instrument (SDLI) developed by Su-Fen Cheng (2010), which consists of 20 items across the following four domains: learning motivation (items 1-6), planning and implementing (items 7-12), self-monitoring (items 13-16), and interpersonal communication (items 17-20). The answers to these questions are graded on a five-point Likert scale from completely disagree to completely agree. A score of 1 is assigned to completely disagree, and a score of 5 is assigned to completely agree. Therefore, the minimum score for the entire questionnaire will be 20, and the maximum score will be 100. According to the difference in the number of items in each dimension, the average scores obtained in each dimension were reported between 1 and 5.

The content and construct validity of this questionnaire were confirmed, and the reliability of the total scale was calculated, rendering a Cronbach's alpha coefficient of 0.916 for the entire questionnaire and 0.801, 0.861, and 0.785 for the mentioned dimensions, respectively. (20).

This questionnaire was prepared and used in Iran for the first time in the study by Ahanchian et al. (2015) using the method of translation and double translation. Moreover, its content validity was confirmed by subject and methodology experts, and its reliability was estimated by the internal consistency method rendering a Cronbach's alpha coefficient of 0.94 (11). In the current study, the reliability of the tool was obtained between 0.76 and 0.89 using Cronbach's alpha method.

The third part: The third tool includes the Perceived Perioperative Competence Scale, which has 33 items and five dimensions. The dimensions of this questionnaire include fundamental knowledge and skills (7 items), leadership (9 items), collegiality (7 items), Proficiency(4 items), and professional development (6 items). The answers to these questions are rated on a five-point Likert scale from never to always. A score of 1 is assigned to never, and a score of 5 is assigned to always. Therefore, the minimum score obtained for the entire questionnaire will be 33, and the maximum score will be 165. According to the difference in the number of items in each dimension, the average score obtained in each dimension is reported between 1 and 5.

Gillespie et al. (2012) obtained the validity of this tool by the content validity method and reported the reliability of the whole tool by calculating Cronbach's alpha coefficient for the whole questionnaire as 0.96(21). psychometric assessment of this questionnaire was performed in Iran for the first time in the study by Ajorpaz et al. (2017) and by calculating Cronbach's alpha coefficient of 0.86. In addition, its content validity was confirmed by 10 faculty members of the operating room departments of Kashan and Isfahan University of Medical Sciences (22). In the present study, the reliability of this tool was checked again using Cronbach's alpha coefficient, and it was estimated at 88%.

### **Data collection method**

Sampling was performed online. The questionnaire was designed in an online format. The questionnaire link was provided to the students along with the explanation letter about the research objectives and satisfaction in the messaging groups. After completion, the questionnaires were checked in terms of answering rate, and incomplete questionnaires were removed. All questionnaires were distributed and collected by a member of the research team.

### Data analysis

The collected data were analyzed in SPSS software (version 20). Descriptive statistics (frequency distribution, mean, standard deviation) were used to describe and categorize the data, and inferential statistics were used to test the hypothesis. Shapiro-Wilk and Kolmogorov-Smirnov tests were used to check the normal distribution of data. In order to determine the relationship of perceived clinical competence and its dimensions with self-directed learning and its dimensions, Kendall's Tau and Spearman tests were used. In all the tests used, the confidence level of 95% and the significance level of 0.05 were considered.

### Results

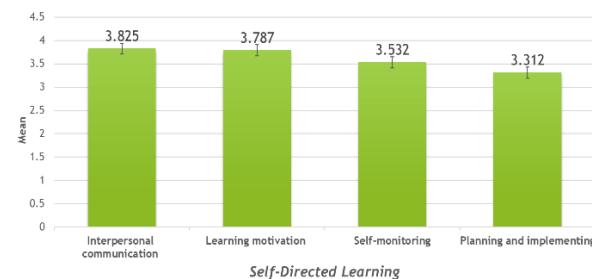
The mean age of the study subjects was  $22.98 \pm 1$  years. In terms of gender, 109 (52.7%) cases were female, and 98 (47.3%) subjects were male. Moreover, 111 (53.6%) of them were eighth-semester students, and 96 (46.4%) cases were seventh-semester students. Among the studied subjects, 77 (37.2%) cases were surgical technology students of Tabriz University of Medical Sciences(TUMS), 57 (27.5%) were students of Maragheh University of Medical Sciences(MUMC), 36 (17.4%) were students of Azad University of Tabriz(AUT), and 37 ( 17.9%) were students of Azad University of Sarab(AUS) (Table 1).

**Table 1.** Demographic characteristics of participants

Qualitative variables		Frequency	Percentage
Gender	Male	98	47.3
	Female	109	52.7
Semester	7	96	46.4
	8	111	53.6
Interest in the major	Yes	165	79.7
	No	42	20.3
University	TUMS	77	37.2
	MUMS	57	27.5
	AUS	37	17.9
	AUT	36	17.4
Quantitative variables		Mean	SD
Age		22.49	1.51
Grade average		16.87	1.12

Findings related to the self-directed learning ability in the final year surgical technology undergraduate students demonstrated that the total mean score of self-directed learning was equal to  $73.87 \pm 8.9$  (range 20 to 100), which is at the average level. As displayed in Figure 1, among the different dimensions of self-directed learning ability, the dimensions of interpersonal communication ( $3.825 \pm 0.473$ ) and motivation to learn ( $3.787 \pm 0.50$ ) had the highest values, respectively, while the dimension of

planning and implementation had the lowest value ( $3.312 \pm 0.48$ ). The findings related to the perceived clinical competence in the final year undergraduate surgical technology students showed that the total mean score of clinical competence was equal to  $107.25 \pm 17.38$  (range 33 to 165), which is an average level. As illustrated in Figure 2, among the various dimensions of perceived clinical competence, the dimensions of collegiality ( $3.401 \pm 0.60$ ) and fundamental knowledge and skills ( $3.257 \pm 0.638$ ) had the highest values, respectively, while the dimension of leadership had the lowest value ( $3.138 \pm 0.537$ ).



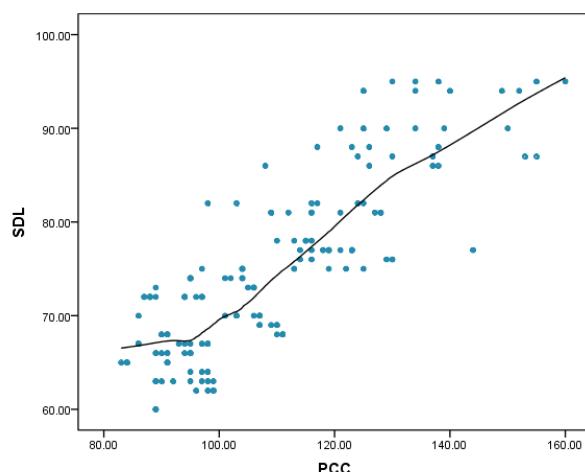
**Figure 1.** Mean of different dimensions of self-directed learning insurgical technology students



**Figure 2.** Mean of different dimensions of clinical competence in surgical technology students

Since the Kolmogorov-Smirnov and Shapiro Wilk tests illustrated that the investigated variables did not have a normal distribution ( $P < 0.05$ ), to further investigate the relationship between the two variables of self-directed learning ability and clinical competence, Spearman's non-parametric correlation coefficients and Kendall's tau were used. Kendall's Tau and Spearman correlation coefficients were 0.601 and 0.794, respectively. These indicators indicated that the two variables had a significant positive relationship with each other; that is to say, an elevation in self-directed learning ability in surgical technology students leads to an increase in their clinical competence. Both correlation coefficient indices point to a significant relationship and the  $P$ -value values of both are less than 0.001. In order to check the

relationship between the two variables, we drew the scatter plot of the two variables and fitted the non-parametric Loess correlation curve. As illustrated, with an elevation in self-directed learning ability, the clinical competence of surgical technology students increases almost linearly (Figure 3).



**Figure 3.** Scatter plot related to the relationship between self-directed learning (SDL) and perceived clinical competence (PCC) in surgical technology students

## Discussion

Based on the results of this study, the status of self-directed learning ability was evaluated at an average level. Previous studies indicate the difference in the level of readiness for self-directed learning among students in different studies. This variety seems logical due to the fact that the level of self-directed learning ability is a context-oriented issue and is affected by various environmental, cultural, social, and even economic factors. For example, in the study by Naranja Sani et al., which was conducted on graduate students of Tehran University, the students under study had a high level of self-directed learning ability (23). The study by Visiers-Jiménez et al., which was performed in several European countries, showed that nursing students had a high level of readiness for self-directed learning (13). In a similar vein, in the study by Örs in Turkey, nursing and midwifery students were relatively well prepared for self-directed learning (24). While the studies by Bahrami et al. in Iran and Lee et al. in South Korea yielded similar results, and nursing students were moderately prepared for self-directed learning (16, 25). The results of the present study suggested that among different dimensions of self-directed learning, surgical technology students were the most prepared in the dimensions of

interpersonal communication and learning motivation, respectively.

In line with the results of the present research, in the study by Bahrami et al., the highest mean among the dimensions of self-directed learning in nursing students was related to interpersonal communication (25). Interpersonal communication skills are a person's ability to communicate with others in order to fulfill their needs, desires, rights, and obligations in an acceptable manner without harming their needs and desires. The components of interpersonal communication skills based on the theme analysis include interaction and willingness to work in a group, the ability to communicate correctly, and group decision-making for problem-solving and learning. Although self-directed learners are autonomous, they need to interact with classmates and learners in order to change the existing information (26). According to PillingCormick et al., the self-directed learning process revolves around the teacher and the student. In this model, the teacher and the student do not act independently in the learning process, and the balance between the teacher, student, and classmates is recognized as learning processes and learning facilitators. In explaining this finding, it can be stated that if learners do not have proper interpersonal communication skills, they will be vulnerable in many aspects of life and education.

Effective interpersonal communication transfers emotions, opinions, thoughts, and ideas between people; moreover, it guarantees the growth of the individual and society (27). In the study by Cheng et al. and Ahanchian et al., among the dimensions of self-directed learning, students had the highest level of readiness and ability in the dimension of learning motivation (11, 28), while in the present study, this dimension ranked second. Motivation is the driving force behind many activities, including learning. In other words, there is a motivation behind any behavior. In fact, motivation is what gives energy to the learner and guides his activities. Learning motivation has been described as an important factor in effective nursing practice. Moreover, motivation plays a significant role in explaining behaviors, predicting the effects of actions, and guiding behavior in order to achieve goals (29). In their study, Hassankhani et al. observed that increasing learning motivation could be related to improving self-efficacy in professional competence in nursing students (30). Based on the results of this study, the perceived clinical competence in the final-year operating room students was at an average level. In a study conducted by Naderi Beh Rad et al.,

which examined the clinical competence of the operating room students of Hamadan University of Medical Sciences, it was observed that they had a high level of clinical competence (31).

In a similar vein, in the study by Imeni et al., the clinical competence of surgical technology students was evaluated at a good level (32). The results of the study by Atmani et al., which was conducted on nursing students of Urmia University of Medical Sciences, showed that the average overall score of nurses' clinical competence was at a high level (33). This discrepancy in results can be ascribed to differences in the instrument used for measuring clinical competence in operating room students. Other reasons can be differences in research environments and the occupational nature of the group under investigation (i.e., nursing students compared to operating room students). Furthermore, competency is a complex and ambiguous concept that encompasses a wide range of preparations in different cognitive, communication, value, and psychomotor dimensions (34). Therefore, the difference in the conceptualization of competency in various studies can lead to different results. The study by Khashei et al., which was conducted on nursing students of Islamic Azad Universities in Isfahan province, yielded similar results, and nursing students had average clinical competence (35). Evaluation of clinical competence is necessary to ensure the achievement of minimum professional standards and readiness to play a role (34).

Considering that universities are obliged to train graduates with sufficient ability to prevent, treat and promote the health of society, it seems that the curricula of medical sciences universities in surgical technology discipline do not meet the expected goals to access the desired clinical competence for providing care services among the students of this field. The results of the present study showed that surgical technology students had the highest level of competence among the different dimensions of clinical competence, respectively, in the dimension of interaction with colleagues and basic knowledge and skills. In the study by Naderi Beh Rad et al. (31) and Imeni et al. (32), surgical technology students had the highest level of competence in the dimension of critical thinking, which is not in line with the results of the present study. In agreement with the results of the present research, in the study of Ilona Āabele et al. in Latvia, the highest mean among the dimensions of clinical competence in operating room nurses was related to interaction with colleagues. Also 52, in the study of Vaeqi et al., the competence of nurses in the

dimension of interpersonal communication was more than in other dimensions (36).

In their research, Wonz and Bargiel came to the conclusion that nowadays, in order to acquire professional and clinical qualifications, in addition to practical skills and knowledge, nurses need the ability to communicate and interact effectively with colleagues, solve problems, make appropriate decisions, and make correct judgments in different situations (37). According to the results of the present study, it can be concluded that the final year operating room students have achieved good qualifications in this field (interaction with colleagues). In the operating room, as a unit where coordination, speed of action, and quality of services assume critical importance, special attention should be devoted to teamwork and effective communication with colleagues. Failure in communication and lack of teamwork in the operating room lead to problems that result in jeopardizing patient safety, interrupting routine work, and increasing tension (38). The study of behaviors in the operating room shows that failure in non-technical skills, such as interaction with colleagues in the operating room, is not rare and can cause adverse consequences and heavy losses (39). The present study is the first research in the field of assessing the relationship between self-directed learning ability and perceived clinical competence in operating room students. The research results pointed to a significant direct relationship between these two variables. This means that an elevation in self-directed learning ability increases the clinical competence of surgical technology students.

Consistent with the findings of the present research, the results of the study by Yang et al. (40) in China, which was conducted to investigate nursing students' readiness for self-directed learning and its relationship with clinical competence, showed that there is a strong significant relationship between these two variables. Along the same lines, the study by Vasli et al. (2022) showed that self-directed learning in nursing students had a significant positive relationship with their clinical competence (41). In another study in South Korea, a significant positive relationship was observed between self-directed learning and clinical competence (42). In 2014, Jho et al. carried out a study to assess the effect of self-directed learning ability and metacognition on the clinical competence of nursing students, and the results indicated a significant direct relationship between the two variables of self-directed learning ability and clinical competence (43).

## Conclusion

The results of the present study pointed out a significant relationship between self-directed learning ability and perceived clinical competence; moreover, self-directed learning predicted the clinical competence of surgical technology students. Considering the fact that the goal of any educational system is to train individuals who are specialized and equipped with up-to-date knowledge of their profession, it is necessary to take the necessary measures to solve small and minor problems as well. Reviewing the curricula of surgical technology students at the BS level and paying attention to the principle of student-centeredness in the learning process, in addition to holding short and long-term training courses on the principles of self-directed learning, can help improve students' clinical competence.

## Ethical considerations

This Research was supported by Tabriz Medical Education Research Center (Grant numbers: 1400-05-11-66887). And the project's compliance with the ethical code was approved by the Ethics Committee of Tabriz University of Medical Sciences (IR.TBZMED.REC.1400.388).

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## Disclosure

The authors declare that they have no conflict of interest.

## Author contributions

O. Zadi Akhuleh(first author): Generating research ideas, writing articles, project management, revising the text. M. Lotfi: writing the article, revising and correcting the text. Z. Sheikhalipour and M. Behshid: generating research ideas, revising the text. V. Rahmani(corresponding author): writing the article, collecting data. MT. Khodayari: Data analysis.

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