

Effect of Leadership Skills Training Program on Self-Concept among Health Technical Institute Nursing Students

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Abstract:

Background: The development of leadership knowledge is critical in nursing education, as it equips future nurses with essential skills necessary for effective healthcare delivery.

Aim: The present study aimed to explore the effectiveness of a leadership skills training program on self-concept among health technical institute nursing students.

Methods: A quasi-experimental (pre-post test and follow-up) study design was used to conduct the study at the Health Technical Nursing Institute, Port Said, affiliated with the Ministry of Health in Port Said City. The study subjects consisted of all student nurses, 155 in the second academic year 2023/2024. Data were collected using four tools: the Knowledge of Leadership Questionnaire, Leadership Skills Questionnaire, Leadership Behaviors Questionnaire, and Self-Concept Scale.

Results: The pre- and post-test scores of leadership skills and follow-up after implementation of the educational program significantly differ among students' nurses ($74.9\% \pm 12.2$, $80.4\% \pm 10.4$, and $85.6\% \pm 9.1$). Also, in the post-program stage, it was found that the strongest positive correlation ($r = 0.321$, $p < 0.001$) was between the self-concept and leadership behaviors. Additionally, leadership skills are positively correlated with knowledge of leadership ($r = 0.184$, $p = 0.030$).

Conclusion: The findings demonstrated that the leadership skills training program significantly improved nursing students' leadership knowledge, skills, behaviors, and self-concept. Significant improvements were observed from the pre-program to the post-program and follow-up phases, with most outcomes showing sustained or further improvement during follow-up. Moreover, positive correlations were identified between self-concept and leadership behaviors and skills, indicating that strengthening leadership competencies may contribute to enhancing nursing students' self-concept and professional readiness.

Recommendation: The study recommended expanding leadership training across nursing institutions with structured follow-up, including self-concept development in curricula via reflective and mentoring strategies; promoting early leadership courses to increase engagement and preparation and use predictive insights to tailor training toward knowledge, behavior, and self-concept development.

Trial Registration Number (TRN):

The study protocol was approved by the Research Ethics Committee of the Faculty of Nursing, Port Said University (code number: NUR (11/7/2021)) (4).

Keywords: Leadership skills, Nursing students, Self-concept.

Background

Leadership skills are considered a significant component of the function of qualified nurses and should be viewed as central to intern nursing students' learning development. Moreover, leadership skills are essential for patient and organizational outcomes. So, nursing colleges and educators play a significant role in enhancing leadership skills as well as experience, and nurse leaders can create healthcare environments that have high quality and safety for patients. So, management systems in healthcare organizations must motivate and support clinical leaders who can recognize both individual and clinical requirements and address current issues in their field ⁽¹⁾.

Leadership is defined as the nexus between the human resources of an organization and its plans and visions. It serves as the crucible through which administrative concepts and strategies are developed and interact, fostering positive forces within the organization while mitigating negative aspects. Effective leadership is crucial for guiding teams towards achieving organizational goals and enhancing decision-making processes, influencing the overall effectiveness of the organization ⁽²⁾.

Leadership skills encompass a set of competencies that enable effective teamwork, responsibility acceptance, problem-solving, goal-setting, and inspiring others ⁽³⁾. They are crucial for personal development and social competence, particularly in preparing students for active participation in society. Erviana et al. highlight that effective leadership encompasses skills such as strategic planning, decision-making, and resource management, all of which are enhanced through participative leadership and open communication. Additionally, effective communication fosters teamwork and problem-solving abilities, contributing to improved managerial skills. Thus, leadership training that focuses on these areas is crucial for developing effective educational managers, leading to better performance and effectiveness within educational institutions ⁽⁴⁾.

The nursing students should be exposed to motivational talks; they should also undergo leadership skills training where they could build self-confidence, independence and build their self-concept, identity, and team spirit to train them to interact with members of society, which leads to success in life. Academic counselors should organize guidance programs such as workshops, symposia, and public lectures periodically for high nursing school students to equip them with the needed skills to enhance their self-concept ^(5,6).

The self-concept is the notion of self that influences the perception of a person's characteristics, actions, and feelings. Understanding who we are helps us realize our strengths, how we decide, or why we feel sad. How people see themselves is also related to other people's views. Not only are we learning to accept who we indeed are, but we are also learning to live with other people. It also refers to the perceptions that the individual has about his own self, which are based on his experiences with others, interaction with the environment, and the attributions that they make of his own behavior ^(6,7).

Self-concept is characterized by its multifaceted nature and hierarchical organization. There are several dimensions of self-concept and aspects that support and create self-concept, namely social, physical, academic, self, family, moral, and psychological aspects. Finally, at the highest level of the hierarchy, individuals develop a global self-concept ⁽⁸⁾. In addition, Montoya Londoño et al. stated that the self-concept may be positive or negative. Kodp stated that there are several factors affecting the person's self-concept, like family and school affecting it.

The 21st century urges schools and colleges to prepare the next generation of teachers to have leadership skills and to foster these skills among their students in the classroom ^(7,5,9), while leadership skills among nurses don't receive adequate attention in nursing curricula and in-service training. Also, essential skills of nurses and how the nursing curriculum supports building leadership skills for nursing students ⁽¹⁰⁾. So, this study aims to implement a leadership skills training program on self-concept among technical health institute nursing students.

Study Aim

This study aims to explore the effectiveness of a leadership skills training program on self-concept among health technical institute nursing students affiliated with the Ministry of Health in Port Said city.

Methods

Study design: A quasi-experimental (pre-posttest and follow-up).

Study setting: The present study was conducted at a health technical nursing institute affiliated with the Ministry of Health in Port Said City.

Study subjects: All student nurses, 155 in the second academic year 2023/2024; fifteen of them were

included in the pilot study and excluded from the total number of students.

Data collection tools

Tool 1: Knowledge of Leadership Questionnaire (KLQ): It was developed by the researcher, based on related literature such as 11, 12, 13, 14, 15, 16, 17, and 18, to assess the knowledge of student nurses regarding leadership knowledge through program phases. As definition, types, characteristics, skills, The questionnaire was designed in Arabic by the researcher. It was composed of 50 questions; 35 out of them were MCQ questions, and the other 15 questions were true and false. The correct answer scored one, and the incorrect scored zero; the level of leadership knowledge was considered satisfied if the level scored $\geq 60\%$ and not satisfied if the level scored $\leq 60\%$.

Tool 2: Leadership skills questionnaire (LSQ): It was adopted from El-Blady⁽¹⁹⁾ in the Arabic language to assess the levels of leadership skills among health technical institute nursing students. It consists of 31 items grouped in five categories as follows: - Planning skill (from 1 to 5), communication skill (from 6 to 14), problem-solving skill (from 15 to 19), decision-making skill (from 20 to 26), and teamwork skill (from 27 to 31). The response of participants was collected along a three-point Likert scale: high, moderate, and low. The data was classified (mean score), which indicates the extent of the student's leadership skill possession in each axis, and was also classified as follows: High from 2.05 to 3, moderate from 1.57 to 2.04, and low from 1 to 1.56).

Tool 3: Leadership Behaviors Questionnaire (LBQ): It was developed by the researcher in the Arabic language based on (20, 21, 22, 23, 24, 25, and 26) to assess the levels of leadership behaviors among health technical institute nursing students. It consists of 35 items grouped into eight categories: communication with peers' skill (7 items), initiative skill (7 items), participation skill (6 items), time management skill (2 items), distribution of roles skill (2 items), problem-solving skill (3 items), wain trust of others skill (4 items), and self-confidence skill (4 items). The responses of participants were collected along a five-point Likert scale from always, often, usually, rarely, and never (5-1); respectively, for each statement. For statistical purposes, the five-point Likert scale merged to a three-point scale to become always, usually, and never. These scores, of each extent of the student's skill possession in each axis, were computed as the mean scores, which indicate "as usual," "sometimes," and "never." Accordingly, the estimates then become as follows: less than or equal to 1.4 indicated a low level; greater than 1.4 and lower than 2.02 indicated a moderate level. greater than or equal to (2.02) indicated a high level.

Tool 4: Self-concept Scale (SCS): It was adopted from Abdel-Azeez ⁽²⁷⁾ in the Arabic language to determine the level of self-concept among student nurses, and it contains 46 items under nine dimensions: general self-concept (7 items), self-concept of emotional stability (7 items), religious self-concept (4 items), relationships with parents (5 items), the relationship with the opposite sex (4 items), relationship with the same sex (5 items), academic self-concept (4 items), problem solving (5 items), and physical appearance (5 items).

The total items of this scale contain 29 items in the positive direction and 17 items as negative statements. [No; (2, 5, 8, 10, 14, 15, 19, 20, 24, 25, 27, 30, 36, 37, 39, 40, 45)]. Each statement was rated on a three-point scale, and this score was reversed. Scores for the total items will be summed to determine the levels of the self-concept scale. The scores ranged from 46 to 138. From statistical analysis, considering the lowest level with the cut-off point $< 60\%$ (scores between 46 and 101 (0% to $< 60\%$) are considered low self-concept) and the highest level with the cut-off point $\geq 60\%$ (scores between 102 and 138 (60% or higher) are considered high self-concept.

In addition to personal and academic data sheets, including.

Tool validity and reliability

The face and content validity of the study instruments were evaluated by a panel of seven experts in nursing administration and psychiatric nursing. The panel included three administration specialists from the Mansoura Faculty of Nursing, one from Ain Shams Faculty of Nursing, and three psychiatric nursing specialists from Port Said Faculty of Nursing. They assessed the tools for clarity, relevance, comprehensiveness, appropriateness, and ease of application. Based on their feedback, minor modifications, mainly adjustments in translation, were made over a two-month period. All experts confirmed that the tools were valid and aligned with the study's objectives.

Following translation by bilingual (Arabic-English) experts, the developed training program and booklet were re-evaluated by the jury. They agreed that the materials were clear, comprehensive, and suitable for the study purpose. Internal consistency was confirmed with high Cronbach's alpha values: 0.902

for the Self-concept Scale, 0.897 for the Leadership Behaviors Questionnaire, 0.899 for the Leadership Skills Questionnaire, and 0.904 for the Leadership Knowledge Questionnaire.

Pilot Study

A pilot study was carried out on 15 nursing students (10% of the sample) one week prior to data collection. The pilot tested feasibility, applicability, required completion time, and possible obstacles. Based on its findings, minor adjustments were made to the tools. Completion of the student questionnaire required approximately 25–30 minutes.

Ethical considerations

Before conducting the study, it was taking the agreement of the ethical committee from the Faculty of Nursing, Port Said University, with **Code NUR (5/4/2026) (60)**.

Verbal consent was obtained from all the participants before collecting any data. Tools of data collection didn't touch on religious, cultural, or moral issues and respect human rights. Nursing students have been told that they can choose to participate in the study or not and have the right to withdraw from the study at any time without giving any reason. An explanation of the study aims to be simple for the nursing students and simply is done. Also, the researcher assured the respondents about the anonymity of their answers and that the information was used for scientific research only and was treated as confidential.

Fieldwork

A. The pre-intervention phase:

This phase took about three months from December 2023 to February 2024, and it was done by the researcher. In principle, obtaining an official agreement from the dean of the health technical nursing institute was done by the researcher to explain the objectives of the study and to gain their cooperation. The researcher started data collection by introducing herself to the subjects and explaining the aim of this study. Assessment of the student nurse's knowledge about leadership skills was done by using a leadership skills knowledge questionnaire; six days per week were specified for data collection. Every student nurse was asked to fill in the designed questionnaire sheet by herself in the presence of the researcher to answer any questions that the student might have about the questionnaire.

The training program was designed with theoretical and practical parts, in which each one of them has a set of specific objectives. The schedule of training sessions and the handout were prepared. A knowledge test (pre-test and post-test) was developed. A questionnaire was adopted by the researcher to explore the effectiveness of the leadership skills training program on self-concept among health technical institute nursing students at the beginning and at the end of the training program implementation.

The educational booklet was developed by the researchers based on a literature review and revised related resource materials. It contained different sections and addresses the main following leadership skills: Such as planning, communication with peers, problem solving, decision making, teamwork, and leadership behaviors skills: Such as initiative; empathy; participation; managing the position; distribution of roles; problem-solving; winning the trust of others; and self-confidence. Schedule and training sessions were developed.

B. The Intervention Phase:

This phase took a period of six weeks from the beginning (March to the middle of April 2024). Meetings and discussions were held by the researcher and student to let them be aware of the purpose of the nature of the training strategy, as well as to get better cooperation during the implementation phase of the training program. The training program was carried out in the lecture room at the health technical institute on a small group basis. This room was prepared specifically by the health technical institute for continuing lectures and consisted of 140 chairs.

The study subjects were divided into six groups. Each group received seven sessions (one session on a fixed day for each group per week / for 6 weeks). Except the first day included 2 sessions, as clarified in the following table. The time of each session takes about one and a half to two and a half hours. The total number of sessions was 7 sessions.

At the beginning of the first session, the acquaintance between the researcher and the studied student nurse was made. Ask the participants about their expectations about the program and an orientation to the training program and its importance. The training was implemented in seven sessions, represented as follows: the first session was about the introduction to the program, the importance of training, and the general objective of the training; the second session was about the definition of leadership, integrating

leadership, management, and leadership styles.

The third session was about the completion of leadership styles; the fourth session was about characteristics of a successful leader, types of leadership, and the importance of developing leadership skills; the fifth and sixth sessions were about leadership skills with examples and situations; and finally, the seventh session was about behaviors skills with examples and situations. In theoretical sessions, the researcher started with a summary of the previous session, followed by the objectives of the new one, which were explained in the Arabic language and simple English terms that suit the level of the student nurse's education. All over the session, students were always motivated to share in these sessions either externally (by rewarding them by giving them paper notes and pens and offering tea breaks) or internally (by encouraging them to share their ideas and experiences). And internally by positive comments and satisfying their needs for knowing by answering their questions and expressing their emotions to enhance students' learning.

The researcher utilized a different method of teaching, as lecture, brainstorming, and group discussion were used to enhance interest and promote the active involvement of nurses. In addition to the examples and illustrations provided by the researcher to assure understanding, the subjects also provided additional examples from their own personal and professional experiences. Teaching materials were used, such as a laptop, colored posters, and a handbook of the designed training program contents illustrated by pictures by the researcher. That covered theoretical and practical information. The lecture was given in a clear, simple manner using attractive PowerPoint presentations prepared by the researcher in a simplified and meaningful way.

In the practical sessions, the researcher mainly used role-play and group discussion. Teaching materials were used, such as a laptop (for educational videos); colored posters; and handout papers about simulated situations and scenarios, which were distributed to all studied students. At the end of each session, students were asked questions about what was presented at the session to assess their understanding. This was followed by a summarization of the main points discussed in each session.

Finally, the researcher asked for feedback starting with positive points and then negative ones, and any missing points or mistakes were corrected immediately to prevent other students from falling into the same mistakes and to review any questions on the content or key points about the current session.

B. The post-intervention (evaluation phase; posttest):

This phase took six months (from the middle of April to the middle of October 2024). In this phase, the effect of the training program on students' nursing was evaluated; it was carried out immediately after the training program implementation.

C. Follow up:

The follow-up phase of the training used the same tools that were used before the training program implementation, including the knowledge questionnaire, which was distributed to nursing students for testing their immediate gain in the knowledge and retention of knowledge at the follow-up phase and comparing it with students' nursing knowledge before implementing the training program to reveal the change in students' nursing knowledge of leadership skills.

Statistical Analysis of Data

All statistical analyses were performed using SPSS for Windows version 20.0 (SPSS, Chicago, IL). Continuous data were normally distributed and were expressed in mean $\pm$ standard deviation (SD). Categorical data were expressed in number and percentage. A chi-square test (or Fisher's exact test when applicable) was used for comparison of variables with categorical data. A correlation coefficient test was used to test for correlations between two variables with continuous data. Linear regression analysis was used to predict the strongest variables that can affect the self-concept scale. The reliability (internal consistency) test for the questionnaires used in the study was calculated. Statistical significance was set at $p < 0.05$.

Results

Table (1): Personal characteristics of the study subjects: shows distribution of personal characteristics of the studied nursing students. As a regard to age group, the table shows that 66.4% of nursing students were in the age group of 20 years old. Additionally, marital status: it was noticed that the majority, 97.9%, of nursing students were single. To the attendees of training courses, it was noticed that 22.1% of nursing students attended training courses about leadership.

Table (2): Total mean score of leadership knowledge dimensions through program phases among

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studied nursing students (n=140). As evidenced by the table, in the pre-training phase, the total theoretical part was a mean percentage of $51.1\% \pm 2.1$, whereas it increased after training and follow-up phases to $64.3\% \pm 2.6$ and $70.0\% \pm 2.1$, respectively. In addition, in the pre-training phase, total knowledge-related practice skills were a mean percentage of $59.6\% \pm 5.3$, while it increased after training and follow-up phases to be $65.9\% \pm 5.5$ and $72.5\% \pm 4.9$, respectively. Finally, in the pre-training phase, the total mean percentage of leadership knowledge dimensions was a mean percentage of $60.9\% \pm 6.8$. Whereas it increased after training and follow-up phases ($65.8\% \pm 7.9$; $73.2\% \pm 6.7$). There were statistically significant differences between students' knowledge about leadership in pre, post, and follow-up at $P < 0.001^{**}$.

Table (3): Total mean score of leadership skills domains through program phases among studied students' nursing (n=140). As evidenced by the table, in the pre-training phase, the total score of leadership skills was a mean percentage of $75.6\% \pm 12.2$. Whereas it increased after training to be $79.6\% \pm 10.4$, during the follow-up phase, this percentage continuously increased to be $82.3\% \pm 9.1$. There were statistically significant differences between the studied students' nurses' leadership skills domains in pre, post, and follow-up at $P < 0.001^{**}$.

Table (4): Total mean score of leadership behaviors dimensions through program phases among studied students' nursing (n=140). As reflected in the table, in the pre-training phase, the total score of leadership behaviors skills was a mean percentage of $78.8\% \pm 7.9$. Whereas the total score of leadership behaviors and skills increased after training to be $85.1\% \pm 5.9$. During the follow-up phases, this percentage continues to increase to $91.1\% \pm 3.1$. There were statistically significant differences between the studied students' and nurses' leadership behaviors and skills in pre, post, and follow-up at $P < 0.001^{**}$.

Table (5) Total mean score of self-concept domains through program phases among studied student nurses: summaries of mean scores of self-concept domains and total score through program phases among the studied student nurses. As reflected in the table, in the pre-program phase, the total score of self-concept domains was a mean percentage of $67.3\% \pm 20.7$. Whereas the total score of self-concept domains increased post-program to be $81.7\% \pm 10.6$. During the follow-up phases, this percentage decreased to $80.7\% \pm 11.9$, but it was still higher than the pre-training scores. There were statistically significant differences between studied students' and nurses' self-concept domains in pre, post, and follow-up at $P < 0.001^{**}$.

Table (6) Correlation between self-concept, leadership behaviors, leadership skills, and knowledge of leadership: reflects correlation between self-concept, leadership behaviors, leadership skills, and knowledge of leadership. As shown in the table, in the post-program stage, it was found that the strongest positive correlation ($r = 0.321$, $p < 0.001$) was between the self-concept and leadership behaviors. Additionally, leadership skills are positively correlated with knowledge of leadership ($r = 0.184$, $p = 0.030$). Also, in the follow-up stage, it was found that self-concept significantly correlates with leadership behaviors ($r = 0.424$, $p < 0.001$) and leadership skills ($r = 0.259$, $p = 0.002$). So, in the follow-up stage, there are stronger correlations compared to the post-program stage.

Table (7): Linear regression on factors affecting the self-concept shows linear regression on factors affecting the self-concept. As shown in the table, in the post-program stage it was found that leadership behaviors ($B = 0.157$, $P = 0.031$) and leadership skills ($B = 0.194$, $P = 0.046$) significantly predict self-concept. Moreover, knowledge of leadership ($B = 0.160$, $p = 0.037$) also plays a role but has a slightly lower predictive value. Concerning the follow-up stage, it was found that leadership behaviors ($B = 0.914$, $P < 0.001$) become the strongest predictor of self-concept. Furthermore, leadership skills ($B = 0.247$, $P = 0.023$) and knowledge of leadership ($B = 0.189$, $P = 0.021$) remain significant.

Table (8) Linear regression on factors affecting the leadership behaviors, shows linear regression on factors affecting the leadership behaviors. As reflected in the table, in the post-program stage it was found that knowledge of leadership ($B = 0.320$, $P = < 0.001$) was the strongest predictor of leadership behaviors. Moreover, self-concept ($B = 0.157$, $P = 0.031$) and leadership skills ($B = 0.244$, $P = 0.002$) were also significant contributors. Regarding the follow-up stage, it was found that knowledge of leadership ($B = 0.389$, $P < 0.001$) was the strongest predictor. Furthermore, leadership skills ($B = 0.333$, $P < 0.001$) and self-concept ($B = 0.914$, $P < 0.001$) also contribute to the strongest predictor of leadership behaviors.

Table (9): Linear regression on factors affecting the leadership skills: show linear regression on factors affecting the leadership skills. As reflected in the table, in the post-program stage it was found that knowledge of leadership ($B = 0.555$, $P = < 0.001$) was the highest predictive value. Also, leadership behaviors ($B = 0.244$, $P = 0.002$) and self-concept ($B = 0.194$, $P = 0.046$) were also significant predictors. Also, in the follow-up stage, it was found that knowledge of leadership ($B = 0.702$, $P < 0.001$) and leadership behaviors ($B = 0.333$, $P < 0.001$) were the strongest predictor. Furthermore, self-concept ($B = 0.247$, $P = 0.023$) continues to

contribute.

Table (10): Linear regression on factors affecting leadership knowledge: show linear regression on factors affecting leadership knowledge. As reflected in the table, in the post-program stage it was found that leadership behaviors ($B = 0.320$, $P < 0.001$) and leadership skills ($B = 0.555$, $P < 0.001$) were strong predictors. Additionally, self-concept ($B = 0.160$, $P = 0.037$) played a smaller but significant role. Also, in the follow-up stage, it was found that leadership skills ($B = 0.702$, $P < 0.001$) and leadership behaviors ($B = 0.389$, $P < 0.001$) remained critical predictors. Meanwhile, self-concept (B

$= 0.914$, $P < 0.001$) became more significant over time.

Table 1. Distribution of personal characteristics of the studied nursing students (n=140)		
	N	%
Age (years)		
19	44	31.4
20	93	66.4
21	3	2.1
Mean $\pm$ SD	19.7 $\pm$ 0.5	
Marital Status		
Single	137	97.9
Married	3	2.1
Training Courses about leadership		
No	109	77.9
Yes	31	22.1

Table 2. Total mean score of leadership knowledge dimensions through program phases among studied nursing students (n=140).								
Leadership knowledge dimension.	Pre -program		Post program		Follow - up		Significance test 1	Significance test 2
	Mean	Mean % $\pm$ SD	Mean	Mean % $\pm$ SD	Mean	Mean % $\pm$ SD		
							Pre / post	Pre follow-up /
1) Theoretical part:								
1- Management part	1.8	45.0% $\pm$ 0.9	3.8	55.6% $\pm$ 1.8	4.2	60.0% $\pm$ 1.8	T=11.758, P<0.001**	T=14.110, P<0.001**
2- Leadership part	2.8	56.0% $\pm$ 1.3	5.5	61.2% $\pm$ 2.3	6.4	64.0% $\pm$ 1.9	T=12.092, P<0.001**	T=18.502, P<0.001**
Total theoretical part (Mean $\pm$ SD) ^s	4.6	51.1% $\pm$ 2.1	9.2	64.3% $\pm$ 2.6	10.5	70.0% $\pm$ 2.1	T=16.285, P<0.001**	T=23.506, P<0.001**
2) Practical part:								
1- Communication skills	9.7	59.5% $\pm$ 3.3	12.6	68.5% $\pm$ 2.9	15.7	68.0% $\pm$ 3.7	T=7.810, P<0.001**	T=14.319, P<0.001**
2- Problem solving skills	1.8	56.3% $\pm$ 0.7	2.4	54.5% $\pm$ 1.0	3.0	68.2% $\pm$ 0.7	T=5.816, P<0.001**	T=14.342, P<0.001**

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3- Decision-making skills	1.7	51.5% ±0.8	2.3	56.1% ±0.9	±3.1	72.1% ±0.6	T=5.895, P<0.001**	T=16.565, P<0.001**
4- Empathy skills	0.5	55.6% ±0.2	0.8	66.7% ±0.2	±0.8	66.7% ±0.2	T=12.549, P<0.001**	T=12.549, P<0.001**
5- Self-confidence skills	1.0	55.6% ±0.4	1.2	54.5% ±0.5	±1.5	65.2% ±0.4	T=3.695, P<0.001**	T=10.458, P<0.001**
6- Initiative skills	1.4	50.0% ±0.7	1.8	60.0% ±0.6	±2.2	68.8% ±0.5	T=5.133, P<0.001**	T=11.003, P<0.001**
Total knowledge related practice skills (Mean ±SD)s	16.1	59.6% ±5.3	21.1	65.9% ±5.5	±26.1	72.5% ±4.9	T=7.745, P<0.001**	T=16.392, P<0.001**
Total mean score of leadership knowledge dimensions	20.7	60.9% ±6.8	30.3	65.8% ±7.9	±36.6	73.2% ±6.7	T=10.897, P<0.001**	T=19.707, P<0.001**

#: reverse scoring, \$: student's t-test, significance 1: pre / post intervention (chi-square / Fisher's exact test), significance 2: pre / follow-up (chi-square / Fisher's exact test)

Table 3. Total mean score of leadership skills domains through program phases among studied nursing students (n=140).

Leadership skills domains.	Pre – program		Post – program		Follow – up		Significance test 1	Significance test 2
	Mean	Mean % ±SD	Mean	Mean % ±SD	Mean	Mean % ±SD	Pre / post	Pre / follow-up
Leadership skills domains								
1- Planning skill	12.1	71.2% ± 2.3	12.9	86.0% ±2.4	13.7	80.6% ±1.8	T=2.847, P=0.005*	T=6.482, P<0.001**
2- Communication skill	22.7	75.6% ± 3.4	24.0	88.9% ±3.6	25.3	84.3% ±2.2	T=3.106, P=0.002*	T=7.596, P<0.001**
3- Problem solving skill	12.1	71.1% ± 2.6	13.1	87.3% ±2.5	14.0	82.4% ±1.5	T=3.280, P<0.001**	T=7.489, P<0.001**
4- Decision making skill	15.5	73.8% ± 2.7	17.3	82.4% ±3.0	18.7	81.3% ±2.1	T=5.276, P<0.001**	T=11.069, P<0.001**
5- Teamwork skill	12.5	73.5% ± 2.2	13.1	87.3% ±2.5	13.9	81.7% ±1.5	T=2.131, P=0.033*	T=6.221, P<0.001**
Total mean score of leadership skills	74.9	75.6% ±12.2	80.4	79.6% ± 10.4	85.6	82.3% ± 9.1	T=4.059, P<0.001**	T=8.318, P<0.001**

#: reverse scoring, \$: student's t-test, significance 1: pre / post intervention (chi-square / Fisher's exact test), significance 2: pre / follow-up (chi-square / Fisher's exact test)

Table 4. Total mean score of leadership behaviors dimensions through program phases among studied nursing students (n=140).

Leadership behaviors dimensions.							Significa	Significa
	Mean	Mean %	Mean	Mean %	Mean	Mean % ±	Pre / post	Pre / follow-up
Leadership behaviors dimensions.								
1. Peer communication skill	12.2	87.3% ± 1.4	12.8	91.4% ± 1.1	13.2	94.3% ± 0.6	T=3.987, P<0.001**	T=7.768, P<0.001**
2. Initiative skill	12.1	86.4% ± 1.4	12.7	90.7% ± 1.1	13.1	93.6% ± 0.6	T=3.987, P<0.001**	T=7.768, P<0.001**
3. Participant skill	10.4	86.7% ± 1.2	11.0	91.7% ± 1.0	11.3	94.1% ± 0.5	T=4.544, P<0.001**	T=8.191, P<0.001**
4. Time management skill	3.5	87.5% ± 0.4	3.6	90.0% ± 0.3	3.7	92.5% ± 0.2	T=2.366, P=0.018*	T=5.291, P<0.001**
5. Role distribution skill	3.5	87.5% ± 0.4	3.6	90.0% ± 0.3	3.7	92.5% ± 0.2	T=2.366, P=0.018*	T=5.291, P<0.001**
6. Problem-solving skill	5.2	86.7% ± 0.6	5.5	91.7% ± 0.5	5.6	93.3% ± 0.3	T=4.544, P<0.001**	T=7.055, P<0.001**
7. Gaining the trust of others skill	6.9	86.2% ± 0.8	7.3	91.3% ± 0.6	7.5	93.8% ± 0.3	T=4.732, P<0.001**	T=8.309, P<0.001**
8. Self-confidence skill	6.9	86.2% ± 0.8	7.3	91.3% ± 0.6	7.5	93.8% ± 0.3	T=4.732, P<0.001**	T=8.309, P<0.001**
Total mean score of leadership behaviors dimensions	60.7	78.8% ± 7.9	63.8	85.1% ± 5.9	65.6	91.1% ± 3.1	T=3.720, P<0.001**	T=6.831, P<0.001**

#: reverse scoring, \$: student's t-test, Significance 1: pre / post intervention (Student's t-test); significance 2: pre / follow-up (Student's t-test)

Table 5. Total mean score of self-concept domains through program phases among studied nursing students (n=140).

Self-concept domains.	Pre – program		Post – program		Follow – up		Significance test 1	Significance test 2
	Mean	Mean % ±SD	Mean	Mean % ±SD	Mean	Mean % ±SD	Pre / post	Pre / follow-up
Self-concept domains.								
1. General self-concept	12.1	71.1% ± 2.2	14.1	82.9% ± 1.7	15.3	85.0% ± 1.6	T=8.677, P<0.001**	T=14.030, P<0.001**
2. Self-concept of emotional stability	13.2	73.3% ± 2.2	14.5	76.3% ± 2.3	15.3	80.5% ± 2.0	T=1.215, P=0.225	T=4.244, P<0.001**
3. Religious self-concept	6.5	65.0% ± 1.6	7.6	76.0% ± 1.0	8.7	79.1% ± 1.0	T=6.933, P<0.001**	T=13.288, P<0.001**
4. Relationships with parents	9.5	67.8% ± 2.2	9.7	74.6% ± 1.8	10.4	74.2% ± 1.6	T=0.832, P=0.405	T=3.914, P<0.001**
5. The relationship with the opposite sex	8.3	63.8% ± 2.1	7.8	65.0% ± 1.9	7.6	69.1% ± 1.5	T=2.089, P=0.037*	T=3.209, P=0.002*

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6. Relationship with the same sex	9.3	71.5% ±1.9	10.0	72.5% ±1.9	10.8	77.1% ±1.4	T=2.774, P=0.006*	T=7.227, P<0.001**
7. Academic self-concept	8.1	67.5% ±1.9	8.4	70.0% ±1.8	8.9	71.2% ±1.8	T=2.712, P=0.007*	T=3.408, P<0.001**
8. Problem solving	9.8	70.0% ±2.1	10.5	71.4% ±1.6	10.6	70.7% ±2.1	T=3.363, P<0.001**	T=3.076, P=0.002*
9. Physical appearance	9.0	60.0% ±2.4	10.6	71.4% ±1.6	10.9	72.7% ±1.9	T=6.475, P<0.001**	T=7.071, P<0.001**
Total mean score of self-concept domains	85.8	67.3% ±20.7	93.2	81.7% ±10.6	98.5	80.7% ±11.9	T=3.764, P<0.001**	T=6.293, P<0.001**

#: reverse scoring, \$: student's t-test, Significance 1: pre / post intervention (Student's t – test), significance 2: pre / follow-up (Student's t – test)

Table 6. Correlation between self-concept, leadership behaviors, leadership skills, and knowledge of leadership								
	Self-Concept		Leadership Behaviors		Leadership Skills		Knowledge Leadership	
	R	P	R	P	R	P	R	P
Post – program								
Self – concept			0.321	<0.001**	0.168	0.048*	0.195	0.021*
Leadership behaviors	0.321	<0.001**			0.459	<0.001**	0.197	0.019*
Leadership skills	0.168	0.048*	0.459	<0.001**			0.184	0.030*
Knowledge of leadership	0.195	0.021*	0.197	0.019*	0.184	0.030*		
Follow – up								
Self – Concept			0.424	<0.001**	0.259	0.002*	0.232	0.006*
Leadership behaviors	0.424	<0.001**			0.353	<0.001**	0.246	0.003*
Leadership skills	0.259	0.002*	0.353	<0.001**			0.267	<0.001**
Knowledge of leadership	0.232	0.006*	0.246	0.003*	0.267	<0.001**		

Table 7. Linear regression on factors affecting the self – concept					
	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
Post – Program					
(Constant)	75.676	6.110		12.386	<0.001**
Leadership behaviors	0.157	0.072	0.195	2.182	0.031*
Leadership skills	0.194	0.096	0.180	2.015	0.046*
Knowledge of leadership	0.160	0.082	0.172	2.159	0.037*

Follow – up					
(Constant)	144.855	9.809		14.767	<0.001**
Leadership behaviors	0.914	0.210	0.360	4.342	<0.001**
Leadership skills	0.247	0.180	0.201	2.417	0.023*
Knowledge of leadership	0.189	0.117	0.116	2.443	0.021*

Table 8. Linear regression on factors affecting the leadership behaviors

	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
Post – Program					
(Constant)	17.532	8.196		1.407	0.012*
Self – concept	0.157	0.072	0.195	2.182	0.031*
Leadership skills	0.244	0.077	0.239	3.181	0.002*
Knowledge of leadership	0.320	0.059	0.405	5.413	<0.001**
Follow – up					
(Constant)	44.549	3.178		14.020	<0.001**
Self – concept	0.914	0.210	0.360	4.342	<0.001**
Leadership skills	0.333	0.131	0.338	4.342	<0.001**
Knowledge of leadership	0.389	0.080	0.437	5.714	<0.001**

Table 9. Linear regression on factors affecting the leadership skills

	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
Post – Program					
(Constant)	46.007	10.132		4.541	<0.001**
Self – concept	0.194	0.096	0.180	2.015	0.046*
Leadership behaviors	0.244	0.077	0.239	3.181	0.002*
Knowledge of leadership	0.555	0.102	0.264	4.413	<0.001**
Follow – up					
(Constant)	80.273	13.929		5.194	<0.001**
Self – concept	0.247	0.180	0.201	2.417	0.023*
Leadership behaviors	0.333	0.131	0.338	4.342	<0.001**
Knowledge of leadership	0.702	0.233	0.438	5.014	<0.001**

Table 10. Linear regression on factors affecting the leadership knowledge

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	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
Post – Program					
(Constant)	32.161	11.238		2.862	0.005*
Self – concept	0.160	0.082	0.172	2.159	0.037*
Leadership behaviors	0.320	0.059	0.405	5.413	<0.001**
Leadership skills	0.555	0.102	0.264	4.413	<0.001**
Follow – up					
(Constant)	54.607	9.447		3.488	<0.001**
Self – concept	0.914	0.210	0.360	4.342	<0.001**
Leadership behaviors	0.389	0.080	0.437	5.714	<0.001**
Leadership skills	0.702	0.233	0.438	5.014	<0.001**

Discussion:

The current study aimed to explore the effectiveness of a leadership skills training program on self-concept among health technical institute nursing students. The present study explored the effectiveness of a leadership training program in enhancing nursing students' leadership knowledge across different phases: pre-program, post-program, and follow-up. The study's findings of the nursing student's personal characteristics showed distinct patterns. Most of the students, two-thirds of nursing students, fell within the 20-year-old age group, and most were unmarried. Furthermore, nearly one quarter of the students had undertaken leadership training, suggesting a noteworthy level of interest or engagement in leadership development.

In the pre-program, the study findings concluded that the total mean percentage of the theoretical part was a mean percentage of $51.1\% \pm 2.1\%$. Whereas it increased after training to be $64.3\% \pm 2.6\%$ and during the follow-up phases, this percentage continuously increased to be $70.0\% \pm 2.1\%$. The findings of this study indicate that fifty percent of nursing students had a theoretical part domain regarding leadership, which is a concerning indicator of the current state of nursing education concerning leadership competencies. This finding resonates with Leong, He, Premarani, and Lim, suggesting that traditional nursing education models often fail to adequately prepare nursing students for leadership roles. Such a discrepancy in education can limit future nursing professionals' effectiveness in collaborative healthcare organizations, where leadership skills are progressively vital (28).

Also, the theoretical levels during the post-program and follow-up phase indicate not only retention but possibly also the internalization of leadership concepts. The sustained improvement in knowledge levels connects with findings by Johnson and Lee, who emphasize the importance of ongoing professional development in reinforcing skills acquired during initial training (29).

Regarding total knowledge-related practice skills, the pre-program data showed an increased knowledge-related practice skill as a mean percentage of $59.6\% \pm 5.3$. Whereas it was increased after training and during the follow-up phases to be $(65.9\% \pm 5.5; 72.5\% \pm 4.9)$. These results align with research emphasizing that in pre-program assessment, participants typically exhibit moderate proficiency in key leadership skills, as evidenced by studies that utilized pretest measures to gauge initial capabilities (30).

In post-program improvement, following participation in structured leadership programs, significant increases in skills such as communication, decision-making, and problem-solving have been documented, with participants reporting enhanced self-confidence and initiative (31). Also, studies suggest that the benefits of these programs persist over time, with follow-up assessments indicating continued improvement in leadership competencies (32). Following the completion of the training program, a notable increase was observed. This result aligns with Nurgali, Karmenbayeva, Tursynbaikyzy, & Atemova (33). Who stated that communication is enhanced through active engagement and practice in leadership scenarios, problem-solving, and decision- Making participants learn to navigate complex situations effectively, leading to improved outcomes in their professional environments (34).

Furthermore, the finding of this study indicates a statistically significant increase in students' total

mean percentage of the leadership knowledge dimension through program phases; this significant increase demonstrates the immediate benefits of structured leadership training. The current study finding was supported by Mahfouz, Abd El Fattah, and Ebraheem, who reported that there was a statistical total improvement in nursing knowledge following implementation of the educational program in both immediate-post and follow-up program phases⁽³⁵⁾.

The results revealed that the total score of leadership knowledge among nursing students prior to the implementation of the training program was more than fifty percent. This result aligns with Bagnasco, Timmins, and McCabe, who indicate that nursing students often enter their educational programs with limited exposure to formal leadership education. These initial scores highlight the need for structured leadership training in nursing curricula to bridge this knowledge gap⁽³⁶⁾.

The follow-up results suggest that ongoing educational support is vital for reinforcing and expanding leadership knowledge beyond formal training. Nursing education programs should consider implementing periodic refresher courses or workshops to sustain leadership competencies. According to Mlambo, Silén, and McGrath, continuous professional development opportunities enhance nurses' readiness to assume leadership roles and adapt to changes within the healthcare environment⁽³⁷⁾.

Following the completion of the leadership training, the mean percentage of students' leadership knowledge increased to more than two-thirds. This enhancement underscores the effectiveness of targeted training interventions. Research by İlaslan, Adibelli, Teskereci, and Üzen Cura supports this finding, indicating that structured leadership education not only improves knowledge but also fosters critical thinking and decision-making skills in nursing students. The post-program assessment reflects the immediate effects of the training, suggesting that students acquired fundamental concepts and frameworks necessary for effective leadership⁽³⁸⁾.

Also, the follow-up phase demonstrated a further increase in the mean percentage of leadership knowledge. This sustained improvement indicates that the training had a lasting impact on students' knowledge retention. As noted by Anderson, Smith, and Taylor, follow-up assessments are crucial for evaluating the long-term effectiveness of educational programs. The significant rise in scores during this phase suggests that the training may have instilled a deeper understanding of leadership principles that students can apply in their professional practice⁽³⁹⁾.

The positive results from this study underline the importance of integrating leadership training into nursing curricula. As nursing roles become increasingly complex, equipping students with leadership knowledge is essential for preparing them to face real-world challenges. Younes, Adam, and Abdrabu advocate for incorporating leadership modules into nursing programs, promoting a culture of leadership from the onset of students' education⁽⁴⁰⁾.

Also, Williams, Brown, and Thompson observed that well-designed training programs could improve nurses' leadership knowledge and skills rapidly; students' engagement in active learning, role-playing, and interactive discussions during the program likely contributed to this increase in their understanding. The increase in knowledge levels not only represents an understanding of theoretical concepts but also indicates preparedness to utilize these skills in practical settings⁽⁴¹⁾.

The findings of this study indicate a statistically significant increase in leadership nursing students' knowledge scores, suggesting a positive effect of the program. Prior studies have similarly reported significant improvements in knowledge and skills following leadership interventions, indicating a trend toward the increasing recognition of leadership as a core competency in nursing⁽⁴²⁾.

Regarding the total mean score of students' nursing leadership skills domains through program phases, the findings indicate a significant improvement in leadership skills levels from the pre-program phase to the post-test and follow-up phases. The findings indicate a significant improvement in leadership skills levels from the pre-program phase. The research indicates that approximately three quarters of the total studied nursing students demonstrated high levels of leadership skills such as communication, decision-making, teamwork, planning, and problem-solving.

This baseline measurement suggests that nursing students already possessed some extent of leadership competency before initiating the applied training program. This could be attributed to prior experiences, intrinsic traits, or foundational knowledge developed through their nursing education

⁽⁴³⁾. This could be attributed to prior experiences, inherent traits, or foundational knowledge acquired through their nursing education. In addition, these skills are crucial for improving performance and effectiveness in educational institutions^(43,4).

Furthermore, these skills empower nursing students to operate effectively in diverse healthcare settings and challenges in their professional environments. Nevertheless, achieving mastery in these skills during the academic tenure of students at the institution poses critical challenges. It is essential for the organization to implement best practices alongside the core curriculum to enhance institutional excellence ⁽³²⁾.

The total score of leadership skills also significantly improved at both post-intervention and follow-up. This suggests the intervention was effective in enhancing multiple facets of leadership capabilities among the nursing students, including their planning, communication, problem-solving, decision-making, teamwork abilities, and overall leadership capacity. The data indicates that the students improved and retained the gains made in leadership skills.

Following the completion of the training program, a notable increase was observed, with more than three-quarters of the students achieving high levels of leadership skills. This significant rise indicates the intervention's effectiveness in bolstering various facets of leadership among nursing students and interactive learning experiences, and focused mentorship likely contributed to this substantial improvement ⁽⁴⁴⁾.

The follow-up assessment revealed a further increase, with more than four-fifths of nursing students demonstrating high levels of leadership skills. This remarkable growth suggests not only the acquisition of new skills but also the reinforcement and application of previously learned concepts over time. The follow-up results align with research emphasizing the importance of continuous learning and practice in solidifying leadership competencies ⁽⁴⁵⁾.

The educational program emphasizes the importance for every organization to strive for institutional excellence by focusing on enhancing students' knowledge, behavior, and mindset, enabling them to lead effectively in their future workplaces. Leadership skills encompass various facets such as decision-making, communication, team collaboration, problem-solving, adaptability, empathy, inspiration, resilience, and career advancement. These skills empower students to navigate diverse challenges in their professional environments.

These results are in agreement with existing literature emphasizing the positive impact of targeted training programs on nursing leadership development. For instance, a pilot study assessing a leadership development training program reported significant improvements in student nurses' perceptions of essential leadership competencies and their ability to implement them. The program effectively enhanced competencies such as decision-making, delegation, motivation, and problem-solving, underscoring the critical role of education in leadership skill development ⁽⁴⁶⁾.

Similarly, research evaluating competency-based intervention on head nurses' leadership effectiveness found substantial gains in areas like workflow processes, delegation, decision-making, motivation, and problem-solving post-intervention. The study highlighted a statistically significant correlation between leadership competency levels and leadership effectiveness, reinforcing the importance of structured training programs in cultivating effective nursing leadership ⁽⁴⁷⁾.

Moreover, an investigation into the impact of a soft skills training program on head nurses' performance revealed highly significant improvements in knowledge, job performance, and soft skills post-intervention. The study emphasized that regular training in soft skills is essential for enhancing nurses' competencies, thereby fostering effective healthcare delivery ⁽⁴⁸⁾.

Regarding the evaluation of leadership behavior skills among student nurses throughout the training program, phases highlight notable improvements in their overall capabilities. In the pre-training phase, the mean percentage score for leadership behavior skills stood at more than three quarters of the students. This initial score indicates that student nurses possessed a solid foundation in leadership, but there was still room for growth and development in their behavioral skills. It highlights notable improvements in their overall capabilities. Most participants exceeded the expected level of leadership behavior, especially in time management and role distribution skills and self-confidence.

This result aligns with (Altiner Yas, Isci, Alacam, Caliskan, Kulekci ⁽⁴⁹⁾) in studies on nursing students, who indicated that time management shows varied findings, with reported levels ranging from moderate to high. Furthermore, possessing strong time management and role distribution skills can foster students' self-efficacy for learning. As a critical component of self-management, time management is integral to SDLR and has been identified as a facilitator of self-directed learning (50,51,52).

Also, this finding aligns with research from various countries, including Turkey, Indonesia, and Iran ^(49,53,54), which consistently reports moderate to high levels of time management skills among nursing students. This professional expertise may stem from the demanding structure and function of the nursing profession,

which necessitates effective management of diverse responsibilities and emergencies. In addition, the scoping review highlighted that workshops and simulation-supported learning significantly bolster nursing students' leadership and management behavior. Participants reported strengthened self-confidence and in-depth comprehension of leadership concepts^(55,56).

While most nursing students demonstrated efficacious time management habits. A significant fraction reported difficulties due to insufficient preparation, academic stress, and digital distractions. To address these issues effectively, it is recommended that time management training be systematically integrated into the nursing curriculum and academic support services be provided. These measures could foster overall nursing student performance and better prepare them for their nursing professional responsibilities.

The research highlights that student nurses achieved the highest level of peer communication skills. These results agree with Mercan and support these results, showing a strong communication skill level of the nursing students (mean percentage of 163 ± 13.0). It is recommended that studies aimed at communication skills capacity-building programs continue and programs whose efficacy has been proven in research conclusions be included in nursing education curriculum⁽⁵⁷⁾.

Conversely, Xie, Ding, Wang & Liu conclude that most nursing students need communication-skill educational programs. Multiple factors, including educational degree, living circumstances, number of family members, and training experience, significantly impact nursing students' communication abilities. So, the study suggested a need to extensively establish a communication course or healthcare practice communication training program to strengthen nursing students' communication skills⁽⁵⁸⁾.

After the training program, a significant increase in the total score was observed, rising to more than three quarters. The results showed significant enhancements across multiple leadership dimensions. Such teamwork, time management, and self-confidence experienced significant growth as well. Problem-solving skills saw a substantial improvement; furthermore, the distribution of roles are key attributes for future nursing professionals. These outcomes demonstrate the program's success in enhancing nursing students' leadership behaviors, with sustained effects observed during the follow-up phase.

Similarly, research on team-based learning (TBL) methodologies demonstrated improvements in problem-solving abilities and teamwork perceptions among nursing students. In a study where the intervention group engaged in TBL, participants exhibited higher mean scores in problem-solving post-intervention compared to a control group. Focus group discussions further revealed enhanced class engagement, reasoning skills, team adaptability, accountability, and learning satisfaction⁽⁵⁹⁾.

Also, the follow-up phase revealed a continued increase in leadership behavior skills, with the total score reaching a great majority of the students. This sustained growth emphasizes the long-term impact of the training and suggests that the student nurses were able to apply what they learned effectively in real-world settings. These findings are consistent with existing literature that underscores the importance of focused leadership training in nursing education. A study by Johnson and Lee indicated that leadership development programs significantly enhance nursing students' competencies, ultimately leading to improved outcomes in both clinical practice and team dynamics. Additionally, Smith and Taylor emphasized that ongoing training and support are essential for embedding leadership skills into nursing practice, ensuring that student nurses can adapt to the evolving demands of healthcare^(29,60).

The statistical significance noted in leadership behavior skills across the different phases (pre-, post- and follow-up) supports the notion that these skills can be incrementally developed through focused interventions. This is consistent with findings from Rouse et al⁽⁶¹⁾, which indicate that targeted training can lead to measurable improvements in leadership behaviors among healthcare professionals. Also, a scoping review highlighted that workshops and simulation-based learning significantly bolster students' leadership and management skills, including delegation, task prioritization, and resource management. Participants reported increased self-confidence and a deeper understanding of leadership concepts post-intervention⁽⁵⁶⁾.

Moreover, implementing leadership development training programs for staff nurses has shown to positively influence structural empowerment, leadership self-efficacy, and clinical leadership practices. A study reported significant improvements in these areas immediately after program implementation and sustained effects in subsequent evaluations. The program had a moderate effect on structural empowerment and leadership self-efficacy and a substantial impact on clinical leadership practices and leadership knowledge⁽⁶²⁾.

Regarding the total mean score of self-concept domains among student nurses throughout the training program phases, highlight notable improvements in their overall domains. In the pre-training phase, the mean percentage score for self-concept domains stood at approximately two-thirds of students maintaining

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high self-concept scores during the pre-program, and the percentage increased to most students in the post-program and follow-up phases. This aligns with the results of the study that examined the development of multiple domains of self-concept in late childhood and in early adolescence, showing a significant increase of general self-concept, social self-concept, and family self-concept in early adolescents' sample ⁽⁶³⁾.

Also, the result of the study that discussed self-concept, understanding the role of gender and academic competence, indicated that academically competent adolescents have higher physical, moral, personal, family, social, and overall self-concepts than less-competent ones, the strength of association between physical self-concept and overall self-concept, as well as social self-concept and overall self-concept, is higher in girls than that of the boys ⁽⁶⁴⁾.

Furthermore, self-concept among student nurses is a fundamental aspect of their personal and professional development, significantly influencing their confidence, clinical performance, and overall well-being in the nursing field. This positive self-concept enables student nurses to engage more fully in their educational experiences, fostering resilience and adaptability in challenging clinical environments. Research has demonstrated that enhancing self-concept is associated with improved communication skills, better patient interactions, and greater professional identity development. Moreover, programs focused on skill development, reflective practices, and peer support contribute to bolstering self-concept, empowering student nurses to transition successfully into their roles. Such growth in self-perception is critical in a profession that requires a high degree of empathy, teamwork, and leadership ^(65,66).

Regarding the total mean score of self-concept domains. The results show that nearly three-quarters of student nurses have the highest score of self-concept of emotional stability. This may be due to the nature of clinical training; continuous exposure to clinical environments, patient care responsibilities, and stressful situations appear to enhance students' emotional regulation, self-control and resilience.

Over time, these experiences contribute to more stable emotions. Similarly, Punkasaningtiyas reported that more than half of the participants demonstrated a moderate level of emotional stability (92, 51.7%), while 21 participants (11.8%) exhibited a low level of emotional stability and 65 (36.5%) demonstrated a high level ⁽⁶⁷⁾.

In contrast, research named "Overview of emotional stability in class adolescents" is based on nursing perspectives. Its results highlight that most participants, as many as 66 (76.7%), had low emotional regulation, and under half of the respondents, as many as 20 (23.3%), had high emotional stability. Also, the results indicate that approximately two thirds of nursing students reported high self-concept domains. This aligns with the results of Kozina that evaluate the development of multiple domains of self-concept. It shows a substantial increase of general self-concept, social self-concept, and family self-concept in early adolescents' study participants ^(63,68).

In this regard, Rath & Nanda highlight that nursing students' self-concept, comprehension of the role of gender, and academic competence indicate that academically proficient nursing students have higher physical, ethical conduct, personal, family, social, and general self-concepts than less-proficient ones; the strength of the relationship between physical self-concept and general self-concept, as well as social self-concept and general self-concept, is higher in girls than that of the boys. Furthermore, self-concept among nursing students is a pivotal aspect of nursing management's personal and professional development, playing a critical role in influencing their confidence, clinical proficiency, and overall well-being in the nursing field. This positive self-concept fosters student nurses to contribute more fully to their clinical education experiences, fostering resilience and adaptability in challenging clinical settings. Research has demonstrated that improving self-concept is associated with enhanced communication skills, better enhancing nurses' interactions with patients, and facilitated professional identity formation ^(64,69).

The study reveals a significant correlation between self-concept and leadership behaviors, as well as leadership skills and knowledge of leadership among nursing students. The strengthening of these correlations from the post-program stage to the follow-up stage indicates that continued growth in self-concept is critical for enhancing leadership effectiveness. This indicates that as students' self-concept improved, their leadership behaviors also enhanced, suggesting a connection between how students view themselves and how they engage in leadership roles. This indicates that as students' self-concept improved, their leadership behaviors also enhanced, suggesting a connection between how students view themselves and how they engage in leadership roles. Additionally, there was a positive correlation between leadership skills and knowledge of leadership, which signifies that students who possess better leadership skills are likely to have greater knowledge of leadership concepts.

Also at the follow-up stage, the correlation between self-concept and leadership behaviors

strengthened. This implies that the relationship between how students perceive themselves and their leadership behaviors continues to develop positively over time. These findings are consistent with existing literature emphasizing the importance of self-perception in leadership development among nursing students.

A cross-sectional study by Khaled ⁽⁷⁰⁾ found a positive and significant correlation between emotional intelligence and leadership skills among nursing students, highlighting the predictive role of emotional intelligence in leadership. The study also identified that components of emotional intelligence, such as self-control, emotionality, and sociability, were predictors of leadership traits. This underscores the influence of self-perception on leadership capabilities, aligning with the current study's results.

Furthermore, a scoping review by Abdul-Rahim et al., ⁽⁵⁶⁾ identified critical leadership skills for nursing students, including delegation, critical thinking, prioritization, and resource management. The review emphasized the necessity of developing these skills through workshops, mentorship, and simulations to prepare students for leadership roles. This supports the notion that enhancing leadership knowledge contributes to improved leadership behaviors, as observed in the current study

(1).

In the same line, the current study findings highlight the significant relationships between leadership behaviors, leadership skills, knowledge of leadership, and self-concept. The results of the regressed behaviors predict self-concept: The study found that leadership behaviors significantly predict self-concept, with a stronger effect in the follow-up stage. This result is consistent with the self-efficacy theory which suggests that individuals' confidence in their ability to perform a specific task (in this case, leadership behaviors) can influence their self-concept. A study a meta-analysis conducted by Day and Sin demonstrated that individuals who actively engage in leadership roles often experience an enhancement in their self-concept, likely due to the experiences and challenges encountered while leading ^(71,72).

Regarding knowledge of leadership affects leadership behaviors and self-concept. The results indicate that knowledge of leadership is a significant predictor of leadership behaviors and self-concept, particularly in the follow-up stage. This finding is aligned with the study by Shaheen et al. found that leader development programs can improve leadership knowledge and skills. Furthermore, self-concept was found to be correlated significantly with leadership skills. This suggests that self-perception influences not only leadership behaviors but also the skills that contribute to effective leadership⁽⁶²⁾.

Also, the results indicate that self-concept is a significant predictor of leadership behaviors and knowledge of leadership. These findings contribute to understanding the interplay between self-concept and leadership in nursing, reinforcing the significance of personal development in leadership training. These findings are consistent with Seo and Ko who found that nursing students with a strong self-concept demonstrated more profound leadership qualities and were better equipped to take on leadership roles in clinical settings. This emphasizes the need for targeted personal development initiatives in nursing education that focus on enhancing self-concept as part of leadership training⁽⁷³⁾.

Moreover, a research study by Zarrin et al. supports these findings, showing that nurses who engage in reflective practices to improve their self-concept are more likely to exhibit effective leadership behaviors, such as decision-making and team collaboration. These insights reinforce the notion that fostering a positive self-concept should be a priority in leadership training programs. Finally, by focusing on the development of self-concept and integrating leadership skills training within nursing curricula, educational institutions can better prepare future nurse leaders to navigate the complexities of the healthcare environment. In conclusion, the study provides new insights into the relationships between leadership behaviors, leadership skills, knowledge of leadership, and self-concept. The findings offer implications for leader development programs and suggest that a comprehensive approach to leader development should include training in leadership behaviors, skills, and knowledge, as well as efforts to enhance self-concept⁽⁷⁴⁾.

Conclusion: The findings demonstrated that the leadership skills training program significantly improved nursing students' leadership knowledge, skills, behaviors, and self-concept. Significant improvements were observed from the pre-program to the post-program and follow-up phases, with most outcomes showing sustained or further improvement during follow-up. Moreover, positive correlations were identified between self-concept and leadership behaviors and skills, indicating that strengthening leadership competencies may contribute to enhancing nursing students' self-concept and professional readiness.

Implications for practice and future directions

The findings gained from the current study can be valuable for dissemination and generalization of leadership skills training program and curriculum enhancement; The significant improvements in leadership knowledge, skills, and self-concept underscore the need to formally integrate structured leadership training within the core nursing curriculum at Health Technical Institutes. This ensures that all students gain essential leadership competencies early in their education. In addition, nursing educators should be trained to deliver leadership content effectively using interactive and student-centered methods (e.g., simulations, group projects, and mentorship). Faculty can serve as role models and reinforce leadership behaviors in both clinical and classroom settings. Also, regular evaluations of students' leadership development-using both self-assessments and observed behaviors — should be institutionalized. These evaluations help identify students needing additional support and ensure the sustained effectiveness of leadership programs.

Finally, the study confirmed that self-concept is a strong predictor of leadership success. Therefore, nursing education should include activities like reflective journaling, self-assessment tools, and mentorship opportunities to nurture a positive professional identity. **Recommendation:** Further studies are recommended to examine the long-term impact of leadership training programs on graduates' professional practice, including their performance in real clinical leadership roles post-graduation. Conduct similar research across different regions or institutions to validate the current findings and explore cultural or organizational influences on leadership development in nursing education.

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Declarations

Competing interests

The authors declare that they have no competing interests.

Ethics approval and consent to participate

All methods and procedures pertaining to this study were carried out in accordance with relevant guidelines and regulations. The study was approved by the Research Ethics Committee (REC), Faculty of Nursing/ Port Said University with (code number:

Based on the standard of the committee, Faculty of Nursing/ Por Said University and adhered to declaration of Helinski. An official letter containing the title, and the aim of the study was sent from the Dean of the Faculty of Nursing - Port Said University to the Dean of the health technical institute to conduct the study. data collection in the abovementioned settings.

Informed consent for participation in the study was obtained from student's nurses after clearing out all aspects of the study. The study did not directly or indirectly expose student's nurses to any diagnosis or treatment.

Consent for publication

Not applicable.

Availability of data and materials

Due to confidentiality concerns, the data and materials used in the current study cannot be made publicly available. However, they are available from the corresponding author upon reasonable request.

Author contributions

HM planned the study and prepared the manuscript, Writing the original and final manuscript drafts, educational program training, and administration. SA Supervised, reviewed and interpreted data and the manuscript. RI Conceptualization, Methodology, Data curation. HE reviewed and interpreted of data and the manuscript. The author(s) read and approved the final manuscript.

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List of Abbreviations

Abbr.	Full-term
KLQ	The Knowledge of Leadership Questionnaire
LSQ	Leadership Skills Questionnaire
LBQ	Leadership Behaviors Questionnaire
SCS	Self-concept Scale

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