

Effect of Implementing Team-Based learning Strategy regarding Gastrostomy Feeding on Group Engagement for Pediatric Nursing Students' Performance

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Abstract

Background: Cooperative learning strategies like team-based learning have a great effect on the learning process. It increase problem solving skill, learning motivation and academic achievement and allows interaction between students and increases their engagement. **The aim of the study** was to evaluate the effect of implementing team-based learning strategy regarding gastrostomy feeding on group engagement for pediatric nursing students' performance. **Research design:** True experimental research design was utilized. **Subjects and setting:** 140 pediatric nursing students in third year, Faculty of Nursing, Tanta University. **Four tools were used to collect data:** **Tool I:** Structured Questionnaire of pediatric nursing Students' Knowledge regarding Gastrostomy Feeding. **Tool II:** Gastrostomy Feeding Observational Checklist. **Tool III** Pediatric Nursing Students' Group Engagement Questionnaire. **Tool IV:** Team-Based Learning Feedback Questionnaire. **The results:** The total scores of pediatric nursing students' knowledge, practices and group engagement were improved immediately and two weeks after the implementation of team-based learning strategy. **The study concluded that** using the team-based learning strategy in the pediatric nursing course has a beneficial effect on enhancing the knowledge, critical thinking, clinical performance, and engagement of the students. **The study recommended** that the curriculum of the pediatric nursing department should contain a team-based learning strategy as an engaging teaching technique.

Key words: Gastrostomy feeding, group engagement, student performance, team -based learning strategy.

Introduction

Competent health professionals can be achieved by integrating knowledge and apply needed skills to match with the need of the society. So the nursing curriculum must be created to produce graduates who have both general and discipline-specific knowledge and abilities that will meet their child's needs. (Hameed., et al . 2017).

Student engagement can be increased through the use of a variety of teaching methodologies, such as problem-solving exercises, team-based learning methods, video presentations, online

learning, case studies, simulation laboratories, active community activities, and others. (Hudson, K, Carrasco, R.(2017). Strategies of team based learning can be define as "a special form of collaborative learning using a special sequence of individual work, group work and immediate feedback to create a motivational framework in which students increasingly hold each other accountable for coming to class prepared and contributing to discussion, Haidet P, Kubitz K, McCormack W(2018) . Team based learning strategy can be carried out

by engaging in activities that take place in the following order: preparation phase, readiness assurance phase, application phase and evaluation phase (**Sakamoto S, Dell'Acqua M, Abbade P.2020**) Through preparation phase, the trainer decides the training's goals, objectives, and material during the preparation phase. Students used of the suggested resources and made an effort to study things that are linked to the established and well-informed learning objectives (**Mansy H , El-Hawashy Z, Sabry Y , Morsy S (2022)**).

Assurance of readiness step composed of two parts. Firstly called individual readiness assurance test by using multiple-choice questions which cover the subject has been studied, each student try to answer it individually. Secondly phase called the team readiness assurance test in which members of each team are then asked to respond as a team to the identical multiple-choice questions. Using answer sheets for the quick appraisal technique, after this test, the team wrote an explanation for one of their responses, and the instructor gave clarity on ideas discussed in the pre class readings. **Koles P, Stolfi A, Nelson S (2020)**. The third stage of team based learning involves applying the material covered in the course through cooperative problem-solving exercises. The learners worked in a shared hall to solve complex problems with course content and peers. (**Koles., et al.2020**). The assessment and evaluation is the final phase which concluded the TBL process; it used to determine how much each team member contributes to the group as a whole. **Ibrahim I, Sleem W 2018**. The learning process is greatly impacted in all ways by team based learning methodologies. It promotes conversation between small groups and improves individual and collective accountability. (**Hudson., et al. 2017**).

Students' interactions, debates, and critical thinking are encouraged through efficient team processes, which helps them go through all phases of the learning process intellectually. (**Yildiz D, ,Surer I , Eren B, , Balamtekin N (2020)**).

Team based learning inspire students to take obligation for their own learning, and enables students to efficiently apply their course concepts in practice' (**Villiers B, werner A .2018**).

Team Based Learning also helps students in active engagement by the application of newly acquired knowledge to fresh challenges, tasks, or inquiries. (**Rotgansn J , Rajalingam P, Ferenczi M, Low-Beer N (2018)**). Engagement of student is defined as "students' time and effort put into educational activities in all settings, including those outside of the classroom, as well as the procedures and regulations used by institutions to motivate students to take part in these activities. (**Correia 2017**).

Students' engagement has positive correlation with students' behaviors and achievement. High level of students' engagement is connected with higher test scores, attendance, and performance enhancement. (**Shuhui ., et al. 2019**). Gastrostomy is one of the most frequent medical operations carried out on children and pediatric nurse has a vital role in carrying for those children **Bedier N, EL-Ata A , Shehab M.(2017)**. Gastrostomy feeding involves inserting food into the stomach through an abdominal incision. The insertion of a gastrostomy is advised for all children who require supplemental artificial enteral feeding for a duration longer than 2 or 3 weeks (**Boullata J, Carrera L, Harvey L, Escuro A, Hudson L, Mays A (2017)**).

Nursing care of children who are seriously ill depends heavily on their nutrition. Pediatric nurses play a particularly crucial role in addressing children' nutritional demands and must be up-to-date knowledge and abilities regarding enteral nutrient access pathways and nutrition technique (**Best. 2019**).

According to the regional wound care guidelines, pediatric nurses should treat the peristomal area to lower the risk of local infection through checking for bleeding and hematomas during the first 48 hours following gastrostomy tube installation by

the nurse. **Valla1 F , Cercueil E , MoriceC , Tume L, Bouvet L.(2022)**. A pediatric nurse should examine the site of tube insertion every day for signs of pressure injury. Gauze that has been dampened with water or saline is frequently used for cleaning, and the fixation plate is subsequently replaced when the gauze has had time to air dry, and using barrier cream or dressings may be advised to stop skin erosion. (**Trigg E, Mohammed T (2018)**). Abdominal distention can be preventing by aspirate stomach residual amount prior to administering new formula. The gastrostomy tube should be flushed before and after feedings and every three hours when not in use by a pediatric nurse in order to maintain patency **McClave P, Taylor E, Martindale G (2017)**. The pediatric nurse should calculate the child's fluid intake and monitoring the volume of tube flushing. This can be achieved by deducting the amount of water in the feeding formula from the patient's total daily demand and dividing the remaining amount over a regular schedule for tube flushing. **Haider I, Isa H. Amin M (2021)**

Pediatric nurse should follow measures to prevent infection during feeding by using cooled or boiled or sterile water to flush the tube, also the surface of the table in which foods are prepared must be clean thoroughly with soap and water then dried and wiped with 70% isopropyl alcohol impregnated wipes. The external surface of gastrostomy tube should wipe with alcohol impregnate prior to use. **Costa A, Martin A, Arreola V, Riera S, Pizarro A, Carol C (2020)**

Significance of the study

Team based learning strategy is an effective learning strategy that assist in the development of appropriate team skills, it improves the student performance, critical thinking and enhance students' engagement which has great role in success within nursing programs. Gastrostomy feeding procedure is selected for implementation of team based learning strategy because its importance and difficulty, and its application require more skillful pediatric student to avoid complication associated with gastrostomy feeding. So, the aim of the study was to evaluate the effect

of implementing team-based learning strategy regarding gastrostomy feeding on group engagement for pediatric nursing students' performance

Aim of the study

To evaluate the effect of implementing team-based learning strategy regarding gastrostomy feeding on group engagement for pediatric nursing students' performance.

Research Hypotheses

1. Pediatric nursing students are expected to achieve more group engagement after implementation of team based learning strategy.
2. Pediatric nursing students' knowledge and practice regarding gastrostomy feeding is expected to be improved after implementation of team based learning strategy.

Subjects and method

Design: True experimental research design was used

Setting: The study was conducted on third-year pediatric nursing students in the pediatric clinical skills lab at Faculty of Nursing, Tanta University.

Subjects: The sample was composed of 140 pediatric nursing students in the third year at Faculty of Nursing, Tanta University by using random selection to represent from the total number of students nearly 1000 include in pediatric nursing course. Two equal groups of pediatric nursing students each contained 70 pediatric nursing students as follows:

Group (1): Study group consisted of 70 pediatric nursing students who studied with implementation of team based learning strategy for gastrostomy feeding procedure.

Group (2): Control group consisted of 70 students who studied by traditional method training as lecture and physical demonstration at pediatric skills lab.

Tools of data collection

Tool (I): A Structured Questionnaire of pediatric nursing Students' Knowledge regarding Gastrostomy Feeding and Team Based Learning Strategy. (**Shuhui et al., 2019, Bedier ., et al. 2016, Boullata ., et al. 2017**) It was created by the researcher to assess the

students' knowledge regarding gastrostomy feeding and team based learning strategy. It comprised of three parts:

Part 1: Socio demographic characteristics of pediatric nursing Students. It contained the age, gender place of residence, participation in clinical training courses for gastrostomy feeding, and team-based learning strategies for pediatric nursing students.

Part 2: Pediatric nursing students' knowledge regarding gastrostomy feeding procedure. It was created in 10 multiple choice questions (MCQs) to cover students' knowledge regarding gastrostomy feeding procedure. The total score of this test was 10 score one mark for each MCQs

Part (3): - Case studies regarding gastrostomy feeding care. Waddle, and Gillespie.2022, Haider., et al. 2020, White & Bradnam. 2015)

It was created by the researcher after reading the recent literature. It composed of three case studies, two for training and one for evaluation. The total scores of this test was 20 score. Case score are 7, 7, 6 respectively for each. The total scores of this test were 30 marks (10 for MCQs and 20 for case study). Pass score of this test was 18mark so the student are ready to participate in team based learning strategy

The students' knowledge was scored as follows

- Coorrect answer and complete was scored (2).
- Correct answer and incomplete was scored (1)
- Wrong answer was scored (0)

The total score of this test was 30 marks (10 for MCQ and 20 for case study). Pass score of this test was 18mark so the student are ready to participate in team based learning strategy

The total scores of pediatric nursing students' knowledge equal 100% and according the students' answers was classified as

- Less than 60% was considered low level of knowledge.
- From 60% to less than 80 % was considered moderate level of knowledge.
- From 80% to 100 % was considered high level of knowledge.

Tool II: Gastrostomy feeding observational checklist. (Haider., et al. 2021, Costa., et al . 2020, Lucendo & Ruiz 2018 , McClave., et al. 2017).

It was adapted by the researcher following a reviewing of relevant literature to evaluate the pediatric nursing students practice regarding gastrostomy feeding procedure.

Assessment of pediatric nursing students' practice regarding gastrostomy feeding was classified as follows:

- Done completely was scored (2).
- Incompletely done was scored (1).
- Not done or wrong done was scored (0).

The total score of the students' practice was classified as follows

- Less than 80 % was considered unsatisfactory.
- More than 80% was considered satisfactory.

Tool III: Pediatric nursing students' group engagement questionnaire.

(Schreiner and Louis. 2006)

It was developed by Schreiner and Louis (2006) and adapted by the researcher for measuring group engagement among pediatric nursing students during team-based learning strategy. The scale had four options: Strongly disagree (1), Disagree (2), Agree (3), and strongly agree (4). It had about ten statements.

It composed of three domains namely as a follow: use of meaningful processing which consisted of 4 statements, participation in team discussion which consisted of 3 statements and attention which consisted of 3 statements.

The total scoring of pediatric nursing students' group engagement Questionnaire was ranged from 10 to 40

- From 10 to less than 20 was considered low group engagement
 - From 20 to less than 30 was considered moderate group engagement
 - From 30 to 40 was considered high group engagement

Tool IV: Team-Based Learning Feedback Questionnaire.(Mennenga. 2010)

It was created by Mennenga (2010) and adjusted by the researcher to track feedback

about team-based learning strategy. It included four parts: preference of team based learning which consisted of 5 statements, students' accountability to team which consisted of 7 statements, satisfaction of team based learning which consisted of 6 statements and evaluation of team effectiveness which consisted of 7 statements. It was composed of a 5-point Likert scale with the following categories: Strongly disagree(1), disagree (2), neither disagree nor agree (neutral) (3), agree(4), and strongly agree(5)

The total scoring of this questionnaire ranging from 25 to 125.

- Less than 60 % was considered negative feedback about team based learning strategy
- From 60 % to 100% was considered positive feedback about team based learning strategy

Method

The study was conducted through the following steps

1-The Dean of Tanta University Faculty of Nursing gave an official approval for the study to be conducted.

- a) Before the study was carried out, the Tanta University Faculty of Nursing_Ethical Scientific Research Committee gave its ethical approval with ethical code (56-5-2022).
- b) Privacy and confidentiality were considered when gathering the data.
- c) Pediatric nursing students were notified of the study's purpose before providing their informed consent for inclusion in the research study. Privacy and confidentiality for the students was assured.
- d) There was no harm or injury to the student as a result of the study.
- e) Nursing student had the right to leave the study at any time.
- f) The aim of study was explained to pediatric nursing students before conducting the study.

2-Tools development: Four tools were utilized in the study

Tool I, II were designed after reviewing relative literature. Tool III was adapted by the researcher to evaluate nursing students' group engagement before, immediately and two weeks after the implementation of team based learning session. Tool IV was used to evaluate student feedback regarding strategy which measure immediately after the implementation of team based strategy.

3-A pilot study involving 10% of pediatric nursing students enrolled in the course was conducted in order to assess the viability and intelligibility of the tools. The essential change was made.

4-Content validity: - Prior to initiating the research, a group of five experts in the field of pediatric nursing examined the instruments to verify that the data was accurate and pertinent. Content validity index were 98%. Recommendation from expertise was done

5-Reliability: - The reliability of the tools (I, II, III, and IV) was evaluated using Cronbach's alpha, which was 0.891.

6-Gastrostomy feeding procedure was implemented by using simulator in clinical laboratory.

7-Sample of student was selected randomly into equal 2 groups, study and control groups, 70 pediatric nursing students for each group.

8-Application of the current study done taking the subsequent steps:

I. Assessment phase :- The researcher reviewed recent related literature about team based learning strategy to be more knowledgeable and expertise in order to implement it in teaching the gastrostomy feeding procedure for pediatric nursing students which include the following :-

1-Preparation of the content

- The researcher developed multiple choice questions and case studies about gastrostomy feeding.
- Case studies was developed according students level of understanding which encouraged students to participate in small group discussion.

2-Preparation of students

- Pediatric nursing students were informed about the aim of the study, steps of team based strategy and the role of each one in team by the researcher.
- The researcher asked study group of student to read about gastrostomy feeding procedure in items such as definition, indications, complication, contraindication, steps of gastrostomy feeding procedure, post care after feeding by using text books and other sources.
- Pediatric nursing students were divided into 10 subgroups in the study group each subgroup consist of 7 students.

II-Implementation phase

- a) **In related to the study group:** the knowledge and engagement of the pediatric nursing students were measured before conducting team based learning strategy using (Tool I, II) The researcher explained students' roles in team based learning as follow: leader, recorder, time keeper and checker. These roles were distributed for the students of each team by the researcher.
- Pediatric nursing student's knowledge about gastrostomy feeding procedure was tested by using individual test consists of 10 multiple choice questions (part 2 tool I). This is called individual readiness assurance test. Each subgroup's students were instructed to sit in a circle and repeat the identical test. The students were allowed to discuss and choose their answers to the questions as a team. After completing the answers of each team, the team presenter allowed to discuss their answers in front of other groups and gave explanation and rationales how they arrived at their answers
 - The researcher gave immediate feedback regarding teams' answers and gave clarification and correct misunderstanding.
 - After that there were group implementation exercise in which students gave two case studied that represented real problem which help students to implement the

knowledge obtained from reading the course of gastrostomy feeding to answer each question

- Two cases studied for training the students and one case study was used for evaluation of them
- All teams worked on the same case studies, brain stormed generate hypotheses related to these case studies, the students discussed with one another the information acquired to choose the best answer for the case studies.
- The researcher went around each team to guide and supervise students work on case studies about gastrostomy feeding.
- Then answers of each team related to case studies presented in front of other groups by team presenter and each team explained how they reach at their answer.
- The researcher explained to the students the rationale for each step while demonstrated the gastrostomy feeding steps on the simulator at the pediatric skill lab
- Each student was given the opportunity to perform the process again while being observed by the researcher and the other students by using gastrostomy observation check list (Tool II).
- The researcher gave immediate feedback regarding the students' clinical practice of gastrostomy feeding procedure.

b) In related to the control groups

It the beginning, the knowledge and group engagement of the control group were assessed before the clinical instructor taught gastrostomy feeding procedure using tools I and II

- Pediatric nursing students in the control group were taught gastrostomy feeding procedure through demonstration and re-demonstration.

- III-Evaluation phase

- Knowledge as well as engagement in the study and control groups were assessed using Tools I, II, and III before, immediately following, and two weeks after the application of the TBL strategy.

For the study and control groups, pediatric nursing students' practice was assessed twice: immediately and two weeks following the deployment of team-based techniques.

- Using Tool IV, the study group's feedback on the team-based learning technique was assessed immediately.

Statistical analysis

- The collected data was arranged, tabulated, and statistically analyzed using the SPSS statistical software, version 26. For the quantitative data, the range, mean, and standard deviation were calculated. Utilizing the Chi-square test (χ^2), qualitative data was compared. The means of two variables within a group were compared using the paired samples t-test. For comparing means for variables over three intervention periods in a group or for more than two variables, the analysis of variance (ANOVA) F-value was calculated. The correlation between the variables was evaluated using R, the Pearson-Spearman correlation coefficient. A significance level of $P < 0.05$ was applied in order to assess the results of the significance tests (*). A highly significant at $P < 0.01$ was also used to interpret the results of the significance tests (**). (White S E. 2019).

Results

Table (1): Illustrates that 55.71% and 40% of students aged between 21 and 22 years in both groups respectively, with statistically significant differences observed at 0.003. In relation to the gender of the student, more than two-thirds (71.43%, 74.29%) were females in both groups respectively. It also clear that both groups student didn't attend any clinical training courses related to gastrostomy feeding or team-based learning strategies.

Table (2): Signifies that the majority of studied students (82.9%) had a moderate level of knowledge during the individual readiness assurance test, while 100% and 90% of the study group had a high level of knowledge

through the team readiness assurance test immediately after and two weeks after the implementation of team-based strategies, respectively. On the other hand, more than two-thirds of control group students (70%) had a low level of knowledge before using traditional methods of teaching, while their level improved to 80% and 57.14% immediately after and two weeks after the implementation of traditional methods, respectively, with a statistically significant difference with a P value (0.000).

Table (3): Demonstrates that about 97.14% of nursing students had a satisfactory level of practice immediately after the implementation of team-based strategy, while it declined to 71.43% two weeks after the implementation of team-based strategy. In relation to the control group, the majority of students (91.43%) had a satisfactory level of practice immediately after using the traditional method of teaching, while this declined to 57.14% two weeks after the implementation of the traditional method. Also, a statistically significant difference was observed in student performance in both groups immediately and two weeks after the implementation of teaching methods, with a P value (0.000) for each. Also, the mean scores of practice were 30.30 ± 2.122 and 26.39 ± 4.008 in the study group, compared to the mean scores of the control group (29.97 ± 2.621 and 27.79 ± 3.945) immediately and two weeks after the implementation of teaching methods.

Table (4): Shows that 97.1% of students in the study group had a moderate level of engagement before the implementation of team based strategy, while (100%, 90%) of them had a high level of engagement immediately after and two weeks after the implementation of the team-based strategy. On the other hand, 85.71% of nursing students in the control group had a moderate level of engagement immediately after the implementation of the traditional method of

learning, with a highly statistically significant difference of P value 0.000.

Table (5): The table clears that there was a positive non-significant correlation between the total scores of engagement and the total scores of knowledge in the study group before and immediately after the implementation of team-based strategy, with r (0.090, 0.214) and P (0.459, 0.554), respectively, while a positive significant correlation was observed between the total scores of engagement and the total scores of knowledge two weeks after the implementation of team-based strategy.

On the other hand, there was a negative non-significant correlation between total scores of engagement and total scores of knowledge before the implementation of teaching methods with r (-0.110) P (0.366), while there was a positive non-significant correlation between total score of engagement and total score of knowledge immediately and two weeks after the implementation of teaching methods with r (0.005, 0.001) P (0.965, 0.996), respectively.

Also, the table signifies that there was a significant positive correlation between the total scores of engagement and the total scores of practice in the study group immediately and two weeks after the implementation of teaching methods, with r (0.218, 0.612) and P (0.049, 0.041), respectively. In relation to the control group, there was a significant positive correlation between the total scores of engagement and the total scores of practice immediately and two weeks after the implementation of routine teaching methods, with r (0.097, 0.317) and P (0.426, 0.508), respectively.

Table (6): Shows that all of the study group students had positive feedback about team-based strategies with mean and SD was 103.81 ± 4.509 .

Figure (1): Displays that 84.11% of the studied students reported their accountability to the team, while 80.70% of them showed their preference for using a team-based strategy. The majority of studied students

(92.10%) reported their satisfaction with team-based learning, while 87.43% reported their feedback related to the evaluation of team effectiveness

Table (1): Percentage distribution of the studied students regarding their sociodemographic characteristics.

Characteristics	The studied pediatric nursing student (n=140)				χ^2 P
	Study group (n=70)		Control group (n=70)		
	No	%	No	%	
Age (in years)					14.043 0.003*
20-<21	29	41.43	25	35.71	
21-<22	39	55.71	28	40.00	
22-<23	2	2.86	15	21.43	
23	0	0.00	2	2.86	
Gender					FE 0.849
Male	20	28.57	18	25.71	
Female	50	71.43	52	74.29	
Residence					FE 0.250
Rural	55	78.57	48	68.57	
Urban	15	21.43	22	31.43	
Attendance of clinical training courses related to gastrostomy feeding and team based learning strategy					-
No	70	100.00	70	100.00	

Table (2): Total knowledge levels of studied pediatric nursing students about gastrostomy feeding with team based learning strategy implementation.

Total knowledge level	The studied pediatric nursing student (n=140)													χ^2 P
	Study group (n=70)						χ^2 P	Control group (n=70)						
	pre		Immediate		Post 2 weeks			Pre		Immediate		Post 2 weeks		
	No	%	No	%	No	%		No	%	No	%	No	%	
Low	4	5.7	0	0.00	0	0.00	-	49	70.00	0	0.00	0	0.00	155.94 0.000*
Moderate	58	82.9	0	0.00	1	10.00		21	30.00	14	20.00	30	42.68	
High	8	11.4	10	100.0	9	90.0		0	0.00	56	80.00	40	57.14	
Range	(15-25)		(30-30)		(26-30)		t=3.772 P=0.001 *	(13-21)		(19-30)		(21-29)		F=281.91 P=0.000*
Mean ± SD	20.56±2.288		30.00±0.00		28.60±1.174			16.21±2.32		25.91±3.36		24.73±2.064		

< 60% Low (60-<80) % Moderate ≥ 80% High

* Significant at level P<0.05

IRAT: Individual readiness assurance test

TRAT: team readiness assurance test

Table (3): Total levels scores of studied pediatric nursing students practices regarding gastrostomy feeding procedure.

Gastrostomy Feeding Practices level	The studied pediatric nursing student (n=140)										
	Study group (n=70)					χ^2 P	Control group (n=70)				χ^2 P
	Immediate		Post 2 weeks		Immediate		Post 2 weeks				
	No	%	No	%	No		%	No	%		
Unsatisfactory	2	2.86	20	28.57	FE	6	8.57	30	42.86	FE	
Satisfactory	68	97.14	50	71.43	0.000*	64	91.43	40	57.14	0.000*	
Range	(22-32)		(13-32)		t=7.221	(22-32)		(27-32)		t=3.861	
Mean \pm SD	30.30 \pm 2.122		26.39 \pm 4.008		P=0.000*	29.97 \pm 2.621		27.79 \pm 3.945		P=0.000*	

< 80% Unsatisfactory

 \geq 80% Satisfactory

* Significant at level P<0.05

Table (4): Total levels of group engagement of the studied pediatric nursing students throughout period of implementation of teaching methods

Engagement Level	The studied pediatric nursing student (n=140)													
	Study group (n=70)						Control group (n=70)							
	Pre		Immediate		Post 2 weeks		χ^2 P	Pre		Immediate		Post 2 weeks		χ^2 P
	No	%	No	%	No	%		No	%	No	%	No	%	
Low	2	2.9	0	0.0	0	0.0		FE 1.00	40	57.14	10	14.29	30	
Moderate	68	97.1	0	0.0	1	10.0	30		42.86	60	85.71	40	57.14	
High	0	0.0	10	100.0	9	90.0	0		0.0	0	0.0	0	0.0	
Range	(17-29)		(31-35)		(27-36)		t=1.309	(16-27)		(17-26)		(17-26)		F=6.889
Mean \pm SD	23.77 \pm 2.391		33.20 \pm 1.317		32.00 \pm 2.582		P=0.207	20.61 \pm 2.650		22.06 \pm 1.880		21.20 \pm 2.344		P=0.001*

Table(5): Correlation between total scores of engagement of the studied pediatric nursing students, their knowledge and gastrostomy feeding scores throughout periods of implementation of teaching methods.

	Total engagement scores						
	r	Study group			Control group		
		Pre	Immediate	Post 2 weeks	Pre	Immediate	Post 2 weeks
Total knowledge Scores	r	0.090	0.214	0.183	-0.110	0.005	0.001
	P	0.459	0.554	0.012*	0.366	0.965	0.996
Total gastrostomy feeding scores	r	-	0.218	0.612	-	0.097	0.317
	P	-	0.049*	0.041*	-	0.426	0.508

Table (6): Total feedback level of the study group pediatric nursing students regarding team-based learning strategy.

Team feedback Level	The studied pediatric nursing student (n=70)	
	N	%
Positive	70	100.0
Range	(94-110)	
Mean \pm SD	103.81 \pm 4.509	

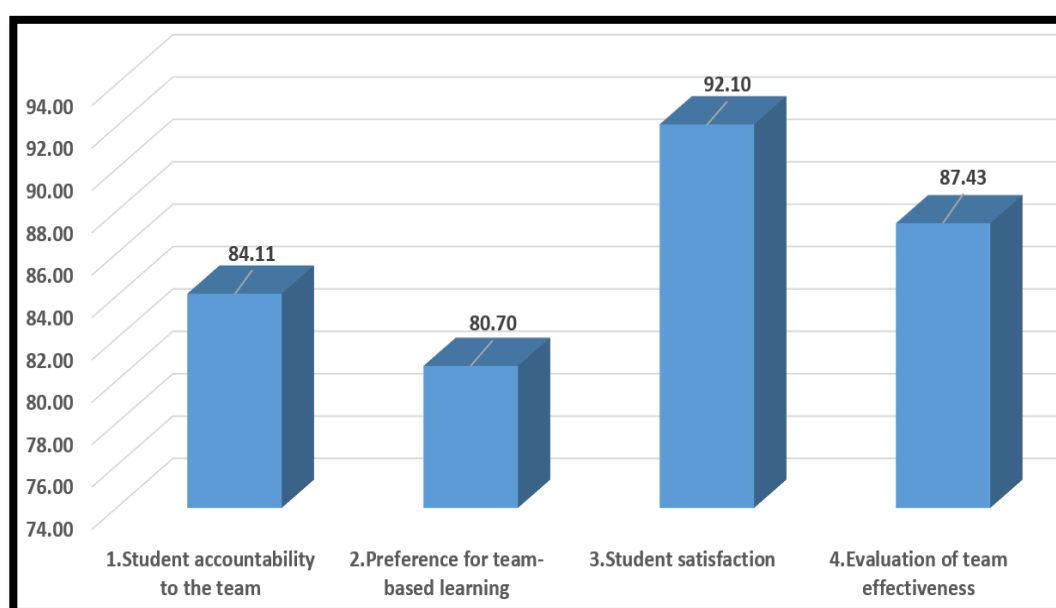


Figure (1): Mean percentage and ranks of feedback domains about team-based learning strategy of the studied pediatric nursing students immediately after implementation of team based strategy

Discussion

A form of cooperative education called team-based learning entails students doing work in groups and individually while receiving rapid feedback. Students now have a greater responsibility to get ready for class and participate in activities. It enhances students' communication and collaborative skills. Additionally, it raises students' grades and opinions. (Yang S , Liu C , Hsieh P (2020). Student engagement is specifically defined as the cognitive investment made by students in their active involvement, which includes attending courses, turning in needed work, and paying attention to what their teachers are teaching in class as well as their emotional commitment to learning. (Shuhui L, Yunchen H (2019).

Regarding student readiness assurance for using strategy of team-based learning. The results cleared that the students in the study group were ready to use TBL to teach gastrostomy feeding procedures. This may be due to the orientation session given by the researcher about the benefits of using TBL and its contribution to their performance. Ibrahim (2018) and Ahmed (2018) were in agreement with this study. They discovered that the majority of the students in the study group were prepared to learn nurse administration using the TBL approach.

Regarding the acquisition of knowledge by using team-based strategies, it was revealed that the majority of studied students had a moderate level of knowledge during IRAT, while the entire pediatric nursing student in the study group had a high level of knowledge during TRAT immediately after and two weeks of the implementation of team-based strategies. The improvement may be due to collaboration and discussion among team members to reach the correct answer and their sense of responsibility toward their answer and their team.

Retention and enhancement of knowledge

level of the study group two weeks after the implementation of a team-based strategy may be explained as using a small number of students within the team, which enhances interaction among the group members and gives the student a sense of responsibility for his learning. Peer assessment and feedback from both researchers and group members increased involvement and engagement, ultimately enhancing the overall understanding of the group.

The current study were on the same line with Kongpet (2022), Hui Xue (2021) , Lee and Parks (2021) Elaraby et al. (2017) and Brandler et al. (2017); who demonstrated that there were differences in students' knowledge levels in both the individual and group readiness assurance examinations. Individual readiness assurance exams are lower than those conducted in groups and discovered that the mean scores of knowledge following the use of TBL was much greater than that before the use of TBL.

On contrary, Haidet (2018) was mentioned that no significant difference between the TBL technique group and the lecture group in terms of knowledge outcomes.

Through the use of active learning approaches, the development of higher thinking skills and knowledge application that are required in contemporary healthcare settings is promoted. Through the use of activities, TBL helps students learn the material more deeply, and it also strengthens their ability to think critically and solve problems.

A statistical significant difference was observed among studied nursing student related to case study No (2). This improvement of student critical thinking may be due to application TBL allow student to connect theoretical knowledge with clinical application in real situation and allow them to critical analysis of the problem, share their opinion and reach suitable solution. Also,

peer interaction and discussion help them to set the priority and solve the problem.

Ulfa et al., (2021) and Kim H, Song Y, Lindquist R, Kang H. 2017 were in alignment with the current study, who discovered a substantial distinction among both the intervention and control groups' clinical reasoning. The clinical reasoning on the PPH score was greater in the intervention group than it was in the control group.

Applications of knowledge lead to improvements in the performance of the majority of students immediately after learning from their peers and through discussion. Peer learning also improve the student transferable skill and raise their performance (**Carris N, Cole J, Franklin A, Sunjic K. 2023**).

The current study illustrated that the study group showed high academic performance and improve their practice regarding gastrostomy feeding procedure. These findings could be explained scientifically as competition among student transforms into friendship, cooperation and partnerships are strengthened, and an inclusive class is called for in order to promote effective thinking and innovation. Students in TBL sessions interact with their peers, successfully resolve conflicts with them, boost their confidence, and learn more while having equal access to educational opportunities.

Aboregela A, Sonpol H, Mohammed O (2023) and Zhang Q, Tang X, Zhao Y, Wang Z. (2022) were in accordance with result of present study. They found that the student practice was elevated in the study group that use TBL compared to the control groups that received by traditional method in teaching the anatomy course. Also, **Anwar K, Kashir J, Sajid M, Rasool A (2020)** showed that using of TBL strategy in learning process help in reduce the stressful situation and gave students a perfect setting to

consolidate the facts they had learned throughout the course, which boosted their academic achievement.

Concerning student engagement throughout using team based learning; it was observed that the majority of study nursing student had moderate level of engagement before the implementation of TBL while all of them and majority of them had high level of engagement immediately and two weeks after implementation of TBL respectively.

The elevation of engagement level among study group could be explained scientifically as dividing student in small group that allow cooperation and give students chance for interaction and working together during TBL sessions and improve their engagement and give sense of inclusion to his team.

The current study results were similar to the study conduct by **Ibrahim(2018)** who found that using TBL improve students' interaction and collaboration during learning session in nursing administration course more than other student in control group which use traditional method

The pediatric nursing student in the study group favored using TBL in the teaching process over other teaching methods. Their preferences for using TBL are due to the following reasons: it provides students with the opportunity to have an active role in their learning rather than being passive receivers, it gives students a sense of willingness to imitate and a sense of confidence, it creates a pressure-free environment that enhances learning outcomes, it encourages students to gain and apply knowledge in real-life situations

The current study was in accordance with **Ibrahim (2018) and Elaraby (2017)**, they found that the students of study group preferred of using TBL more than other methods of teaching. Conversely, the findings of the present study are inconsistent with **Rezende (2020)**, he found that most medical

students reported that TBL did motivate them and most of them preferred to learn through a combination of regular lectures and TBL.

The majority of the students in the present study reported that application of TBL has positive impact on their learning. It improved student participation and collaboration, kept student responsible for his learning, increased critical thinking and problem-solving abilities, gave them the opportunity to gain communication skills, and kept them more engaged. It also help student to apply theoretical knowledge in practical situation **Saadaldin and Hyun (2022)** were in accordance with the current study, they found there is substantial effect of the TBL on the student satisfaction. They found that students' satisfaction was significantly increased during use TBL compared to traditional classrooms.

One of the primary principles of TBL is the accountability of the student. Preparation of the content before team based s sessions help student to work independently and give sense of responsibility. (**Rachel E, Corey J , Colyer1 , Manning J .2017**).

Regarding student accountability toward their learning, most of studied nursing student feel accountability toward TBL. This result may be due to the student takes initiative and conducts independent research on the issue throughout the preparation phase, in which he becomes active and searches for information about the topic, which gives him a sense of accountability for his team's success. Also, students volunteer to participate in group discussions, and every student has a role in his team that gives him a sense of responsibility.

Methaneethorn (2022) was in a line with current result. He found that application of a TBL in pharmacokinetic courses have positive impact in different areas in learning process such as increase examination grades, improvement in professionalism aspects such

as humanity, responsibility, and morality. Student engagement and their interaction, peer learning and peer evaluation, and the improvement of transferable skills.

In relation to correlation between pediatric nursing students' total knowledge, total practice and their engagement. The findings of the current study showed a favorable correlation between the study group's total engagement scores, total knowledge scores, and total practice scores. The finding could be explained scientifically as students who are engaged in class and communicate with one another experience in a less stressful environment, which raises their level of understanding and proficiency.

The present study were in accordance with **Vlachopoulos and Buckton (2021), Siah (2019), Dearnley(2018)**. They discovered a strong correlation between final grades and built-in TBL assessments, suggesting that TBL has the ability to predict performance. And have a favorable effect on students' motivation, contentment, performance, and effective teaching and learning.

Conclusion

Based on the findings of the current study, it can be concluded that using a team-based learning approach in a pediatric nursing course has a beneficial effect on enhancing the knowledge, critical thinking, clinical performance, and engagement of the students regarding gastrostomy feeding.

Recommendations

1. The curriculum for the pediatric nursing should contain a team-based learning strategy as an engaging teaching technique.
2. Improving all teaching staff members' awareness about TBL strategy and group involvement through the conduction of educational seminars as part of in-service training.
3. Developing a procedure handout containing planning and implementation

of TBL for faculty staff.

- The educational program should give attention in developing teaching methods that enhance student engagement in the class room.

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