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Applying Problem Based Learning Model on Secondary Technical Nursing School Students

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Abstract
Problem-based learning is students – centered pedagogy in which students learn about a topic through the experience of solving an open – ended problem found in a stimulus material. **Aim:** Apply Problem Based Learning Model on Secondary Technical Nursing School. **Design:** quasi-experimental study design. **Study subject:** It included all 3rd year of nursing students. **Setting:** It conducted at the Sahel Seleem Nursing School. **Study tools:** included four tools: (I) Socio-demographic data, (II) problem-based learning questionnaire, (III) self-assessment questionnaire and (IV) peer assessment questionnaire. **Results:** There was a high main score in skills "knowledge base, problem solving skills, clinical reasoning, collaborative work, self-directed learning and attitude and professional skills" of the studied nursing students after applying of Problem Based Learning Model than pre applying it; also, there were improvement in self- assessment and peer assessment. **Conclusion:** By using PBLM, there was an improvement of the students' skills in self-directed learning, clinical reasoning, problem solving, knowledge base, attitude and professional skills and collaborative work skills. Following the use of the problem-based learning approach, self- and peer-assessment were also established. **Recommendation:** Develop an educational plan by those who develop the curriculum to implement problem-based learning model to students in nursing schools in Egypt.

Keywords: Problem based learning model, Secondary technical Nursing Student & Apply.

Introduction:
Education is being seen to be able to enable students to maximize their potential as a trustworthy resource candidate in order to be analytical, logical, and imaginative in dealing with and addressing any problem encountered, education plays a vital part in producing reliable human resources. Nursing education, in particular, should design to help students reach their full potential. **(Sagala, et al., 2017).**

As education is "a process of changing attitudes and behavior, act of educating". The application of Problem Based Learning (PBL) is expected students are more active, effective, and able to accept the lessons delivered by the teacher learning. It uses real-world problems as a context for students to learn about how to think actively, creatively, innovatively, and critical. It also trains students and encourages them to have thinking initiative in problem solving skills **(Trianingish, 2020).**

Model Problem-Based Learning is a learning model approach to the problem of geniune student learning so that students can build their own knowledge, develop and grow superior competencies. The student's independence and to enhance student's trust. This model characterized by the use of real-life problems as something to be learned students to exerience and enhance critical thinking skills and problem solving as well as gain knowledge of key concepts, in which the teacher's role should concentrate on helping students achieve self-directed skills. Use problem-based learning in advanced-level thinking, problem-oriented situations, including how to learn. It also, will help students to improve the needed skills in the current era of globalization. In PBL curriculum, designed problems requires students aquire vital informtion, making them adept at solving the problem and it has its own learning strategies and skills to share in the team. The learning process uses a systemic approach to solving the problems or challenges that need in everyday life. With the model PBL students are expected to aquire more skills than knowledge memorized. Starting from the problem-solving skills, clinicl reasoning skills, collaborative work, interpersonal and communication skills, as well as seking and information processing skills **(Nurzaman, 2017).**

PBL is a teaching and learning method that improves the students' education to apply it in clinical practice and improves learning, productivity, knowledge base,

problem-solving skills, clinical reasoning, self-direction, collaborative work, and professionalism skills **(Abd El-Hay & Abd-Allah, 2015)**.

PBL is a stimulating, demanding, and pleasurable learning strategy that emerged from the process of attempting to comprehend and solve problems. It's also a clinical scenario used to encourage students to learn specific skills, information, and talents in order to solve the problem. Students employ scientific methods of investigation, evaluation, to develop the clinical reasoning abilities. Its goal is to increase scientific understanding using real-life examples, as well as reasoning and self-directed learning methodologies **(Neuman, 2016)**. One of the learning models used to promote students' higher-order thinking in real-world problem-oriented settings, including learning how to learn, is problem-based learning (**Simamora** & **Manurung**, **2021**). A cognitive process in which an individual or a group identifies or discovers efficient coping mechanisms for issues that arise in everyday life have been defined as problem solving skills by **(Shin, &Kin, 2013)**. To satisfy the patients' health care needs, these skills include the knowledge base ability in knowing issues, creating solutions, alternatives, an action plan, progress notes, and end results outcomes **(Wikipedia, 2020)**.

Assessment, analysis, outcome identification, planning, implementation, and evaluation, used to develop problem-solving abilities. Assessment is a technique for detecting the presence of an issue, as well as collecting and recognizing data. The goal of analysis is to accurately deviate detection, determine priorities, and produce a list of all feasible solutions. Outcome identification is a technique for determining the outcomes and predicting the probability of each one occurring. Planning used to create a plan for resources, create a list of intended actions, and create a time plan. Implementation used to apply the solution and give clear directions to involved personnel. The action utilized to put the idea into action and provide simple instructions to all parties involved. The end phase was track how well a plan is working and to change ineffective tactics to evaluation used to follow the result of the model and change ineffective actions **(Abd El-Hay& Abd-Allah, 2015).**

PBL is a pedagogical approach that provides students with learning opportunities by actively engaging in meaningful problems**.** In PBL, students must define a problem, participate in research, and integrate theory and practice in order to develop practical solutions **(Romanowski, & Karkouti, 2021).** One of the most prominent strategies is problem-based learning (PBL), which asks students to solve a case that is similar to the types of problems that practitioners face. Theorists assert that problem solving is an important element of effective learning, especially given that many of the problems encountered within the domain practice are ill-structured **(Andrew, et al., 2021).**

The capacity to investigate and foster creative strategies to identify solutions to any difficulties encountered referred to as problem-solving ability **(Csapó & Funke, 2017).** Knowledge applied through a mental process. This entails applying previously acquired knowledge and proper methods to a specific problem; problem solving is an activity that entails formulating new solutions that go beyond just using previously taught principles to achieve a specific goal. Numerous issues-solving strategies divided into four steps; understanding the problem, making a plan, carrying it out, and finally looking back **(Maknun, 2021).** It is a process of finding answers by each individual who applies his prior knowledge and skill into any device and applications to meet new requirements that are unknown, so problem solving skill trains students to connect prior experience into new experience and to learn through active participation (**Nalurita, & Cahyono, 2021).**

PBL is a student-centered approach to learning in which students have an active part in their own education. PBL encourages lifelong learning and self-directed learning. The students used textbooks, journal papers, and online resources such as the Medline database to find advanced knowledge. **(Gholami et al., 2016).** PBL requires self-directed learners who can develop the ability to assess knowledge and seek out resources to address their insufficiency **(Romanowski & Karkouti, 2021**).

Clinical reasoning is a cognitive process used to assess and manage a patient's medical situation. It influenced by the individual's attitude. It is the sum of decision-making, thinking and cognitive processes associated with clinical practice; it is a critical skill of health professionals with importance for acquiring an autonomous and professional practice that allows health students to make assertive decisions, which implies students and implies a better action based on a judgment within a specific context **(Cerrelio, 2016).** PBL encourages students to work well in groups by resolving disagreements, negotiating group activities, building common ground, and making well-informed judgments. As students express their thoughts in groups, it facilitates effective teamwork and improves the learning tool. Students become acquainted with one another and feel a sense of belonging as they work in groups. Students take responsibility for their own learning, learning how to build on existing information and focusing on the process of knowledge acquisition, and how to solve problems through group

agreements as part of the PBL approach. **(Amen, 2020)**.

PBL in teaching activities either in the classroom or at a practical experimental place produces clear benefits for students, such as self- learning improvement, knowledge base, problem solving skills, clinical reasoning, collaborative work and professionalism skills **(Tosun & Senocak, 2013). And Al Najar et al., (2019)** added that, PBL has been a widely spread learning method adopted by many institutions after medical schools and other health related curriculums globally**.**

Self-assessment is essential for its success to providing guided opportunities for students to practice it. Students need to do it, discuss it and justify it. After students have self-assessed their work, they will be able to set new learning goals based of what they have learnt about themselves. Peer assessment involves students taking responsibility for assessing the work of their peers against set assessment criteria. They can therefore be engaged in providing feedback to their peers (sometimes referred to as peer review), summative grades (moderated by you or your colleagues), or a combination of the two. Peer assessment, or self-assessment, is a process whereby students or their peers grade assignments or tests based on a teacher's benchmarks. The practice is employed to save teachers time and improve students' understanding of course materials as well as improve their metacognitive skills. Rubrics are often used in conjunction with Self- and Peer-Assessment **Wikipedia, (2020)**.

Significance of the study:

While the researcher reviewing the related literatures founded that there were three internationally published studies, the first one titled by "The effects of problem-based versus lecture-based learning on the development of critical thinking, problem-solving, and self-directed learning skills in nursing students" done by (**Al Najar et al., 2019)**, the second one titled by "Problem-based learning. Educational technology based learning" studied by (**Kurt, 2020**) and lastly the third one titled by "Effects of problem-based learning on clinical reasoning in c therapy" done by (**Scaffa, & Wooster, 2020)**. In addition, there were no studies conducted in Upper Egypt about PBLM. The researcher as a teacher in Secondary Technical Nursing School noticed that the students have no skills in problem solving as regard to education because they learned by the traditional methods. So, the researcher felt it was necessary to determine the impact of a problem-based learning approach to problem-solving abilities, self-directed learning, clinical reasoning, and collaborative work and professionalism skills for secondary technical nursing school students.

Aim of the study: This study aims to:

Apply Problem-Based Learning Model on secondary technical nursing school students in Sahel Seleem city.

Specific objective: The aim of this study fulfill the following objectives:

- Apply (PBLM) on secondary technical nursing school students in Sahel Seleem city.
- Determine the effect of PBLM on problem solving skills, knowledge base, clinical reasoning and self-directed learning, collaborative work and professionalism skills for secondary technical nursing school students.
- Explore the effect of PBLM on student's self-assessment and peer assessment.

Research hypothesis:

- High mean scores of the secondary technical nursing school students in (problem solving skills, self-directed learning, knowledge base, clinical reasoning, professionalism skills and collaborative work) have improved after applying the problem-based learning model.
- High percent of the students' self-assessment and peer-assessment will be developed after applying for the PBL Model.

Subjects and Methods:

Design: Quasi-experimental design was conducted in this study

Setting: At Secondary Technical Nursing School in the Sahel Saleem city

Subject: Convenient sample of all 3rd year of secondary technical nursing students at Sahel Saleem Nursing School (No. = 30 students).

Data collection tools:

The study tools included four tools It developed by the researcher after reviewing the literatures **(Montemayor, 2014, Khoiriyah et al., 2015 & Al Najar et al., 2019).**

(I) Socio-demographic data for the studied subject included information about studied nursing students: age, marital status and place of residence.

(II) Problem-based learning questionnaire: It developed by **(Tukamushaba & Musinguzi, 2016)** and it consisted of 42 items classified into five factors: knowledge base (five items), problem solving skills and clinical reasoning (eleven items), self-directed learning (eight items), collaborative work (eight items) and attitude and professionalism during the discussion (ten items). **Scoring system:** It had three points (0-2) Likert scale type ranging from Undeveloped (0), Average (1) and Developed (2) and the sum of total scale ranged from **(0-126)** and it was computed if the scores percent was ≥ 60% it

indicated Developed skills and scores ≤ 60% indicated Undeveloped skills.

(III) Self-assessment questionnaire: It consisted of 42 items classified into five factors: Knowledge base (five items), problem solving skills and clinical reasoning (eleven items), self-directed learning (eight items), collaborative work (eight items) and attitude and professionalism during the discussion (ten items). **Scoring system:**It had three points (0-2) Likert scale type ranging from Undeveloped (0), Average (1) and Developed (2) and the sum of total scale ranged from **(0-126)** and it was computed if the scores percent was ≥ 60% it indicated Developed skills and scores ≤ 60% indicated Undeveloped skills.

(IV) Peer assessment questionnaire: It consisted of 19 items classified into two factors: collaborative work (nine items), attitude, and professionalism during the discussion (ten items). **Scoring system:** It had three points Likert scale type ranging from: Undeveloped (0), Average (1) and Developed (2) and the sum of total scale ranged from **(0-57)** and it was computed if the scores percent was ≥ 60% it indicated developed skills and scores ≤ 60% indicated Undeveloped skills**.**

Methods:

After inspecting the accessible writings concerning the subject of the examination, translation of the tools from English to Arabic was finished. Official permission obtained to collect data from the directors of the secondary technical Sahel Salem Nursing School and the director of Sahel Salem hospital.

Ethical considerations:

Research proposal was approved by the Ethical Committee at the Faculty of Nursing at Assuit University. There was no risk to study students during the application of the study. The study was following common ethical principles in clinical research. The nature and the purpose of the study were explained to the students that participate in the study. Confidentiality and anonymity were assured.

Study procedures:

The study was conducted throughout three main phases: preparatory phase, implementation and evaluation phase.

Preparatory phase: It included needs assessment of participants and data collection tools was constructed and tested after extensive literature reviews. The face validity of the study tool was reviewed by the expertise in the field of the nursing administration. Five nursing administration, academics (Jury) from Assuit University's Faculty of Nursing examined the study tool's face validity. Content validity checked and analyzed using confirmatory factor analysis test to assure (importance, clearness, and accountability of each item on the study tool) and its result was ≥ 1.8 for all items of the study tool (= 0.947).

Pilot study:

A pilot research done on three nursing students over the course of two weeks to assess the language understood, the relevance of points, and the time spent in the various instruments. Some changes made based on the findings of the pilot research and included the students in the research. Reliability analysis with the results and the researcher was done the modification of items before the application of pilot study according to nursing experts in jury.

A pilot study was carried out to assess tool understandability, applicability and time estimate of the study tools. Moreover, to identify problems that may be encountered during the actual data collection. It applied on (10%) from total sample of studied nurses (n=3) .The researcher met with each staff nurse introduced herself and explained the aims of the study then ask them to fill the questionnaires of the study and respond to any question regarding to the questionnaire content . Data collected from the pilot study was analyzed and no changes were done , so the nurses included in the pilot study not excluded from the total number. The Cronpach alpha was equal (α=0.897).

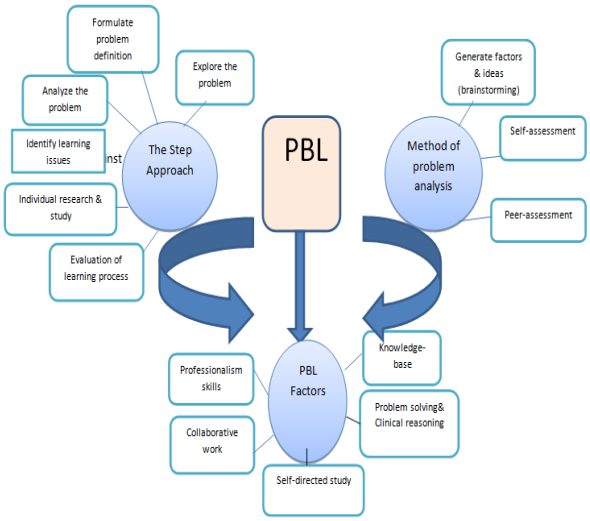
Reliability Statistics of the Study tools as measured by internal Consistency.

Tools	No of Items	Cronbach's Alpha	Validity
Knowledge Base	5	0.741	0.860
Problem Solving Skills and Clinical Reasoning	11	0.751	0.866
Self-Directed Learning (Self-Study)	8	0.754	0.868
Collaborative Work	8	0.791	0.889
Attitude and professionalism during the discussion	10	0.766	0.875
Total	**42**	**0.897**	**0.947**

Implementation Phase: This model, which developed by **(Tukamushaba & Musinguzi, 2016)** was applied by the researcher for secondary technical nursing students in 3rd year. It carried out at the first semester (from mid of October to the end of December 2020) and the nursing students were participating in sessions (one session / week, each session 2 hours). The studied nursing students divided into 6 groups in which each sub group includes 5 students.

Field Work:

Pre- and post-tests done by applying genuine case studies related to pediatric nursing to assess problem-solving abilities in generating nursing care plans by using this Model framework. It consisted of real case studies with certain health problems about pediatric nursing. The questions on the sheet included: Completion, matching, essay, arranging, true or false and multiple choices offer a variety of options to examine nursing students' abilities in assessing, analyzing (finding problems), identifying outcomes, planning, implementing, and evaluating the patient's difficulties.



Problem-Based learning Model (Tukamushaba & Musinguzi, 2016)

Evaluation Phase:

The researcher evaluated the worth outcomes of the PBL model through pre and post tests**.**

Statistical analysis:

SPSS version 22 statistical software tools for social sciences were used for data entry and analysis. Data presented using descriptive statistics such as frequencies and percentages, as well as mean and standard deviation. The impacts of the problem-based learning paradigm for secondary technical nursing school students were evaluated using the (ANOVA test), with statistical significance defined as a P-value of less than 0.05.

Results:

Table (1): - Percentage distribution of socio-demographic data of the studied nursing students. (N= 30).

Socio-demographic data	No.	%
Age (years)		
18	**16**	**53.3**
- <18	14	46.7
Mean ±SD	17. 92±0. 092	
Marital Status		
Single	**28**	**93.33**
Married	2	6.67
Divorced	0	00
Place of Residence		
Rural	**24**	**80**
Urban	6	20

Table (2): The distribution of the studied subjects as regard to problem solving skills and clinical reasoning pre-post applying PBLM (N=30).

Problem Solving Skills and Clinical Reasoning	Pre						Post						P. value
	Undeveloped		Average developd		Developed		Undeveloped		Average develope		Developed		
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
1. Distinguish the important information about the problem.	24	80	6	20	0	0	0	0	2	6.67	**28**	**93.33**	< 0.001**
2. Identify patient's problems.	19	63.3	11	36.7	0	0	0	0	1	3.33	**29**	**96.67**	< 0.001**
3. Prioritize patient's problems.	29	96.7	1	3.3	0	0	0	0	2	6.67	**28**	**93.33**	< 0.001**
4. Understand information given in the problem.	26	86.7	4	13.3	0	0	0	0	2	6.67	**28**	**93.33**	< 0.001**
5. Able to support clinical reasoning and decision-making.	30	100	0	0	0	0	0	0	4	13.33	26	86.67	< 0.001**
6. Show evidence of the facts about the problem.	30	100	0	0	0	0	0	0	13	43.33	17	56.67	< 0.001**
7. Demonstrate the ability to diagnose the problem.	30	100	0	0	0	0	0	0	8	26.67	22	73.33	< 0.001**
8. Able to make decisions related to the problem.	30	100	0	0	0	0	0	0	4	13.33	26	86,67	< 0.001**
9. Able to make decisions related to the therapeutic approach to the problem.	30	100	0	0	0	0	0		4	13.33	26	86.67	< 0.001**
10. Able to create an alternative diagnostic hypothesis according to new information.	29	96.7	1	3.3	0	0	0	0	8	26.67	22	73.33	< 0.001**
11. Able to infer and summarize the problem.	28	93.3	2	6.7	0	0	0	0	4	13.33	26	86.67	< 0.001**

N=30 *** Highly statistically significant difference (p<0.01).*

Table (3): Percentage distribution of the studied nursing students as regard to knowledge base pre-post applying PBLM (N=30)

Problem Solving Skills and Clinical Reasoning	Pre						Post						P. value
	Undeveloped		Average developd		Developed		Undeveloped		Average develope		Developed		
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
1. Comprehensive reading of the problem.	29	96.7	1	3.3	0	0	0	0	2	6.67	**28**	**93.33**	< 0.001**
2. Show knowledge about the problem.	30	100	0	0	0	0	0	0	11	36.67	19	63.33	< 0.001**
3. Answer questions.	29	96.7	1	3.3	0	0	0	0	3	10	**27**	**90**	< 0.001**
4. Share opinions about the problem.	20	66.7	9	30	1	3.3	0	0	2	6.67	**28**	**93.33**	< 0.001**
5. Apply knowledge to the problem.	29	96.7	1	3.3	0	0	0	0	6	20	**24**	**80**	< 0.001**

N=30 *** Highly statistically significant difference (p<0.01).*

Table (4):- Percentage distribution of the studied nursing students as regard to self-directed learning (self-study) pre-post applying PBLM (N=30).

Problem Solving Skills and Clinical Reasoning	Pre						Post						P. value
	Undeveloped		Average developd		Developed		Undeveloped		Average develope		Developed		
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
1. Define learning objectives.	0	0	30	100	0	0	0	0	0	0	**30**	**100**	< 0.001**
2.Achieve the learning objectives.	30	100	0	0	0	0	0	0	10	33.33	20	66.67	< 0.001**
3. Read sources about the problem.	6	20	24	80	0	0	0	0	1	3.33	**29**	**96.67**	< 0.001**
4. Make an effort to develop self-learning.	30	100	0	0	0	0	0	0	1	3.33	**29**	**96.67**	< 0.001**
5. Seek advice when needed.	2	6.7	28	93.3	0	0	0	0	0	0	**30**	**100**	< 0.001**
6. Lead the self to the limits of self-abilities and knowledge.	29	96.7	1	3.3	0	0	0	0	20	66.67	10	33.33	< 0.001**
7.Identify areas of opportunity	30	100	0	0	0	0	0	0	19	63.33	11	36.67	< 0.001**
8.Identify learning objectives and needs and develop a plan to meet them.	30	100	0	0	0	0	0	0	18	60	12	40	< 0.001**

N=30 *** Highly statistically significant difference (p<0.01).*

Table (5):- Percentage distribution of the studied nursing students as regard to collaborative work pre-post applying PBLM (N=30).

Problem Solving Skills and Clinical Reasoning	Pre						Post						P. value
	Undeveloped		Average developd		Developed		Undeveloped		Average develope		Developed		
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
1. Work towards achievement of the group's goals.	19	63.3	11	36.7	0	0	0	0	1	3.33	**29**	**96.67**	< 0.001**
2. Show effective personal abilities.	15	50	15	50	0	0	0	0	4	13.33	26	86.67	< 0.001**
3. Interest in participating in discussion.	11	36.7	19	63.3	0	0	0	0	2	6.67	28	93.33	< 0.001**
4. Share sources of the problem with classmates.	20	66.7	10	33.3	0	0	0	0	1	13.33	**29**	**96.67**	< 0.001**
5. Respect classmates' opinions.	16	53.3	14	46.7	0	0	0	0	2	6.67	28	93.33	< 0.001**
6. Help classmates who fall behind.	30	100	0	0	0	0	0	0	2	6.67	28	93.33	< 0.001**
7. Express the reactions in a constructive manner.	27	90	3	10	0	0	0	0	3	10	27	90	< 0.001**
8. Work hard like other peers in the team.	29	96.7	1	3.3	0	0	0	0	1	3.33	**29**	**96.67**	< 0.001**

N=30 *** Highly statistically significant difference (p<0.01).*

Table (6):- Percentage distribution of the studied nursing students as regard to attitude and professionalism during the discussion pre-post applying PBLM (N=30).

Problem Solving Skills and Clinical Reasoning	Pre						Post						P. value
	Undeveloped		Average developd		Developed		Undeveloped		Average develope		Developed		
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
1. Accept different reactions openly.	17	56.7	13	43.3	0	0	0	0	4	13.33	26	86.67	< 0.001**
2. Interact positively with criticism.	17	56.7	13	43.3	0	0	0	0	5	16.67	25	83.33	< 0.001**
3. Control the impulse appropriately.	25	83.3	5	16.7	0	0	0	0	3	10	27	90	< 0.001**
4. Defend his point of view towards the problem.	30	100	0	0	0	0	0	0	3	10	27	90	< 0.001**
5. Make efforts to suit his behavior to circumstances.	30	100	0	0	0	0	0	0	2	6.67	**28**	**93.33**	< 0.001**
6. Show ability to change his view in light of new information.	30	100	0	0	0	0	0	0	14	46.67	16	53.33	< 0.001**
7. Attend all classes and arrive on time.	10	33.3	20	66.7	0	0	0	0	3	10	27	90	< 0.001**
8. Demonstrate responsibility and commitment.	0	0	30	100	0	0	0	0	3	10	27	90	< 0.001**
9. Be honest.	0	0	30	100	0	0	0	0	0	0	**30**	**100**	< 0.001**
10. Compatible appearance and clothing with the medical uniform professional.	1	3.3	29	96.7	0	0	0	0	0	0	**30**	**100**	< 0.001**

N=30 *** Highly statistically significant difference (p<0.01).*

Table (7): Mean scores of the studied nursing students as regard to students' development in pre-post applying PBLM (N=30).

Factors	Pre		Post		P. value
	Range	Mean ± SD	Range	Mean ± SD	
1. Knowledge Base.	0 - 3	0. 47±0. 73	6 - 10	8. 93±1. 14	**<0.001****
2. Problem Solving Skills and Clinical Reasoning	0 - 4	0. 83±0. 91	11 - 22	**20. 27±2. 65**	**<0.001****
3. Self-Directed Learning (Self-Study).	1 - 4	2. 77±0. 57	11 - 16	13.7±1.6	**<0.001****
4. Collaborative Work.	0 - 5	2.43±1.76	12 - 16	15.47±1.01	**<0.001****
5. Attitude and professionalism during the discussion.	3 - 7	4. 67±1. 27	13 - 20	**18.77±1.65**	**<0.001****
Total Score	**6 - 21**	**11. 17±3. 71**	**55 - 84**	**77.13±6.08**	**<0.001****

Independent ***samples*** T Test, ** Highly statistically significant difference (p<0.01).

Table (8): Percentage distribution of the studied nursing students' level as regard to all factors of PBLM pre-post applying it. (N=30).

Factor	Max Score	Pre		Post	
		Develop Points		Develop Points	
		(%)	Level	(%)	Level
1. Knowledge Base.	10	4.7	Unsatisfactory	**89.3**	**Satisfactory**
2. Problem Solving Skills and Clinical Reasoning.	22	3.8	Unsatisfactory	**92.1**	**Satisfactory**
3. Self-Directed Learning (Self-Study).	16	17.3	Unsatisfactory	**85.6**	**Satisfactory**
4. Collaborative Work.	16	15.2	Unsatisfactory	**96.7**	**Satisfactory**
5. Attitude and professionalism during the discussion.	20	23.3	Unsatisfactory	**93.8**	**Satisfactory**
Total Score	84	13.3	Unsatisfactory	**91.8**	**Satisfactory**

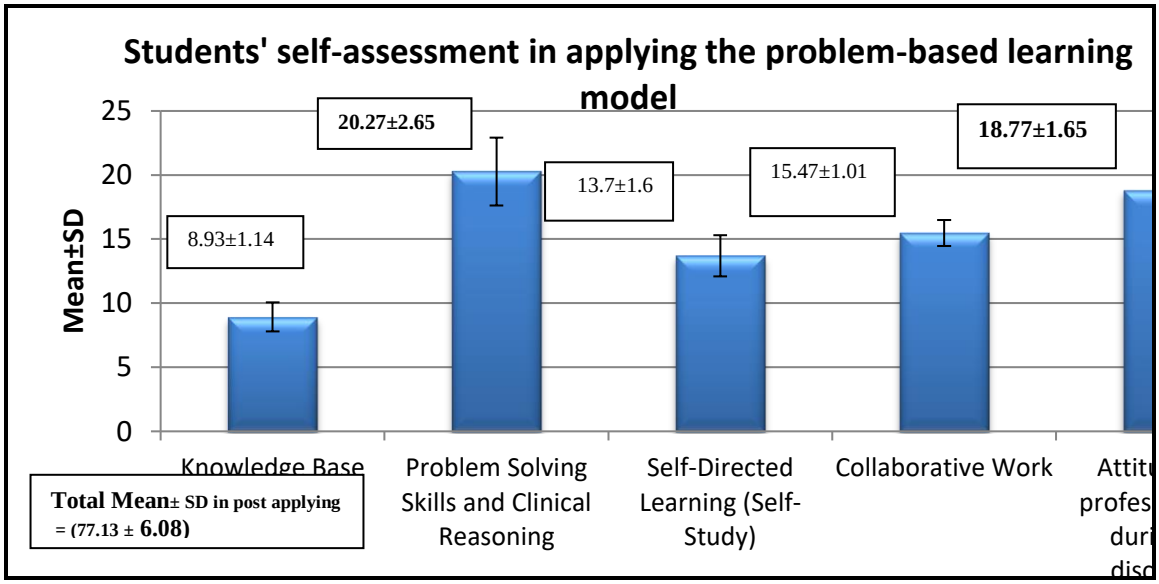


Fig. (1): Students' self-assessment post applying the problem based learning model.

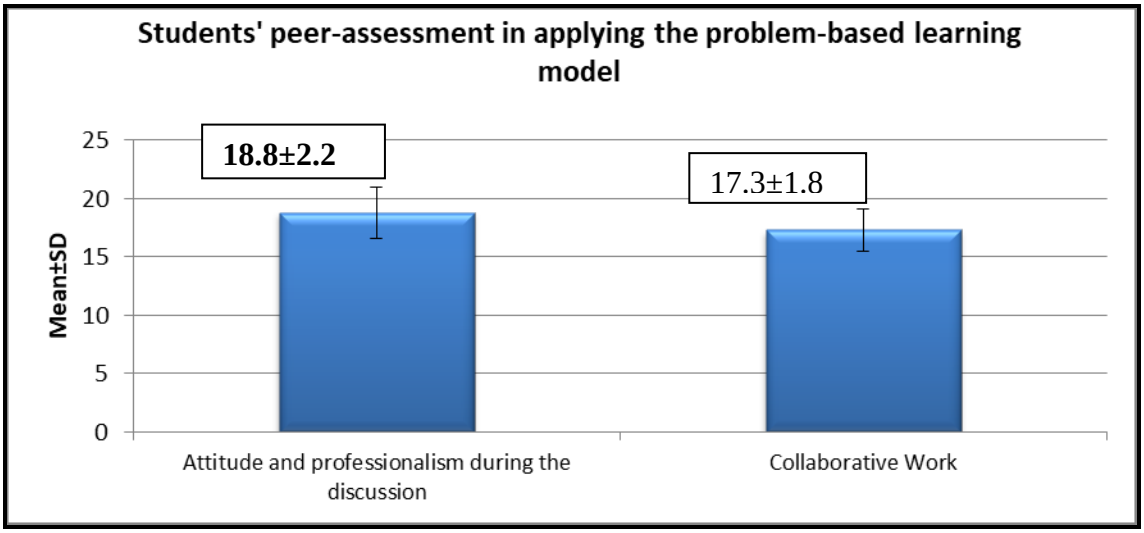


Fig. (2): Students' peer-assessment post applying the problem-based learning model

Table (1): Showed that, the highest percentage of the studied nursing students was aged 18 years and was single. Also, the table illustrated as regard to the place of residence, the most of them was from a rural place (**93.3, 80 & 53.3%**) respectively.

Table (2): The scores of the studied nursing students as regard to developed problem solving skills and clinical reasoning post applying problem based learning model demonstrated in. It illustrated that, the highest percentages of the studied nursing students were developed as regard to identify the patient's problem, distinguish the important information about the problem, understand information given in the problem and prioritize patient's problems **(96.67 & 93.33%)** respectively.

Table (3): Illustrated that, the distribution of the studied nursing students as regard to developed knowledge base post applying problem based learning model. The highest percentages of the studied nursing students were developed as regard to comprehensive reading of the problem, sharing opinions about the problem, answering questions and applying knowledge to the problem **(93.3, 93.3, 90 & 80%)** respectively.

Table (4): Illustrated the distribution of the studied nursing students as regard to developed self-directed learning (self-study) post applying problem based learning model. The highest percentages of the studied nursing students were developed as regard to define learning objectives, seek advice when needed, make an effort to develop self-learning and read

sources about the problem **(100 & 96.67%)** respectively**.**

Table (5): Showed the distribution of the studied nursing students as regard to developed collaborative work post applying problem based learning model. The highest percentages of the studied nursing students were developed as regard to work towards achievement of the group's goals, share sources of the problem with classmates and work hard like other peers in the team **(96.67, 96.67 & 96.67%)** respectively.

Table (6): Demonstrated the distribution of the studied nursing students as regard to developed attitude and professionalism during the discussion post applying problem based learning model. The highest percentages of the studied nursing students were developed as regard to compatible appearance and clothing with the medical uniform professional, honesty and making efforts to suit his behavior to circumstances **(100, 100 & 93.33%)** respectively.

Table (7): Showed that, the distribution of the studied nursing students as regard to students' development in pre-post applying problem based learning model. The highest mean scores of the studied nursing students in post applying of PBLM as regard to problem solving skills and clinical reasoning, attitude and professionalism during the discussion, were (**20. 27±2. 65 & 18.77±1.65)** respectively, Also obvious the highly statistical significant difference between studied nursing students developed in pre and post applying of this model a regard to all factors **(P<0.001**)**

Table (8): Demonstrated the distribution of the studied nursing students' level as regard to all factors of PBLM pre-post applying it. The highest percentages of studied nursing students' level in after applying the model were satisfactory **(96.7, 93.8, 92.1, 89.3 & 85.6)** respectively**.**

Figure (1): Mean scores of the studied nursing students as regard to students' self-assessment post applying the problem based learning model described in. The highest mean scores of the studied nursing students in post applying of PBLM as regard to problem solving skills and clinical reasoning, attitude and professionalism during the discussion, were (**20.27±2.65 & 18.77± 1.65**) respectively**.** And there were high total mean scores of the studied nursing students in post applying of PBLM as regard to all factors of PBLM were (**77.13±6.08)**, Also, there is a high statistical significant difference between studied nursing students developed in pre and post applying this model as regard to all factors.

Figure (2): Showed that, the highest mean scores of the studied nursing students in post applying of PBLM as regard to, attitude and professionalism during the discussion and collaborative work were (**18.82.2± & 17.3±1.8)** respectively.

Discussion:

PBLM that improves and develops student's learning, The present study was conducted with the aim applying (PBLM) on secondary technical nursing school students in Sahel Salem city and assess the effect of it on improving problem solving skills, knowledge base, clinical reasoning and self-directed learning, collaborative work and professionalism skills for secondary technical nursing school students.

The current study revealed that, more than three quarter of the studied subject had developed as regard to be able to support in clinical reasoning and decision-making item. The researcher point of view is the clinical reasoning and decision-making are the thinking processes and strategies that used by the students to understand data and choose between alternatives with regard to identifying patient problems in preparation for making nursing diagnoses and selecting nursing outcomes and interventions. This finding consistent with, **Fulgencio, et al., (2020)** who represented in his study the Improving the clinical reasoning after implementing Problem-Based Learning Model on secondary school students improved their skills.

There were highly statistically significant differences between studied nursing students as regard to students' development, which were satisfied in post applying problem based learning model in the current study. The researcher point of view, the problem based learning process does not focus on solving problems through a specific solution, but allows the development of other desirable skills and attributes.

This finding supported by **Osman, & Shalaby, (2014)** who suggested that, student's performance' throughout PBL sessions were at a good level and Identify learning objectives and demonstrate constructive thinking process after clarifying, defining, and analyzing the situation from the scenario. The majority of kids performed admirably when it came to sharing their views and opinions with their peers and participating in regular discussions. The majority of students performed well in terms of attitudes, communication skills, responsibility and dedication, responding positively to feedback and criticism, and effectively using presentation materials.

At the same line, **Sari & Sumamri, (2021)** who depicted on his study's that the results revealed that the problem-based learning model has a substantial impact on students' problem-solving abilities and scientific writing skills, and that the combination of problem-based learning and problem-solving skills

had a large impact on scientific writing skill. Moreover, this finding agrees with **Gallagher, et al (2021)** founded that, the students assessed, along with a control group, to see how their spontaneous use of problem-solving procedures changed as they considered an ill-structured problem. The SSF group's results demonstrate some significant differences not seen in the comparison group. And **Mansong et al., (2021)** who reported that, two pedagogical lesson plans employing Problem Based Learning and the 5E Model a science problem solving skill exam used as research instruments. There were 20 multiple choice test items in all. The results revealed that the experimental group's Science Problem Solving ability was much higher than the control groups.

The current study revealed that a highly statistically significant of the studied nursing students as regard to students' self-assessment post applying the problem based learning model, including problem solving skills and clinical reasoning, attitude and professionalism during the discussion, Collaborative Work, self-directed learning (self-study) and knowledge base found in (Fig.1). **The researcher point of view**, the assessment is a message about the students that should be about learning. As a result, students will take different approaches depending on the circumstances. As a result, excellent assessment is about the tutor and students' engagement in a relational process as learning, not just about choosing "acceptable" approach.

This finding was consistent with the study of **Abd El-Hay& Abd-Allah, (2015)** PBL, according to the majority of nurses (90 %), improves students' ability to make self-assessment by allowing them to freely share their thoughts, encourage to engage, reach to made decisions, and documented the ideas. More than a third of them said that the model made taught them to constantly respect one another, synthesize thoughts, and avoid blaming, fighting, and nonfunctional conduct. In addition **Akdogan, et al., (2021)** who reported that, the high mean of the students in the research group was **(18.9±0.85)**, when he studied the perceptions of medical faculty students,and discover the positive effect of problem-based learning on self-regulated learning skills.

There were highly statistically significant differences between studied nursing students as regard to students' peer assessment post applying problem based learning model including attitude and professionalism during the discussion and collaborative. **The researcher point of view**, assessment of the peer requires students to provide their peers feedback or marks (or both) on a product or a performance, depending on the criteria of excellence for that product or event, which students may have helped to develop.

The present finding agreement by, **Aplon, (2012)** study where who showed According to his study, that the collaborative problem-solving strategy improves emotional and social performance in students. It also helps learners develop effective communication skills by requiring to share the ideas with the group, as well as to use his or her talents to assist and support one another in problem solving and decision-making. After using a learning procedure, students' communication, involvement, and decision-making skills improved significantly. In addition, **Gholami, et al (2016)** demonstrated in his study the communication abilities for the most of nursing student's become good participation skills and three-quarters of nursing students had good participation skills when PBL implemented. Moreover, the clinical reasoning, following this learning technique, the majority of nursing students display solid clinical abilities. This study supported by **Abd El-Hay& Abd-Allah, (2015) & Abu-Shams, (2016)** According to their findings, problem-based learning increased nursing students' communication abilities, participation skills, and good decision-making skills. Students worked together to complete the job and talents, ask for information, evaluate the ideas, and supervise the performance, ending these results.

Conclusion:

Using PBLM leads to an improvement of the students' self-directed learning, clinical reasoning, and problem-solving abilities, knowledge base, attitude and professional skills and collaborative work skills. Following the conduct of this approach, self- and peer-assessment were also established.

Recommendation(s):

The researchers recommended as regards the results of this model as the following:

1- Dissemination of the model to all nursing schools.
2- Encouraging the school's senior administration and all nursing educational committees to facilitate the application of the model.
3- Develop an educational plan by those who develop the curriculum to implement problem-based learning model to students in nursing schools in Egypt.
4- Modify the curriculum to suit the application of the model.
5- Holding educational programs for the teaching staff in schools on the application of the PBLM.
6- Raising the awareness level among learners by linking what they learn with their daily, world and practical life.

7- Applying PBLM for generalized at all nursing schools in Assuit City.
8- Conduct more research to verify the findings of this study and to advance the use of problem-based learning in the learning process.

Limitation:

This study was limited by the amount of time provided for clinical training and discussion sessions, some resistance to the PBL method anticipated, especially for students who were very comfortable learning through a didactic lecture format and propagation of coronavirus.

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