IOSR Journal of Nursing and Health Science (IOSR-JNHS)
e-ISSN: 2320–1959.p- ISSN: 2320–1940 Volume 4, Issue 3 Ver. V (May. - Jun. 2015), PP 01-13
www.iosrjournals.org

Effect of Problem-Based Learning Strategy on Development of Problem Solving Skills among Undergraduate Nursing Students

Seham A. Abd El-Hay PhD [1,2], Samah A. Abd-Allah MD [2,3]
[1]College of Nursing, Medical &Surgical nursing D., Tanta University, Egypt, [2]College of Applied Medical Science, Dammam University, Hafr Al-Batin, KSA, [3]College of Nursing, Nursing Administration D., Tanta University, Egypt.

Abstract
Background: *Problem-based learning is a method of learning and teaching that improves the learning of the nursing students by teaching them how to apply theory in clinical practice and developing their problem-solving skills. It enhances student's learning, productivity, problem solving skills, critical thinking, self-directness, and professional skills.*
Aim: *This study was conducted to assess the effect of PBL on development of problem solving skills among undergraduate nursing students.*
Setting & Subjects: *This study was carried out in College of Applied Medical Science, Dammam university at Hafr El-Batin Governate in KSA on all the available (27) third year undergraduates nursing students who were registered at Faculty of Health Science during their clinical rotation.*
Methods: *Four tools for data collection were used: Problem Solving Skills Evaluation Sheet, Individual Evaluation Sheet, Feedback Questionnaire and Group Evaluation Sheet.*
Results: *There were statistical significant improvement in nursing students` problem solving skills post implementation of problem based learning strategy than pre implementation. Nursing students' perceptions and self- evaluation about their experience with problem based learning strategy were positive. Also there were improved in participation, communication and decision making skills among nursing students.*
Recommendations*: According to these results, we recommended that implementing the problem based learning strategy for teaching students in both classroom and clinical setting. Because it produced clear benefits for students, such as increased autonomous learning, critical thinking, problem solving and communication skills.*
Keywords: *problem based learning, problem solving skills.*

I. Introduction

The complexity of today's society is characterized by an infinite, dynamic and changing mass of information, these rapid changing labor market demanding a more flexible labor force that is directed toward a growing proportion of knowledge-intensive work in team and lifelong learning[(1)]. As a consequence, today's information community expects nursing graduates not only to have a specific knowledge base but also to be able to apply this knowledge to solve complex patients' problems in an efficient way and to further develop their ability to plan, communicate, teach, and make a clinical decisions with confidence[(2,3)]. Moreover, the core of nursing education is to help students to apply knowledge from nursing and other disciplines in making independence decisions and solve the problems in nursing practice situations[(4)]. Problem based learning addresses all of these, as students acquire problem-solving skills while critically analyzing problems posed to them in a collaborative setting [(5)].

Problem based learning was first introduced in the medical schools and has had a major impact on thinking and practice in medical education for the past 30-40 years. This approach has been based on active learning in small groups with clinical problems used as stimulus for learning [(6)]**.** PBL is defined as a motivating, challenging, and enjoyable learning approach that has resulted from the process of working towards understanding of resolving problems [(7,8,9)]**.** It is also a clinical situation presented as a stimulus for students to acquire specific skills, knowledge and abilities in the solution of the problem [(10)]**.** It is faster the ability to think critically and clinical reasoning; students use skills of inquiry and critical thinking as well as peer teaching and peer evaluation. It aims to develop scientific understanding through real-world cases, develop reasoning strategies, and develop self-directed learning strategies [(11, 12).]

PBL operates in several major steps, the steps can be summarized into three major stages namely; initial stage, PBL stage, and final stage [(13)]**.** In the initial stage, the first step is a group formation to read the problem and analyze what they need [(14)]**.** The specific activities in this stage include; formulating of learning objectives, identifying knowledge gaps, generating hypotheses, defining the learning issues and the concepts to

be learned. In this case, the facilitator guides students to learn through the PBL process cycle [15]. The PBL stage begins with students performing an independent self-study. They are expected to master the knowledge that relevant to the problem to be solved. Then, students conduct a group brainstorming and discussion session. They share their information with all the learning issues and hypotheses and reach to an acceptable definition that is agreed by all members [16]. The facilitator monitors the group's progress through direct observation. In the final stage, students prepares for a project presentation and assessment during the last meeting session [17]. Each student provides a self-evaluation of their performance and their peers and the facilitator provide feedback [14].

Problem-based learning improves the training of student nurses by teaching them how to apply theory to clinical practice and by developing their problem-solving skills [18]. Problem solving skills have been defined as a cognitive-affective-behavioral process, through which an individual or group identifies or discovers effective means of coping with problems encountered in every living [7]. These skills component encompass cognitive-behavioral abilities in identifying problems, generating solutions, evaluating options, implementing a plan, monitoring progress and evaluating outcomes to meet the patients' health care needs [18, 19].

Problem solving skills is achieved by using skill sheet of problem solving process for patients which includes assessment, analysis, outcome identification, planning, implementation, and evaluation [20]. Assessment used to recognize the existence of the problem, collect and recognize data. Analysis used to define the problem clearly, establish priorities and develop a list of all possible strategies that could resolve the problem. Outcome identification used to establish the desired outcome, and predict the likelihood of each outcome occurring [21]. Planning used for developing a list of resources, preparing a list of desired actions and preparing a time schedule. Implementation used to implement the solution and give clear directions to involved personnel. Evaluation used to monitor the response to the strategy and modify ineffective actions [22].

Nursing graduates must be prepared to identify the actual and potential health problems of patients, act in a professional and ethical manner when faced with complex situations [23]. They must be able to identify human and material resources, identify their own learning needs, setting goals, choose learning strategies, and evaluate results of the learning process [24, 25]. So the teachers at the faculties of nursing should use variety of teaching strategies that equip their graduates with knowledge and skills necessary for competent nursing practice [26]. Therefore, the intention of this study is to determine whether problem solving skills could be acquired and developed by nursing students via a short-term problem based learning intervention.

II. Aim of the study

Assess the effect of problem based learning on developing problem solving skills among undergraduate nursing students at College of Applied Medical Science, Dammam University at Hafr -Albatin Governate.

III. Materials And Methods

Research design: A quasi-experimental pretest–posttest design was used in the present research.

Setting: The study was carried out at Nursing Department,College of Applied Medical Science, Dammam university and King Khaled Hospital at Hafr El-Batin Governate in Kingdom of Saudi Arabia.

Subjects: All the available (27) third year undergraduate nursing students who were registered at Faculty of Health Science, Dammam University enrolled in the nursing department during the course entitled medical & surgical nursing through second term clinical rotation in academic year (2014) in the following clinical settings (medical, cardiology, chest, and kidney unit) at King Khaled Hospital. Exclusion criteria are previous experience with problem based learning.

Tools of data collections: Four tools were developed by the researchers to collect the data for this study. These tools aimed to assess the effect of problem based learning strategy on improving problem solving skills among undergraduate nursing students in the clinical setting.

Tool (1): Problem Solving Skills Evaluation Sheet.
This tool was developed by the researchers based on **Osman A.M (2010) [22] and Mohamed A.H. (1997)[27]** and current related literature [28, 29, 30]. It was consisted of two parts:

Part 1: Socio-demographic characteristics of the nursing students namely as; name, age, marital status, previous graduation school, academic achievement, and previous training programs.

Part 2: A simulated case study was used for pre and post-test to assess nursing students' ability to apply problem solving skills in formulating care plan following the framework of the problem based learning. It was consisted of real cases studies with certain health problems such as (chronic obstructive pulmonary disease,

bronchopneumonia, respiratory failure, congestive heart failure, acute and chronic renal failure, and diabetic ketoacidosis). The questions of the sheet were included completion, matching, arranging and multiple choices to assess nursing students' skills in assessment, analysis (identify problems), outcome identification, planning, implementation, and evaluation of patient's problems.

Scoring system for data collection was calculated by summing up the scores of each skill of assessment, analysis, outcome identification, planning, implementation, and evaluation of patient's problems. A score of (1) was given for each correct answer and a (zero) for incorrect answer. High score indicates high skills in problem solving.

Tool (2): Individual Evaluation Sheet:

This tool was modified by the researchers based on **Ulrich D.L. & Glendon G.J. (2005) [(31)] and Osman A.M (2010) [(22)]**. It was consisted of 10 items reflect students self-evaluation about the qualities of each individual which was brought to the group and how function individually.

Scoring system: the questionnaire has four point (0-3) Likert Scale type: never (0), sometimes (1), usually (2), and always (3). Scoring system for data collection was calculated by summing up the scores. Higher score indicates the students were positive contributing to the group.

Tool (3): Student's Feedback Questionnaire:

This tool was developed by the researchers based on **Osman A.M (2010) [(22)] and Mace M.S. (2002) [(32)]** and review of current related literature [(29)]. This tool was consisted of two subscales reflect the nursing student's perception about the main features of problem based learning (7) points and their descriptions about problem based learning as a teaching strategy (4) points.

Scoring system: the questionnaire has five point (0-4) Likert types: strongly disagree (0), disagree (1), uncertain (2), agree (3), strongly agree (4). Higher score indicates high perception of this teaching strategy.

Tool (4): Group Evaluation Sheet:

This tool was modified by the researchers based on **Osman A.M (2010) [(22)] and Mace M.S. (2002) [(32)].** It was included 11 items subdivided into three subscales as follows:

Communication skills: 3 items to measure how the group members communicate together.

Participation skills: 4 items to measure how the group members participate and contribute to the group success.

Decision making skills: 4 items to measure the group experience and support for decision making and conflict management.

Scoring system: the questionnaire has four point Likert scale ranging from (0-3) when never =(0), sometimes =(1), usually =(2), and always =(3). Scoring system for data collection was calculated by summing up the scores of each subscale. Higher score indicates high skills.

Ethical consideration

The necessary official approval was obtained from the Dean of the Faculty of Applied Medical Science in Dammam University at Hafr Al Batin Governate, KSA. The aim of the study was explained to each student and oral consent to participate was obtained. They were given an opportunity to refuse to participate and they could withdraw at any stage of the research. Additionally, they were assured that the information would be confidential and used for the research purpose only.

Methods of data collection:

1. Tools for data collection, orientation program and simulated cases study were revised by 3 experts in the field of nursing and education to ascertain the content clarity and validity of items.
2. A pilot study was conducted on (3) nursing students for two times separated by two weeks to test clarity of language, applicability of items and time consumed for filling the different tools. According to the results of pilot study some modifications were done. These students were not included in the study.
3. Data collections for this study was carried out in the period from mid March 2014 to May 2014 (second term). The methods of teaching used in implementing the PBL strategy were lectures, group discussion and role playing.
4. Problem Solving Skills Evaluation Sheet (Tool 1) was distributed by the researchers at the beginning of the study as a baseline measure before starting PBL strategy and cases study discussion to assess nursing students need. The questionnaire sheet was taken 30 minutes for each student to be filled.

5- The process of problem based learning phase:

a. At the beginning of the study, two sessions (one session / week, each session 3 hours) were conducted for all nursing students to provide knowledge about PBL and problem solving skills and prepare the students for applying them, sessions were divided as following; ***First session*** was included introduction about PBL strategy, benefits, elements, steps of problem solving and guidelines for effective utilization of it. ***Second session*** was included the definition of nursing process, advantages, characteristics, steps and relationship between problem solving skills and problem based learning [28,29,30].

b- The students in the course entitled medical & surgical nursing were assigned to 5 groups, each group was consisted of 5 students except two groups were consisted of 6 students. Each student of the group had a specific role contributing to all the group works. All students had library orientation to prepare them to conduct effective literature search except for the content regarding designed simulated case studies.

c- PBL was completed by distributed the following simulated cases study on small groups; (chronic obstructive pulmonary disease, bronchopneumonia, respiratory failure, congestive heart failure, acute and chronic renal failure, and diabetic ketoacidosis). To avoid narrowing their exploration of the PBL, we did not give any assigned reading information related to cases study.

d- Nursing students were participated in a 6-weeks (one session /week, each session 3 hours) problem based learning strategy based on **EL-Shaer A. and Gaber H. (2014) [13], Bradshaw M. and Lowenstein A.J. (2007) [14], Hmelo-Silver C. E. (2004) [15], Wee K.N.L. (2004) [16] and Kolmos A. & Holgaard J.E. (2007)[17]** to apply of new knowledge to solve problem and evaluate their development of problem solving skills based on implementation of PBL. Each group was worked together to explore the learning issues underpinning the scenario and had a team leader to bring up the leadership and communication kills.

e- The facilitator was helped students to establish the ground rules and to sort out the responsibility of each group member in addition to presentation of their discussions. They were kept the learning process going and modulated the challenge of the scenario situations.

f- In the following sessions students were free to seek tutorial advice at any time, as they need. By the end of the sessions students were asked to illustrate their decisions about problems, identify problems (analysis), make assessment, identify learning goals, planning, implementation to achieve these objectives and evaluation. The students were completed nursing care plan for simulated cases in organized sequence and summarize periodically the information that presented at the end of each part of the nursing care.

g- After each session group works and progress were evaluated immediately by Group and Individual Evaluation Sheet (tool 2 and 3) . Each evaluation sheet was taken 15 minutes to be filled by the students.

6- Final phase

- Following completion of the scenarios final evaluation for problem solving abilities of the developed cases study were done by using Problem Solving Skills Evaluation Sheet (tool 1).
- At the end of clinical rotation, students feeling, reflection and opinion about problem based learning strategy were assessed by Student's Feedback Questionnaire (tool 4). It was taken 15 minutes to be filled by the students.

IV. Methods Of Data Analysis

All data were collected, coded, tabulated and subjected to statistical analysis. Statistical analysis is performed by statistical Package SPSS in general (version 16), also Microsoft Office Excel is used for data handling and graphical presentation. Quantitative variables are described by the Mean, Standard Deviation (SD), while qualitative categorical variables are described by proportions and percentages. Descriptive statistics are used to analyze the response to individual items and the respondents' characteristics. Chi-square and P-value test used to test correlation. The 0.0 5% level was chosen to test the significance of the obtained results.

V. Results

Table (1): shows the distribution of the studied nursing students according to their socio-demographic characteristics. As regard to age, the table shows that all students were below or equal 21 years with range from 19-21 years and mean age 20.67±0.55. High percent (66.7%) of them were single and all of them were had secondary school education. As regard to academic achievement more than half (51.9%) of them achieved excellent score. Furthermore, the table illustrates that all of nursing students (100%) no attend any training program before.

Table (2): shows the level of nursing students' ability to assess the patients' data during simulated cases studies pre and post implementation of PBL. This table shows that significant improvement in the level of the students ability to assess patients' data related to education, obesity, history, laboratory investigation and X-ray as

following from (55.5, 74.1, 88.9, 81.5, 59.3%) pre implementation of PBL as compared to (100, 100, 100, 92.6, 77.8%) respectively post implementation of problem based learning with p value = 0.002.

Figure (1): shows the ability of the nursing students to identify patients' problems during simulated cases studies at pre and post implementation of PBL. This figure shows that the majority of the nursing students (88.9%) have good ability to detect problems of the situations post implementation of problem based learning compared to (37%) of them before implementation of PBL.

Table (3): shows the ability of nursing student's to identify patients' outcome during simulated cases studies at pre and post implementation of PBL. This table shows that majority of the nursing students (81.5%) demonstrate good level of identify patients' outcomes post implementation of PBL as compared to (14.8%) pre implementation of PBL with statistical significant improvement at p value = 0.001.

Figure (2): shows the level of nursing students' ability to order the nursing care plan for patients' problems according to priorities at pre and post implementation of PBL. This figure shows that the majority of the students (70.4%) have good ability to make complete nursing care plan for patients' problems according to priorities post implementation of PBL as compared to (18.5%) pre implementation of PBL. In contrast to students who was made incomplete nursing care plan for patients' problems according to priorities post implementation, the table reveals that there was decrease in the number of these students from (63%) pre implementation to (29.6%) post implementation of PBL.

Figure (3): Shows the ability of the nursing students to identify the most suitable nursing intervention of patient's problems during simulated cases studies at pre and post implementation of PBL. This figure shows that the majority of the nursing students (88.9%) have good ability to detect most suitable nursing intervention of the patients' problem during situations post implementation as compared to (63%) pre implementation of PBL**.**

Table (4): shows the level of nursing student's ability to evaluate patient's problems at pre and post implementation of PBL. The table shows that significant improvement in nursing student's abilities to evaluate patient's problems, whereas the majority of the nursing students (85.2%) were improved in their ability to evaluate the problems post implementation than (3.7%) pre implementation with p value = 0.001.

Figure (4): illustrates the level of nursing students' ability to apply nursing process to solve patients' problems at pre and post implementation of problem based learning. The figure shows that the majority of nursing students demonstrate improvement in their ability to apply nursing process from (18.5%) pre implementation to (81.5%) post implementation of problem based learning.

Table (5): illustrates the distribution of nursing students according to their self-evaluation after problem based learning strategy. More than (90%) of nursing students reported that their work was always contributed to their ideas freely, listen objectively to other ideas, encourage other to participate, consensus when the decision were made and record the ideas. High percent (88.9%, 85.2% and 81.5%) of them reported that their PBL work were always respect each other, help the group in conflict management, summarize the ideas, and help to avoid blaming, arguing and nonfunctional behavior respectively.

Table (6): illustrates the distribution of nursing students according to their feedback after problem based learning strategy. Overall (100%) of nursing students reported that the best perceptions about features and descriptions of problem based learning were toward; encourage students to be active, motivate people to do best, provide supportive environment, provide learning experiences more than other strategies, stimulate the ability to think, encourage students to sharing ideas and different opinions, different students have different strength that help in solution of problems, students are individually accountable or responsible for their work, the timing is enough for each session and the students working together in small group to accomplish a common task.

Table (7, 8 and 9): illustrates the level of communication, participation, decision making skills of nursing students after implementation of problem based learning strategy. As regard to communication skills the table shows that the majority of nursing students (96.3%) demonstrates good communication skills post implementation of PBL. Regarding participation skills, the table shows that around three quarter (74.1%) of the nursing students demonstrates good participation skills post implementation of PBL. Finally in relation to decision making skills, the table shows that overall (100%) of nursing students demonstrates good decision making skills following the implementation of problem based learning strategy.

Table (1): Distribution of the studied students according to their socio-demographic characteristics

Socio-demographic data	Studied students (N=27)		X^2	P
	N	%		
Age(years):				
19	1	3.7	**18.66**	**0.000***
20	7	25.9		
21	19	70.4		
Range	**19-21**			
Mean±SD	**20.67±0.55**			
Current marital status:				
Single	18	66.7	**6.000**	**0.008***
Married	9	33.3		
Previous graduation school:				
General secondary school	27	100.0	-	-
Technical Institute of Health	0	0.0		
Your academic achievement:				
Good	1	3.7		
Very good	12	44.4	**10.88**	**0.004***
Excellent	14	51.9		
Had previous training program?				
Yes	0	0.0		
No	100	100.0	-	-

***Significant or P<0.05**

Table (2): Distribution of the studied students according to their ability to assess patient's data at pre and post implementation of PBL.

Patient's data	Pre (n=27)		Post (n=27)		X^2	P
	No	%	No	%		
Age:						
Know	27	100.0	27	100.0	-	-
Don't know	0	0.0	0	0.0		
Sex:						
Know	27	100.0	27	100.0	-	-
Don't know	0	0.0	0	0.0		
Occupation:						
Know	25	92.6	27	100.0	-	-
Don't know	2	7.4	0	0.0		
Education:						
Know	15	55.5	27	100.0	**22.41**	**0.002***
Don't know	12	44.4	0	0.0		
Marital status:						
Know	27	100.0	27	100.0	-	-
Don't know	0	0.0	0	0.0		
Smoker:						
Know	26	96.3	26	96.3	**0.000**	**1.000**
Don't know	1	3.7	1	3.7		
Obese:						
Know	20	74.1	27	100.0	**18.45**	**0.001***
Don't know	7	25.9	0	0.0		
History:						
Know	24	88.9	27	100.0	-	-
Don't know	3	11.1	0	0.0		
Vital signs:						
Know	25	92.6	27	100.0	-	-
Don't know	2	7.4	0	0.0		
Laboratory investigation:						
Know	22	81.5	25	92.6	**1.282**	**0.258**
Don't know	5	18.5	2	7.4		
X- ray:						
Know	16	59.3	21	77.8	**6.785**	**0.001***
Don't know	11	40.7	6	22.2		
Total right answer	15	55.5	21	77.8	**9.18**	**0.002***

***Significant or P<0.05**

Fig (1): Distribution of the studied nursing students according to right answers regarding their ability to identify patient's problems during situation at pre and post implementation of PBL.

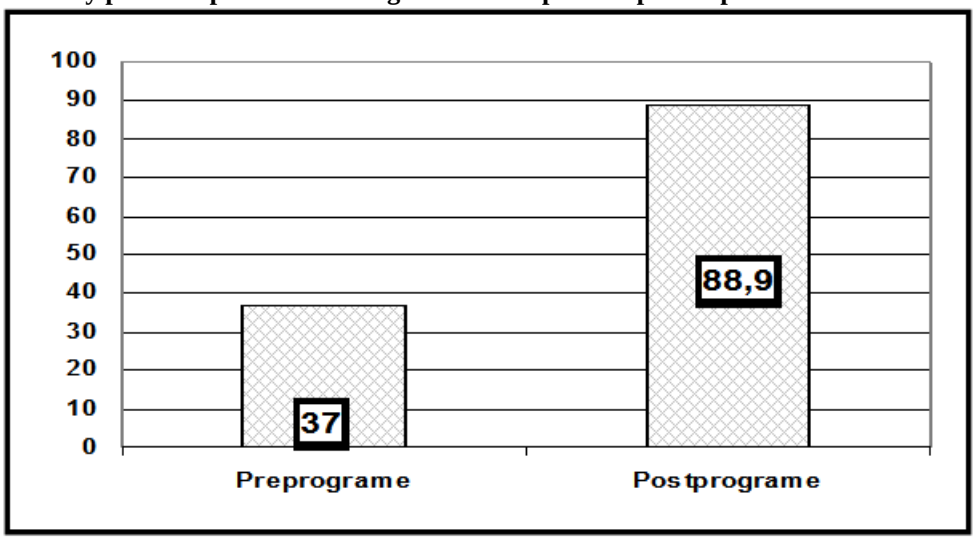

Table (3): Level of ability to identify patient' outcome among studied students at pre and post implementation of PBL.

Time of assessment	Level of ability to identify patient' outcome (n=27)					
	Poor (0-1)		Moderate (2-3)		Good (4-6)	
	N	%	N	%	N	%
Pre-program	1	3.7	22	81.5	4	14.8
Post-program	0	0.0	5	18.5	22	81.5
F	**43.27**					
P	**0.001***					

***Significant or P<0.05**

Fig (2): Level of ability to order the nursing care plan for patient' problems according to priorities among studied students at pre and post implementation of PBL.

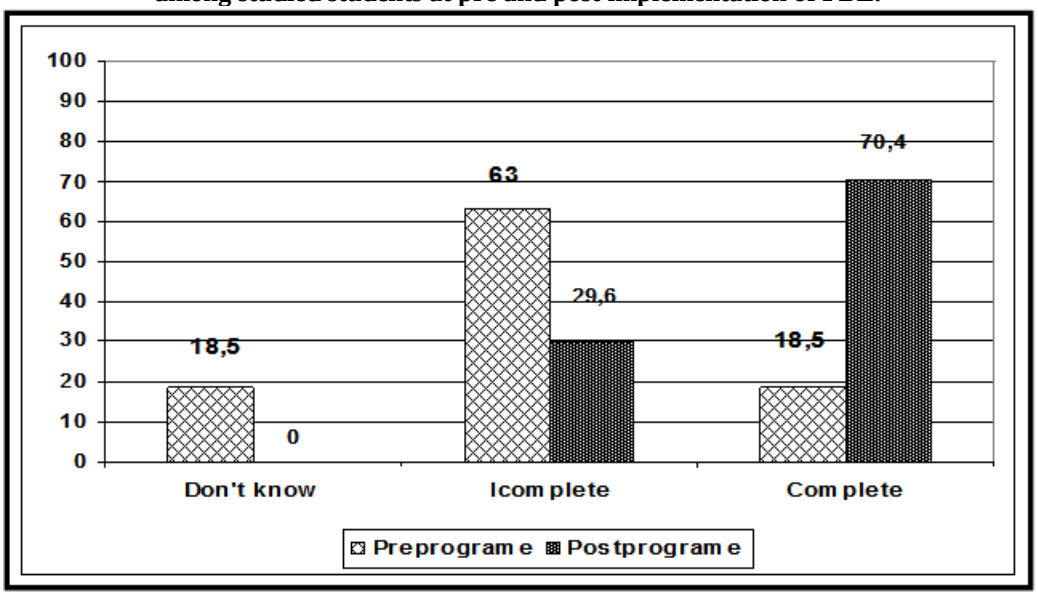

Fig (3): Distribution of the studied students according to right answer regarding their ability to identify the most suitable nursing intervention of patient's problems at pre and post implementation of PBL.

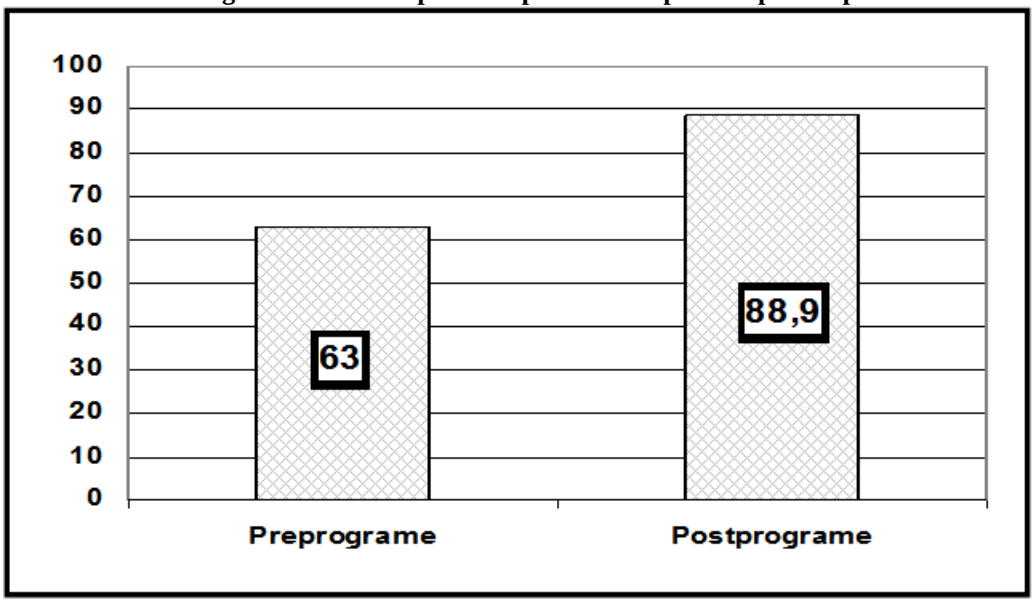

Table (4): Level of ability to select appropriate evaluation for patient's problems at pre and post implementation of PBL.

Time of assessment	Level of ability to select appropriate evidence for patient's problems (n=27)					
	Poor (0-1)		Moderate (2-3)		Good (4-6)	
	N	%	N	%	N	%
Pre-program	3	11.1	23	85.2	1	3.7
Post-program	0	0.0	4	14.8	23	85.2
F	33.16					
P	0.001*					

***Significant or P<0.05**

Fig (4): Level of ability to apply nursing process to solve patient's problems at pre and post implementation of PBL.

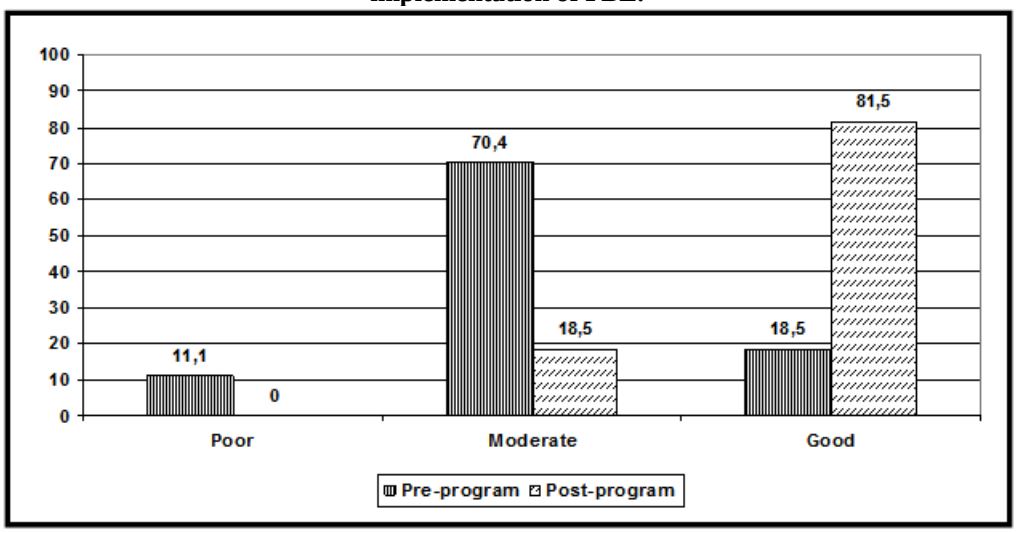

Table (5): Distribution of the studied students according to their ability to self-evaluation after problem based learning

Self-evaluation	Studied students (N=27)		X^2	P
	N	%		
I contributed with my ideas freely:			**33.46**	**0.001***
Sometimes	2	7.4		
Always	25	92.6		
I listened objectively to others ideas:			**41.21**	**0.010***
Usually	1	3.7		
Always	26	96.3		
I encouraged others to participate:			**41.21**	**0.010***
Usually	1	3.7		
Always	26	96.3		
I respected others:			**37.45**	**0.002***
Sometimes	1	3.7		
Usually	2	7.4		
Always	24	88.9		
I paid attention and focused on the tasks:			**29.43**	**0.001***
Never	1	3.7		
Usually	5	18.5		
Always	21	77.8		
I avoided blaming, arguing, expressing personal feelings, and other nonfunctional behaviors:			**33.46**	**0.001***
Sometimes	4	14.8		
Usually	1	3.7		
Always	22	81.5		
I helped the group in conflict management:			**31.24**	**0.001***
Usually	4	14.8		
Always	23	85.2		
I asked for group consensus when decisions were made			**37.16**	**0.001***
Usually	2	7.4		
Always	25	92.6		
I summarized the ideas:			**32.13**	**0.010***
Usually	5	18.5		
Always	22	81.5		
I recorded the ideas:			**31.42**	**0.001***
Usually	1	3.7		
Always	26	96.3		

***Significant or P<0.05**

Table (6): Distribution of the studied students according to their feedback after problem based learning

Students feedback	Studied students (N=27)		X^2 P	
	N	%		
A- student's perception about the main features of problem based learning				
Encourage students to be active				
Agree	27	100	**34.24**	**0.001***
Motivate people to do their best				
Agree	27	100	**33.43**	**0.001***
Interesting and fun experience			**37.46**	**0.001***
Uncertain	1	3.7		
Agree	26	96.3		
Provide a supportive environment			**26.73**	**0.010***
Agree	27	100		
Provide learning experiences more than other teaching strategies				
Agree	27	100	**37.42**	**0.003***
Group interactions stimulate thinking process			**28.43**	**0.020***
Agree	27	100		
Encourage students to sharing ideas and different opinions				
Agree	27	100	**37.42**	**0.001***
B- perceptions about descriptions to problem based learning as a teaching strategy				
The activities were structured so that students need each other to accomplish their learning activities			**34.13**	**0.012***
Agree	27	100		
Different students have different strengths that help in solution of problems			**29.43**	**0.013***
Agree	27	100		
Students are individually accountable or responsible for their work				
Agree	27	100	**37.28**	**0.002***
Students are working together in small groups to accomplish common tasks			**27.46**	**0.031***
Agree	27	100		
The timing is enough for each session			**37.12**	**0.011***
Agree	27	100		

***Significant or P<0.05**
Strongly agree+ agree= agree.

Table (7): Distribution of the studied students according to their level of communication skills.

Level of total communication skills among studied students. (n=27)						F	P
Poor (0-3)		Moderate (4-6)		Good (7-9)			
N	%	N	%	N	%		
0	0.0	1	3.7	26	96.3	**42.15**	**0.010***

***Significant or P<0.05**

Table (8): distribution of the nursing students according to their Level of total participation skills

Level of total participation skills among studied students. (n=27)						F	P
Poor (0-4)		Moderate (5-8)		Good (9-12)			
N	%	N	%	N	%		
0	0.0	7	25.9	20	74.1	**35.46**	**0.001***

***Significant or P<0.05**

Table (9): Distribution of the studied students according to their decision making skills

Level of total decision making skills among studied students. (n=27)						F	P
Poor (0-4)		Moderate (5-8)		Good (9-12)			
N	%	N	%	N	%		
0	0.0	0	0.0	27	100.0	-	-

***Significant or P<0.05**

VI. Discussion

Problem based learning is an instructional learner-centered approach that empowers learners to conduct research, integrate theory & practice and apply knowledge and skills to develop a viable solution to a defined problem. It enhances students' learning, critical thinking, decision making, and problem solving skills. Nurse educators are challenged to teach nursing students appropriate knowledge and skills for clinical problem solving. This requires the ability to make observation, recognize health problems, solve problems in clinical settings, and maintain expertise in a rapidly changing environment [(33,34)].

This study aimed to investigate the effectivness of using problem based learning strategies on the development of the problem solving skills among undergraduate nursing students. In this respect **N.P.Gunusen P., etal. (2014)** [(35)] said that according to their study problem based learning was more effective method in the development of problem solving skills among students. Also **Al-Naggar R. and Bobryshev Y. (2012)** [(36)] reported that the implementation of problem based learning improved student's problem solving skills among medical students at the management and Science University in Malaysia.

Due to the importance of problem solving skills for nursing students to improves their abilities in nursing field and guide them to make decisions about patients problems and health needs. So six steps of problem solving skills were examined in our study through application of problem based learning strategy and combination it with steps of nursing process as following; assessment to collect the relevant data, analysis (identify problems), outcome identification to establish the desired outcome, planning to develop a list of desired resources and actions, implementation to implement the proposed decision, and evaluation to modifying the actions.

In this respect **Terzioglu F. (2006)** [(37)] emphasized that the ability to use the problem solving process is very important element in professional nursing practice to be able to decrease the cost of the health care and increase the quality of patients' care. Also **Hsiao H.C. & Chang J.C. (2003)** [(38)] noted that, the development of problem solving skills is the core ability in nursing education. In order to expand students abilities in specialized field, educators should guide students to make decisions and apply knowledge to new settings . This will direct students to do problem solving work smoothly.

Findings of the present study results showed that improvement in nursing students ability to apply the nursing process post implementation of problem based learning strategy (81.5%) than pre implementation (18.5%) **fig (4).** Also **table (2,3,4) & fig (1,2,3)** showed significant improvement in nursing student's abilities in all steps of nursing process as following; more than three quarter of them was improved in their abilities to assess the patient data, identify patients' problems from (37%) pre study to (88.9%) post study, identify the patients outcome from (14.8%) pre study to (81.5%) post study, identify the most suitable nursing intervention

for patients problems from (63%) pre study to (88.9%) post study and select appropriate evaluation for patients problems from (3.7%) pre study to (85.2%) post implementation of problem based learning strategy .

These results might be because in well-functioning problem based learning groups, students can share conceptual and procedural knowledge and argument roles. They request clarification, justification, and elaboration from one another. **Swansburg R.C. & Swansburg R.J. (2002) [(26)]** supported our study finding and they noted that the process of problem solving promotes more complete data collection, creative planning, successful implementation, and better evaluation. Also **Denning R. & Smith P. (2000)[(39)]** who conducted a study for teaching problem solving skills, their findings revealed that, problem based learning provide a very powerful tool for teaching problem solving skills and its steps.

In addition to **Sohn M. etal., (2013) [(40)]** said that problem based learning was effective in enhancing the students' skill in health behavior assessment and giving of health promotion advice to patients related to problems which is a nursing skill that is more often needed in acute care clinical settings. In the same line **Walton H.J. and Walton M.B. (1989) [(41)]** stated that students' ability to prioritize problems is not an easy skill to master; PBL targets this area of learning. The substantial improvement in prioritizing nursing care may indicate that PBL was well-integrated with simulation and resulted in a higher level of learning. In addition to **Osman A.M. (2010) [(22)]** who founded that overall problem solving skills mean score were significantly improved after implementing learning strategy in the study group nursing students compared with slightly increased among the control group.

In the present study students were distributed into small groups with different case studies and each group member was assigned to specific role in order to achieve positive interdependence and achievement among group members. These roles helped the student to work together effectively with group. One member was a (leader) who oversees the assigned task which is carried out. Second one was a (recorder) who takes note during the discussion. Third one was a (checker) who makes sure that each one in the group finishes the assigned task. Fourth one was a (encourager) who encourages participation from all group members. Fifth one was a (summarizer) who provides summary of the discussion for other students. In the same line, **Brown S.A. and Klein B.D. (2012) [(42)]** who founded improvement in students perception of learning and in actual performance with the problem based learning groups. They emphasized that the problem based learning benefits were achieved if each member of the group have a specific role and avoid the free riders.

Our study results revealed that PBL improve students ability to make self-evaluation as following; more than (90%) of nursing students reported that their work was always contributed to their ideas freely, listen objectively to other ideas, encourage other to participate, consensus when the decision were made and record the ideas. And more than three quarter of them reported that their PBL work were always respect each other, summarize the ideas and help to avoid blaming, arguing and nonfunctional behavior respectively **(table 5)**. In this respect **Woods D.R. (1996) [(43)]** found that PBL help people to work with a group or teams, cope with different situations, improves self-learning and self-evaluation skills and motivates people to practice these skills. Also **Samy A. (2001) [(44)]** who said that Problems are solved by dividing the work and having each student learn one aspect, which he or she is expected to bring back and teach the other members in the group.

Our study results revealed that problem based learning improves feedback of all nursing students related to perceptions about features and descriptions of strategy of PBL on encouraging students to be active, providing supportive environment, stimulating the thinking process and providing learning experience more than other teaching strategy**,** also students have different strength that help in problem solving, helping students to work together **(table 6)**. These results might be due to encourage students to sharing ideas and different opinions, different students have different strength that help in solution of problems and the students working together in small group to accomplish a common task.

These results were hand in hand with **Sharan Y. (2010) [(45)]** who identified that problem based learning promoted mutual liking, high acceptance and support, as well as demonstrated an increase in a variety of thinking strategies among individuals in the group. Also, the results of **Brady M. & Tsay M. (2010) [(46)]** supported the notion that problem based learning is an active pedagogy that fosters higher academic achievement. **Hagen J. P. (2000) [(47)] and Lord T. R. (2001) [(48)]** also supported our study finding and they founded that problem based learning improved student performance, increased student motivation and satisfaction. **Savery J.R. (2006) [(49)]** who mentioned that problem based learning empowers learners to conduct research, integrate theory and practice, and apply knowledge and skills to develop a viable solution to a defined problem.

Our study finding also indicated that problem based learning was improved nursing students related communication skills for about (96.3%), participation skills for about (74.1%) and good decision making skills all (100%) nursing students **table (7, 8 and 9)**. These results due to students working to finish the group task, capitalize on one another's resources and skills, asking one another for information, evaluating one another's ideas, and monitoring one another's work. In agreement with this present study finding, **Lonning R.A. (2006) [(50)]** who noted that problem based learning develops students oral communication skills. When students work in

pairs, one partner verbalizes his or her idea while the other listen, ask questions, or comments on what he or she has heard.

Osman (2010) [(22)] supported our study finding and indicated that the students evaluation of their learning skills concerning communication, participation in the group process and decision making was generally positive. Also **Linnethe J. (2002) [(51)]** supported our study finding and argued that, problem based learning strategy can enhance students reasoning abilities, critical thinking, problem solving and decision making skills. **Aplon G.V. (2012) [(52)]** stated that, collaborative problem solving approach enhances students emotional and social performance. It also enhance learner to build effective communication, each group member is actively participate and sharing his idea with the rest of the group, using his skills to help each other to learn and encourage each other to participate in problem solving and decision making.

VII. Conclusion

It can be concluded from the present study that, there was a statistical significant improvement in all problem solving skills scores after implementation of problem based learning strategy for the nursing students than pre implementation. Nursing students' attitude and self-evaluation about their experience with problem based learning strategy were positive. Also participation, communication and decision making skills were developed after implementation of problem based learning strategy.

VIII. Recommendations

As a result of this study, it is recommended that:

- Teacher should create an autonomy-supportive learning environment in order to develop stronger relationships with their students and foster higher levels of engagement. Autonomy-supportive behavior would include open dialogue between instructor and student, more student-centered methods of instruction, informative feedback, and encouragement.
- Problem solving skills should be addressed in nursing curriculum philosophy and objectives and should be integrated in application of nursing process in clinical experiences.
- PBL strategy should be conducted for teaching students in both classroom and clinical setting.
- Training workshops should also be conducted for nurse educators and instructors to increase their competencies in applying problem based learning as a teaching strategy in the clinical teaching.

Limitation of the study;

Small sample size and lack of true experimental design due to small number of student who were registered at Faculty of Health Science this year which would hinder randomization of the study results.

References

[1]. Dochy F., Segers M., Bossche P.V.D., and Gijbels D., Effects of Problem-Based Learning: A meta Analysis, Learning and Instruction, 2003;13: pp 533–568.

[2]. Khamis L.M., Impact of Management Program on Competencies of Baccalaureate Nursing Graduates during Internship Year; Doctoral Thesis, Faculty of Nursing,Tanta University, 2008: p 8- 26.

[3]. Yam M.B., Rhoades K., Sweeney L.B. and Kaput J., Changes in the Teaching and Learning Process in a Complex Education System, New England Complex Systems Institute, Cambridge, MA USA, 2002, p 1.

[4]. Caffarella R.S. and Knowles M.S., Planning Programs for Adult Learners: A practical Guide for Educators, Trainers, and Staff Developers, 2nd ed., New York: John Wiley&Sons Inc., 2002; pp173-179.

[5]. Rangachari PK., Design of a Problem-Based Undergraduate Course in Pharmacology: Implications for the Teaching of Physiology, Adv. Physiol. Educ., 1991; 5: pp14–21,.

[6]. Ibrahim A.F., Effect of Role Play Versus Lecture Teaching Strategies on Nursing Student's Communication Skills during Patient Education, Doctoral thesis, Faculty of Nursing. Alexandria University, 2011; pp 1-3.

[7]. Chiu M. M., Adapting Teacher Interventions to Student Needs during Cooperative Learning, American Educational Research Journal, 2004; 41(2): pp 365-399.

[8]. Gillies R.M., and Ashman A.F., Cooperative Learning: The Social and Intellectual Outcomes of Learning in Groups, New York: Routledge Falmer, 2003, p 1.

[9]. Creasia J.L. and Parker B., Conceptual Foundations: The Bridge of Professional Nursing Practice. 3rd ed. St. Louis: Mosby, 2001; pp 384, 404.

[10]. Billings D.M and Halstead J.A., Teaching In Nursing. A Guide For Faculty, 2 nd ed. 2005; pp 300-310.

[11]. Chiu M. M., Group Problem Solving Processes: Social Interactions and Individual Actions, Journal for the Theory of Social Behavior, 2000; 30 (1): pp 27-50-600.

[12]. Chiu M.M., Flowing Toward Correct Contributions during Groups' Mathematics Problem Solving: A Statistical Discourse Analysis, Journal of the Learning Sciences, 2008; 17 (3): pp 415 - 463.

[13]. EL-Shaer A. and Gaber H., Impact of Problem-Based Learning on Students`Critical Thinking Dispositions, Knowledge Acquisition and Retention, Journal of Education and Practice, 2014; 5(14): pp74-86.

[14]. Bradshaw M. and Lowenstein A.J., Innovative Teaching Strategies in Nursing and Related Health Professions, 4th ed., Jones and Bartlett Publishers, 2007; pp131-140.

[15]. Hmelo-Silver C. E., "Problem-Based Learning: What and How do Students Learn?", Educational Psycho. Rev., 2004; 16 (3): pp 235–266.

[16]. Wee K.N.L., "Jump Start Authentic Problem Based Learning", Singapore: Prentice Hall Pearson Education South Asia Pte. Ltd, 2004.
[17]. Kolmos A. & Holgaard J.E., "Alignment of PBL and Assessment. Proceeding of 1st International Conference on Research in Higher Education" Honolulu, American Educational Research Association, 2007; pp. 1-9.
[18]. Shin IS. and Kim JH., The Effect of Problem-Based Learning in Nursing Education: A meta-Analysis, Advanced Science Health Education Theory and Practice, 2013;18(5): pp1103-20.
[19]. Radi S.M., Motivation, Problem-Solving Skills and Perception of Adherence to Diet Regimen in Cardiac Rehabilitation Patients, Doctoral Thesis, Frances Payne Bolton School of Nursing, Case Western Reserve University,2006; p 50-51.
[20]. Taylor C., Problem Solving in Clinical Practice, Journal of Advanced Nursing, 1997; 26(2): pp329, 36.
[21]. Lipe SK., Critical Thinking in Nursing, London: Lippincott Williams & Wilkins, 2004; p27.
[22]. Osman A.M., The Effect of Cooperative Learning Strategy on Development of Problem Solving Skills for Nursing Students, Doctoral Thesis, Faculty of Nursing, Alexandria University, 2010; pp1-3.
[23]. Masek A., Yamin S., The Effect of Problem Based Learning on Critical Thinking Ability: A Theoretical and Empirical Review, International Review of Social Sciences and Humanities, 2011; 2(1): pp. 215-221
[24]. Schmidt H.G., Problem Based Learning: Rationale and Description, Medical Education, 1983;17 (1): pp11–16.
[25]. Tork H.M.M. and Shahin E.S.M., The Effectiveness of Problem-Based Learning (PBL) in Nursing Education: Cross-Cultural Student's Perspective, Journal of American Science, 2011;7(11): pp516-521.
[26]. Swansburg R.C. and Swansburg R.J., Introduction to Management and Leadership for Nurse Managers. 3rd ed., Sudburry, Massachusetts: Jones and Bartlett Publishers, 2002; pp 263,264.
[27]. Mohamed A.H., The Effect of Decision Making Training Program on Clinical Decision Making Ability and Locus of Control of Baccalaureate Nursing Graduates, Doctoral Thesis, Faculty of Nursing, Alexandria University, 1997; p 40.
[28]. Timby B.K. and Smith N.E., Introductory Medical Surgical Nursing, 8th ed., London: Lippincott Williams&Wilkins, 2003; pp 15-20, 380-630.
[29]. Moyet L.J.C., Nursing Care Plans & Documentation: Nursing Diagnosis and Collaborative Problems, 4th ed., New York: Lippincott Williams&Wilkins, 2004; pp 900-1158.
[30]. Smeltzer S.C., Bare B.G., Hinkle J.A. and Cheever K.H., Medical & Surgical Nursing, 11th ed., New York: Lippincott Williams&Wilkins, 2008; pp 1323-1330.
[31]. Ulrich D.L. and Glendon K.J., Interactive Group Learning, 2nd ed., New York: Springer Publishing Company, 2005; pp 39-42.
[32]. Mace M.S., Adoption of a Cooperative Learning Teaching Strategy in a Bachelor of Science in Nursing Course, Master thesis, Faculty of Education, Lakehead University, 2002; p 77.
[33]. Abrahamson K.L., Effective Clinical Teaching Behaviors as Perceived by Associate and Baccalaureate Degree Nursing Students, Doctoral Thesis, Kirhof School Nursing, Grand Valley State University, 2002, p50 .
[34]. Gardner E.A., Instruction in Mastery Goal Orientation: Developing Problem Solving and Persistence for Clinical Settings, Journal of Nursing Education, 2004; 45(9): pp 343-47.
[35]. N.P.Gunusen P., Sercekus A. and Edeer A.D., A Comparison of Problem Based Learning and Traditional Education on Nursing Students Locus of Control and Problem Solving Skills, International Journal of Nurses Knowledge, 2014, p 23.
[36]. Al-Naggar R.A., & Bobryshev Y.V., Acceptance of Problem Based Learning among Medical Students, J Community Med. Health Educ., 2012, 2: p146. doi:10.4172/2161-0711.1000146.
[37]. Terzioglu F., The Perceived Problem Solving Ability of Nurse Managers, Journal of Nursing Management, 2006; 14(1): pp 340-47.
[38]. Hsiao H.C. and Chang J.C., A quasi Experimental Study Researching How A problem Solving Teaching Strategy Impacts on Learning Outcomes for Engineering Students, 2003, availaple at http:// www.google.problem-solving.com
[39]. Denning R. and Smith P., Teaching Problem Solving Through A cooperative Learning Environment, 2000. available at www.co-operation.org.
[40]. Sohn M., Ahn Y., Lee M., Park H. and Kang N., The problem-Based Learning Integrated with Simulation to Improve nursing Students' Self-Efficacy, Open Journal of Nursing, 2013; (3): PP 95-100
[41]. Walton H.J. and Walton M.B., Essentials of problem-based learning. Medical Education, 1989 ;(23): pp 542-558. doi:10.1111/j.1365-2923.1989.tb01581.
[42]. Brown S.A. and Klein B.D., Are Cooperative Learning Technique Fragile in Information System?: An Examination in the Context of Data Base Management Course, Journal of Informatics Education Research, 2012; p 666.
[43]. Woods D.R., Problem Based Learning, Helping Your Student Gain the Most From PBL, 3rd Edition, USA, 1996.
[44]. Samy A. Azer, Problem-based learning Challenges, barriers and outcome issue, Saudi Med. J., 2001; 22 (5): p88.
[45]. Sharan Y., Cooperative Learning for Academic and Social Gains: Valued Pedagogy, Problematic Practice, European Journal of Education, 2010; 45(2): pp 300-313.
[46]. Brady M. and Tsay M. A Case Study of Cooperative Learning and Communication Pedagogy: Does Working in Teams Make a difference?, Journal of The Scholarship pf Teaching and Learning, 2010; 10(2): pp 78-89.
[47]. Hagen J.P., Cooperative Learning in Organic II: Increase Retention on a Commuter Campus, Journal of Chemical Education, 2000; 77 (11): pp 1441-1444.
[48]. Lord T.R., 101 Reasons for Using Cooperative Learning in Biology Teaching, The American biology teacher, 2001; 63 (1): pp30-38.
[49]. Savery.J.R., Overview of Problem Based Learning: Definition and distinction, Interdisciplinary Journal of Problem Based Learning, 2006; 1(1): p11.
[50]. Lonning R.A., Effect of Cooperative Teaching Strategies on Students Verbal Interactions and Achievement during Conceptual Change in Instruction in 10 th Grade General Science, Journal of Research in Science Teaching, 2006; 30(9): pp1087-1101.
[51]. Linnethe J., Evaluation of a Problem Based Learning Package on Pregnancy Induced Hypertension for B.Sc. Nursing Students, Nursing Journal of India, 2002. available at http:// findarticle.com.
[52]. Aplon.G.V., Collaborative problem solving becomes non-collaborative, but still jointly authored,2012. Available at http://tushnet.blogspot.com/2012/09/collaborative-problem-solving-becomes.html.