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Impact of problem-based learning on nurse manager's managerial competencies

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Abstract---Background: In the rapid changing environment, health organizations are facing greater challenges, which increase the importance to promote problem based learning to overcome daily work problem, and to stay competitive. The ability to create problem based learning at work is depending on knowledge and experience of individuals, which is used to solve ill structure and new problems and generate innovative solution. Aim: To examine the impact of problem-based learning on nurse manager's managerial competencies at New El-Kasr ElAiny Teaching Hospital. Design: Quasi – experimental design was utilized in this study. Subject: a purposive sample of nurse managers who working at intensive care units (N=30). Setting: Study was carried out in all intensive care units at New El-Kasr ElAiny Teaching Hospital. Tools: Three tools were used for data collection: Problem-based learning knowledge questionnaire (25) questions, Problem-Based Learning Skills Questionnaire (23items), and managerial competencies observational checklist (65) items. Results: There was a statistical significant difference in total PBL knowledge test scores ($F = 383.53$, $P = 0.0001^*$), as well as in mean scores of total PBL skills ($F = 20477.6$, $P = 0.0001^*$) among nurse managers during different periods of assessment. A statistical significant difference was seen in managerial competencies total mean scores ($F = 255.23$, $P = 0.0001^*$). As well, a high level in total test scores in applying problem-based learning skills immediately post-program, and during program implementation compared to preprogram. Also, a statistically significant positive correlation were found between immediate post program implementation period and three months post program implementation period regarding PBL total knowledge, and total

managerial competencies scores. Conclusion: The study concluded that PBL training program had improved nurse managers' problem based learning knowledge and skills, as well had a positive impact on their managerial competencies. Recommendations: Attention is needed to address the obstacles of problem-based learning among nursing are needed, PBL training program must be provided to nursing staff in various levels to improve their competences.

Keywords---Problem based learning, Nurse managers, managerial competences.

Background

PBL places the responsibility for learning in the hands of the learner and is concerned with both what learners learn and how they learn it (Wang et al., 2016; Kartikeyan and Malgaonkar, 2018; Kim, 2019). Problem-based learning is a learner-centered problem-based and small-group method of learning that emphasizes the use of realistic scenarios. Moreover, PBL is the learning that results from the process of working toward the understanding or resolution of a problem under the guidance of a tutor (Ahamad et al., 2017; Wosinski et al., 2018).

Problem-based learning is a powerful learning approach offering many benefits including increased acquisition and retention of knowledge, stimulation of problem-solving, enhancement of intrinsic subject interest, enhanced communication, teamwork, presentation, and critical appraisal skills, and enhanced clinical skills (Kim, 2019). PBL has been proved to be a success in enhancing and developing critical thinking ability, leadership qualities, self-directed learning, professional and interpersonal skills, management skills, collaborative learning, and practicing empathy. (Ansari et al., 2015).

The tutor's role is to facilitate and guide learners towards discovering answers independently instead of being given the answers, offering learners a richer and more holistic learning experience .PBL is a structural strategy and a method to organize the learning process in such a manner that the learner is actively engaged in finding solutions by them (Heaviside et al., 2018).

Nurse managers must be able to exercise their multiple roles of care providers, managers, teachers, as well as lifelong learners and researchers. To do so, they should be able to solve problems through analysis, synthesis, critical thinking, effective communication, and other skills. Nurse managers are related to the different specialties of nursing such as all critical care unit, cardiac catheterization, medical-surgical specialties, intensive care unit, cardiothoracic surgery, maternal and newborn health nursing, pediatric unit, and nursing administration where they are trained clinically through these specialties. (Makhlof and El- Saman, 2017).

Managerial skills are parts of managerial competencies. Management skills identify abilities or behaviors that are crucial to success in managerial positions. The term "skill" refers to the ability to do something in an effective manner (El-Sayed et al., 2015).

Managerial competencies are specialized technical knowledge and a set of behaviors in certain jobs that managers should possess to perform their duties and roles. Also, managerial competencies are acquiring and learning abilities and it can be defined as the manager's ability to transform information and knowledge into practice. The competencies were necessary for the nurse manager differing in the development of the competencies in management; the competencies as decision making, communication skills, leadership, ethical principles, collaboration, and team management skills and others (Sayyah et al., 2017).

Significance of the study

Problem-based learning has been proposed as an important method to retain and to promote knowledge and skill development. Where, the literature reviews have been found many problems because of lack of the implementation of problem-based learning such as no teamwork and commitment, dissatisfaction, conflict, absenteeism, and turnover, on the other hand, enhance the implementation of problem-based learning outcomes would improve managerial competencies which improve the nurse manager's satisfaction, nurses' relationship and as organizational cost containment . Sayyah et al., (2017) claimed that some earlier researches confirmed a positive correlation among problem-based learning, costs, satisfaction with the workplace, willingness to change behavior at workplaces, and structurally positive work environment. (Fatima et al., 2019).

From work experience of the investigator, nurse managers have a significant role within health care organization and constitute an important member of any hospital management, but unfortunately they lack essential management skills and competencies that prepared them to handle workplace problems, as well as they, lack opportunities to make a positive difference in their work. Also in the workplace nurse managers are promoted to their managerial position with little or no training, they learn through traditional management practices of others and by trial and error. Placing nurse managers in management positions for which they are not trained on how to be creative in solving the problem leads to poor unit management and a lack of productivity.

Aim of the study

The aim of this study is to examine the impact of problem-based learning on nurse's managers' managerial competencies in a selected University hospital

Research hypothesis

H1: There was a difference in nurse managers' knowledge test score of problem-based learning after program implementation compared to before.

H2: There was a difference in nurse managers' mean scores regarding their skills in applying problem-based learning after program implementation compared to before.

H3: There was a difference in the nurse manager's mean scores of managerial competencies after program

Subjects and Methods

Research Design

Quasi-experimental design was utilized at this study. Setting: The current study was conducted in all intensive care units at New Kasr El Aini teaching hospital which is affiliated to Cairo University hospital. Subjects: A purposive sample, of (n=30) nurse managers were divided into, first-line nurse managers (n=8), charge nurses (n=6), and nursing supervisors (n=16) who are working in all intensive care units, accept to participate in the educational program, have baccalaureate degree of nursing and at least one year experience working as nurse manager. Tools: To fulfill the aim of the study three tools were used to collect data, and used at the three different periods of assessment times (pre, immediate, and three months post program) as follows:

- 1) Problem-based learning knowledge questionnaire: It was developed by the investigator guided by literature review, Hartini, Kusdiwelirawan, & Fogarty(2014), Szabó, et al (2014), Jung & Kong (2017) to measure nurse managers problem based learning knowledge, it divided into two parts as follows:-*1st part:* personal characteristics datasheet. *2nd Part:* Problem-based learning knowledge questionnaire, it was consisted of (25) questions divided into, MCQ (11) questions, matching questions (3), Rearrange (1) question, and true and false questions (10 questions). *Scoring system:* one point for the correct answer and zero for incorrect answer. The cut point was 60 %. Scores of (< 60%) indicate low PBL knowledge, (60 – <75%) indicate moderate PBL knowledge, and (≥ 75%) indicate high PBL knowledge.
- 2) Problem-Based Learning Skills questionnaire: it was developed by the investigator guided by (Szabó,etal 2014 & Khaled, 2020), used to assess the nurse managers skills in applying problem based learning skills by using scenario problems; it consisted of five dimensions and (23items), subdivided into:- Critical appraisal (6 items), utilization of learning resources (3 items), group work (7 items), communication skills (4 items), individual dimension (3items), *scoring system* : always = 2, sometimes =1, and never =0, the cut point was 60 %. Scores of (< 60%) indicate low PBL skills, (60 – <75%) indicate moderate PBL skills, and (≥ 75%) indicate high PBL skills.
- 3) Managerial competencies observational checklist: it was developed by the investigator guided by Bakanauskienė & Martinkienė (2011), Jung, Kong (2017), Nader et al (2018) used to assess nurse managers' managerial competences it included two classifications of managerial skills (conceptual skill and human relation skill). It was consisted of (65) items distributed as the following; *A-Conceptual skills* which consisted of three dimensions and subdivided into (18 items) as critical thinking skills (7 items), decision-

making skills (4 items), and problem-solving skills (7 items). *B-Human relation* skills consisted of five dimensions divided into (47) items as, communication skills (10 items), empathy ability (10 items), interpersonal skills (13 items), collaboration skills (10 items), and teamwork (4 items). *The scoring system:* done = 2, not done = 1 and, not observed = 0, as the total score for all questions was 130. Total scores were expressed as percentages, cut point is 60 %. Scores of (< 60 %) indicate low managerial competencies, (60 % - < 75 %) indicate moderate managerial competencies, and (≥ 75 %) indicate high managerial competencies.

Procedure: Primary formal approval was granted from the ethical committee and then from the Vice Dean of post Graduate Studies and Research at the Faculty of Nursing - Cairo University and then from the general medical and nursing directors of the selected hospital.

First phase: The researcher developed the study tools based on the literature review, then tools validity, pilot study, reliability were done. The researcher met the nurse director and explained the aim, benefits, nature, and significance of the study were explained for every nurse managers, to obtain their written acceptance to participate in the study.

Second phase: An initial assessment of the nurse manager was done using previous mentioned tools, and scenario problem was prepared by the investigator based on real work problems affiliated to managerial competencies offered to practice at the end of each session. Moreover nurse managers were asked to fill out the work engagement questionnaire. Then the learning program schedule was arranged and program content will be based on the development of PBL knowledge and skills and impact of it on managerial competencies and problem solving abilities. Program scenarios will covered nurse's manager's essential managerial competencies such as, a-conceptual skills which contained (critical thinking, decision making, and problem-solving skills), b- human relation skills It contained (communication skills, empathy ability, interpersonal skills, collaboration skills, and teamwork).

Third phase: The problem-based learning training program was carried out in two months from 15th September to the 15th November 2020, one lecture per week. The program was supposed to be 16 hours, with total number of eight sessions two hours for each, given at the conference room at the hospital. Using power point and activities during sessions.

Fourth phase: Evaluation of the immediate impact of program on nurses using the same previously used tools. It was carried out in one and half months from 15th November to the end of December 2020. Follow-up: To measure nurse managers' knowledge retention, follow-up was conducted to assess nurse managers' PBL knowledge and competencies among nurses' managers by using the same previous tools. It was carried out in two months from 1st Jun to the 1st of August 2021.

Ethical consideration

A primary approval of the research ethical committee at Faculty of Nursing Cairo-University was obtained to conduct the study. An official permission was obtained

from the Medical & Nursing Director of New Kasr El Aini Teaching Hospital to conduct the study. Participation in the study was voluntary and based on the nurse managers' agreement to give informed written consent , after explaining the purpose ,nature of the study and stating the possibility to withdraw at any time .To ensure confidentiality for the participants; data will not be accessed by any other party without taking permission of the participants. The study was posing no risk for the participants. Finally a second approval of the ethical committee at the Faculty of Nursing Cairo –University was obtained.

Data Analysis

A statistical package for social science "(SPSS) Version 20. Data were used for statistical analysis of data. , parametric inferential statistics as descriptive (mean &SD) ,t-test,(ANOVA) and regression analysis were used to examine the differences between the study variables as well as analysis of variance (R) test to examine correlations. Probability (p-value) less than 0.05 was considered significant and less than 0.001 considered as highly significant.

Results

Table (1): Distribution of nurse managers personal characteristics (N=30)

Personal Characteristics	No.	%
Gender		
Female	30	100 %
Age		
<30	8	26.67%
30- <35	1	3.33%
35-<40	5	16.67%
40-<45	6	20%
≥45	10	33.33%
Marital status		
Single	7	23.33%
Married	23	76.67%
Level of education		
Baccalaureate degree	25	83.33%
Postgraduate diploma	2	6.67%
Master's degree	3	10%
Years of experience in nursing		
5-<10	9	30%
10-<15	4	13.33%
≥15	17	56.67%
Years of experience as a nurse manager		
<5	2	6.67%
5-<10	4	13.33%

10-<15	7	23.33%
≥15	17	56.67%
Previous working experience		
Ccu (2A, OH , Elgande)	7	23.33%
Icu (Icu-0 , 6B, 7B)	8	26.67%
Chest icu , SHerief Moktar , premature	15	50%
Current intensive care working place		
Ccu (2A, OH, Elgande)	11	36.67%
Icu (Icu-0 , premature , 6B, 7B)	14	46.67%
Chest icu , SHerief Moktar	5	16.67%
Attending Previous problem-based learning training program		
Yes	3	10%
No	27	90%

Table shows that all (100%) of participants were female, also the highest percentage (33.3%) of the participants were in age groups (≥ 40 years), the highest percent (76.6 %) of nurse managers were married, the majority of participants (83.3%) had a baccalaureate degree in nursing. Also, the highest percentage (56.6%) of participants had years of experience (≥ 15). And the highest percentages (46.6%) of the participants work in ICU, while only (16%) work in chest ICU. While (90 %) of the participants did not attend any previous training program about problem based learning.

Table (2): Frequency distribution of nurse managers' total problem-based learning knowledge levels during different periods of assessment (pre, immediately post-program, and three months later) (N=30)

Total PBL knowledge levels.	Preprogram		Immediate Post program		Three months post program		x ²	p-value
	No.	%	No.	%	No.	%		
Low (< 60%)	25	83.4	0	0.0	0	0.0	25.0	0.0001*
Moderate (> 60 % – <75 %)	5	16.6	0	0.0	1	3.3	2.6	0.1
High ($\geq 75\%$)	0	0.0	30	100.0	29	96.7	29.0	0.0001*

*significant at p-value<0.05

Table revealed that there was a statistical significant difference in total PBL knowledge test score during different periods of assessment. As shown the majority of them had high score immediately, and three months post-program

implementation (100 % & 96.7%) respectively compared to preprogram($\chi^2 = 29$, $P = 0.0001^*$)

Table (3): Comparison of the mean score of nurse managers regarding applied problem-based learning skills during different periods of assessment (N=30)

problem-based learning skills	Maximum score	Pre program			immediate post program implementation			F- value	p-value
		Mean	SD	Mean (%)	Mean	SD	Mean (%)		
Critical appraisal	12	7.21	0.42	40.08	18.00	0.01	100.00	18654	0.0001*
Utilization of learning resources	6	4.64	1.25	51.59	9.00	0.01	100.00	338.2	0.0001*
Group work	14	8.57	1.07	40.82	21.00	0.01	100.00	3784.7	0.0001*
Communication skills	8	4.79	0.42	39.88	12.00	0.01	100.00	8346.6	0.0001*
Individual dimension	6	3.82	0.39	42.46	9.00	0.01	100.00	4936.47	0.0001*
Total	46	29.04	1.48	42.08	69.00	0.01	100.00	20477.6	0.0001*

*significant at p-value <0.05

It was clear from the above table that there was highly statistical significant differences in mean scores of all problem based learning skills dimensions immediate post program implementation compared to preprogram, ($F = 20477.6$, $P = 0.0001^*$).

Table (4): Frequency distribution of nurse managers' levels of total problem-based learning skills levels during different periods of assessment (N=30)

PBL skills Levels	Pre program		immediate post program implementation		Chi square χ^2	p-value
	No.	%	No.	%		
Low (< 60%)	29	96.5	0	0.0	84.0	0.0001*
Moderate (> 60 % – <75 %)	1	3.5	1	3.3		
High ($\geq 75\%$)	0	0.0	29	96.7		

*significant at p-value<0.05

The above table showed that there was a statistical significant difference in total PBL skills immediate post program and marked improvement was noticed compared to preprogram as (96.7 %) scored high (≥ 75 %)

Table (5): Comparison of the total mean scores of nurse managers' managerial competencies dimensions during different periods of assessment (N=30) 30×3 observations

Managerial Competencies dimensions	Pre program			Immediately Post program			Three months post program			F-value	p-value
	Mean	SD	Mean (%)	Mean	SD	Mean (%)	Mean	SD	Mean (%)		
Critical thinking competence.	0.25	0.35	24.71	0.96	0.12	95.86	0.88	0.23	88.14	160.41	0.0001*
Decision making competence.	0.29	0.35	29.00	0.97	0.08	97.25	0.92	0.16	91.75	205.27	0.0001*
Problem solving competence.	0.75	0.44	75	1.00	0.00	100	1.00	0.00	100	9.000	0.0001*
Communication competence.	0.57	0.85	57.33	0.92	0.17	92.44	0.85	0.33	85.11	14.38	0.0001*
Empathy ability competence.	0.62	0.44	62.33	0.93	0.24	93.44	0.85	0.35	85.33	6.80	0.001*
Inter_ personal competence.	0.57	0.43	57.22	0.90	0.22	89.67	0.94	0.11	94.44	25.00	0.0001*
Collaboration competence.	0.47	0.40	46.78	0.96	0.17	95.78	0.99	0.04	99.11	45.37	0.001*
Team work competence.	0.18	0.29	18.00	0.97	0.08	97.25	1.00	0.00	100.00	205.49	0.0001*
Total mean scores	28.7	4.19	44.1	61.2	5.68	94.1	59.4	5.5	91.3	255.23	0.0001*

*significant at p-value <0.05

It was clear from the above table that there was a highly statistically significant difference in mean scores of all managerial competencies immediately post-program and three months later compared to preprogram, which was reflected in the total mean score respectively (F = 255.23, P = 0.0001*).
 .Table (6): Frequency distribution of nurse managers' regarding total managerial competencies levels during different periods of assessment (N=30).

Competences levels	Pre program		Immediate post program		Three months later		Chi-square X2	p-value
	No.	%	No.	%	No.	%		
Low (< 60%)	23	76.6	0	0.0	0	0.0	23.0	0.0001*
Moderate (> 60 - <75%)	6	20.0	1	3.4	2	6.6	2.0	0.15
High (≥75%)	1	3.4	29	96.6	28	93.4	26.1	0.0001*

*significant at p-value<0.05

The table shows a statistically significant difference and marked improvement in nurse managers competences at immediate post-program, (96.6%) of them had high score, and slightly decreased to (93.4%) after three months post-program, (X2 = 26.1, P = 0.0001*) ,while preprogram, (76.6%) of them scored low (< 60 %)

Table (7): Correlation between nurse managers' total problem based learning knowledge and total managerial competencies (N=30)

Variables	Managerial competencies			
	Immediately post program		Three months post program	
Total PBL knowledge	r	p	r	p
	0.79	0.001*	0.21	0.76

*significant at p-value<0.05

The above table shows that there was statistical significant positive correlation between the nurse managers' total PBL knowledge and their managerial competencies immediate post program implementation ($r = 0.79$, $p = 0.001$)

Discussion

Problem based learning has been proved to be a successful approach in enhancing and developing critical thinking ability, leadership qualities, self-directed learning, professional and interpersonal skills, management skills, collaborative learning, practicing empathy, and many more (Kim, 2019).

The aim of the study was to examine the impact of PBL on nurse managers' managerial competencies. Regarding to personal characteristics, result of the current study revealed that all participants were females, the majority of them had bachelor's degrees in nursing, and married; these results were agree with Abd-Elmonem (2019) who found that all unit managers were females, married and had bachelor's degrees in nursing science. While it was contradicted with Burgess, et al (2018) found that only less than half of the study participants had baccalaureate degree in nursing and most of them were male and not married.

The current study revealed that most of nurse managers were in age more than forty five years old, and the majority of them had more than fifteen years of experience in nursing and experience as a nurse manager. This result was consistent with the research of Sanyal& Hisam (2018), who founds that the majorities of nurse managers were in a management position more than fifteen years of experience and, aged more than forty years. Also, results were matched with Burgess,et al (2018) who founds that more than sixty-three head nurses had more than ten years of experience, and most of them were aged from thirty-five to forty years or more. Moreover, Sanyal&Hisam (2018) found that more than fifty percent of nurse managers were in the age group of forty and more, and the majority of them had more than ten years of experience in nursing, and more than fifteen years' experience as nurse managers.

Furthermore, the current study showed that most of the nurse managers were working in the critical care units (ICU) in addition, previous working experience in CCU, this result were contradicted with, Fatima,et al (2019) who found that it only nineteenth percent of nurse unit managers were working in intensive care units and the majority were working in medical-surgical departments.

The study result showed that most of the nurse managers did not attend the previous problem-based learning training program. From the researcher's point of view, this might be due to that the annual training plan of the nursing department includes other training courses such as quality of care, leadership skills, infection control, and time management, rather than problem-based learning and managerial competencies training program.

The current findings of this study revealed that there were statistical significant differences in mean scores of nurse managers regarding problem-based learning knowledge during different periods of assessment. As they had the highest mean scores immediately post-program and three months later compared to before program implantation.

Moreover, statistical significant differences and marked improvement in nurse managers' total mean scores in PBL knowledge as the highest percentage of nurse managers had high mean scores immediately post-program, and three months post-program compared to preprogram.

This result was supported by, Kartikeyan & Malgaonkar, (2018) who found that highly significant and a significant improvement in knowledge after attending the PBL program and emphasized the importance of training opportunities to support and update their knowledge. Moreover, Abd Rabou, (2017), revealed that there was marked improvement of knowledge scores at posttest of the implementation of problem based learning program.

In the same issue, Thabet, et al (2017) found a significant improvement in nurses managers' knowledge after attending PBL program and emphasized the importance of training opportunities to support and update their knowledge and improve the managerial capability. In addition, Sangma, et al (2019) & Yadav et al., (2018), indicated that there were marked improvement of the level of PBL knowledge attainment at immediate, and three months post - tests.

From the researcher point of view this marked improvement in nurse managers' knowledge after implementation of the problem-based learning training program this might be due to the interest of the participants in this program content, this program contained a lot of real work situational examples, ideas, and knowledge, the participant's discussion was opened, this was an advanced and new strategy which stimulated participant interest and participation in the learning process, self-directed learning, reasoning skills, learning in context, Also, PBL is a better method for enhancing knowledge acquisition and retention.

The results of the current study showed that there was a highly statistically significant difference in mean scores of nurse managers' PBL skills compared to preprogram regarding all dimensions and total mean score. The result of the current study revealed that high percentage of nurse managers had scored high skills after program implementation compared to preprogram. This result might indicate the program had a positive impact on nurse managers' PBL skills. This result was consistent with, Heaviside et al., (2018) found a highly statistically significant improvement of nurse managers PBL skills immediately after program

implementation, and significant differences were found between the mean scores of pre and post - scores. Also, Kim, (2019) who confirmed that PBL is an significant effective approach, especially for the retention and application of practice knowledge and PBL skills compared to preprogram.

The current study revealed that there was a statistically significant difference in total mean scores of nurse managers' managerial competencies regarding all dimensions of competencies. As they had the highest mean scores immediately post-program and after three months relative to preprogram. This result might indicate the positive effect of PBL program on nurse managers' managerial competences.

This result is consistent with Othman, et al (2018), revealed that a highly statistically significant improvement in nurse leaders' performance after attending PBL programs and had a positive effect on managerial competencies. Also, Abd Rahman et al., (2019) found that the PBL approach are useful for learning in a new brand, and it can be had a positive impacts on management capabilities. In the same issue, Orji and Ogbuanya, (2018) verified that PBL is an operational approach, especially for the preservation and development the competencies and practice acquaintance. Also, Kim, (2019) naked that PBL had statistically significant difference in sharing capabilities, searching for acquaintances, which stimulated the participant to more accomplishment and had a significant positive impact on competencies. From the researcher point of view, the current study shows a marked improvement in PBL competencies among nurse managers this result could be related to the remarkable interest of nurse managers in the training program, teamwork, communication, and other skills and their intention to develop the managerial competencies.

Moreover, the current study revealed that there were a statistically significant positive correlation between the nurse managers' managerial competencies and, total problem based learning knowledge in immediate post-program, while no significant correlation with post three months later, this could be related to work over load and shortage among them which might be interfere with their capabilities to retain knowledge and constant demonstrate acquired skills and competencies. This result was contradicted with Wosinsk, et al. (2018) was found a positive correlation between the participants' competencies and, PBL knowledge immediate post training and at follow up compared to before training.

Conclusion

The study concluded that PBL training program had improved PBL knowledge and skills, as well as had a positive impact on their managerial competencies.

Recommendations

- 1) Replication of the current study with a more representative sample of nursing managers and their assistants for all hospital.
- 2) Attention is needed to address the obstacles of PBL among nursing administrative positions.

- 3) Collaboration between nursing education and nursing services to eliminate the gap between the theory and practice of nursing management.4) Conduct a study to compare the efficacy of PBL versus traditional TBL methods.

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