ORIGINAL RESEARCH

Effectiveness of simulated delivery room classes on practical achievement and satisfaction of maternity nursing students

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ABSTRACT

Objective: This study aimed to assess the effectiveness of simulated delivery room classes on practical achievement and satisfaction of maternity nursing students. **Methods:** A randomized controlled trial was carried out at the maternity lab in the faculty of nursing and labor & delivery room of Mansoura university hospital. This study comprised a convenience sample of 92 female maternity nursing students out of 196 assigned to the maternity course during the first semester of the academic year 2014-2015. They were randomly assigned to one of two groups; the simulation group received simulated delivery room classes' one week pre the conventional clinical training and the control group received only the conventional clinical training. Two tools were used for data collection: the 1st tool was an observational checklist of 20 items that was used to evaluate the students' practical achievement and the 2nd tool was a 5 item student's satisfaction scale that was used to evaluate the students' satisfaction with the clinical experience. **Results:** The students of the simulation group had a highly statistically significant higher scores than the control group (46.5 ± 4.7 versus 36.9 ± 3.6 respectively; 95% CI 11.25, 7.75 & $p < .001$) for the practical achievement and (21.1 ± 3.8 versus 11.2 ± 3.3 respectively; 95% CI 8.396, 11.331 & $p < .001$) for the students' satisfaction with the clinical training experience. **Conclusions:** These study results pointed out that the simulation classes is an effective training method for enhancing the students' practical achievement and satisfaction. Thus, providing the maternity students with simulated delivery room classes prior the conventional clinical training is recommended.

Key Words: Simulated delivery room classes, Practical achievement, Student's satisfaction and maternity nursing

1. INTRODUCTION

The main goal of Nursing Education is to produce qualified nursing graduates, who are able to perform efficiently the anticipated clinical skills. However, the clinical environment which is expecting to acquire the nursing students with the opportunities to achieve that goal is unfavorable; such environment limits the student's chance to hands-on care.[1, 2]

Maternity nursing students, in particular, are facing multi

obstacles during labor and delivery rotation that are interfering with their learning opportunities; expressly the parturient women are commonly admitted at early stage of labor and the students may complete the labour and delivery rotation without even observing the entire birth process. Additionally, maternal-fetal safety and ethical considerations suggest no individual students' involvement in hands-on care with subsequent poor practical achievement.[3, 4] Therefore, the National League for nursing 2005 had stated that the nurs-

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ing educators must create learning environments to prepare "graduates for practice in a complex, dynamic health care environment".[5]

Simulation is potential tools that may help the nursing educators prepare the future nurses to practice in a real environment. It is a teaching strategy that provides students with artificial representation of a complex real-life for enabling them to learn in a safe environment; based on its degree of realism it ranges from low to high fidelity. Low fidelity simulation refers to that is used in teaching the physical assessment and psychomotor skills, while medium fidelity reflects more realism than that of low fidelity. Yet, high fidelity simulation refers to that which mimics the reality of a human patient in clinical environment.[6–8]

Review of literature had revealed several beneficial effects of simulation. It purposely offers the opportunity for students to improve the intended learning outcomes such as clinical skill performance, knowledge acquisition, clinical reasoning ability and student satisfaction.[9–14] Yet, still there is a need for more research to prove that skills acquired in a simulated environment are transferable to real-life patient care. Thus, this study aimed to assess the effectiveness of simulated delivery room classes on practical achievement and satisfaction of maternity nursing students.

1.1 Significance of the study
Since unpredictable progress of labor and unexpected occurrences confine the maternity nursing students to manipulate or even observe the childbirth process, it is imperative for maternity nursing educators to investigate the effectiveness of new learning technologies like simulation in order to provide the nursing students with the best learning opportunities. Considering the lack of Egyptian studies that addressed simulation subject in maternity specialty, this study was conducted to assess the effectiveness of simulated delivery room classes on practical achievement and satisfaction of maternity nursing students.

1.2 Aim of the study
This study aimed to assess the effectiveness of simulated delivery room classes on practical achievement and satisfaction of maternity nursing students.

1.3 Study hypotheses
To fulfill the aim of this study, two research hypotheses were tested:

Hypothesis 1: Maternity nursing students who attend simulated delivery room classes' achieve higher practical achievement scores than those who do not attend.

Hypothesis 2: Maternity nursing students who attend simulated delivery room classes' exhibit higher satisfaction scores than those who do not attend.

2. MATERIALS AND METHOD

2.1 Research design
This study was designed as a randomized controlled trial.

2.2 Study settings
This study was conducted in two settings:
(1) Labor and Delivery room of Mansoura University Hospital, Egypt.
(2) Maternity Nursing Lab at the Faculty of Nursing- Mansoura University, Egypt. It is a simulated Labor and Delivery suite, with two high fidelity full-body simulated parturient women mannequin; with working programmable fetal monitor and two intermediate fidelity full-body simulated parturient women mannequin (NoelleTM Gaumard simulator).

2.3 Sampling
Participated in this study, female students who were enrolled in the third year of nursing baccalaureate program; when they assigned to the maternity nursing course during the 1st semester of the academic year 2014-2015. All of them did not receive labor and delivery simulation training or clinical experience before the enrollment, as well as they did not receive a theoretical lecture on labor and delivery management.

Group assignments
A convenience sample of 196 female students was randomly divided into two equal groups, simulation and control groups (98 students per each group). Randomization was carried out using a numbered students' name list. Odd numbers represents the simulation group and even numbers represents the control group. Each group was further divided into 49 team; two students per each team. A flow chart of the students' assignments is presented in Figure 1.

2.4 Tools of data collection
Tool I. Observation checklist
An observation checklist was used to assess the students' practical achievement. It was mostly developed from a checklist supported by USAID 2008.[15] It consists of 20 items: 5 items centered on preparation for spontaneous vaginal delivery, 3 items centered on supportive care, 3 items centered on maternal-fetal monitoring, 9 items centered on performing basic nursing actions and the Obstetrician role was omitted during evaluating the students' practical achievement. Each item was scored 3 if competently performed; scored 2 if incompletely performed, and scored 1 if the task is not performed. Total score ranges from 20 to 60, the higher

score indicates the better achievement. Table 1 represents the developed observation checklist.
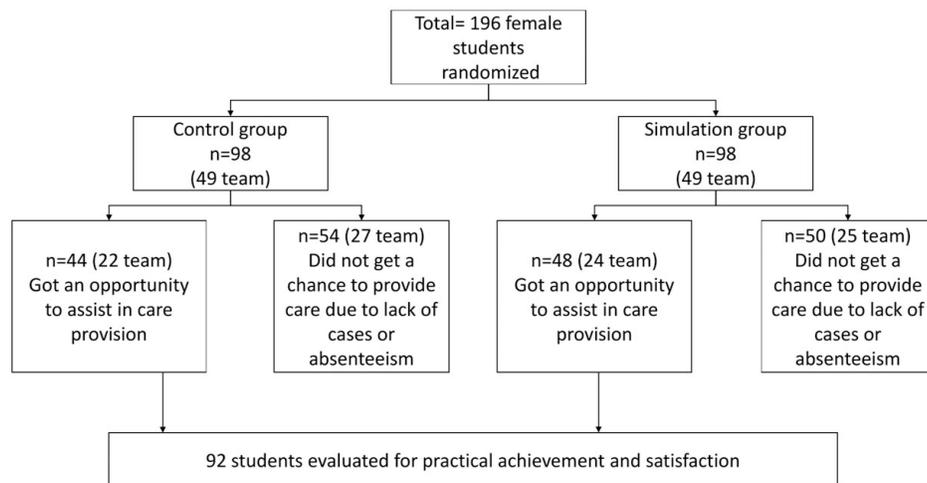

Figure 1. Flow chart of the students' assignments

Table 1. Second and third stage observation checklist

n	Checklist items	1	2	3
	A. Preparation for delivery			
1.	Scrubbing, gowning and gloving.			
2.	Prepare delivery and newborn resuscitation equipment.			
3.	Explain to the woman what is happening.			
4.	Assist the woman to take the position assigned for 2nd sage of labor.			
5.	Wash vulva and perineum properly with antiseptic solution and then drape the woman adequately and keep the perineum clean.			
	B. Supportive care			
6.	Promote maternal well-being and relief of pain (*e.g.*, applying cool compresses; bladder is emptied when second stage starts and then hourly, keep woman clean and dry throughout the second and third stage and providing massage and touch).			
7.	Keep the woman and her accompanists fully informed and reassured about the process of labor.			
8.	Providing education; by instructing the woman not to push through the 1st stage of labour and to push during contractions & relax in between through the 2nd stage and not to push once head is delivered, explain the anticipated events and aim of procedures like episiotomy incision or giving medicines.			
	C. Maternal-fetal monitoring			
9.	Check vital signs: pulse /15 min.; BP/30 min.; Temperature/hour.			
10.	Continuous monitoring of FHR and uterine contractions.			
11.	Hydration is maintained and checks urine for acetone using dipstick and/or observing dark yellow colour.			
	D. Perform basic nursing actions			
12.	Immediately at the time of delivery, baby's mouth and nose are wipe/suctioned.			
13.	Baby is dried, stimulated and placed on the radiant warmer.			
14.	Umbilical cord is clamped with two clamps and cut in between.			
15.	10 units Oxytocin in 500 ml Ringer Lactate infusion starts according to the labour and delivery room protocol.			
16.	When the placenta is delivered Methergine 0.2 mg given IM.			
17.	Uterus is massaged until it is contracted and doesn't get soft or relaxed after cessation of massage.			
18.	After suturing the episiotomy incision perineal care was done, sterile pad was applied and return woman to her bed.			
19.	Delivered placenta and membranes are checked carefully for completeness.			
20.	Document clearly the delivery time, baby sex and delivery events.			

Tool II. Students' satisfaction scale

Students' satisfaction with the clinical experience was assessed using a scale developed by the National League for nursing (2005).[5] It consists of five items that was originally designed to measure student's satisfaction with the simulation activity. In this study the scale was adapted; by replacing the word simulation to clinical training, to measure the students' satisfaction with the two assigned learning experiences either simulation or conventional. Each item was scored using a 5 point Likert scale. Strongly disagree scored 1, disagree scored 2, undecided scored 3, agree scored 4, while strongly agree scored 5. Total score ranged from 5 to 25, the higher score indicates the higher satisfaction.

Validity and reliability

Tools content validity ascertained by a panel of 3 experts in the field of maternity nursing and the looked-for modifications were carried out. While their reliability was tested giving Cronbach's $\alpha = 0.86$ for the 1st tool and 0.98 for the 2nd tool.

2.5 Ethical considerations

Ethical approval from the Nursing Faculty Ethics Committee was granted. Informed consent was obtained from the enrolled students after clarifying the aim and approach of this study. Privacy was protected by recording the simulation scenes using the researcher's personal digital camera and confidentiality of data was maintained by permanently deleting the recorded scenes after debriefing. Students' scores were used only for research aim, not as a part of students' course grades. Additionally, after collecting the required data students who had been allocated to the control group were invited to attend the simulation training classes to gain the same benefits.

2.6 Pilot study

Pilot study was conducted on two teams of four students. It aimed to assess the required time for each team to perform the task and to assess clarity and applicability of the tools. The results of the pilot indicated that the task needs 15-20 minutes to be completed and statements of the tools are clear and applicable. The pilot sample was excluded from the study.

2.7 Research process

2.7.1 *Simulation group*

The simulation group received simulated delivery room classes at the maternity lab one week before attending the conventional clinical training at the real labor and delivery room. Simulated delivery room classes were provided over a six week period in teams. Each team spent 15-20 minutes to perform the task. Such classes were conducted through two phases; the preparation phase and the scenario running.

(1) Preparation phase

This phase call for the scenario designing and preparing the required facilities and equipment.

(a) Scenario designing

One of the scenarios in the Mannequin guideline book provided by Gaumard Scientific Company Inc. was adapted by the researcher to be applied with the simulation group. The modified scenario was revised by a panel of three experts in the maternity nursing specialty and the needed modifications were carried out in developing the final scenario.

The simulated scenario was on a 22-year primigravida woman who attended the emergency room with frequent labour pain; assessment of the parturient woman revealed that the blood pressure is 110/70 mmhg, temperature is 36.7 °C, pulse is 88 b/min, and respiratory rate is 14C/min, strong uterine contractions frequent as 3/10 minutes, fetal heart rate is 148 b/m and vaginal examination revealed a fully dilated cervix with the fetal head at +3 station. The Obstetrician on duty asked the nurse to transfer the woman to the delivery room for spontaneous vaginal delivery.

(b) Preparing required facilities and equipment

Day before simulation the researcher prepared the maternity lab by checking the simulated parturient woman that is working. Also, the researcher prepared the consumables, instruments and medicines needed for a spontaneous vaginal delivery. On top of these requirements a digital camera was prepared to record the simulation training scenes for debriefing.

(2) Scenario running

The simulation training did start with a brief overview of the simulation-based training and a detailed orientation to the simulation environment including labor and delivery mannequin and equipment was provided. All participants were asked to divide themselves into pair teams; one assign the maternity nurse role, and the other assign the role of a nurse who is receiving the neonate, while the investigator assigned the Obstetrician role in all teams and this role was not involved in the evaluation process.

The scenario was explained and role of each participant was clarified, then participants of the first team were asked to start the simulation; two teams were allowed to observe the performance of each team in order to increase the duration of exposure to the simulation environment. All scenes were video recorded by one of the other participants; by standing

on higher place to comprehensively view the three parties and the simulation environment. The simulation training was followed by a debriefing of self-review via watching the recorded video and comment on the individual's performance by the investigator.

2.7.2 Control group

This group received the conventional clinical training at the real labor and delivery room, Mansoura University Hospital. It necessitate 30-45 minutes power point presentation on the management of 2nd and 3rd stages of labor by the assigned faculty supervisor for labour and delivery rotation, watching a videotape on care of laboring woman and one week clinical training without attending the simulation classes.

2.7.3 Study outcomes

The students' practical achievement and their satisfaction with the clinical training experience were evaluated for the both groups after receiving the assigned intervention.

(1) Students' practical achievement

It was evaluated at the real delivery room, Mansoura University Hospital. The enrolled students were allowed to provide care for parturient women in their second and third stages of labor; for maternal-fetal safety and ethical issue each student scrubbed along with maternity registered nurse on duty.

Although the simulation training was provided by the investigator, students' practical achievement was evaluated by the assigned faculty supervisor using the developed observation checklist to maintain consistency of the scoring. The evaluator was exclusively blinded to the type of training provided to each team.

(2) Students satisfaction with the clinical training experience

Students of both groups were asked to self report their satisfaction with the clinical training experience using the 5 items students' satisfaction scale.

2.8 Limitations of the study

Inadequate flow rate of parturient women in active phase of labor; led the faculty supervisor to extend some time after clinical hours to complete the evaluation of students' achievement. This study was designed as a post test not pre-post test that may compare the results deeply; however, the investigator depend on that all enrolled students were homogenous at the baseline where all did not expose to theoretical or clinical labour and delivery experiences previously. Investigation findings can not be generalized because the sample was selected from one setting. Lastly, lack of Egyptian studies about simulation in maternity nursing specialty was another limitation of this study as it led to poor in national references in the introduction and discussion sections.

2.9 Data analysis

The statistical package for social sciences software (SPSS/WIN 20.0) was used for data analysis (SPSS Inc., Chicago, IL, USA). The general characteristics of the simulation group and the control group were expressed as Mean ± SD and were compared between the two groups by means of an independent t-test. The internal consistency (reliability) of the tools used in this study was measured by determining of Cronbach's α value.

3. RESULTS

Table 2 compares the practical achievements scores between the simulation and control groups. The practical achievements total score of the simulation group was 46.4 ± 4.7 compared to only 36.9 ± 3.6 in the control group. This difference was significant (95% CI, 11.25, 7.75 & $p < .001$). The practical achievement items also significantly varied between the two groups. Students in the simulation group had significantly higher preparation for delivery score by 1.1, significantly higher supportive care score by 2.4, significantly higher maternal fetal monitoring score by 0.9 and significantly higher basic nursing actions score by 5.1 than the control group. Differences observed were highly significant ($p < .001$).

Table 3 demonstrates the student's satisfaction with the clinical training experience of the simulation and control groups. The student's satisfaction total score among the simulation group was 21.1 ± 3.8 compared to 11.2 ± 3.3 in the control group. This difference was highly significant (95% CI, 8.396, 11.331, $p < .001$). When the students' were asked to report their perception if the used teaching methods in the assigned clinical training were helpful and effective? Student's in the simulation group had significantly higher score than those in the control group (4.1 ± 1.1 versus 1.6 ± 0.6, $p < .001$). When the students were asked if the clinical training had provided them with a variety of learning materials and activities to promote their learning, the student's in the simulation group had significantly higher score than their colleagues in the control group (4.3 ± 0.7 versus 2.5 ± 0.6, $p < .001$). When the students were asked if they enjoyed the way instructor taught the clinical training, the student's in the simulation group had significantly higher score than those in the control group (4.1 ± 0.7 versus 2 ± 0.9, $p < .001$), when they were asked if the teaching material used in the clinical training was motivating and helped the process of learning, the students' in the simulation group had significantly higher score than those in the control group (4.3 ± 0.7 versus 2.5 ± 0.6, $p < .001$) and when they were asked if the way their instructor taught the clinical training was suitable to the way they learn, the students' in the simulation group had signif-

icantly higher score than those in the control group (4.3 ± 0.7 versus 2.5 ± 0.6, $p < .001$).

Table 2. Practical achievements scores of the simulation and control groups

Items	Simulation group	Control group	95% CI	P
1. Preparation for delivery				
Range	12-15	9-12		
Mean ± SD	13.6 ± 1.1	12.5 ± 1.1	2.682, 3.637	< .001[*]
2. Supportive care				
Range	7-9	5-7		
Mean ± SD	8.2 ± 0.8	5.8 ± 0.8	1.965, 2.672	< .001[*]
3. Maternal-fetal monitoring				
Range	5-7	4-6		
Mean ± SD	6 ± 0.8	5.1 ± 0.8	0.589, 1.275	< .001[*]
4. Basic nursing actions				
Range	16-25	10-17		
Mean ± SD	18.6 ± 2.1	13.5 ± 2.5	4.140, 6.087	< .001[*]
Total				
Range	**40-56**	**28-42**		
Mean ± SD	**46.4 ± 4.7**	**36.9 ± 3.6**	**11.25, 7.75**	**< .001[*]**

[*]Highly significant

Table 3. Student's satisfaction with the clinical training experience among the simulation and control groups

Satisfaction scale items	Simulation Group	Control group	95% CI	P
The teaching methods used in this clinical training were helpful and effective	4.1 ± 1.1	1.6 ± 0.6	2.108, 2.847	< .001[*]
The clinical training provided me with a variety of learning materials and activities to promote my learning	4.3 ± 0.7	2.5 ± 0.6	1.477, 2.023	< .001[*]
I enjoyed how my instructor taught the clinical training	4.1 ± 0.7	2 ± 0.9	1.842, 2.521	< .001[*]
The teaching material used in the clinical training was motivating and helped me to learn	4.3 ± 0.6	2.6 ± 0.6	1.417, 1.992	< .001[*]
The way my instructor taught the clinical training was suitable to the way I learn	4.3 ± 0.7	2.5 ± 0.6	1.469, 2.0303	< .001[*]
Total score	**21.1 ± 3.8**	**11.2 ± 3.1**	**8.396, 11.331**	**< .001[*]**

* Highly significant

Figure 2 shows the correlation between the practical achievements total score and the total satisfaction score, it reveals that the practical achievements score was significantly posi-tively correlated with the satisfaction score in the participants in the simulation group ($r = 0.866$, $p < .001$).
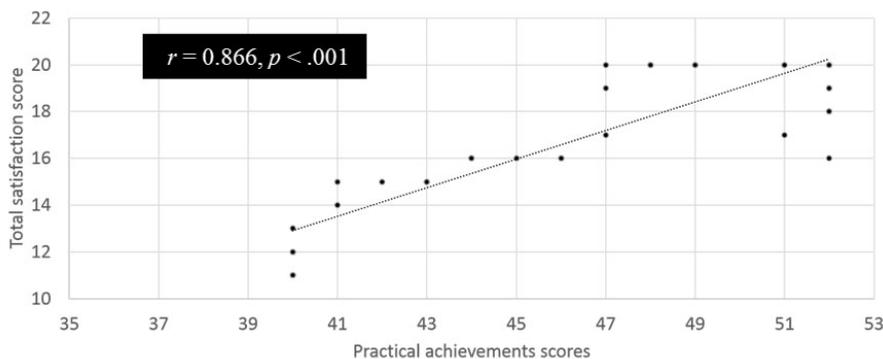

Figure 2. Correlation between the total practical achievements scores and the total satisfaction scores ($r = 0.866$, $p < .001$)

4. DISCUSSION

This study aimed to assess the effectiveness of simulated delivery room classes on practical achievement and satisfaction of maternity nursing students. These study findings revealed that students of the simulation group had achieved higher practical achievement scores than those of the control group; accordingly the study hypothesis 1 was accepted, "Maternity nursing students who attend simulated delivery room classes' achieve higher practical achievement scores than those who do not attend".

This study finding is consistent with prior research studies that had evaluated the effect of simulation based education on nursing students' practical achievements and indicated a higher clinical performance post simulation.[16–18] In Young *et al.*'s study,[16] 70 Korean junior nursing students were assigned either to experimental or control group over a two consecutive academic years. During the 1st academic year the control group exposed to the conventional clinical training while during the next year the experimental group exposed to three weeks simulation based classes on two scenarios one described a normal labor and delivery and the other described a high-risk case. Using a tool of 19 items the students' performance was evaluated at baseline and after two weeks of attending the clinical area. The authors concluded that the performance score of the simulation based education group was increased by 0.63 points while the score of the control group increased by 0.15 points, indicating a significant difference between the both groups ($t = -2.71$, $p = .009$).

Parallel with this finding, a randomized prospective study conducted in Stanford on 32 maternity nurses and obstetrics residents divided into eight teams. Teams randomly assigned to a simulation group who received three hours training on shoulder dystocia and eclampsia, or a didactic group who received the traditional teaching methods for managing the same selected cases. Using video recordings of labor and delivery drill the performance was evaluated through an expert-developed checklist and the investigators pointed out that the performance testing showed a statistically significant higher scores for the simulation group towards both shoulder dystocia (Simulation = 11.75, Didactic = 6.88 & $P = .002$) and eclampsia management (Simulation = 13.25, Didactic = 11.38 & $P = .032$) compared to the didactic group.[17]

Similar studies have been published in other specialties of nursing education. In critical care nursing a pretest posttest study was conducted in United Kingdom on 99 nursing students in their second year diploma.[18] Change in performance level was evaluated in simulation based training versus traditional clinical training; just before and after six months from the clinical training. Both groups improved their test scores, but the scores of the simulation group significantly improved by 13.4 whereas the control group improved by 6.76.[18]

The higher practical achievement scores reported by the simulation group in the present study may be explained by the notion that the students in the simulation group overpass the listening and showing phases to performance phase as the simulation experience afforded them with an opportunity to hands-on care of a simulated parturient woman like preparing the delivery set, positioning the woman, listening to FHR, initiating nursing interventions for abnormal FHR, preparing and initiating oxytocin infusion, instructing the woman when to push and relax, explain the labor progress to parturient woman, examining the placenta, preparing for immediate baby care and others.

In the present study the practical achievement was evaluated in real clinical area using twenty items observation checklist after two weeks of simulation classes. The difference of achievements scores post simulation in this study either lower or higher than those of the other studies[16–18] may be explained by that the practical achievement was evaluated at various intervals, with different methods, using different tools, with different sample size, and in different specialties.

Also students' satisfaction with the assigned clinical experience was evaluated in the present study and revealed that students of the simulation group reported a significantly higher satisfaction scores compared to the control group. Accordingly, the study hypothesis 2 was confirmed, "Maternity nursing students who attend simulated delivery room classes' exhibit higher satisfaction scores than those who do not attend".

Hall 2013 supporting the present study finding, by evaluating the effect of simulation based education on baccalaureate nursing students' satisfaction and reporting that the students were very satisfied with the simulation learning activity with a mean score of 24.27 out of 25 possible points.[19] Similarly, Reynolds *et al.* had evaluated the students' satisfaction with the learning experience on a subgroup of 53 students; 27 exposed to labor and delivery scenario based-simulation and 26 belonged to the self-study arm and found that 93% versus 54% respectively were positively satisfied with their learning experience.[20] Additionally, congruent with this finding a quasi experimental study evaluated the effect of a 3-hour postpartum simulation exercise and observed an increase in nursing students' confidence levels and satisfaction level when caring for a postpartum woman.[21]

The significantly higher satisfaction level that was reported by the students of the simulation group may be explained by

the fact that those students had given a chance for demonstration and make a mistake and redemonstration and correction of their mistakes that had led to gaining confidence of providing care in real practice setting and subsequently enhance their satisfaction levels.

The correlation between the practical achievements total score and the total satisfaction score was also evaluated in the present study and revealed that the practical achievement score was significantly positively correlated with the satisfaction score of the simulation group ($r = .866$, $p < .001$). Simulation experiences offer the opportunity for accommodating diverse styles of learning not offered in the conventional clinical training. When students perceive satisfaction with the simulation experience, this realization may reschedule and increase their confidence and ability to care for actual patients.[6]

The present study finding ensures the Chinese proverb *"Tell me, I will forget. Show me, I may remember. But involve me and I will learn."* Whereas the students of the simulation group bridge the listening and showing phases to performance phase.

5. CONCLUSIONS AND RECOMMENDATIONS

Simulated delivery room classes were an effective training approach; they were equipped the students with practices that result in a significantly higher practical achievements and higher satisfaction scores compared to the conventional training. Thus the researcher recommends providing the maternity nursing students with simulated delivery room classes prior the conventional clinical training and application of more scientific research to investigate the effect of simulation classes using scenarios on high risk cases and investigating the effect of replacing the conventional clinical training by simulated delivery room classes on the practical achievement.

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CONFLICTS OF INTEREST DISCLOSURE

The author declares that there is no conflict of interest statement.

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