E- Learning Strategy versus Traditional Learning Strategy on Pediatric Nursing Students' Knowledge, Engagement, and Clinical Performance during COVID 19

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Abstract:

Background: Introducing multimedia technologies in learning in many universities has been observed as means of improving accessibility and quality of delivery and learning among the students. **Aim**: This study aimed to compare the effect of e-learning strategy versus traditional learning on pediatric nursing students' knowledge, engagement, and clinical performance regarding neonatal endotracheal suction during COVID 19 Pandemic. **Design:** A comparative quasi-experimental design was carried out. **Subjects**: A convenient sample of 120 pediatric nursing students, who selected from the pediatric nursing course during the first semester of academic year 2020-2021 were randomly assigned into two equal groups. **Setting:** Faculty of Nursing, Matrouh University, E- learning group taught through the university official Microsoft teams' platform. While, traditional learning group taught in pediatric nursing laboratory. **Tools:** three tools were used; Tool I: Pediatric Nursing Students` Knowledge Concerning Neonatal Endotracheal Suction Questionnaire, Tool II: Neonatal Endotracheal Suction Performance Observational Check List, Tool III: Pediatric Nursing Students' Engagement Scale. **Results**: The mean participants' knowledge in e-learning group was 5.25+ 1.310, 11.20+1.867, 12.48+0.771 and 10.28+0.585 compared to 6.68+ 1.642, 12.60+1.330, 13.48+0.725 and 10.28+0.585 for traditional group all over the periods of the study. Students who received e-learning learning retained more skills all over the periods of the study (21.13+2.046, 47.88+9.620, 50.57+2.396, and 51.05+2.459) compared to traditional learning (21.13+2.046, 47.88+9.620, 39.60+10.791, 40.87+11.465 and 38.55+4.260). Students of traditional group more engaged than those of e-learning group all over the periods of the study 64.8833+4.57366 compared to 65.4500+ 4.20018. **Conclusion**: Expending traditional strategy through face to face interaction was effective in improving students' knowledge retention, while e-learning group retained more skill than those of traditional group. **Recommendation**: it was recommended to conduct more studies to confirm the impact of adopting both E-learning and traditional strategies in accelerating the efficacy of knowledge and skills retention for students, as well as improving their engagement.

Keywords: E-Learning; Traditional Learning; clinical performance; Nursing Students; COVID 19 Pandemic.

Introduction

Propagation of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), as a pandemic on 13 March 2020 by the WHO, indeed that the main public health reference was to stay at home and remain safe within it. It has been observed how, at great speeds, schools and universities have closed in the world. So, we have to reach solutions for the future nursing education continuation, accordingly multiple education has been arranged, all of which are based on distance learning (**Cheng Chih.2020, Lai CC, et al. 2020, Peeri NC.et al 2020**) Nursing is a discipline which is responsible

for developing a professional individual who possesses expert knowledge and skills in a specific domain; this acquired through form professionally education in institution of higher education, and the one who behalf of society by serving specific clients. Nursing as a professional discipline which is differentiated from academic discipline by its practice component **(Oldland E.2020, M Attree 2001, Ghasemi M.2020)**

Educational strategies are the means or tools that are used to teach students. Nurse educators are being courage to use teaching strategies which enable students to be more responsible for their learning innovative teaching strategies in nursing education are expected to promote nursing students' skills to be actively involved in self-regulating learning, to transform traditional one-way delivery of knowledge and to cultivate patients-centered learning **(Deng, R. 2020, Murray TA 2016)**. Moreover, students in higher education, depend on computer to do their study. Also, using network technology can create, foster, deliver, facilitate learning, and enhance students experience and knowledge. So, the rapid developments and growth of information literacy and communication technology have had a profound influence on higher nursing education. That is called e-learning, means that teachers and students perform course task through internet, a way different with traditional classroom. Within the last 20 years, the advocates of learning via computers have challenged that the traditional lecture is necessarily the most appropriate means of facilitating learning in a school environment **(Costley KC.2014, Block J. 2017).**

The term e-learning refers to any electronically assisted instruction, and the instruction is mostly offered through computer and the internet by using various electronic delivery methods, therefore, the learning here is learner-centered approach.

And the learner-centered instruction means that students will engage more in classroom. So, it can be agreed that one of the primary aims of higher education in today's information technology enabled classroom, is to make nursing students more active in the learning process **(Petretto 2021)**. Furthermore, Online and traditional education share many qualities. Students are still required to attend class, learn the material, submit assignments, and complete group projects. While teachers, still have to design curriculums, maximize instructional quality, answer class questions, motivate students to learn, and grade assignments. Despite these basic similarities, there are many differences between the two modalities. Traditionally, classroom instruction is known to be teacher-centered and requires passive learning by the student, while online instruction is often student-centered and requires active learning. **(Paul J. 2019)**

It was found that e-learning has its own advantages on student learning outcomes through research on comparison research about differences between e-learning and traditional classroom. That is, the traditional classrooms will offer benefits that maybe cannot fully be obtained in any other teaching strategy. On the other hand, gaps in process effectiveness will be narrowed as technology becomes friendlier for both educators and students **(Paul J. 2019)** But there is rarely literature to research because the differences emerge. Researcher assumes that the engagement difference in traditional classroom-based and internet-based course leads to different learning outcome. Also, the proposition that there is difference between students 'behavior engagements in two different course leads to different learning outcome (in knowledge and practice retention **(Xu, D.,2016).**

Behavioral engagement is an important aspect, which is defined in three ways of positive conduct, involvement in

learning and academic tasks, and participation in school-related activities. Here, behavioral engagement represents observable behaviors during the course, such as attention, asking questions, contributing to class discussion. Generally, engagement is determined by the interactions between the environment and the individuals, so that social and academic changes in class or clinical area transform students' perceptions and engagement. That is, engagement facilitates the influence of curricular and instructional changes on student performance and achievements **(Prokess 2011)** The e-learning program is appropriate for nurses to resolve the problems resulting from nurses' inability to preset at traditional courses because of shift schedules. This comparative study has offered comparing the e-learning and traditional method for developing nurse's knowledge and practice (Lundberg, J. 2008) Also, considerate the experiences and expectations of the students when faced with these important changes, is necessary to learn from these experiences and to define the strong and weak points. Nursing educators must assure that the students meet the academic requirements, and at the same time, identify the current conditions faced by them, and the needs of concurrently satisfying the demands from nursing students' roles in the day living **(El- Seoud, M.,2014).** Despite the great role of e-learning strategy in enhancing students' skills acquisition, no studies integrate a diversity of innovative active teaching strategies and its effect on clinical performance of nursing students at the Faculty of Nursing, Matrouh University. Moreover, pediatric nursing students must be competent to tackle real clinical situations efficiently and apply the training in real situations. Hence, it is crucial for the students to receive training in a safe place as skills lab before performing skills on real neonates **(Ali et al., 2011).** Additionally, students thought that training on neonatal endotracheal suction procedure using traditional methods was not sufficient for them to be confident and

competent in performing it. Therefore, reform in nursing education is needed to provide students with learning experiences to prepare them for professional practice. This necessitates the incorporation of innovative clinical training approach such as e-learning teaching strategy for students to improve their performance in skills lab which in turn, could efficiently affect their practical skills and confident level in the clinical settings (**Schröder et al., 2017**), that's why the researchers intended to conduct this study.

Aim of the study

This study aims to compare the effect of e-learning strategy versus traditional learning strategy among pediatric nursing students during COVID 19 Pandemic on their knowledge, engagement, and clinical performance regarding neonatal endotracheal suction.

Research Hypotheses

• Pediatric nursing students who learn through e-learning strategy exhibit higher score of knowledge, and practices' retention level than those who learn through traditional learning method.

• Pediatric nursing students who learn through e-learning strategy exhibit higher engagement level than those who learn through traditional learning strategy.

Materials and method
Research Design
A comparative quasi-experimental research design was used.

Setting

This study carried out online through the university official Microsoft teams' platform and at the pediatric nursing laboratories at the Faculty of Nursing, Matrouh University. These labs contain equipment, supplies and pediatric manikins designed for students' clinical practices about different procedures as: neonatal endotracheal suction, neonatal resuscitation, etc.

Subject

A convenience sampling of 120 nursing students out of 140 students who enrolled in the Pediatric Nursing Department, Faculty of Nursing, Matrouh University, during the first semester of the academic year 2020-2021. All students who had computer skills and internet access were included in the study.

The sample size was estimated using Epi info program version 10 according to the following parameters; population size of 140, Confidence coefficient of 95%, expected frequency of 50%, and acceptable error of 5%. The minimum sample size required was 103 students.

Eligible students who fit the inclusion criteria and agreed upon their participation were randomly assigned using random number generator program into two equal groups (60 students per group). The control group: who received the traditional learning and the study group who received E- learning strategy, as illustrated in **Figure1**.
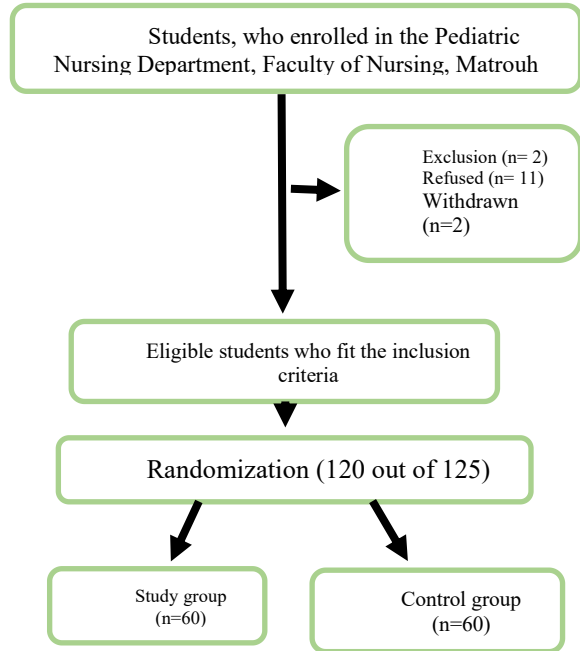

Figure 1: Flow chart of participants' recruitment process.

Tools of the study

Tool I: Pediatric Nursing Students` Knowledge Concerning Neonatal Endotracheal Suction Questionnaire: The researcher developed this tool after thorough review of relevant literatures (Hockenberry and Wilson 2011) to assess pediatric nursing students' knowledge about neonatal endotracheal suction. It was consisted of two main parts: **Part I: Socio demographic Characteristics of Pediatric Nursing Students**, such as, name, age, sex, residence, computer skills and having access to internet. **Part II: Pediatric Nursing students` Knowledge about Neonatal Endotracheal Suction** includes seven items namely; definition, indications, purpose of ETT suction, frequency of ETT suction, size of ETT catheter, standard equipment needed for ETT suction and complications of ETT suction. It was developed in the form of open & multiple-choice questions. Each question

scored as follow: two for correct and complete answer, one for correct and incomplete answer and zero for incorrect answer or unknown.

Tool II: Neonatal Endotracheal Suction Performance Observational Check List: This tool was developed by the researcher to assess pediatric nursing students' performance about neonatal ETT suction. Students' performance scored as follow: two for completely done, one for incompletely done and zero for not done.

Tool III: Pediatric Nursing Students' Engagement Scale: This scale was originally developed by Deng, et al., 2020. It was modified by the researcher to be applicable for measuring nursing students' engagement levels during the e-learning and traditional learning strategies. It consisted of four domains as behavioral (6 statements), cognitive (4 statements), emotional (5 statements) and social engagement (7 statements). The total number of statements are approximately 22 statements with 4 points likert scale ranging from strongly disagree (1) to strongly agree (4).

Method

The study was performed according to the following steps:

1. Formal consent from The Research Ethics' Committee of Alexandria Faculty of Nursing was obtained before conducting the research.

2. Written permissions to conduct the study were obtained from the head of the Pediatric Nursing Department after explaining the purpose of the study.

3. Tool (I &II) were developed by the researchers after extensive review of recent, current &relevant literatures **(Hockenberry M and Wilson D., 2011)** .

4. Tool III was adopted.

5. All tools were submitted to five experts in the related field to assess its content validity then the necessary modifications were done. The content validity index was=0.856

6. The reliability of tools was accomplished to measure the internal consistency of their items by using test & retest technique. The internal consistency was acceptable (Cronbach's alpha= 0.73 for Tool one and 0.72 for Tool two).

7. 120 students from student's list were selected according to eligible criteria. Then, students were randomly assigned into two equal groups

8. A pilot study was done on 12 nursing students to test the clarity, feasibility & applicability of the tools and the necessary modifications were done accordingly. Pilot study participants were excluded from the study.

9. The data were collected during the first semester of the academic year 2020-2021 over a period of three months starting from October to December 2020.

10. Initially, pediatric nursing students' personal and academic characteristics were taken and recorded by the researchers for both groups through a self-administered questionnaire sheet that was distributed among students at the beginning of the clinical day at the pediatric nursing labs.

11. The study carried out according to the following **three** phases:

Assessment (Preparation) phase, during this phase, the researcher prepared the **content**, **environment**, and **students** for the field work (Pediatric Nursing Laboratories at the Faculty of Nursing, Matrouh University and Microsoft Teams platform). Before

starting data collection, the researcher developed a theoretical and practical foundation about neonatal endotracheal suction through reading recent, updated references.

1. Content, Intended Learning Outcomes (ILOs), theoretical and practical content for neonatal endotracheal suction selected and organized guided by Pediatric Nursing Procedures & Concepts book

2. Environment, the study conducted in two settings (pediatric nursing laboratories at the Faculty of nursing, Matrouh University and students' official platform (Microsoft Teams). Preparation of these settings included the following: **a. Pediatric nursing laboratory**, Equipment was prepared e.g. suction device with sterile suction tube in the suitable size, sterile gloves, sterile normal saline, towel or the waterproof pad, sterile gauze, alcohol hand rub, oxygen source (wall, cylinder), disposable plastic apron, physician's order form 24 hours' flow sheet-ventilation record and manikin for demonstrating skills of neonatal endotracheal suction. **b. students' official platform** (Microsoft Teams)**,** creating channel for endotracheal suction, also, adding all students to the channel. Then uploading the videos concerning neonatal endotracheal suction which prepared and recorded by the researchers to the students' official platform.

3. Student: Students of both groups was assessed for their characteristics and knowledge about neonatal endotracheal suction by using **tool one (part I& II)**. Students were assured that the assessment is formative and that results would not contribute to their grades or affect their academic progress. E- Learning group was oriented about the Microsoft teams channel for neonatal endotracheal suction.

Implementation Phase, **a.** Pediatric nursing students' knowledge was assessed

before providing teaching session for both groups. **b.** Traditional demonstration group was taught in pediatric nursing laboratory face to face by the researcher using demonstration strategy. **c.** E- Learning group was taught through the students' official platform by the researcher.

For control group at the nursing lab, neonatal endotracheal suction procedure was demonstrated at the first day of the clinical rotation with traditional demonstration method of teaching (two step approach: see once and do once). Where, the clinical instructor performed the neonatal endotracheal suction procedure only one time. Then, the students were allowed to perform it independently for one time (redemonstration) under the clinical instructor's supervision.

For study group through students' official platform, the application of the e-learning strategy was conducted in one day as follows: The videos concerning neonatal endotracheal suction were prepared and recorded by the researchers. Then, they were uploaded to the students' official platform (Microsoft Teams). These videos contained theoretical parts of neonatal endotracheal suction. Along with the videos, captions were included to enhance students' understanding.

• During the clinical day, both traditional and e-learning teaching strategy training was implemented as described in the following Agenda:

Time allowed	Duration	Activity& teaching method
9:00 am	20 minutes	• Orientation about the educational strategy.
9:20 am	1 hour	• The researcher performed the neonatal endotracheal suction procedure (demonstration) **for the control group**. • The researcher discussed the recorded videos concerning neonatal endotracheal suction **for the e-learning group**
10:20 am	150 minutes	• The students in both groups were allowed to perform the procedure independently for one time (redemonstration) under the researcher' supervision.
12:50 pm	10 minutes	• Closing session of the clinical day by interpretation of any remarks

Evaluation Phase, Knowledge and skills related to neonatal endotracheal suction was evaluated three times for all students in nursing laboratory using tool I and tool II (through real time re-demonstration) for both groups, immediately following the teaching session (immediate follow-up), after one week and three weeks later.

- **Regarding the control group'** practical skills, the researchers used neonatal endotracheal suction practical skills observational checklist **(Tool Two)** immediately after performing the procedure,

after one week and then three weeks later (during the time of rotation evaluation).

- **Regarding the study group's** practical skills, the researchers used neonatal endotracheal suction practical skills observational checklist **(Tool Two)** immediately after performing the procedure after one week then three weeks later (during the time of final rotation evaluation).

• **The engagement level** was measured for all the pediatric nursing students in both the study and control groups in the first day of rotation immediately after the conduction of teaching and performing the procedure using **(Tool three)**.

Ethical considerations

Before, applying the interventions and collecting the data, the researchers approached the participants who fulfilled the inclusion criteria and clarified to them the detailed description of the nature of strategies and research purpose. They kept the subject's privacy. They also emphasized their right of self-determination and their rights above all other interests. The researchers also ascertained the participants' free decision to voluntarily participate in the study, right to refuse to participate or withdraw from the study at any time without any change of the quality of the received care. Confidentiality of the obtained data, students' anonymity and privacy was assured and maintained during the implementation of the study. After participants' agreement, they signed a written informed consent that included all those details.

Statistical Analysis

After the data collection, they were coded and transferred into specially designed formats to be suitable for computer feeding Statistical Package for Social Sciences (SPSS) version 25. Following data entry, checking and verification processes were carried out to

avoid any error during data entry. Descriptive statistics such as number and percentage were used to describe demographic characteristics, while mean and standard deviation were used to describe the students' mean age. Prior to selecting the suitable Analytical statistic's tests, variables were tested for normality using Kolmogorov-Smirnov test. Accordingly, Mann-Whitney test (Z^{MW}) was used in comparing mean between the two groups regarding their mean age, knowledge, practices and engagement. A Chi-Square (X^2) and Exact Tests (EX) were used to test the relationship between the students' demographic characteristics, total knowledge scores, practices score and engagement scores regarding both groups. All of the statistical analyses were considered significant at P <0.05.

Results:

Table 1 indicates the distribution of the students in relation to their socio-demographic and academic data. It was observed that there weren't any statistically significant differences between the e-learning and traditional groups in relation to their age, sex, academic degree, except for their original residence (P = 0. 042*). It was noticed that more than two thirds of the e-learning and traditional groups were aged from 20 to less than 22 years old (66.7% & 68.3% respectively). The mean age participants in e-learning group was 21.0333 + 0.84305 and 20.9667+ 0.90135 years for the traditional group with no significant statistical difference between the two groups. Also, nearly three quarters of both groups had secondary certificate (71.7% & 73.3 % respectively). Moreover, eighty & seventy percent of students were female in both groups respectively. In relation to original residence, it was found that 66.7% of the e-learning group lived in rural dwellers, while 51.7% of the traditional group lived in urban dwellers.

Table 2 represents that both groups had improvement in their knowledge levels regarding **neonatal ETT suction** after providing teaching session. It was observed that the mean participants' knowledge in e-learning group was 5.25+ 1.310, 11.20+1.867, 12.48+0.771 and 10.28+0.585 compared to 6.68+ 1.642, 12.60+1.330, 13.48+0.725 and 10.28+0.585 for traditional group all over the periods of the study, where students of the traditional group retained more knowledge than those of the e-learning group. A highly statistical significant difference was found between the two groups, before, immediate, after one week and after three weeks later, where P = (0.000, 0.000, 0.006 & 0.000 respectively).

Table 3 illustrates that both groups had improvement in their practice regarding **neonatal ETT suction** after providing teaching session. It was detected that the mean participants' practices in e-learning group was more than the traditional group, where students of the e-learning group retained more skill than those of traditional group all over the three period of the study (21.13+2.046, 47.88+9.620, 50.57+2.396, and 51.05+2.459) compared to traditional learning (21.13+2.046, 47.88+9.620, 39.60+10.791, 40.87+11.465 and 38.55+4.260). A highly statistical significant differences were found between the two groups; immediate, after one week and after three weeks later P = (0.000, 0.000 & 0.000 respectively). This denotes that long retention of skill among e-learning group was better than that in the traditional group.

Table 4 illustrates that although there weren't any statistically significant differences between the e- Learning and traditional groups in relation to behavioral, cognitive, emotional, social as well as, total engagement. It was noticed that more than half of them in the traditional group had "high" level of social engagement. While, 55% of traditional group had "moderate"

level of emotional engagement. Additionally, the majority of the students had "moderate" total score of engagement levels among both groups (86.7% & 93.3% respectively). Also, the mean participants' engagement in e-learning group was 64.8833+4.57366 compared to 65.4500+ 4.20018 the traditional group, where students of the traditional group more engaged than those of the e-learning group all over the three periods of the study with no significant statistical difference between the two groups.

Table (1): Distribution of The Pediatric Nursing Students According to Their Socio-Demographic Characteristics.

Socio-Demographic data	E-Learning (n=60) No.(%)	Traditional (n=60) No. (%)	Significance
Age (years):			
Less than 20	3(5.0)	3(5.0)	
20- >22	40(66.7)	41(68.3)	^{MC}P = 1.000
22& more	17(28.4)	16(26.6)	
Mean + SD	21.0333 + 0.84305	20.9667+ 0.90135	Z^{MW} = -0.532 P = 0. 595
Sex			
Male	12(20.0)	18(30.0)	=1.600
Female	48(80.0)	42 (70.0)	P = 0.206
Original residence :			=4.126
Urban	20(33.3)	31 (51.7)	P = 0. 042*
Rural	40(66.7)	29 (4 8.3)	
Academic degree:			**2**= 0.042
Secondary	43(71.7)	44(73.3)	P = 0.838
Technical nursing institute	17(28.3)	16(26.7)	

2: Chisquare Test ^{MC}P: Montcarlo test Z^{MW} = Mann-Whitney   test   P =Significance Level >0.05

Table 2: Comparison of Students' Knowledge Levels of The Studied Students Regarding ETT Suction

Total score of knowledge	Before		Immediate		After 1 weeks		After 3 weeks	
	E-Learning (n=60) No. (%)	Traditional (n=60) No. (%)	E-Learning (n=60) No. (%)	Traditional (n=60) No. (%)	E-Learning (n=60) No. (%)	Traditional (n=60) No. (%)	E-Learning (n=60) No. (%)	Traditional (n=60) No. (%)
Poor	35 (58.3)	20 (33.3)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
Fair	25 (41.7)	36 (60.0)	14 (23.3)	0 (0.00)	6 (10.0)	0 (0.00)	44 (73.3)	0 (0.00)
Good	0 (0.00)	4 (6.7)	46 (76.7)	60 (100.0)	54 (90.0)	60 (100.0)	16 (26.7)	60 (100.0)
Mean + SD	5.25+ 1.310	6.68+ 1.642	11.20+1.867	12.60+1.330	12.48+0.771	13.48+0.725	8.03 + 1.615	10.28+0.585
Z^{MW} (p)	-4.530 P = 0.000*		-4.140 P = 0.000*		-2.765 P = 0.006*		-6.427 P = 0.000*	
2 (p)	^{MC}P= 0.000*		= 15.849 P= 0.000*		^{MC}P= 0.027*		= 69.474 P= 0.000*	

Z^{MW} = Mann-Whitney   test   2: Chisquare Test ^{MC}P: Montcarlo test   P =Significance Level >0.05

Table 3: Comparison of Students' Practice Levels of The Studied Students Regarding Neonatal ETT Suction

Total score of practice	Before		Immediate		After 1 weeks		After 3 weeks	
	E-Learning (n=60)	Traditional (n=60)	E-Learning (n=60)	Traditional (n=60)	E-Learning (n=60)	Traditional (n=60)	E-Learning (n=60)	Traditional (n=60)
	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)
Poor	40 (66.7)	25 (4.7)	4 (6.7)	7 (11.7)	0 (0.00)	4 (6.7)	0 (0.00)	0 (0.00)
Fair	20 (33.3)	35 (58.3)	3 (5.0)	11 (18.3)	0 (0.00)	15 (25.0)	0 (0.00)	18 (30.0)
Good	0 (0.00)	0 (0.00)	53 (88.0)	42 (70.0)	60 (100.0)	41 68.3)	60 (100.0)	42 (70.0)
Mean + SD	21.13+2.046	21.30+3.238	47.88+9.620	39.60+10.791	50.57+2.396	40.87+11.465	51.05+2.459	38.55+4.260
Z^{MW} (p)	-0.181 P = 0. 857		-5.599 P = 0.000*		-5.696 P = 0.000*		-9.659 P = 0.000*	
(p)	= 7.552 P = 0.006*		= 6.663 P = 0.036*		^{MC}P= 0.000*		= 21.176 P = 0.000*	

Z^{MW} = Mann-Whitney   test   2: Chisquare Test ^{MC}P: Montcarlo test   P =Significance Level >0.05

Table 4: Comparison of Students' Engagement Levels of The Studied Students Regarding Neonatal ETT Suction

Total Students' Engagement Levels		E-learning n =60	Traditional n =60	Significance
		No. (%)	No. (%)	
Total behavioral engagement	Moderate	1 (1.7)	1 (1.7)	^{Ex}P=1.000
	High	59 (98.3)	59 (98.3)	
Total cognitive engagement	Moderate	4 (6.7)	4 (6.7)	^{Ex}P=1.000
	High	56 (93.3)	56 (93.3)	
Total emotional engagement	Moderate	29 (48.3)	33 (55.0)	= 0.534 P=0. 465
	High	31 (51.7)	27 (45.0)	
Total social engagement	Moderate	9 (15.0)	8 (13.3)	= 0.069 P=0. 793
	High	51 (85.0)	52 (86.7)	
Total engagement	Low	8 (13.3)	4 (6.7)	= 1.481 P=0. 224
	Moderate	52 (86.7)	56 (93.3)	
Mean + SD		64.8833+4.57366	65.4500+ 4.20018	Z^{MW} =-0.720- P=0.471

2= Chisquare Test ^{Ex}P = Exact significance (2-sided) Z^{MW} = Mann-Whitney   test   P =Significance Level >0.05

Discussion

Due to the drastic surge of COVID-19 all over the educational institutions, a remarkable change in the methodological strategies of teaching-learning process occurred. In this study, the researchers aimed to explore the effect of E-learning strategy versus traditional learning strategy among pediatric nursing students. The present study was emphasized the usage of two variants of teaching methods in the clinical training of

pediatric nursing students about neonatal suction procedure to explore their effects on knowledge, clinical skills, and engagement level at the time of COVID 19 outbreak.

The results of the current study revealed that students who had received clinical training program about neonatal suction procedure using traditional method of teaching had more knowledge retention than those who received it through e-learning in all over the three period of the study. A statistically significant difference was found between the two groups immediate, after one week and after three weeks later. This may be due to the lack of nursing students' experience in using different e-learning platforms especially in the first era accompanying the outbreak. Additionally, the beginning of any new methodology facing resistance from both educators and students, that's why they preferred the traditional method of teaching where they were familiar with. This result in line with who found that following teaching, significant improvements were seen in both knowledge and practice.

However, this result in-compatible with the study of **Morsy et al (2021)** who found that a statistical significant differences were found between the study and control groups and in the study group afterwards the implementation of computer mediated instruction technique in relation to students 'knowledge. Moreover, this result in contradiction with the study of **Elsayed et al (2017)** who conducted a study titled " Effect of Computer Based Learning Regarding Airway Suction On knowledge and Skill Retention of Pediatric Nursing Students." They found that there was a significant improvement in knowledge retention of students studied with computer based learning method in relation to airway suction than students studied with traditional learning method.

In addition to, **Abdalla et al (2013)** who reported in a study entitled " The effect of e-learning versus traditional teaching methods on students' performance regarding critical care nursing " that there were a highly statistically significant difference between pre and posttest mean scores of knowledge for both E-learning and traditional teaching methods regarding critical care nursing

Regarding the clinical skills of ETT suction procedure, the results revealed that before the teaching session, all of students of both groups had not perform correct skills of ETT suction procedure. Also, there was no statistically significant difference between both groups. While, immediately and after one week following the teaching session it was observed that there were higher performance skills on behave of the study group than for the control group allover the procedural steps of ETT suction. This result may be due to the probability of repeating the videos and recordings uploaded on the online platforms on contrary of learning clinical procedures at laboratories, where the chance of redemonstration may be once or not at all. Moreover, the difference between groups was highly statistically significant. Finally, after three weeks after the teaching session it was detected that almost all of the study and about two third of the control groups had performed all the procedural steps correctly. Also, there was highly statistically significant difference between them

This findings in line with the study of **Khatoon and Prakash 2020** who found the students' practice scores were significantly higher after receiving computer assisted learning than those taught through face-to-face method. Moreover, this results in line with the study of **Essa, et al (2018)** who conducted a study titled "Effect of Computer Based Learning on Nursing Students' Knowledge and Skills retention Regarding Placenta Examination", where they found

higher skill retention in favor of the computer-based learning group.

Spotting the light on the engagement levels of students, the results showed that regarding behavioral, cognitive, and emotional engagement it was found that almost most students had moderate level of engagement regarding both methods of teaching; traditional and e-learning. While, regarding social engagement, it was observed that both groups had low level of social engagement, in addition to the sense of being isolated was high among study group. This finding in line with the study of **Haiso et al. (2021)** titled "The effects of a virtual simulation-based, mobile technology application on nursing students' learning achievement and cognitive load: Randomized controlled trial" they found that the experimental group who used the mobile app had significantly higher knowledge scores, significantly lower intrinsic and extraneous cognitive load, better skill performance, and higher satisfaction than the control group.

Also, a study which supported by the result of **Cain, & Pitre, 2016** who considered the Internet as an efficacious tool in expediting student learning. Whereas, the Internet facilitated the exploration, retrieval, and access of educational support resources with subsequent positive impact on a student academic performance. Moreover, **Sadia et al (2021)** found the intranet-based format to be advantageous for widespread distribution, its easy accessibility a particular strength in training health care providers.

Also, a study by **Dini and Danahy (2021)** about "Dynamics of scientific engagement in a blended online learning environment", showed that contributes to research on scientific engagement by explaining that, within an online mostly text-based medium, learners can stably engage in sense-making practices and collaborate towards achieving epistemic goals. Moreover,

participants' online engagement was significantly shaped by their expectations regarding course activities, and that those expectations were continually negotiated and transformed within interactions. Finally, engagement is critical key for better learning. A key issue in online learning is to improve learners' engagement with their educational activities. It is widely acknowledged that engagement and affect are linked to increased productivity and learning gain.

Limitation of the study

Although the current study results had demonstrated a favorable impact of applying the e-learning on the students' performance during clinical training. Faculty members and students showed that through using e-learning modalities, there was lack of immediate feedback. Also, the students reported limited attention span and weak technological awareness and bad internet connections. To overcome these limitations students, need to be taught how to stay focused when they are learning online. Moreover, the small sample size affected the power of the findings of assessment. So, conducting this study on a larger sample including all nursing courses would provide more generalizable findings.

Conclusion

Expending traditional strategy for pediatric nursing students regarding neonatal ETT suction were effective in improving knowledge retention, while e-learning group retained more skill than those of traditional group all over the three period of the study. Furthermore, the majority of the students had **"moderate"** total score of engagement levels among both groups.

Recommendations

Based on the current study, the authors recommend the following:

• More studies to confirm the impact of adopting both E-learning and traditional strategies in accelerating the efficacy of knowledge and skills retention for students, as well as improving their engagement.

• Develop workshops or training programs for all nurse educators at Faculty of Nursing, Matrouh University about e-learning teaching strategy to help them apply this approach effectively.

• Replicate the study on a larger number of students for generalization.

• Include innovative methods of teaching in the curricula of undergraduate program.

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Conflict of Interest

No conflict of interest has been declared by the authors.

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