

The Effectiveness of Educational Interventions about Sustainability Development among Nursing Students

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Abstract

Poverty, health inequalities, food insecurity, infectious diseases, shortage of resources, and more are the effects of climate change on the world. Sustainability development is the key solution to manage those effects. Nursing plays a critical role in sustainability development, so nursing students should be prepared well to apply that role. **Purpose:** This study aimed to evaluate the effectiveness of education intervention about sustainability development among Nursing Students. **Methods:** Quasi-Experimental pre-test and post-test design was conducted using two groups (study and control group). A systematic random sampling method was used to have the required sample size (N =800) of nursing student who enrolled fourth, third, and second levels in the Nursing College, Menoufia University, Egypt. Three instruments were; Sustainability Knowingness, Attitude and Behavior Questionnaires regarding Sustainability Consciousness Questionnaire (SCQ). **Results:** The study results revealed higher mean score of nursing students' knowledge, attitude and behavior toward sustainability development post intervention for study group. There was a highly significant difference between study and control group post educational intervention at $p \leq 0.05$. **Conclusion:** Based on the study findings, the educational interventions were effective ways in an improvement of the nursing students' knowledge, attitudes and behavior toward sustainability development. **Recommendation:** Based on the findings, the concept of Sustainability development should be included in nursing curricula. Also, enrich and update awareness of nursing educator about sustainability development to spread sustainability development culture among students.

Keywords: Educational Intervention, Sustainability Development and Nursing Students

Introduction

World health organization stated that climate change impact on human health; therefore, healthcare institutions must address this issue and its global effect (WHO, 2018). Droughts, heat waves, rain-related floods, hurricanes, and storms are all caused by climate change, and they have an indirect or direct impact on people's health and well-being. It also has far-reaching implications for healthcare professionals, systems, and the national economy. Nurses have a huge opportunity to safeguard their patients from the effects of climate change by striving to build climate-smart hospitals and health systems (Anåker et al.,2021).

Sustainability is a dynamic state that has relations between ecological, economic, and social systems to achieve the capacity to avoid the shortage of natural resources and maintain an ecological balance. The healthcare system has a clear mission to achieve the UN Sustainable Development Goals (SDGs), 'to

ensure healthy lives and promote well-being for every one of all ages' among other goals (UN, 2020).

Sustainability in nursing is conceptually related to the long-term goal of preserving a safe environment for current and future generation. The health-care sector urgently has to become more ecologically responsible and sustainable, based on the moral obligation to implement a health-in-all-policies strategy (i.e., "first do no harm") (Anåker and Elf, 2014). The delivery of healthcare has an influence on the environment and contributes to climate change. Thus, nursing education should include information on how nurses use and dispose of natural resources in clinical practice, as well as their impact on the environment. There must be ways to include sustainability issues into nursing curricula, bringing them "closer to home" and more relevant to clinical practice (Richardson et al., 2017).

Sustainable development, according to the Commission on Sustainable Development

(CSD), is defined as development that satisfies the current needs of the world's people without affecting future demands (United Nations Agenda 21; Olsson et al., 2016). Its significance is underscored by the United Nations General Assembly's conclusion that society's survival is in danger. In response to this danger, the Assembly established 17 Sustainable Development Goals (SDGs) to address global issues such as poverty, unemployment, growing inequalities and inequities in gender, income, and power, as well as political and environmental dangers. The Sustainable Development Goals (SDGs) are based on three pillars: economic well-being, environmental quality, and social cohesion. The Sustainable Development Goals (SDGs) are part of the 2030 Agenda for Sustainable Development, which aims to assert that development does not threaten future generations' ability to meet their needs (Holden & Banister, 2017 and UNESCO, 2017).

Economy, environment, and society are the three dimensions of sustainable development. Human rights, gender equity, peace and human security, cultural diversity, and inter-cultural understanding are all part of the societal dimension of sustainable development. Also, Social services, the right to health and education, and social justice are other issues that should be addressed with it (Atmaca & Pehlivan, 2018). While, environmental sustainability has issues such as the protection of natural resources (water, air, soil, energy, agriculture, and biodiversity), sustainable urbanization (UNESCO, 2006).

Reduction of environmental pollution, the use of renewable energy sources (geothermal, wind energy, etc.) instead of non-renewable energy sources (coal, petrol, etc.) are included in environmental sustainability. Moreover, protection of forests and increasing green land, reducing of resource usage and environmental pollution by recycling of wastes, ecological footprint minimization, and stopping the global warming (Atmaca, et al., 2018). On the other line the economic sustainability has issues such as conservative use of resources, income and expense balance, elimination of income distribution inequality, sustainable production and cost, reliable environments for investments, investments in high, income

sectors, investments in vital sectors, and research and development (Atmaca, et al., 2018; Olsson, Gericke, & Chang Runghen, 2016).

Nursing students could be prepared to act as change agents who can challenge existing practice and realize improvements. This requires an emphasis within nurse education on critical thinking and change agency, which should be expected from higher education institutes. Additionally, to challenge practice on issues in relation to climate change and sustainability, student nurses need to be knowledgeable about the topic (Felicilda et al., 2018). The educational intervention is based on research program and is explicitly designed to emphasize the relevance of climate change and sustainability to nursing students (Álvarez-Nieto et al., 2018; Grose et al., 2015).

Education for sustainable development (ESD) is essentially one of the most essential tools for raising awareness for all environmental issues in a framework where environmental issues are taken into account together with economic, social, political and ethical issues. Raising awareness on sustainable development and its sub-dimensions and creating awareness should be under the responsibility of many disciplines and institutions (Tekbiyik & Celik, 2019). Educational intervention for Sustainable Development is revealing specific areas in which higher education is attempting to create sustainability competences in graduates. Education for Sustainable Development (ESD) is commonly understood as education that motivates changes in knowledge, skills, values and attitudes to enable a more sustainable and just society for all. ESD aims to empower and equip current and future generations to meet their needs using a balanced and integrated approach to the economic, social and environmental dimensions of sustainable development (Leicht, & Byun. 2018).

Sustainability awareness is a multidimensional concept that encompasses knowledge, attitudes, and behaviors related to environmental, social, and economic challenges. Individual citizens must have a greater grasp of, more positive attitudes about,

and activities that are consistent with the concepts of SD in order to make the transition to a sustainable future. Educational activities are aimed at equipping students with the skills they need to deal with such essential change elements. Climate change, disaster risk reduction, diversity, poverty reduction, and sustainable consumerism are instances of essential sustainable development subjects that should be included in teaching and learning. Critical thinking, visualizing future scenarios, and making collaborative decisions are some of the competencies that education for sustainable development promotes (Olsson, et al., 2015; UNESCO. 2015).

Knowledge, behavior and attitude are the three dimensions that education for sustainability development tools is focused (Biasutti, & Frate, 2017, Biasutti, 2015). Knowledge is defined as the understanding of something, as well as the range of one's information or understanding; behavior is defined as the way in which one behaves oneself, including anything that an organism does in response to stimulation and the response of a person, group, or humans to its surroundings; attitudes are defined as a cognitive position, feelings, or emotions with regard to, and toward, a fact or state; attitudes are defined as a mental position, feelings, or feelings with respect to, and toward, a truth or situation (Online Dictionary. accessed on 25 March 2020).

Significance of the Study

Climate change will impact negatively on people's health and healthcare systems' capacity to provide proper and timely care. Additionally, due to a lack of resources, nurses need to practice in more sustainable ways (Aronsson et al., 2020). There has been limited attention to the knowledge and competencies nurses will need to respond to global sustainability challenges; traditionally, within higher education, there has been an absence of climate change and sustainability topics in nursing. Furthermore, some important insights can be gained from the wealth of global research into the more general field of Higher Education for Sustainable Development ESD. Its specific focus has been on developing in nursing students the core sustainability

competency of systems thinking, realizing the interconnections between their vocational goal of supporting healthy living and the global issue of climate change (Richardson et al., 2019). Similarly, in Egypt, to date, there is a lake of study regarding this. So, the purpose of this research was to evaluate the effectiveness of educational intervention about sustainability development among nursing students. **This purpose should be fulfilled through the following objectives:**

- 1- Assess level of knowledge, attitude, and behavior of sustainability development among nursing students' pre-educational intervention for study group and control group.
- 2- Develop educational intervention about sustainability development among nursing students for study group.
- 3- Assess the difference between pre and post educational intervention regarding knowledge, attitude, and behavior towards sustainability development for both study and control group.
- 4- Evaluate the effectiveness of educational intervention about sustainability development among Nursing Students on study group.

Research hypothesis

- H1- Nursing students who receive the sustainability development educational intervention will have improvement in their knowledge, attitude, and behavior toward sustainability development.
- H2- There will be a significance difference between pre and post educational intervention regarding knowledge, attitude, and behavior of sustainability development among study group.
- H3- There will be a significance difference between study and control group regarding knowledge, attitude, and behavior of sustainability development at post educational intervention.

Operational definitions of study variables:

Sustainability development educational intervention is operationally defined first as the obtained nurses' students' knowledge regarding

their sustainability development score, measured by a knowledge questionnaire. Second, the obtained nurses' attitude regarding their sustainability development score measured by attitude questionnaire. Third, the obtained nurses' students' behavior regarding their sustainability development score, measured by a behavior questionnaire. Those questionnaires were developed by (Gericke et al., 2018) and modified by the researchers.

Methods:

Research Design:

A quasi-experimental design was used in the study, assigning subjects between the study group and a control group using pre-test and post-test. Study subjects are equally distributed to both the study group and a control group.

Setting and Sample:

The current study was conducted at the Nursing College, Menoufia University at Shebin Elkom in Egypt. The sample participants were assigned into a study group (N=400) and control group (N=400), the total sample of 800 completed the intervention, from both genders was drawn from nursing students in the second, third, and fourth levels of baccalaureate nursing programs, The total number of nursing students who enrolled in the first semester in academic year 2021/2022.

Sampling technique:

A systematic random sampling method was used to have the required sample size, among different academic years University three strata (second, third, and fourth levels of baccalaureate nursing programs)

Sample size:

In order to calculate the sample size required to examine the effectiveness of intervention for knowledge, behavior, and attitude among nursing students, the Sample Size for Unmatched Case-Control Study approach of Epi website (Open-Source Statistics for Public Health) * was used, with the equation,

$$\text{Sample size } n = \frac{[\text{DEFF} * N_p (1-p)]}{[(d^2/Z_{1-\alpha/2}^2 * (N-1) + p * (1-p))]}$$

Where: N = Population size, n = Sample size, DEFF = Design effect, P= % frequency of knowledge among Nursing students = Confidence limits as % of 100 (absolute +/- %) (d) = 5%, Z= 1.96, and $\alpha = 0.05$. **The assumptions were:**

1. A two-sided confidence level of 95% = (1- α).
2. A power (1- β) or (% chance of detecting) = 80%.
3. Ratio of sample size, unexposed (control)/exposed (study group) = 1
4. % of unexposed with outcome (knowledge) = 37%
5. One of two parameters was entered which was % of exposed) = 47% (from a pilot study), and the other parameter, Odd's Ratio (OR) would be calculated by the Epi website program.

In this study, the equation results were presented using Fleiss method, with 383 nursing students as study group, and 383 as control group, with a total sample size of 766. To compensate for the incompliance of some nursing students to complete the post intervention study tool, we approximate the total sample size to 800, with 400 nursing students in each group. The total sample size was distributed proportionally between 2nd (0.50), 3rd (0.31), and 4th (0.19) University years. Accordingly, the distribution of the total sample size was: 400 for second year University (200 for study group and 200 for control group), 248 for third year University (124 for each study control groups), and 152 for fourth year University (76 for study group and 76 for control group). Because the precision of the estimates can often be improved by allocating more of the sample to the smaller strata, we allocate more sample to the fourth university year to become 160 nursing students, with 80 students for each study and control groups.

Instruments

Instrument: The Sustainability Consciousness Questionnaire (SCQ) developed by Gericke et al., 2018. SCQ measure student's knowledge, attitudes, and behaviors regarding sustainability. In the SCQ instrument, these three psychological constructs were then related to the three

dimensions of SD (environmental, social and economic). **The Sustainability Consciousness Questionnaire (SCQ) was composed of four sections:**

- 1- Demographic characteristics of sample participants
- 2- Sustainability Knowingness Questionnaire (SNQ)
- 3- Sustainability Attitudes Questionnaire (SAQ)
- 4- Sustainability Behavior Questionnaire (SBQ)

The first section was involved demographic characteristics, including gender, academic year, hearing about sustainability development and source of information.

The second section: Sustainability Knowingness Questionnaire (SNQ) measure nursing students' knowledge towards sustainability development. It included 19 items have three dimensions namely; environmental (6 items), social (8 items) and economic (5 items). The studied sample marked their answers to the SNQ items on a 5-point Likert scale from strongly disagree to strongly agree, (1 strongly disagree- 2 disagree- 3 neutral- 4 agree- 5 strongly agree).

The third section: Sustainability Attitudes Questionnaire (SAQ) measure nursing students' attitudes towards sustainability development. It included 14 items have three dimensions namely; environmental (4 items), social (6 items) and economic (4 items). The studied sample marked their answers to the SAQ items on a 5-point Likert scale from strongly disagree to strongly agree, (1 strongly disagree- 2 disagree- 3 neutral- 4 agree- 5 strongly agree).

The fourth section: Sustainability Behavior Questionnaire (SBQ) measure nursing students' behaviors towards sustainability development. It included 17 items have three dimensions namely; environmental (7 items), social (6 items) and economic (4 items). The participants marked their answers to the SBQ items on a 5-point Likert scale ranged from strongly disagree to strongly agree, (1 strongly disagree- 2 disagree- 3 neutral- 4 agree- 5 strongly agree).

Validity of instruments:

The instruments of this study (The Sustainability Consciousness Questionnaire (SCQ) were tested for validity (face & content) through the distribution of the instruments to a panel of experts consisted of three professors and two assistant professors from nursing administration specialty. The study instruments were considered valid from the experts' perspective

Reliability of instruments:

Reliability was applied by the researcher for testing the internal consistency of the instruments, these instruments were tested for reliability to estimate the consistency of measurement. Reliability performed using Alpha Coefficient test (Chronbach alpha). Internal consistency of the first instrument (Knowledge questionnaire) with Cronbach alpha is ($\alpha = 0.85$), Internal consistency of the second instrument (attitude questionnaire) with Chronbach alpha coefficient is ($\alpha = 0.75$), and Internal consistency of the third instrument; behavior questionnaire is ($\alpha = 0.70$)

Field of work

Official approval was obtained from the Dean of Nursing College. The respondent's rights were protected by ensuring voluntary participation, so that informed written consents were obtained after explaining the purpose, nature, time of conducting the study, the potential benefits of the study and how data was collected. The respondents assured that data was treated as strictly confidential. Furthermore, the respondents' anonymity was maintained as they were not be required to mention their name.

The pilot study was carried out on 10 % of the study sample (40 nursing students) to evaluate study instruments in terms of its clarity, applicability and time required to fulfill all the study instruments and also to explore its feasibility. The accuracy modification and exclusion will be done.

Data Collection procedure

Undergraduate nursing students were informed to complete electronic sheet of the Sustainability Consciousness Questionnaire (SCQ) using the Google application website,

which was sent to all students who included in the current study via clinical what's up and Facebook groups, students' email, and other forms of online communication. The researchers assured the undergraduate nursing students that all data gathered would be utilized specifically for research purposes. All studied sample were given the option of participating in the study voluntarily. The research was conducted over a six-month period, from the beginning of August 2021 to the last day of Jan. 2022.

An educational intervention on sustainability development were divided into four stages: assessment, planning, implementation, and evaluation.

I. Assessment:

This stage aimed to assess level of knowledge, attitude, and behavior of sustainability development among nursing students' pre and post educational intervention for study group and control group. Also, to assess nursing students' hearing about sustainability development and source of information through need assessment technique (questionnaires) have been used in this study:

- Sustainability Consciousness scale.
- Self-administered questionnaires to assess level of students' knowledge, attitude, and behavior on sustainability development.

II. Planning:

The aim of sustainability development educational intervention for undergraduate nursing students was to improve their knowledge, attitude, and behavior toward sustainability development. Based on the findings of the knowledge, attitude, and behavior questionnaires among nursing students and their level of agreement regarding sustainability development before intervention, the sustainability development educational intervention was applied. Study questionnaires were distributed for both study and control groups of students at two different times; the first time was administrated before the intervention; the second time was done two months after the intervention to evaluate the effectiveness of the educational intervention. The researchers develop educational

intervention about sustainability development based on assessment outcomes.

The following were among the topics covered in sustainability development intervention:

- The concept of climate change.
- The effect of climate change.
- The concept of sustainability and sustainable development.
- The relationship between climate change and sustainability.
- Sustainability Development Goals.
- The barriers for Sustainability among nursing students
- The nursing role regarding climate change.
- The nursing role toward sustainability development.
- The basic knowledge about sustainability development involving dimensions namely: environmental, social and economic.
- Positive attitude toward Sustainability development involving dimensions namely: environmental, social and economic.
- Positive behavior toward Sustainability development involving dimensions namely: environmental, social and economic.
- Sustainability and health scenario

III. Implementation:

The sustainable development intervention was implemented through electronic learning such as Zoom meeting and Microsoft teams. The total number of nursing students was 800, it divided into 400 study group and 400 control group. So, study group was divided into eight groups to be effective and each group involved 50 nursing students. The total duration (16 hours theory) for each group, it was divided into eight sessions with two hours for each session. The sustainable development intervention implemented in 8 sessions for each group and two session was conducted weakly. Study group received two lectures and online interventions about sustainability development weakly, while, control group didn't received intervention. The intervention lasted for four months, from the beginning of August 2021 to the end of November 2021. Teaching methods which conducted in the intervention were; group discussion, lecture, scenario-based situations and brainstorming were very important with effective clinical practice. Teaching aids were: PowerPoint, videos, and

electronic poster and electronic brochure. **The educational intervention contents conducted in 8 sessions for each group as the following:**

The first session: Greeting nursing students, providing a soft handout, then demonstrating the intervention objectives for study group only and completing the pretest (electronic sheet of Sustainability questionnaires) by both study and control group.

The second session: provide theoretical and practical information on the concept and effect of climate change, as well as lead a group discussion with nursing students.

The third session: provide theoretical and practical information related to the concept of sustainability and sustainable development and relationship between climate change and sustainability by demonstrating lecture and videos.

The fourth session: provide theoretical and practical information related to the barriers for sustainability among nursing students and demonstrating scenario-based situations on Sustainability Development Goals.

The fifth session: provide theoretical and practical information related to the nursing role regarding climate change and sustainability development and demonstrating health scenario about sustainability.

The six sessions: provide theoretical and practical information about sustainability development involving dimensions namely: environmental, social and economic and demonstrate examples of environmental, social and economic sustainability.

The seven sessions: provide theoretical and practical information related to positive attitude toward Sustainability development involving dimensions namely: environmental, social and economic and carry out brainstorming to solve problems associated with sustainability.

The eight sessions: provide theoretical and practical information related to positive behavior toward Sustainability development involving dimensions namely: environmental, social and economic. Also, fill posttest (electronic sheet of Sustainability

questionnaires) by both study and control group. At the end of each session summary.

IV. Evaluation:

- To assess level of nursing students' knowledge about sustainability development pre and post educational intervention for study group and control group.
- To assess level of nursing students' attitude toward sustainability development pre and post educational intervention for study group and control group
- To assess level of nursing students' behavior towards sustainability development pre and post educational intervention for study group and control group.
- To evaluate the effectiveness of educational intervention about sustainability development for study group at the end of the four months post-intervention using the same tools before and post intervention tests.

Data Analysis

Data was entered and analyzed by using SPSS (Statistical Package for Social Science) statistical package version 22. Graphics were done using Excel program. Quantitative data were presented by mean (X) and standard deviation (SD). It was analyzed using paired sample T-test for comparison between two means and the level of significance was set as P value at $p \leq 0.05$. Qualitative data were presented in the form of frequency distribution tables, number and percentage. It was analyzed by chi-square (χ^2) test. However, if an expected value of any cell in the table was less than 5, Fisher Exact test was used, or Likelihood Ratio (LR) test (if the table was more than 4 cells). Level of significance was set as P value at $p \leq 0.05$. **Scoring system:**

The nursing students 'questionnaire contained, items related to the their' demographic criteria as well as **19 knowledge assessment** items each was five points Liker scale (1 – 5) as (1) for Strongly disagree, (2) for Disagree, (3) for Neutral, (4) for Agree, and (5) for Strongly agree. The student 'knowledge about sustainability development (SD) was evaluated giving a total score of 19- 95. The total score of each student was categorized into:

- “Poor knowledge; when he /she achieved < 50% of the total score (< 48 points of the total score),
- “Fair knowledge; when he /she achieved 50% to < 75% of the total score (48 - <71 points),
- and “Good knowledge; when he /she achieved \geq 75% of total score (71 – 95 points).

The nursing students ‘**attitude**’ was evaluated with **14 attitude assessment** items each was five points Likert scale (1 – 5) as (1) for Strongly disagree, (2) for Disagree, (3) for Neutral, (4) for Agree, (5) for Strongly agree. The student ‘attitude about sustainability development (SD) was evaluated giving a total score of 14 - 70. The total score of each student was categorized into:

- “Poor attitude.” when he /she achieved < 50% of the total score (< 35 points of the total score),
- “Neutral attitude” when he /she achieved 50% to < 75% of the total score (35 - <53 points),
- and “Good attitude.”. When he /she achieved \geq 75% of total score (53 – 70 points).

The nursing students ‘**Behavior**’ was evaluated with **17 behavior assessment** items each was five points Likert scale (1 – 5) as (1) for Strongly disagree, (2) for Disagree, (3) for Neutral, (4) for Agree, (5) for Strongly agree, the student ‘behavior about sustainability development (SD) was evaluated giving a total score of 17 - 85. The total score of each student was categorized into:

- “Poor behavior.” when he /she achieved < 50% of the total score (< 43 points of the total score),
- “Neutral behavior” when he /she achieved 50% to < 75% of the total score (43 - <64 points),
- and “Good behavior” when he /she achieved \geq 75% of total score (64 – 85 points).

Results

Table 1 demonstrates that 50% of studied students were in second academic year, 31% of them were in third academic year, and 19% of studied students were in fourth academic year for each study and control groups. Majority was female (74.2% and 72.2% among study and control groups respectively).

Table 2 demonstrates that the low percentage of nursing students who know the SD was 4.5% of nursing students among study group pre-intervention and 6% among the control group pre-intervention. Internet is the only source of information with 100% among both study and control groups.

Table (3) demonstrated the descriptive statistics of knowledge dimensions and its grand total scores. As shown, the low grand total mean for of knowledge was (33.6, 33.9) for both study and control groups respectively at pre-educational intervention. Moreover, the table revealed that the highest mean score regarding knowledge dimensions (environmental (25.3), social (33.6), and economics (21.8) for the study group post intervention program with a highly significant improvement ($P < 0.0001$).

Table 4 demonstrated the descriptive statistics of attitude dimensions and its grand total scores among studied nurses’ students, pre, and post interventions for study and control group. As shown, the low grand total mean of attitude was (18.6, 9.2) for both study and control groups respectively at pre-educational intervention. Moreover, the table revealed that the highest mean score regarding attitude dimensions (environmental (18.1), social (22.4), and economics (15.8) for the study group post intervention program with a highly significant improvement at ($P < 0.0001$).

Table 5 revealed that mean scores were increased in grand total behavioral dimension from 23.2 ± 5.4 pre intervention to 76.6 ± 6.5 post intervention for the study group with highly significant difference at ($p < 0.0001$). Furthermore, control group had the lowest grand total mean of behavior was (25.2 ± 6.7) post intervention.

Table 6 highlighted the efficacy of the Educational intervention about SD on the knowledge, attitude and behavioral dimensions of the participated nurses’ students. Post intervention program revealed a highly significant improvement ($p < 0.000$) in the all three different dimensions of knowledge, attitude and behavior. Among the study group, the post intervention program good knowledge responses were increased with a range of 77.3% to 99.8 %, while among the control group, the percentage of good knowledge response ranged from 1.5% to 6%. Among the study group, the post intervention

program good attitude responses were increased with a range of 6.5% to 99.8%, while among the control group, the percentage of good attitude response ranged from 0.8% to 2.3%. Among the study group, the post intervention program good behavior responses were increased to a high level of 99.7%. While among the control group, the percentage of good behavior response was very low ranged.

Figure 1 revealed the high level regarding total mean of knowledge, attitude, and behavior among study group of nursing students was (80.7, 56.1, and 76.6) respectively at post the

educational intervention about Sustainability development.

Figure 2 revealed the comparison between study and control of nursing student at post the educational intervention. As shown in the figure, the high level regarding total mean score of knowledge, attitude, and behavior among study group of nursing students. These results approve the study hypothesis that stated that there were a difference between study and control group regarding knowledge, attitude, and behavior of sustainability development at post education intervention

Table 1: Distribution of studied groups according to their academic year and gender among nursing students (N=800).

Variables	Study group		Control group		X ²	P value
	NO.	%	NO.	%		
Academic year):					0.0	1.0
2 nd year	200	50	200	50		
3 rd year	124	31	124	31		
4 th year	76	19	76	19		
Gender:					0.41	0.52
Male	103	25.8	111	27.8		
Female	297	74.2	289	72.2		
Total	400	100	400	100		

Table 2: Source of information about Sustainability development among nursing students (N=800).

Variables	Study group		Control group		X ²	P value
	NO.	%	NO.	%		
Hearing about SD?					0.91	0.34
Yes	18	4.5	24	6		
No	382	95.5	376	94		
If Yes Source of information's (NO. =24)						
Internet	18	100	24	100	*	
Total	18	100	24	100		

* = No statistics are computed because source of information variable is constant.

Table 3: Descriptive statistics of different three knowledge dimensions and grand total knowledge scores among studied nursing' students pre, and post interventions (N=800)

knowledge dimensions		Study group				P1 value	Control group				P2 value	P3 value
		Mean	±SD	Min.	Max.		Mean	±SD	Min.	Max.		
Environmental	pre	7.4	2.6	0	21	(paired) = 104.3 P<0.0001	7.6	2.5	0	21	t(paired)=0.85 P=0.25	t= 12.7 P<0.0001
	Post	25.3	3.5	12	30		7.6	2.9	0	24		
Social	pre	16.9	3.6	8	35	t(paired)= 203, P<0.0001	17	3.8	8	35	t(paired)=0.85 P=0.25	t= 25.1 P<0.0001
	Post	33.6	1.7	16	40		17.1	3.8	8	35		
Economic	pre	9.3	3.5	3	20	t(paired) =201, P<0.0001	9.4	3.6	3	20	t(paired)=0.62 P=0.73	t= 10.6 P<0.0001
	Post	21.8	1.1	10	25		9.4	3.7	3	20		
Grand total Kn. On SD	pre	33.6	9.5	26	35	t(paired)= 254, P<0.0001	33.9	10.6	26	76	t(paired)1.53, P=0.07	t= 75.6 P<0.0001
	Post	80.7	4.5	38	95		34.1	4.1	26	76		

P1= Comparison of each dimension of knowledge among study group pre and post intervention.

P2= Comparison of each dimension of knowledge among control group pre and post intervention.

P3= Comparison of each dimension of knowledge among study and control groups post intervention.

Table 4: Descriptive statistics of different three attitude dimensions and grand total attitude scores among studied nurses' students, pre, and post interventions (N=800)

Attitude dimensions		Study group					Control group				P2	P3
		Mean	±SD	Min.	Max.	P1 value	Mean	±SD	Minimum	Maximum		
Environmental	pre	5.3	2.8	1	16	t (paired)= 104.3 P<0.0001	5.5	2.4	1	16	t(paired) =0.85 P=0.25	t= 13.2, P<0.0001
	Post	18.1	1.3	12	20		7.8	1.4	6	16		
Social	pre	5.5	2.4	1	24	t(paired)= 203, P<0.0001	5.8	3.2	1	24	t(paired) =0.85 P=0.25	t= 21.5, P<0.0001
	Post	22.4	2.5	18	30		5.8	3.2	1	24		
economic	pre	7.7	1.1	6	16	t(paired)= =201, P<0.0001	7.9	1.4	5	16	t(paired) =0.62 P=0.73	t= 9.8, P<0.0001
	Post	15.8	2.1	10	20		5.5	3.1	1	16		
Grand total attitude. On SD	pre	18.6	4.6	13	56	t(paired)= 254, P<0.0001	9.2	6.3	12	56	t(paired))1.53, P=0.07	t= 56.4, P<0.0001
	Post	56.1	3.9	40	70		19.1	7.8	13	56		

P1= Comparison of each dimension of attitude among study group pre and post intervention.

P2= Comparison of each dimension of attitude among control group pre and post intervention.

P3= Comparison of each dimension of attitude among study and control groups post intervention.

Table 5: Descriptive statistics of different three behavior dimensions and grand total behavior scores among studied nursing students pre, and post interventions (N=800)

Behavior dimensions		Study group					Control group				P2 value	P3
		Mean	±SD	Min.	Max.	P1 value	Mean	±SD	Min	Max.		
Total score of Environmental dimensions	pre	8.7	2.5	4	28	t (paired)= 104.3 P<0.0001	9.1	2.1	4	28	t(paired)=1.3 P=0.17	t= 73.2, P<0.0001
	Post	30.1	1.6	7	35		9.2	2.1	4	28		
Total score of social dimensions	pre	7.6	1.3	4	28	t(paired)= 203, P<0.0001	8.3	2.4	4	24	-----	t= 64.8, P<0.0001
	Post	26.1	1.4	18	30		8.3	2.4	4	24		
Total score of economic dimensions	pre	6.9	2.3	1	14	t(paired)= =201, P<0.0001	7.6	2.1	2	16	t(paired)=0.65 P=0.43	t= 34.7, P<0.0001
	Post	20.4	5.1	12	70		7.6	2.3	2	16		
Grand total behavior. On SD	pre	23.2	5.4	13	65	t(paired)= 254, P<0.0001	25.1	4.2	19	68	t(paired) 0.81, P=0.41	t= 116.5, P<0.0001
	Post	76.6	6.5	47	85		25.2	6.7	19	68		

P1= Comparison of each dimension of behavior among study group pre and post intervention.

P2= Comparison of each dimension of behavior among control group pre and post intervention.

P3= Comparison of each dimension of behavior among study and control groups post intervention.

Table 6: Effect of the educational intervention about Sustainability development on knowledge, attitude and behavior levels of participants' pre and post intervention (N0. =800).

Grand total of knowledge, Attitude & Behavior	pre- intervention						Post intervention						*χ ² /LR	P value
	Poor behavior.		Neutral behavior		Good behavior.		Poor behavior.		Neutral behavior		Good behavior.			
	N0	%	N0	%	N0	%	N0	%	N0	%	N0	%		
Knowledge:														
Study group	336	84	61	15.3	3	0.8	1	0.3	0	0	399	99.8	760	<0.0001
Control group	331	82.8	66	16.5	3	0.8	331	82.2	60	15	9	2.3		
Attitude:														
Study group	400	100	0	0	0	0	1	0.3	373	93.3	26	6.5	705	<0.0001
Control group	400	100	0	0	0	0	376	94	24	6	0	0		
Behavior														
Study group	387	96.8	8	2	5	1.2	0	0	1	.3	399	99.7	758	<0.0001
Control group	376	94	17	4.3	7	1.8	376	94	18	4.5	6	1.5		

*χ²: Using Repeated Friedman Test (type of Chi square test for repeated procedures for qualitative data) for comparison of (Knowledge, Attitude and behavior levels) between the two time points of intervention in nurses 'students participating in the study.

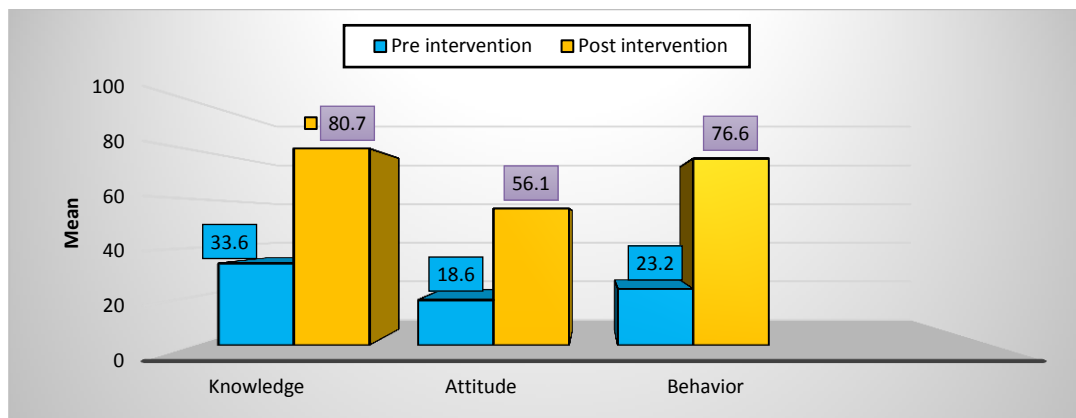


Figure 1: Comparison between pre and post the educational intervention about Sustainability development on total mean of knowledge, attitude, and behavior among study group of nursing students (No. =800)

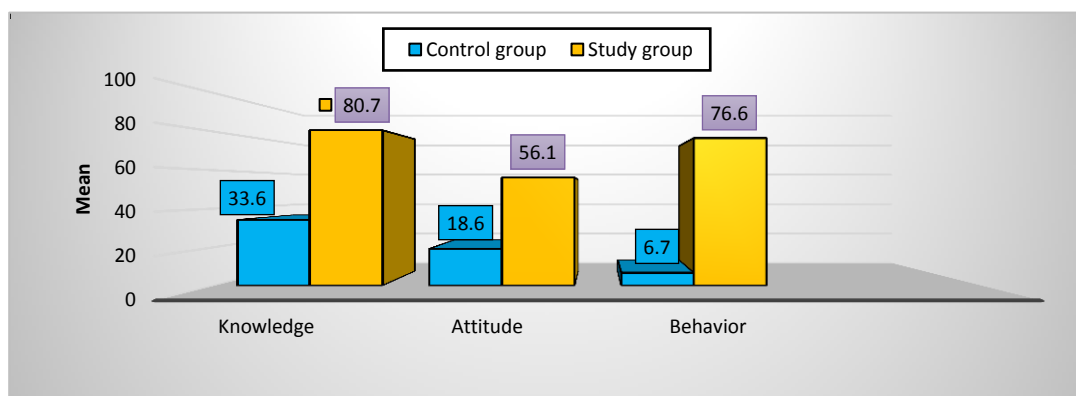


Figure 2: Comparison between Study and Control of Nursing student regarding total mean of knowledge, attitude, and behavior post the educational intervention about Sustainability development (No. =800).

Discussion

Nurses have a critical role in reducing the consequences of climate change on the healthcare sector and responding to it. Thus, nursing students must be prepared for a new professional role regarding sustainability development, so it is critical to assess students' views on climate change and sustainability (Anåker et al., 2021). As a consequence, higher education is in high demand around the world to prepare students to deal with the severe environmental, social, and economic implications of climate change and sustainability (Shaw et al., 2021).

The current study aimed to evaluate the effectiveness of educational interventions about sustainability development among nursing students. The result showed that that half of studied students were in second academic year

among study and control group. These results may be consequence of constantly increasing the number of students who enrolled in nursing colleges recently due to its advantages of human field, employment, high income, helping people and others. The study reported that the majority of the students were female with approximately three quarters among study and control groups respectively. It might be explained by the fact that our college is considered recent in having male student. Moreover, the study indicated that the minority of nursing students know about the sustainability development among both tow groups. Internet is the only source of information about the topic as reported. As Internet is the language of the age and is the most widely used search, communication, and knowledge tool.

Knowledge, attitude, and behavior of Sustainability development pre-education intervention

The results revealed that the low mean was for total score of environmental dimension, social dimension, and economic dimension related to sustainability knowledge for both tow groups was at pre period of educational intervention. At the same line, the majority of students had poor knowledge among both groups as only 3 students for each group had good knowledge regarding sustainability development pre intervention. Moreover, the economic dimension was the highest percentage of poor knowledge among other dimension for both tow groups.

The assumption that the concept of sustainability development is still fairly recent for nursing students could be one explanation for this result also it is globally known. Moreover, their nursing curriculum didn't include any data regarding this subject. Similarly, the majority of them reported that they didn't hear about sustainability and this may be due to the stress and overload regarding the nursing study. Thus, there was no time to attend any workshop or training program about sustainability development.

These study results are supported with (Anåker et al., 2021). The aim of this study was to assess Nursing students' perception toward climate change and sustainability. The study revealed that sustainability was complex to apply and opined that further education is needed according to nursing students' perception. Also, the study stated that these different views amounted to a discrepancy as a result of the inability to correlate or balance the various perspectives on climate change and sustainability. This may have an effect on the development of new curricula and courses to address such significant global challenges, with a particular focus on the relationship between climate change, sustainability, and their higher role as nurses. Stronger attention on global issues is needed in the creation of nursing curricula, with the effects of climate change on health being more explicitly underlined.

Furthermore, the study results is consistent with several studies which have found that nurses lack the necessary knowledge

to support and participate in climate change and sustainability development strategies (Anåker et al., 2015; Kangasniemi et al., 2014; Tiitta et al., 2021). Similarly, Aronsson et al. (2020) argued that undergraduate education that is focusing on the relevance and sustainability of climate change for health and healthcare can assist nurses in overcoming challenging unsustainable clinical practice.

At the same line, it is asserted that education plays an important role in achieving sustainable development goals (Otto et al., 2020; Shaw et al., 2021). As a result, nursing education must focus on training future nurses on how to provide sustainable healthcare. Students should be taught how to solve complicated societal problems, according to several researchers. They should be qualified to act and influence others in order to achieve long-term development (ICN, 2018; Leffers et al., 2017; Leffers and Butterfield, 2018). To conclude, nursing students must be prepared to act in a world affected by climate change and contribute to healthcare and society that is sustainable. The perspectives and experiences of students are critical to the development of education (Sperstad et al., 2020).

The results revealed that the low mean was for total score of environmental dimension, social dimension, and economic dimension sustainability attitude for both tow groups was at pre period of educational intervention. At the same line, the all students had poor attitude regarding sustainability among both groups. Moreover, the environment dimension was the highest percentage of poor attitude among other dimension for both tow groups as all students had it. Furthermore, the low mean regarding grand total sustainability behavior was at pre-education intervention among both tow groups. Also, the majority of students had poor behavior among both groups. All students had poor Economic dimension related to sustainability behavior among study and control groups.

The interpretation of these results may be due to the nursing students had poor knowledge regarding sustainability and the result ascertain it. So, the students didn't know the basic concepts regarding sustainability development as it is ambiguous for them. They didn't

prepare well to have the good behavior and attitude regarding sustainability by knowing their role and functions related it to manage the climate change and apply the goals of sustainability development. These results are supported by study done to provide an overview of the attitudes of students from Arab regions toward climate change and environmental sustainability in health care and their inclusion in nursing curricula. The result revealed that Saudi students had more positive attitudes toward environmental sustainability in health care compared with students from Iraq, Egypt, and the Palestinian Territories.

In the same line, the study results are supported by (Cruz et al., 2018) study. The purpose of that study was to assess nursing students' attitudes on the environment and sustainability in health care as influenced by a range of factors in Saudi Arabia. The study reported that nursing students' attitude are significantly predicted by learning about environmental themes in nursing school, being aware of climate change, and attending environment-related seminars and trainings. Moreover, Richardson et al. (2014) also found similar results among nursing students. They reported that student nurses have not received proper education to understand the link between climate change and global health issues. Without proper education on these issues, policies will remain in documents and not acted upon.

Knowledge, attitude, and behavior of Sustainability development post education intervention. According to literature, the educational intervention is based on a prior research program and is specifically designed to underline the importance of climate change and sustainability to nursing (Álvarez-Nieto et al., 2018; Grose et al., 2015). By developing education intervention about sustainability development, the result highlighted the efficacy of this educational intervention on the knowledge, attitude, and behavior aspects of the participated nursing students. As Post intervention revealed a highly significant improvement ($p < 0.0001$) in the all-different items of the three dimensions of knowledge, attitude, and behavior (Environmental, social, and economics) among the study group.

Moreover, the post intervention good knowledge, good attitude, and good behavior responses were increased with a high range while among the control group; the percentage of good knowledge response was very low ranged. In the same line, the high mean score for knowledge, attitude, and behavior of sustainability development was for study group at post education intervention. Also, the comparison between study and control group regarding post intervention result, it is stated that the study group had the highest mean score regarding for knowledge, attitude, and behavior of sustainability development. In addition, comparing post intervention mean of study group with the post intervention mean of control group regarding knowledge, attitude, and behavior of sustainability development showed also statistically significant difference between them ($P < 0.0001$). These results approve the study hypothesis of this study which stated "There will be a difference between study and control group regarding knowledge, attitude, and behavior of sustainability development at post educational intervention."

These results may be due to many explanations. One of these explanations is by developing education intervention about sustainability development, the nursing students knew about this concept and related items. Also, students had learned about nursing role in sustainability and what are the goals of sustainability development. Also, the education intervention ascertained the importance of application sustainability in healthcare. That motivate nursing student to have the desire to apply sustainability development.

Another explanation, nursing students had the necessary knowledge by having this education intervention which helps them to have the required skills to support and participate in sustainability development. Also, the content education intervention had different situations and problems which require sustainability actions. Thus, these increase their skills of critical thinking and problem solving. So, their behavior and attitude had improved to good level according study results. While, the control group which students hadn't the education interventions had very low improvement because they still didn't know

about sustainability and their role in it. They didn't have the necessary knowledge to behave in a sustainable manner.

In Egypt there is a lack of study regarding developing education intervention about sustainability development for nursing students. At the same line it is international found in little studies. One of these studies was done by (Cruz et al., 2018). This study emphasized the necessity of incorporating environmental issues and concerns, as well as sustainability in health care, within the nursing course and offering chances for students to participate in environment-related extracurricular activities such as seminars and workshops.

Similarly, it is found that environmental and sustainability attitudes of nursing students appear to be positively influenced by learning about the environment and related concerns in the nursing curriculum, being aware of climate change, and attending environment-related seminars and trainings (Sayan & Kaya 2016).

Furthermore, the study is supported by a study done by Richardson et al. (2017). It is found that adopting a scenario-based learning method with nursing and midwifery students can influence their attitudes and understanding about sustainability and climate change. Using this method in the context of clinical skills creates a unique and interesting approach that is both instructional and clinically relevant.

According to Sayan and Kaya (2016), Turkish nursing students who contemplated taking an environmental pre-requisite course in college, were interested in environmental themes, and had much better attitudes toward the environment than those who did not. Individual awareness developed as a result of education and training, which may have influenced their attitudes.

So, nursing students need to be prepared to act in a world facing climate change and contribute to sustainable healthcare and society. Students' experiences and voices are pivotal to the continuous development of education (Sperstad et al., 2020). Similarly, Aronsson et al. (2020) highlighted that sustainability training that focused on sustainability can help nurses to implement

change management and sustainability development.

Conclusion

In the light of the present study findings, it can be concluded that the efficacy of the educational intervention about sustainability development was highlighted on the knowledge, attitude, and behavior aspects of the participated nursing students. Sustainability development intervention was an effective mechanism for improving nursing students' knowledge, skills and attitude levels toward sustainability. The result demonstrated that the majority of students had low mean score regarding knowledge, attitude, and behavior toward sustainability development at pre-educational intervention. The result also highlighted that post intervention revealed a highly significant improvement on sustainability developments' knowledge, attitude, and behavior for study group. On the other hand, the study findings revealed a highly significant difference between the study and control groups regarding knowledge, attitude, and behavior of sustainability development post intervention. In addition, the high mean of these was for study group. Thus, from these results the education intervention about had success in achieving its objectives. Moreover, all hypothesizes of the study are accepted.

Recommendations

Based on the literature review and the findings of this study, the following recommendations are proposed:

- Education intervention and workshops about sustainability development and its objectives should be updated and conducted continuously on regular basis for all nursing students should be recommended.
- Sustainability development must be emphasized in the curricula by using different educational strategies to prepare nursing student to apply their professional role in sustainability development.
- Using social media and internet communication in knowing sustainability development to be more spread for large numbers of nursing student as well as nurses.

- Increase awareness of nursing educators about Sustainability development and update their competencies regarding this to spread the culture of sustainability development among students.

Limitations

The most important limitation of this study is that the research data were only from one Nursing faculty. Therefore, selecting sample from different nursing Faculties are recommended for future studies to generalize the findings.

Acknowledgement

We would like to thank all participant nursing students for their cooperation and help during data collection.

Conflict of Interest

The authors declare no conflict of interest.

Source of funding

This research has not received any funding.

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