Effect of training program about sustainability and climate change on nursing internship students' awareness

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Abstract

Background: Climate change and sustainability are broadly recognized as the most pressing global challenges for human health in the coming decade. Nurses play a central role, not only in mitigating the impact of climate change on the healthcare sector, but also in adapting to this phenomenon **Aim:** This study aimed to assess the effect of training program about sustainability and climate change on nursing internship students' awareness **Methods:** A one-group quasi-experimental research design was carried out at Sohag University Hospitals involving 150 nursing internship students. Structured interviewing questionnaire include characteristics, knowledge and Green managent and sustainability practices were used to collect data. **Results:** 72.3% of nursing internship students had unsatisfactory practice, pre intervention, while 63.3% of them had satisfactory practices, post intervention, with high significant difference at p value <0.01**. Also, 51.4% of nursing internship students had poor knowledge, pre intervention, while 73.3% of them had good knowledge, post intervention, with high significant difference at p value <0.01**. **Conclusion:** The training program significantly improved the level of climate change and sustainability knowledge and practices among nursing internship students. Also, attending training courses, achieving a higher GPA, and the influence of age play crucial roles in enhancing the overall knowledge and practice related to these important subjects. **Recommendations:** Encourage nursing students to participate in ongoing training courses about sustainability and climate changes. Implement regular assessments and provide constructive feedback to students to track their progress in sustainability and climate change knowledge and practices.

Keywords: Climate change, sustainability, nursing internship students

Introduction:

In recent decades, the world has witnessed an unprecedented transformation in the way we perceive and address the challenges of our environment. Sustainability and climate change have emerged as two interconnected and inescapable global imperatives that demand our urgent attention and concerted action **(Alam, 2022).**

Climate change, primarily accelerated by human activities such as fossil fuel combustion, deforestation, and industrial processes, has led to a swift increase in greenhouse gas emissions. Consequently, this has set in motion a chain reaction of environmental repercussions, including the escalation of global temperatures, the occurrence of more frequent and severe weather events, rising sea levels, and disturbances in ecosystems. The ramifications of climate change are far-reaching, affecting not only the natural world but also human societies, economies, and health **(Okada & Gray, 2023).**

Sustainability, on the other hand, represents a holistic approach to safeguarding our planet's future. It encompasses the responsible use of resources, the protection of biodiversity, social equity, and economic viability. Sustainability aims to achieve a subtle equilibrium, ensuring that current needs are satisfied without jeopardizing the capacity of future generations to fulfill their own requirements **(Olabi & Abdelkareem, 2022).**

The connection between sustainability and climate change lies in the need for sustainable practices to mitigate and adapt to climate change. To address climate change effectively, societies and industries must transition to more sustainable modes of production and consumption. This involve reducing greenhouse gas emissions, transitioning to renewable energy sources, conserving natural resources, promoting eco-friendly technologies, and adopting sustainable land use and urban

planning practices **(Abbass et al., 2022 & Harris et al., 2022).**

Climate change poses an urgent threat to global public health, exacerbating health disparities and demand for healthcare services. As frontline providers, nurses play a critical role in climate change mitigation and adaptation efforts in healthcare systems. However, research suggests nurses often lack adequate education and awareness on the health impacts of climate change and sustainable healthcare best practices. This highlights the need to integrate sustainability science and climate change into nursing curricula, including during clinical training **(Kemp et al., 2022).** The growing interest in climate change education has seen a notable uptick in recent years, owing in part to increased financial support and dedicated leadership for educational initiatives focused on addressing the challenges of climate change **(Shukla et al., 2022).**

Nursing internship students" refers to students who are pursuing an internship or clinical placement as part of their nursing education or training. During such internships, nursing students typically gain practical experience and apply the knowledge and skills they've acquired in a real healthcare setting, working alongside experienced nurses and healthcare professionals. These internships are an essential component of nursing education, allowing students to develop clinical competence and prepare for their future careers as registered nurses **(López-Medina et al., 2022).**

Nurses make up the largest segment of healthcare providers globally and have a crucial role to play in climate change adaptation and mitigation efforts in the health sector. However, studies have found that nursing education often lacks adequate focus on sustainability science, climate-related health impacts, and strategies to 'green' healthcare practices **(Agache et al., 2022).**

Significant of the Study:

Integrating climate change into nursing curricula is vital for building a workforce literate on the links between environmental sustainability and human health **(Pan et al., 2022).** The nursing internship period represents a formative stage when knowledge and competencies gained can shape new nurses' practices over their careers. However, few interventions have been experimentally evaluated that aim to improve nursing interns' understanding of the drivers of climate change, the manifold health consequences, identification of populations vulnerable to climate threats, and practical strategies healthcare systems can employ to strengthen climate resilience and adaptation.

Aim of the Study:

The current study aimed to assess the effect of training program about sustainability and climate change on nursing internship students' awareness, through:

-Assess nursing internship students' knowledge and practice about sustainability and climate change pre intervention.

-Applying sustainability and climate change training program on nursing internship students.

-Assess the effect of sustainability and climate change training program on nursing internship students' knowledge and practice.

Hypothesis:

H1: The sustainability and climate change training program had a positive effect on nursing internship students' knowledge.

H1: The sustainability and climate change training program had a positive effect on nursing internship students' practice.

Materials and Methods:

Research design

One-group quasi-experimental research design was conducted to achieve the aim of study **(Cook & Wong, 2008).**

Setting

The study was carried out at Sohag University Hospitals

Participant

Participants were selected through a convenience sampling method. A total of 150 nursing internship students who agreed to

participate in the study from the previously mentioned setting were included in the study.

Sample Size: The sample size was determined based on a statistical power of 95%, a level of confidence (1-Alpha Error) of 95%, an Alpha of 0.05, and a Beta of 0.1. This calculation resulted in a sample size of 150 nursing internship students.

Tools of Data Collection

Tool I: The researcher developed a structured interview questionnaire sheet in the Arabic language after conducting a thorough review of the existing literature as **Mustapha et al., 2017** and **Yildiz Çankaya & Sezen, 2019**.

Part I concerned with the demographic profile of the studied nursing internship students, included characteristics of the nursing internship students such as age, gender, GPA, marital status, residence, training courses.

Part II concerned with nursing internship students' knowledge and included 26 multiple-choice questions included Concept of climate change (3 questions), Concept of sustainability (3 questions), Causes of Climate Change (5 questions), Benefits and barriers of sustainability (5 questions), Mitigation Strategies (5 questions), Impacts on Human Health (5 questions).

Each correct answer was given a score of 1, while incorrect answers received a score of 0. The total knowledge score was categorized as unsatisfactory (<70.0%) or satisfactory (≥ 70.0%).

Tool II: Green managent and sustainability practices: It adapted by the researchers from **Ghazy & Fathy, 2023**. This tool was employed to evaluate the daily life practices reported by the students, encompassing 11 statements assessing indoor practices and 8 statements evaluating outdoor practices. Participants indicated their responses as either "done" or "not done" for each statement. A total score was computed by summing the practices marked as "done," which was then converted into a percentage. The results were categorized into two groups: unsatisfactory practice if the score was below 70.0%, and satisfactory practice if the score was equal to or greater than 70.0%.

Pilot study:

A pilot study involving 15 nursing internship students, which constituted 10% of the estimated sample size, was carried out to assess the feasibility of the research tools and the clarity of the questionnaire questions. Additionally, the pilot study assisted in gauging the time needed for participants to complete the questionnaire. Following the analysis of the pilot study's results, it was determined that no modifications or exclusions were necessary for the questionnaire items. Furthermore, the nursing internship students who took part in the pilot study were included in the final sample.

Validity and Reliability:

The data collection tools were evaluated by a group of three experts in nursing administration to ensure that they accurately measured the concept being studied and covered all relevant aspects. To assess the reliability of the tools, consistency of results across time, observers, and test sections was measured using the Cronbach's alpha test. The reliability scores for tools I and II were 0.830 (good) and 0.819 (good). This indicates that the tools were reliable and consistent in measuring the targeted constructs.

Fieldwork:

The researcher was present at the research setting during the morning shift from 9:00 a.m. to 1:00 p.m. The data collection phase extended for a duration of 2 months, commencing on October 1st, 2023, and concluding in November 2023. This period encompassed the pretest, the implementation of the educational program sessions, and the posttest. The researcher introduced herself to the nursing internship students and explained the aim of the study. Data collection was carried out through group interviews with the nursing internship students, and each interview lasted for approximately 30 minutes.

Framework

Assessment phase: The researcher provided a detailed explanation of the study's objectives and introduced the components of the research tools to the nursing internship students under investigation. Subsequently, the researcher distributed a questionnaire to these students to evaluate their knowledge and practices related to green management and sustainability. The educational program was meticulously crafted and tailored to meet the specific needs of nursing internship students, a process informed by both the pretest results and a thorough review of relevant literature as **Mustapha et al., 2017** and **Yildiz Çankaya & Sezen, 2019.**

Intervention phase: The researcher organized the studied nursing internship students into five groups and conducted a series of three one-hour training sessions for each group, consisting of both lectures and seminars. Students were informed of their respective group assignments through invitation letters that also detailed the training schedule and venue. The theoretical sessions took place in the hospital conference hall over a seven-week period, with sessions held every Sunday and Thursday from 9 a.m. to 10 a.m. The training program was designed by the researcher after a comprehensive literature review, aiming to enhance the students' understanding and implementation of green management and sustainability principles.

Training Program: Sustainability and Climate Change

Session 1: Introduction to Sustainability and Climate Change: Introductions and expectations from the training, Definition and principles of sustainability, Importance of sustainable practices, Causes and consequences of climate change, Overview of global climate change agreements. At the end of session, encourage participants to ask questions and engage in a group discussion.

Session 2: Sustainable Practices and Solutions: Brief review of key concepts from the first session, Sustainable Energy and Resource Management, Renewable energy sources, Efficient resource management, Reducing food waste and promoting sustainable diets, Strategies for waste reduction and recycling, Encourage participants to ask questions and share insights.

Session 3: Climate Action and Personal Commitment: Summarize key takeaways from the previous sessions, Climate Action at the Individual Level, Personal carbon footprint reduction, How organizations can integrate sustainability into their strategies, Green certifications and initiatives.

This three-session training program provides participants with a comprehensive understanding of sustainability and climate change, explores practical sustainable solutions, and empowers individuals and organizations to take meaningful action in addressing these critical global challenges. Provide participants with additional resources and recommendations for ongoing learning and engagement. Evaluate the training program directly post intervention after three weeks by using previous mentioned tools as pre intervention.

Ethical Considerations

The study obtained ethical approval from the Institutional Review Board of the Faculty of Nursing at Sohag University In addition to this, the researcher obtained oral consent from each nursing internship student after providing them with a clear understanding of the study's objectives. Moreover, students who consented to participate were guaranteed the confidentiality of all data collected during the study, and they maintained the right to withdraw from the study at any time. The questionnaires were completed anonymously, and the data collected were handled with the utmost confidentiality, exclusively for research purposes.

Statistical Analysis

The collected data were meticulously organized and categorized, with the results presented in tabular format for clarity. Data analysis was carried out on a compatible personal computer using SPSS; version 21). The ANOVA test was utilized to compare mean scores before, after, and during the

follow-up intervention, following the methodology described by Franke et al. (2012).

The correlation coefficient was employed as a numerical indicator of statistical relationships between various variables, revealing the extent of their correlation. Additionally, linear regression analysis was utilized to predict the value of one variable based on the value of another. Results were considered significant if p <0.05 and highly significant if p <0.01. Furthermore, the developed research tools were subjected to reliability testing using Cronbach's alpha test, as outlined by Nayak and Hazra (2011), to ensure their consistency and accuracy in measuring the intended constructs.

Results:

Table (1) shows that the mean age of nursing internship students was 21.79 (0.87) years, with 76.7% of them being female. Additionally, 96.7% of them were single, and according to residence 59.3% of them from rural area. The data indicates that only 14% of nursing internship students attended training courses on sustainability and climate change, Also, 40% of nursing internship students had 3.75 – 4.49 GPA.

Table (2) indicates that 50.7% and 53.4% of nursing internship students had average knowledge about concept of climate change and sustainability, pre intervention, while 75.3% and 72% of them had good knowledge about concept of climate change and sustainability, post intervention, with high significant difference at p value <0.01**. Additionally, 44% and 46% of nursing internship students had poor knowledge about causes of climate change and benefits/ barriers of sustainability, pre intervention, while 73.3% and 70% of them had good knowledge about causes of climate change and benefits/ barriers of sustainability, post intervention, with high significant difference at p value <0.01**.

Table (3) reveals that, prior to the intervention, 72.7% of nursing internship students exhibited unsatisfactory indoor daily life practices, while post-intervention, 62.7% displayed a significant improvement with satisfactory practices, as evidenced by a highly significant difference at a p-value of <0.01**. Additionally, 69.3% of nursing internship students had unsatisfactory outdoor daily life practices before the intervention, with this percentage decreasing to 65.3% post-intervention, indicating a highly significant difference at a p-value of <0.01**.

Figure (1) demonstrates that prior to the intervention, 72.3% of nursing internship students had unsatisfactory practices, whereas post-intervention, 63.3% exhibited a significant improvement with satisfactory practices, as evidenced by a highly significant difference at a p-value of <0.01**.

Figure (2) depicts that prior to the intervention, 51.4% of nursing internship students exhibited insufficient knowledge, whereas post-intervention, 73.3% demonstrated a significant improvement with good knowledge, as evidenced by a highly significant difference at a p-value of <0.01**.

Table (4) demonstrate a strong positive correlation between the total knowledge and practice levels both before and after the intervention, with a p-value of <0.01**, indicating statistical significance.

Table (5) reports that the F-test value for the high significant model was 9.660, with a p-value of 0.000. This model explains 42% of the variation in total knowledge, as indicated by the R^2 value of 0.42. Additionally, the table highlights that attended training courses, high GPA and increasing practice had a high frequency of positive effects on total knowledge, with a p-value of <0.01**. While, age had a slight frequency of positive effects, with a p-value of <0.05*. On the other hand, the gender, residence and marital status had no significant effect on total knowledge at p value >0.05.

Table (6) reports that the F-test value for the high significant model was 7.800, with a p-value of 0.000. This model explains 37% of the variation in total practice, as indicated by the R^2 value of 0.37. Additionally, the table highlights that attended training courses and increasing knowledge had a high frequency of positive effects on total practice, with a p-value of <0.01**. While, age and increasing GPA had a slight frequency of positive effects, with a p-value of <0.05*. On the other hand, the

gender, residence, and marital status had no significant effect on total practice at p value >0.05.

Table (1): Distribution of nursing internship students' according to their characteristics (n=150)

Items	n	%
Age:		
< 23	119	79.3
23 - 24	31	20.7
Mean (SD) 21.79 (0.87)		
Gender:		
Male	35	23.3
Female	115	76.7
Marital status:		
Single	145	96.7
Married	5	3.3
Residence:		
Rural	89	59.3
Urban	61	40.7
Training program about sustainability and climate change		
Yes	21	14
No	129	86
GPA		
<2	9	6
2 – 2.74	23	15.3
2.75 – 3.74	38	25.3
3.75 – 4.49	60	40
>4.49	20	13.4

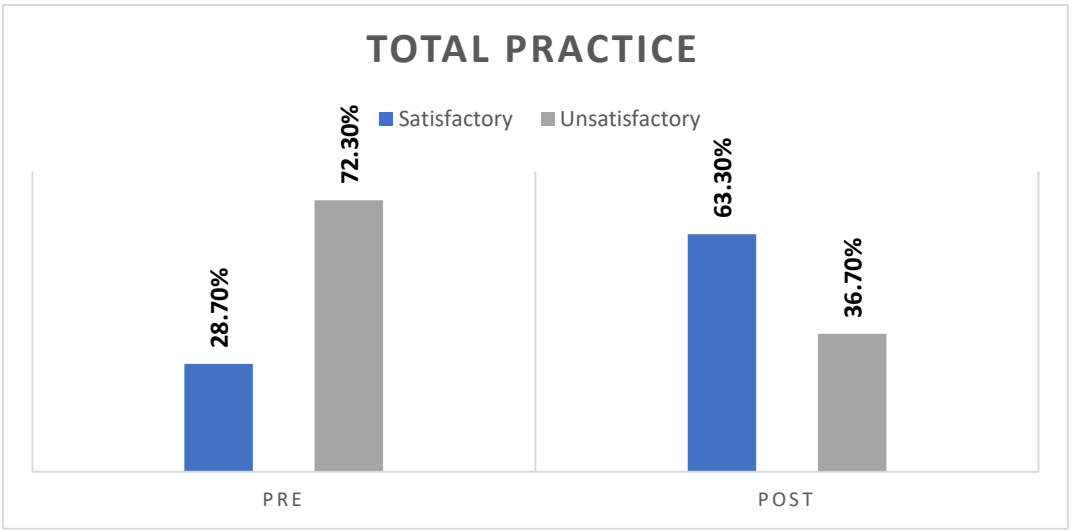
Table (2): Distribution of nursing internship students according to their knowledge about sustainability and climate change (n=150)

		Pre		Post		Chi-square P. value
		n	%	n	%	
Concept of climate change	Good	23	15.3	113	75.3	9.004
	Average	76	50.7	27	18	<0.01**
	Poor	51	34	10	6.7	
Concept of sustainability	Good	20	13.3	108	72	10.333
	Average	80	53.4	26	17.3	<0.01**
	Poor	50	33.3	16	10.7	
Causes of Climate Change	Good	19	12.7	110	73.3	8.663
	Average	65	43.3	23	15.3	<0.01**
	Poor	66	44	17	11.4	
Benefits and barriers of sustainability	Good	21	14	105	70	7.552
	Average	60	40	25	16.7	<0.01**
	Poor	69	46	20	13.3	
Mitigation Strategies	Good	14	9.3	107	71.3	11.203
	Average	46	30.7	25	16.7	<0.01**
	Poor	90	60	18	12	
Impacts on Human Health	Good	30	20	120	80	10.430
	Average	63	42	23	15.3	<0.01**
	Poor	57	38	7	4.7	
Total	Good	20	13.3	110	73.3	12.236
	Average	53	35.3	28	18.7	<0.01**
	Poor	77	51.4	12	8	

Table (3): Distribution of nursing internship students' according to their practice about sustainability and climate change (n=150)

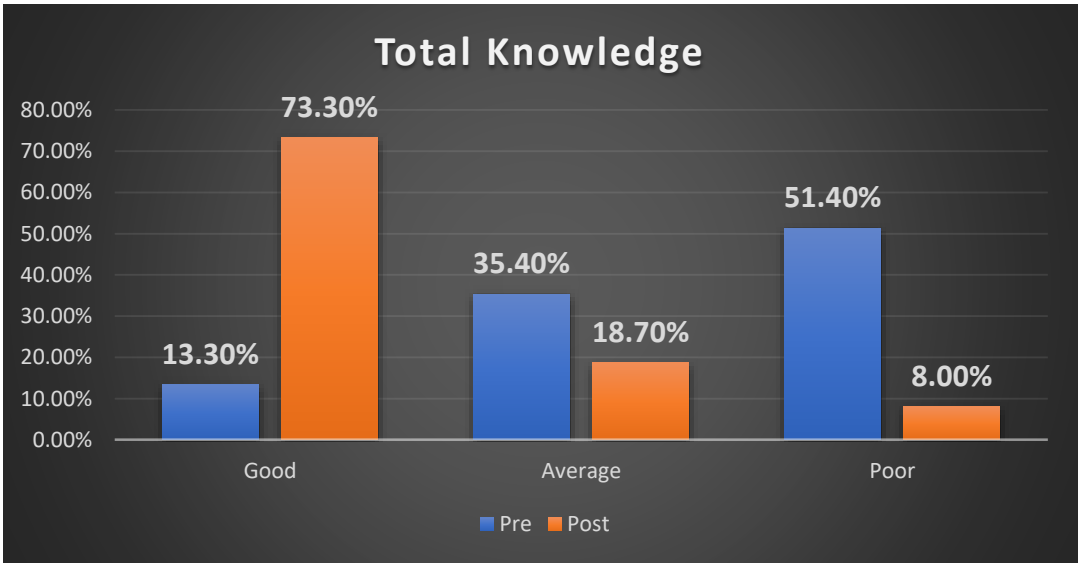
		Pre		Post		Chi-square P. value
		n	%	n	%	
Indoor daily life practices	Satisfactory	41	27.3	94	62.7	8.540
	Unsatisfactory	109	72.7	56	37.3	<0.01**
Outdoor daily life practices	Satisfactory	46	30.7	98	65.3	7.823
	Unsatisfactory	104	69.3	52	34.7	<0.01**
Total practice	Satisfactory	43	28.7	95	63.3	9.990
	Unsatisfactory	107	71.3	55	36.7	<0.01**

Figure (1): Distribution of nursing internship students' according to their practice about sustainability and climate change (n=150)



X^2 9.990. *P* value <0.01**

Figure (2) Distribution of nursing internship students related total knowledge (n=42)



X^2 12.236. *P* value <0.01**

Table (4): Correlation between nursing internship students' knowledge and practice

	r.	p. value
Knowledge and Practice pre intervention	0.603	<0.01**
Knowledge and Practice post intervention	0.647	<0.01**

Table (5): Multiple Linear regression model for nursing internship students' knowledge post intervention (n=150).

		Unstandardized Coefficients	standardized Coefficients		
		B	**B**	**T**	**P. value**
Age		.180	.123	2.601	<0.05*
Gender (Male)		.091	.034	0.879	>0.05
GPA		.253	.212	4.012	<0.01**
Training course (Yes)		.260	.219	4.239	<0.01**
Residence (Urban)		.063	.021	0.620	>0.05
Total practice		.297	.235	5.033	<0.01**
Marital status (Single)		.066	.020	0.540	>0.05
Model	**R^2**	**Df.**	**F**	**P. value**	
Regression	**0.42**	6	9.660	.000**	

a. Dependent Variable: **Total knowledge**

b. Predictors: (constant): Age, Gender, GPA, Training course, Residence, Total practice, Marital status (Single)

Table (6): Multiple Linear regression model for nursing internship students' practice post intervention (n=150).

		Unstandardized Coefficients	standardized Coefficients		
		B	**B**	**T**	**P. value**
Age		.176	.110	2.540	<0.05*
Gender (Male)		.076	.021	0.540	>0.05
GPA		.198	.154	2.998	<0.05*
Training course (Yes)		.219	.176	3.886	<0.01**
Residence (Urban)		.070	.025	0.644	>0.05
Total knowledge		.240	.201	4.110	<0.01**
Marital status (Single)		.039	.008	0.077	>0.05
Model	**R^2**	**Df.**	**F**	**P. value**	
Regression	**0.37**	6	7.800	.000**	

a. Dependent Variable: **Total practice**

b. Predictors: (constant): Age, Gender, GPA, Training course, Residence, Total knowledge, Marital status (Single)

Discussion:

Promoting awareness of sustainability and climate change within nursing internship programs will not only empower future nurses to address the health challenges associated with environmental issues but also contribute to a more sustainable and resilient healthcare system. Promoting awareness of sustainability and climate change is essential in preparing the next generation of healthcare professionals to address the complex health issues associated with environmental challenges **(La Torre et al., 2023).**

The current results mentioned that there was a substantial improvement in the knowledge of subjects regarding the concepts of climate change and sustainability as a direct outcome of the intervention. In addition, according to total knowledge was detected that overall shift in knowledge levels among the nursing internship students. Prior to the intervention, the more than half of them were characterized as having poor knowledge. However, following the educational intervention, a substantial less than three quarters of students had transitioned to a status of good knowledge.

These results attributed to that the education program well-defined and achievable learning objectives, well-designed, up-to-date, and relevant to real-world needs. The program encourage active participation and engagement

from students, promoting critical thinking, problem-solving, and creativity.

These findings are regular with the research conducted by **Nousheen et al. in 2020,** which demonstrated a noteworthy enhancement in the attitudes of student-teachers towards sustainable development (SD) following an intervention. Moreover, the study by **Breakey et al., 2023** revealed that a substantial proportion of students exhibited limited knowledge about climate change, emphasizing the significance of educating future health professionals on the intersection of climate change and health. This collective evidence underscores the value of interventions and educational efforts in addressing these critical issues. Also, **Olsson et al., 2022** revealed that students' knowledge related sustainability improved post intervention. Furthermore, **Esringü & Süleyman, 2020** mentioned that University Students had good knowledge and high awareness post training. Moreover, **Ayanlade, A., & Jegede, 2016** showed that most of students had poor knowledge about sustainability and climate change and recommended to continuous training program related these vital topics.

Regarding reported practice, our study represented that overall shift in daily life practices among the nursing internship students. Before the intervention, a substantial majority were characterized by unsatisfactory practices. However, after the educational intervention, a notable less than two thirds of students transitioned to the category of satisfactory practices. These results supported with the study by **Grandisoli & Jacobi, 2020** stated that the participating students demonstrated substantial changes in both knowledge and behaviors when contrasted with a control group. Also, **Badea et al., 2020** showed that sustainable development improved subjects' practice. Additionally, **Kolenatý et al., 2022** stated that climate change education program increased willingness to act among university students. Furthermore, **Ghazy & Fathy, 2023** detected that the education program has a notable and positive impact on the students' knowledge, attitudes, and daily life practices concerning climate change.

The results suggest that the intervention effectively improved the knowledge and reported practice levels of nursing internship students regarding climate change, sustainability, its causes, and its benefits/barriers. This enhanced knowledge is vital for healthcare professionals, as it equips them with the understanding needed to address climate-related health challenges and promote sustainable healthcare practices. These findings underscore the importance of educational initiatives in preparing future healthcare providers to confront the critical issues associated with climate change and sustainability.

As climate change education programs expand and draw from the accomplishments of their predecessors, they can assume a pivotal role in fostering communities of forward-thinking individuals who possess the practical insight required to confront the challenges that lie ahead **(Monroe et al., 2019).**

Regarding factors affecting nursing internship students' knowledge and practice; This study found attending training courses, higher GPA, age increased overall knowledge and practice related sustainability and climate change. while gender, residence, and marital status did not. Furthermore, a highly significant and positive correlation was observed between the knowledge and practice levels of nursing internship students. These findings suggest that the strong positive correlation between knowledge and practice scores underscores the notion that a robust conceptual understanding of sustainability significantly enhances the capacity to effectively apply sustainability principles in practical situations.

These findings align with the research conducted by **Michel and Zwickle, 2021**, who observed that training courses had a positive impact on students' sustainability knowledge. Additionally, **Zhang et al., 2022** found a positive correlation between knowledge and the level of practical application. Furthermore, **Ofori et al., 2023** identified statistically significant associations between respondents' knowledge and factors such as their level of education, program of study, ethnicity, religion, and mother's occupation. This body of evidence underscores the importance of

education and highlights various influential factors related to knowledge and practice in the context of sustainability and climate change. Also, **Li & Liu, 2022** stated that increase academic achievement increase their students' knowledge about climate change. While, inconsistent with the study by **Tolppanen et al., 2022** who reported that gender of students had significant effect on their knowledge.

Conclusion:

The training program significantly improved the level of climate change and sustainability knowledge and practices among nursing internship students. Also, the findings of this study shed light on several key factors influencing nursing internship students' knowledge and practice in the context of sustainability and climate change. It is evident that attending training courses, achieving a higher GPA, and the influence of age play crucial roles in enhancing the overall knowledge and practice related to these important subjects. Interestingly, gender, residence, and marital status did not appear to significantly impact the nursing internship students' knowledge and practice levels.

Recommendations:

1. Encourage nursing internship students to participate in ongoing training courses about sustainability and climate changes.
2. Implement regular assessments and provide constructive feedback to nursing internship students to track their progress in sustainability and climate change knowledge and practices.
3. Encourage interdisciplinary collaboration between nursing and environmental science or sustainability programs to enhance knowledge exchange and practical applications.
4. Involve nursing internship students in community initiatives related to sustainability and climate change.

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