

Knowledge, Attitudes and Awareness of Human Centered Design (HCD) Approach among Undergraduate Nursing Students -A Pilot Study

Nkechi M Enwerem*, Zillah J Wesley, Davene M White, Sasha Sherwood and Devora Winkfield

College of Nursing and Allied Health Sciences, Howard University, Washington, DC, USA.

*Correspondence:

Nkechi M. Enwerem, College of Nursing and Allied Health Sciences, Howard University, Washington, DC, USA.

Received: 04 May 2025; Accepted: 20 Jun 2025; Published: 28 Jun 2025

Citation: Enwerem NM, Wesley ZJ, White DM, et al. Knowledge, Attitudes and Awareness of Human Centered Design (HCD) Approach among Undergraduate Nursing Students -A Pilot Study. Nur Primary Care. 2025; 9(2): 1-5.

ABSTRACT

Background: Human Centered Design, employs a user-centered approach, constant innovation and creative problem solving to enrich the learning experience of college students.

HCD is increasingly recognized as being a valuable contributor when addressing today's complex healthcare challenges. The aim of this study is to examine the knowledge, attitude, and awareness of undergraduate nursing students in Human Centered Design using a pre -and post -test questions to evaluate outcome before and after lecture.

Method: This is a cross-sectional study, using a pre and post-intervention research design to assess changes in participant's knowledge, attitude and awareness of Human centered design after a six weeks training lecture. The subjects were undergraduate nursing students from the department of Nursing, Howard University serving their Community Health rotation in DCNEXT! Project. The mean, standard deviation of the total pre and posttest scores were calculated. The unpaired t tests were performed to check for the significant differences in the pre-and post-lecture test scores.

Results: The mean post-lecture test scores were significantly greater than the mean pre-lecture test scores

Conclusion: To enhance nursing curricula, educators need to incorporate Human Centered Design training that emphasizes empathy and end-user (patient centered) approach into the nursing process.

Keywords

Pre-test, Post-test, Questions, Human centered design, Didactic lecture, Scores.

Introduction

Nursing plays an important role in public health by promoting health from the physical, mental, emotional, and social aspects [1,2]. To meet the challenges of a complex health care system, changes in cultural and people's needs and technological advances, require highly qualified and nurses who have a creative mind [2-4]. While nurses creatively solve problems in their work daily, most do not learn how to employ innovative methodologies to fix the problem [5-7].

The Future of Nursing Report 2020-2023 identifies *human-centered design thinking and innovation mindset* within the competency expectations for nursing education [1,8].

There is a need to use and explore more innovative pedagogical approaches to addressing contemporary educational challenges [1,9,10]. The implementation of innovative education strategies is crucial to ensure that nursing education remains relevant, engaging, and effective in preparing students for the demands of the modern world [1,11]. Human-centered design (HCD) is a methodology that focuses on understanding a problem from users' (e.g., patients, families, nurses) point-of-view and developing an innovative strategy or creative solution to address it [5,6,12].

HCD offers a methodological framework that can revolutionize the way current educational challenges are addressed. It's user-centered approach, constant innovation and creative problem solving provides a unique opportunity to enrich the learning experience of university students.

HCD is increasingly recognized as being a valuable contributor when addressing today's complex healthcare challenges [13].

Human Centered Design is the co-creation of effective products/services/systems/intervention with the people you are designing for at the center of the innovation. Human-centered design is focused on using empathy to understand the depth and complexity of user needs, behaviors and pain points to create tons of ideas; synthesize insights, select ideas that would be acceptable and feasible, build prototypes by partnering with the people for whom the products/services/systems/intervention is developed. Then make the ideas concrete, receive feedback from the users, refine the idea to better meet the needs of the end users. Involving the end-users from the start of the innovation to finish of the creation of product/services/systems/ intervention and to implementation will increase the acceptability of the product/service/systems/ intervention. Human -centered design, stands at the top of innovation and user satisfaction [13,14]. It has been used in various sectors such as in health (inpatient pain management, a nurse-led quality improvement project). Human-Centered Design offers an innovative approach to develop solutions to address complex issues in health care and public health crises such as childhood obesity, teen pregnancy, physician burnout, STDs, healthcare access disparities etc. [13,14].

The qualities of HCD that makes it different from other qualitative research approach includes: (a) the belief that end-users, hold the power to address challenges they face. (b) The inclusion of extreme users in the study. Although extreme users are few, they provide great insights that the mainstream users may not know. Solving the needs of extreme users directly means that all users would be satisfied with the solution. (c) Research is rooted in empathy where the research team see problems from the perspective of the end-user. Interviewing by empathy, allows the interviewer to understand the participant's thoughts, emotions, pain points, "aha" moments and motivations (d) Co-creates solution rapidly, refine prototype rapidly with end-users. (e) Allocates most of the research time on data collection from end-users and the experts (subject matter experts). (f) Solutions are co-created in a creative and collaborative manner [13,14].

The history of Human Center Design (HCD) can be traced back to the 1960s. It became more popular with the creation of IDEO firm in the 1990s [14-16]. It's use started from the private sector, where traditionally, it's been used in engineering and business as a framework for developing services and products. it is now adapted in healthcare systems to address the growing complexities caused by social, financial, and political crises. Human-centered design can be applied to a variety of practical public health problems at the individual, community, organizational and policy levels.

For example, it has been used in teen pregnancy development programs to prevent new and repeated teen pregnancy [14].

HCD strategy has been combined with other research methods such as community-based participatory research and implementation science. Such combinations have led to collection of rich quantitative and qualitative data. Implementation Science investigates for ways to translate evidence-based care, interventions, and policies into practice to improve health. Combining HCD and implementation science approaches, has led to integration of evidence-based practices within clinical and public health settings. Human Centered design and community-based participatory research (CBPR) are people-centered approach, used in addressing real-world complex problems. CBPR has been used by academic and community organizations in partnership to problem solving. A combination of HCD and CBPR leads to solutions that will be readily accepted by the stakeholders [14].

HCD is considered as a three (3) phase process by IDEO (inspiration; ideation and implementation). Other school of thoughts have proposed a diamond shape process and Hasso Plattner Institute of Design proposed 5 phases (inspiration, define, ideate, prototype and test) [14,17].

The inspiration phase starts with clearly stating the problem to be addressed in form of a problem question. During the inspiration phase, the design team, explores the root causes of the problem/ challenge of importance to the end users whom the innovation is developed. The key characteristics of this phase are, empathy, ability to listen, observe for verbal and non-verbal expressions and ask relevant questions related to the problem using a structured and unstructured interview guide. Information gathered are used for the ideation phase.

At the ideation phase, the researchers come together to examine the data collected from the inspiration phase. The ideation phase consists of two stages (a) Creation of How Might We (HMW) questions: At this stage, ideas with related information are clustered together as themes (insights). (b) Brainstorm. The goal of this stage is to generate many ideas to answer the HMW question.

At the Implementation stage, the selected idea is prototyped by making each idea visual, tested by different group of end-users and feedback received for refinement (iteration) [13,14].

The aim of this study is to examine the knowledge, attitude, and awareness of undergraduate nursing students in Human Centered Design using a pre -and post -test questions to evaluate outcome before and after lecture.

Pre-test and post-test is a research design used to evaluate participant's attitudes or perceptions after an intervention such as a training session to assess if a participant would apply the information presented. The assumption is that there would be an increase in knowledge or positive attitude score on a post-test compared to a pre-test [18].

Method

This is a cross-sectional study, using a pre and post-intervention research design to assess changes in participant's knowledge, attitude and awareness of Human centered design after a training lecture. This is a 6 weeks study conducted in February 2022. The subjects were undergraduate nursing students from the Department of Nursing, Howard university serving their Community Health rotation in DCNEXT! Project. There were a total of 25 students. Institutional Review Approval through Howard University and informed consent was obtained from all participants before participation. Human Centered Design lecture was given after a pretest before the lecture and a post-test at the end of a six-week lecture. The pretest administered, contained 19 items of open ended questions (Table 1) covering the key points pertaining to the lecture to be delivered. The test consists of 19 open ended questions testing knowledge, attitude and awareness on the different phases of IDEO Human Center Design phases (inspiration, ideation and implementation) (Table 1 and 2). The pre- and post-test questions are the same. Means and standard deviations were calculated. A score of less than 50%, is considered low.

Statistical Analysis

Unpaired student's t test was used for comparing the total pre- and post-test scores. P values were calculated using excel. $P < 0.05$. was considered as significant.

Table 1: Open-ended questions.

General
Q1. What is Human Centered Design (HCD)?
Q2. What are the mindsets of a HCD?
Q3. My current nursing education should include HCD?
Q4. Compare and contrast Nursing process and HCD
Inspiration Phase
Q5. How to frame your first design challenge question?
Q6. How can you define knowns, unknowns, and constraints in your design challenge?
Q7. List the different research methods and ways of gathering data.
Q8. How can you create a HCD research plan?
Q9. Conduct and document your first design research process.
Q10. How can you generate a 'How might We Questions'
Ideation
Q11. How can you create insight statements?
Q12. Understand and plan for the process of prototyping.
Q13. What are some ideation tools you can use to make your ideas more visual?
Q14. How can you document the process of ideation?
Q15. How can you test your prototypes?
Q16. How can you practice real-word testing of your prototype in the field?
Implementation
Q17. How can you learn define and gain an understanding of your target audience?
Q18. How can you create an action plan and a pitch for your design solution
Q19. What are the process of selecting an intervention

Results

A total of twenty-five community health nursing students, participated in this open ended pre- and post-test. Total post-test correct responses [18] were higher than the pre-test correct

responses (0). Post-test response was improved after the training. The overall mean scores showed a great improvement in the post-test scores (78.682 ± 15.058) of all the students compared to their pre-test scores (3.201 ± 9.678) (Table 2).

None of the students had heard about HCD. In the pre-test of the 19 questions, students scored a zero (0) in 15 questions. The percentage correct answers in the post-test, ranged from 41.66-100%. The lowest post-test score (41.66%) was a question under implementation (How can you create an action plan and a pitch for your design solution?). All the students planned to integrate Human Centered Design in their practice. The 'p'-score showed that there is a significant difference between post-test scores compared to the pretest.

Table 2: Pre- and Post-test scores.

Item #	Question	Pre-test (%)	Post-test (%)
General Question			
1	What is Human Centered Design (HCD)?	0	100
2	What are the mindsets of a HCD?	0	83.33
3	My current nursing education should include HCD?	0	100
4	Compare and contrast Nursing process and HCD	0	91.66
Inspiration			
5	How to frame your first design challenge question?	8.33	75
6	How can you define knowns, unknowns, and constraints in your design challenge?	0	75
7	List the different research methods and ways of gathering data.	2.5	91.66
8	How can you create a HCD research plan?	0	75
9	Conduct and document your first design research process.	0	60
10	How can you generate a 'How might We Questions'	0	83.33
Ideation			
11	How can you create insight statements?	0	66.66
12	Understand and plan for the process of prototyping.	0	75
13	What are some ideation tools you can use to make your ideas more visual?	0	83.33
14	How can you test your prototypes?	0	60
15	How can you test your prototypes?	0	75
16	How can you practice real-word testing of your prototype in the field?	8.33	83.33

Implementation			
17	How can you learn define and gain an understanding of your target audience?	41.66	100
18	How can you create an action plan and a pitch for your design solution	0	41.66
19	What are the process of selecting an intervention	0	75
Mean		3.201	78.682
SD		9.678	15.058
T-test (unpaired)			
P value (7.01574E-20)			

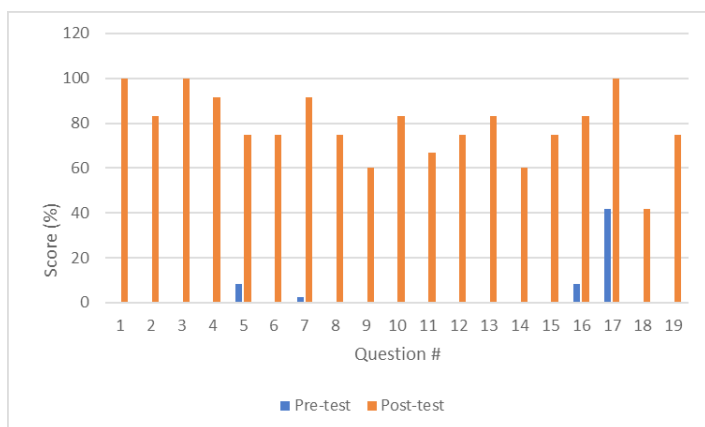


Figure 1: Pre- and Post-test on Human Centered Design (HCD).

Discussion

Pre and post-testing are important in research as evaluation methods and they are well suited to investigating effects of educational innovations and are common in educational research [19-21]. They provide valuable insights into the effectiveness of interventions by measuring changes that occur before and after their implementation. They have been utilized in various fields including education, nursing, psychology, marketing and healthcare [19,20].

The results of this study revealed that post-test scores were higher than pre-test. Also, in all the questions asked, only one question was below 50 % following post-test. Previous prospective research studies have reported the same pattern [19] suggesting that the students were attentive to the lecture and so were able to grasp the key objectives of the lecture. Tayyaba et al., 2019 in their studies, showed that pre-test/post-test model was significantly more effective for students in achieving their learning outcomes in a lecture as compared to post-test only model. Pre and posttest are useful to evaluate participants increase in knowledge but are not effective in evaluation of skills [22]. This study showed a high post test score compared to pretest. Similar findings have been reported by other researchers [19,23].

Conclusion

Pre-test and post-test research design, is a good way to assess if

an intervention has been successful. This study also, suggests that to enhance nursing curricula, educators need to integrate Human Centered Design training that emphasizes empathy and end-user (patient centered) approach in the nursing process.

Funding

This work was supported by Grant Number TP2AH000069 from the US Department of Health and Human Services Office of Population Affairs. The content is solely the responsibility of the authors and does not necessarily represent the official views of the US Department of Health and Human Services or the Office of Population Affairs.

References

- Hassmiller SB, Wakefield MK. The future of nursing 2020–2030 Charting a path to achieve health equity. *Nursing Outlook*. 2022; 70: S1-S9.
- Wakefield MK, Williams DR, Le Menestrel S, et al. The Future of Nursing 2020-2030 Charting a Path to Achieve Health Equity. 2021.
- Pepito JA, Locsin R. Can nurses remain relevant in a technologically advanced future. *Int J Nurs Sci*. 2019; 6: 106-110.
- Risling T. Educating the nurses of 2025 Technology trends of the next decade. *Nurse Educ Pract*. 2017; 22: 89-92.
- Holt, Jeana M, Talsma, et al. Human-Centered Design in Graduate Nursing Education Outcomes From a Cohort Study. *Nurse Educator*. 2025; 50: E68-E74.
- Harte R, Glynn L, Rodríguez-Molinero A, et al. A human-centered design methodology to enhance the usability, human factors and user experience of connected health systems a three-phase methodology. *JMIR Hum Factors*. 2017; 4: e8.
- Göttgens I, Oertelt-Prigione S. The application of human-centered design approaches in health research and innovation a narrative review of current practices. *JMIR Mhealth Uhealth*. 2021; 9: e28102.
- American Association of Colleges of Nursing. AACN essentials. 2021. <https://www.aacnnursing.org/AACN-Essentials>
- Rao BJ. Innovative teaching pedagogy in nursing education. *International Journal of Nursing Education*. 2019; 11: 176-180.
- Sharma RK. Emerging innovative teaching strategies in nursing. *JOJ Nurse Health Care*. 2017; 1: 55558.
- Pangandaman HK, Boloron RP, Lambayong JHC, et al. Innovative classroom pedagogy In nursing education A systematic review. *International Journal of Health Medicine and Current Research*. 2019; 4: 1543-1549.
- Altman M, Huang TT, Breland JY. Design thinking in health care. *Prev Chronic Dis*. 2018; 15: 180128.
- Melles M, Albayrak A, Goossens R. Innovating health care key characteristics of human-centered design. *International Journal for Quality in Health Care*. 2021; 33: 37-44.

-
14. Nkechi Mercy Enwerem. SASH a Structured Approach in Solving a Human-related problem. 2025.
 15. Erwin K, Krishnan JA. Redesigning healthcare to fit with people. BMJ. 2016; 354.
 16. Wildevuur S, Thomese F, Ferguson J, et al. Information and communication technologies to support chronic disease self-management preconditions for enhancing the partnership in person-centered care. Journal of Participatory Medicine. 2017; 9: e8846.
 17. Weinberg U. Hasso Plattner Institute of Design Stanford d. School. 2025.
 18. Stratton SJ. Quasi-experimental design pre-test and post-test studies in prehospital and disaster research. Prehospital and disaster medicine. 2019; 34: 573-574.
 19. Shivaraju PT, Manu G, Vinaya M, et al. Evaluating the effectiveness of pre-and post-test model of learning in a medical school. National Journal of Physiology. Pharmacy and Pharmacology. 2017; 7: 947.
 20. Dugard P, Todman J. Analysis of pre-test-post-test control group designs in educational research. Educational Psychology. 1995; 15: 181-198.
 21. Dugard P, Todman J. Analysis of Pre-test-Post-test Control Group Designs in Educational Research. Educational Psychology. 1995; 15: 181-198.
 22. Alam TGMR. Comparative analysis between pre-test/post-test model and post-test-only model in achieving the learning outcomes. Pakistan Journal of Ophthalmology. 2019; 35.
 23. Shankar N, Vallabhajosyula R. Pre and post-lecture test scores for assessment of short term effectiveness of didactic lectures in anatomy and as a predictor for performance in summative evaluation. South-East Asian Journal of Medical Education. 2012; 6.