Original Article

Investigating the improvement of nursing students' clinical competence through the mastery learning approach compared to the traditional method in the oncology department: A mixed-methods study

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Abstract

Background & Objective: Providing exceptional attention to cancer patients requires nursing education in the oncology unit. Thus, this study aimed to acquire and improve clinical competency in nursing students through the Mastery Learning approach and compare it with traditional education.

Materials & Methods: This study used a mixed-method (exploratory sequential design) approach to develop a clinical competency checklist and evaluate students' skills through Mastery Learning. This research started with a qualitative study and continued with a quantitative one. We developed the checklist using a three-round Delphi method, comprising 41 items based on 7 criteria. An internship program was offered to 20 nursing students in two groups (i.e., Mastery Learning training and traditional training) at the oncology department of Hakim Hospital, Neyshabur, Iran, for one semester. To assess the impact of the intervention on students' anxiety, an Evaluation Apprehension Measure questionnaire was administered to each student before the posttest, followed by a 5-item objective structured clinical examination (OSCE) to assess students' final skills. The competency and anxiety questionnaire was also checked for reliability and validity.

Results: For the clinical competence checklist, 41 out of 52 items showed more than 80% agreement. The results of the anxiety test demonstrated that students receiving Mastery Learning were moderately anxious, while students undergoing traditional training had high levels of anxiety. The results of the OSCE test showed that the students in the Mastery Learning group had significantly higher scores than their peers in the traditional training group.

Conclusion: This study found that Mastery Learning led to a reduction in test anxiety and an increase in clinical competence.

Keywords: Anxiety, Clinical Competency, Deliberate Practice, Mastery Learning, Nursing, Oncology, Traditional Training

Introduction

In medical education training programs, competency-based curricula are replacing time-based curricula. Learner's learning outcomes and skills are the focus of competency-based education, where learners are assessed on their ability to perform skills and demonstrate knowledge (1). A competency-based education program that focuses on mastery learning is a rigorous approach to teaching. Through the use of mastery learning, all learners are encouraged to achieve

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an objective level of performance that varies little or not at all and is higher than the level of mere mastery (2).

The nursing service is currently plagued by a shortage of clinically qualified nurses. Hospitals are facing various difficulties in delivering nursing services due to this problem, which has led to a reduction in the quality of care and lower patient satisfaction and is considered a crucial factor in their survival (3). Educators are partially responsible for the low quality of health care services by utilizing ineffective teaching methods and curriculums (4, 5). Several medical experts believe that inadequate skills within the medical team can jeopardize the health of society (6). Evidence suggests that the skills acquired by students are far from ideal and they have not gained adequate professional qualifications (7). Oncology is one of the modern courses offered to student nurses where they can develop the necessary skills to care for cancer patients. A review of the literature shows that nurses lack expertise in the care and treatment of cancer patients, which has a detrimental effect on the quality of care provided to cancer patients (8). Oncology nurse education is an important component of cancer care that is rarely discussed in the literature.

The mastery-based learning model is one of the learning models in which learning progress is determined by individual performance rather than by the passage of time. In this method, learners are assessed regularly until they reach the desired mastery level. The amount of time required for mastery is the same for all learners, although the amount of time required varies (9). The mastery learning model was first developed by Benjamin Bloom, James Block, and John Carroll in 1963. Bloom's theory states that a learner must practice continuously for a certain period to reach the desired level of mastery. Once the learner has reached the desired level (80%-90%), they are allowed to move on to the next lesson or program (10). The Mastery Learning model thus encompasses the same goals for all learners without fixed learning time.

Previous studies in the medical field have mostly focused on the impact of mastery learning on practical skills, such as Central Venous Catheter placement, thoracentesis, paracentesis, cardiopulmonary resuscitation, and lumbar puncture (11-17). These studies mainly searched medical resources and databases, and the researchers were all from Northwestern University of Chicago. However, a limited number of articles were published in other medical disciplines, such as nursing and occupational therapy. The research findings suggest that this model can be applied to students in other medical disciplines and professions with different levels of competence and that its effectiveness can be evaluated. Therefore, this study investigated the effect of mastery-based clinical competence training in an oncology course on nursing students to improve students' clinical skills in managing cancer patients.

Materials & Methods

Design and setting(s)

An exploratory sequential mixed method study was conducted to evaluate nursing students' clinical competence in the treatment of cancer patients during the 2018-2019 academic semester in the oncology department (Clark and Creswell, 2011). This study employed a Delphi method for instrument development that is followed by confirming its psychometric properties, such as validity and reliability.

In this study, the model presented in Association for Medical Education in Europe (AMEE) Guide No. 82, which is based on mastery learning, was used and modified to assess clinical competence (2). The basis of this model is to design assessment questionnaires and take measures in accordance with clinical education outcomes and goals. To evaluate mastery learning, a quantitative intervention was conducted based on the minimum score required for each clinical skill on the competency checklist. For this purpose, nursing students were randomly assigned to two groups. One group received competency-based education and the other received traditional education. This intervention was quasi-experimental and included a pretest and a posttest. This study was conducted according to the modified model shown in Figure 1, which includes the activities required to conduct the study.

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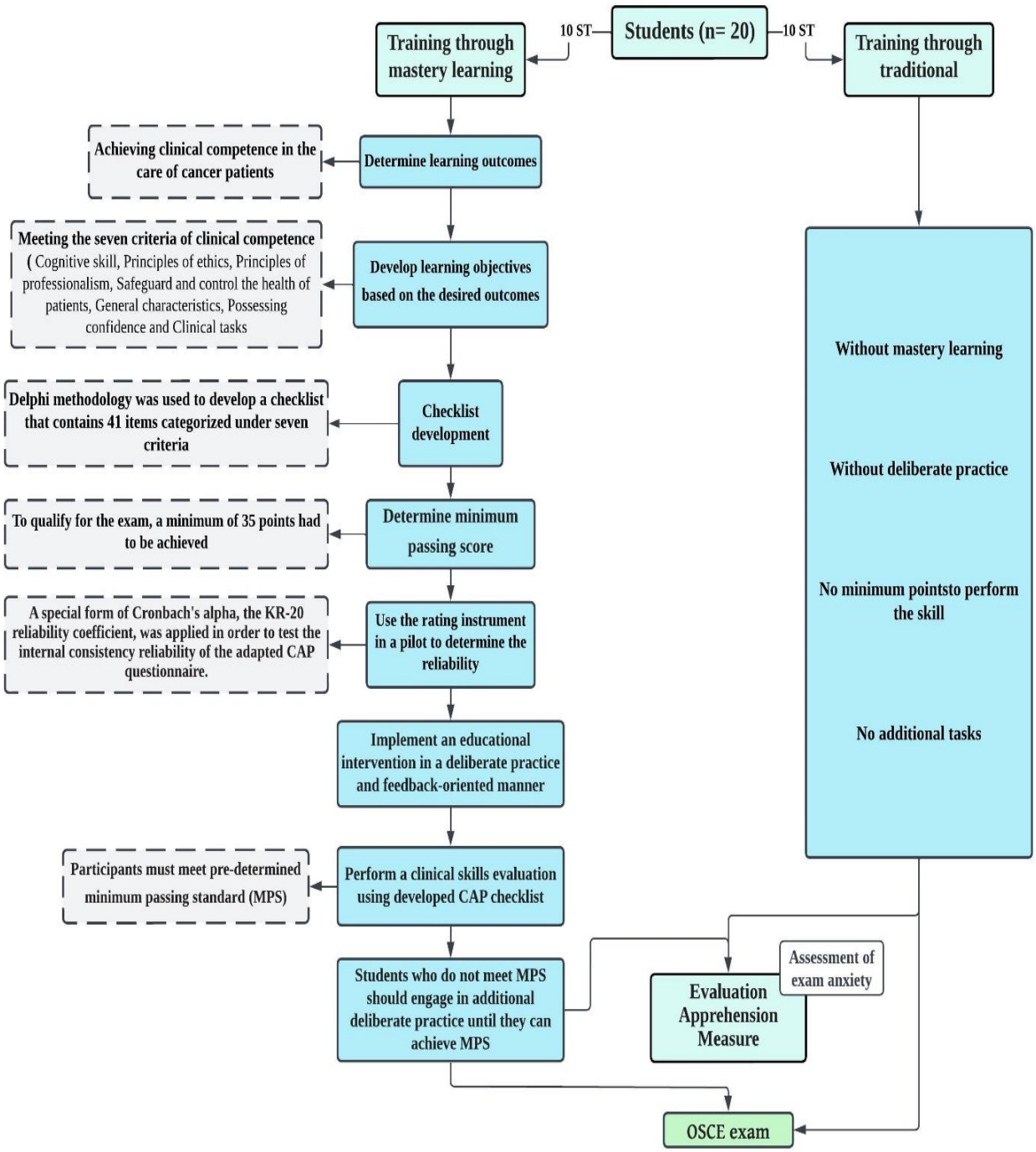


Figure 1. Flowchart of the study and stages in the development of the CAP

Participants and sampling

The study was carried out in the oncology department of Hakim Neyshabur Hospital, Neyshabur, Iran. Study participants included nursing students who were enrolled in the fourth semester and had provided written informed consent. To be eligible, students had to have a study section in the oncology department, attend all study sessions, and complete all assignments. A total of 20 students were divided into two groups based on mastery learning and traditional training. The study's consort flow is illustrated in Figure 2.

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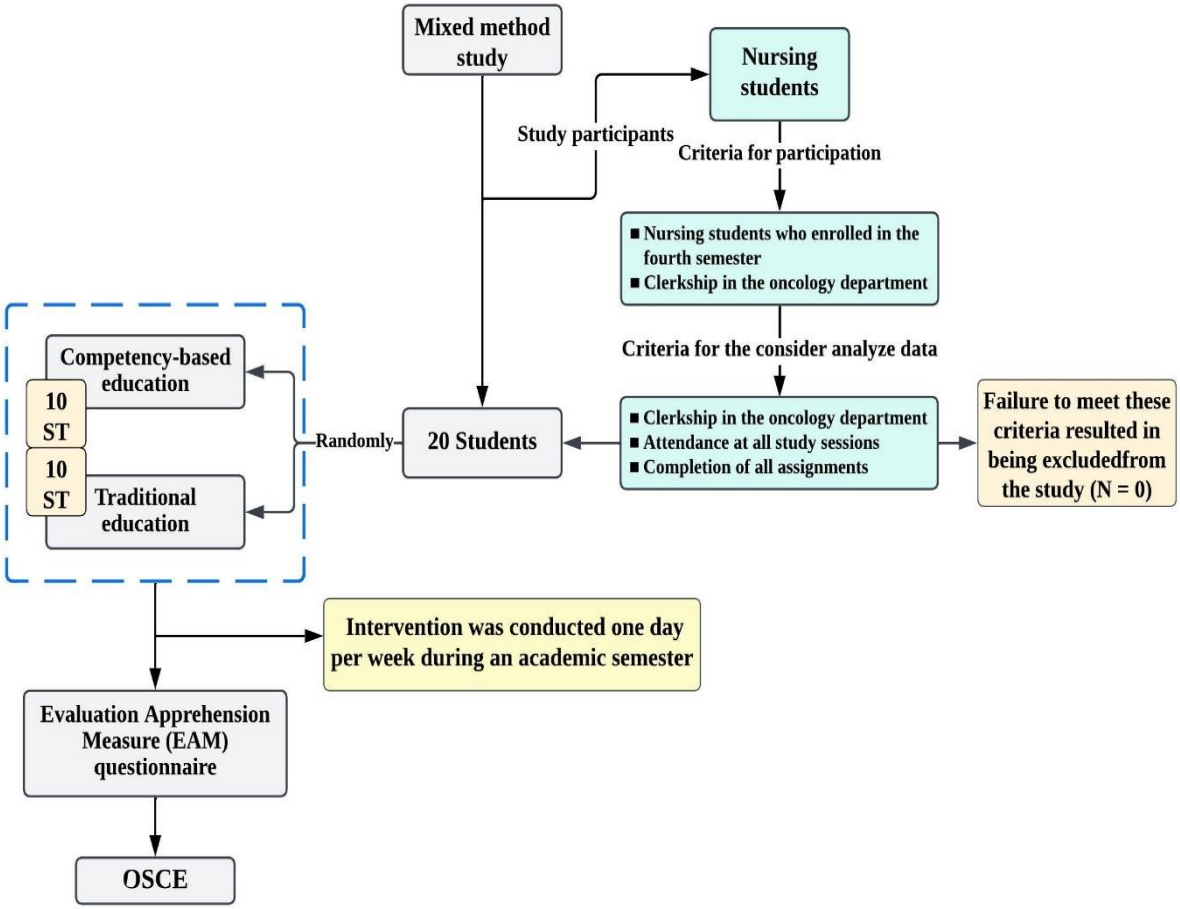


Figure 2. Criteria for inclusion of students and flow of the study

Data collection methods

Using the Delphi method, a checklist of clinical skills required in the oncology department was created and its validity and reliability were evaluated. In accordance with this checklist, an objective structured clinical examination (OSCE) was performed. It consisted of five subscales, each focusing on a specific skill. The exact measure of performance for each section subscale was calculated using the average time spent by three experts on completing them. Students had to work within the given time frame. For the whole test, there were 10 points for each section and a maximum score of 50, with students required to receive 10 points for progressing to the next section within the allotted time and 5 points for progressing to the next section beyond the allotted time. The validity and reliability of the portions of this test was confirmed by ten clinical faculty members. The OSCE examination was conducted using AMEE Guide No. 49, and the stations were arranged accordingly (18).

To measure the effectiveness of the educational intervention in reducing students' anxiety before the OSCE test, the Evaluation Apprehension Measure (EAM) questionnaire was used (19). This questionnaire was administered after the implementation of the intervention. A reliability of 0.85 was determined for this 20-item instrument using Cronbach's alpha. The replies to this tool are rated on a 5-point Likert scale (1=strongly disagree, 2=disagree, 3=neutral, 4=agree, and 5=strongly agree). The total score is obtained in the range of 20-100, with a score of ≤ 25 representing low test or assessment anxiety, 26-79 demonstrating moderate test or assessment anxiety, and ≥ 80 indicating high test or assessment anxiety (19). In Box 1, the instructions for using this questionnaire and its scoring and interpretation are provided.

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Box 1. Guide to Scoring and Interpreting the Evaluation Apprehension Measure questionnaire

Note: "SCORING: To compute your scores, add your scores for each item as indicated below:
Step One: Add scores for items 1, 2, 5, 7, 8, 9, 11, 14, 17, & 20.
Step Two: Add scores for items 3, 4, 6, 10, 12, 13, 15, 16, 18, & 19.
Step Three: Add 60 points to Step One.
Step Four: Subtract the score for Step two from the score for Step Three.
After recoding the previous questions, add all the numbers together to get your composite EAM score.
The score should be between 20 and 100. Scores of 80 and above indicate high test or assessment anxiety, scores of 25 and below indicate low test or assessment anxiety and scores between 26 and 79 indicate moderate test or assessment anxiety."

Because the decisions of other students might influence the outcome, we conducted the anxiety test individually for each student, and their results were also independent of those of other participants. Finally, a qualitative report of the obtained results was prepared.

Face validity of the EAM questionnaire

To translate the questionnaire from English into Persian, the standard "forward-backward" procedure was utilized. In this procedure, two independent translators had to translate the questionnaire into the target language and then compare their results. Any potential discrepancies were discussed and resolved before releasing the final version. All items were clear and none of the statements had to be removed. To quantitatively assess the face validity, 20 student nurses from the target population (from departments other than oncology) were asked separately to rate on a Likert scale the difficulty in understanding the concepts, the ambiguity of perceptions, and the appropriateness and relevance of each item. The impact score was calculated using the suitable formula to determine the appropriateness and relevance of the items.

Impact score: frequency in percent × importance score

In the percentage method, frequency represents the number of respondents who assigned four or five points to the item (important, simple, clear, and absolutely important, simple, and clear), while importance represents the mean (3). Responses are scored on a Likert scale from 1 to 5. In addition to the quantitative analysis, the validity of the study was also confirmed qualitatively by a panel of experts consisting of the members of the research team, translators, and experts.

Development of competency checklist

The competency checklist (Competency Assessment Program [CAP]) was developed following the first three processes described by Streiner and Norman for developing quality assessment tools. This process consists of five critical steps: (1) preliminary conceptual decisions; (2) item generation; (3) assessment of face validity; (4) field trials; and 5) generation of a refined instrument that allows an instrument to be generated, refined, and potentially adapted as a result of continuous improvement. As part of our study, we created an initial checklist that was modified and finalized by a Delphi expert group. Given its unique advantages, Delphi studies were a fitting approach for the current study. These benefits include anonymity, lack of sociopsychological pressure on panelists, and a higher response rate than other study techniques.

A typical Delphi survey consists of three rounds of questionnaires, and consensus decisions are made among respondents at the end of the third round. The essential clinical competencies expected in the oncology department were identified in three sessions of focused group discussions by several educators having experience in teaching this field (senior nurses and five experienced nurses). As a first step, the researcher explained the objectives of the study to the participants and asked them to answer all questions accurately and honestly. There were seven open-ended questions about expected clinical competence in the oncology department (Cognitive skill, Principles of ethics, Principles of professionalism, safeguarding and controlling the health of patients, General characteristics, possessing confidence, and Clinical tasks), which were answered by the sample units. The researcher then prepared a checklist listing the items for each category and crossing out duplicate comments. In the second session, the checklist was discussed, and participants were asked to assign a score to each item according to its importance and necessity (0 to 4 points). After the second session, the mean score of each item was calculated. In the third session, a checklist with three columns for each item was discussed. The first column represented the person's previous score, the second column was the overall mean for the desired item, and the third column was dedicated to the person's final score at the end of the third session. Following the third session, the mean score for each item was recalculated, and we included the items

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with scores above the mean in the checklist as indicators of clinical competence. An analysis of descriptive statistical indicators, including mean frequency and percent frequency, was performed to determine the priority of effective items for clinical competence. As part of the checklist for some items, experts determined a measurement standard that could be used to assess mastery; however, this article does not discuss it in any detail.

Reliability of CAP

A special form of Cronbach's alpha, the KR-20 reliability coefficient, was applied to test the internal consistency reliability of the adapted CAP questionnaire (20). KR-20 reliability coefficients of less than 0.50 are considered low, between 0.50 and 0.80 moderate, and above 0.80 high (20). The reliability of the test-retest was evaluated by requesting four faculty members (20%) to complete the questionnaire again after two weeks. Considering the dichotomous nature of the questionnaire responses, Cohen's kappa statistics were used for the reliability testing. Kappa results can be interpreted as follows: values of 0 indicating no agreement, 0.01-0.20 as none to slight agreement, 0.21-0.40 as fair agreement, 0.41-0.60 as moderate agreement, 0.61-0.80 as substantial agreement, and 0.81-1.00 as almost perfect agreement (21).

Intervention

At Hakim Neyshabur Hospital, Neyshabur, Iran, an intervention was conducted one day per week during an academic semester. Both groups were to participate in the same clinical tasks. The training was conducted in the same way by the instructors of both groups; nevertheless, the manner of delivery was different. To assess the stress of the exam, the students were asked to complete the anxiety questionnaire prior to the start of the OSCE exam. The description of the tasks students were required to complete is provided in Table 1.

Mastery learning training

Instructors were given a list of clinical tasks that the students had to complete each week in the oncology department, along with instructions that if students completed the tasks correctly and on time, they would have the opportunity to attend training the following week. Students were also required to attend additional training if they did not complete their assignments correctly. Students had to master one skill before they could attempt to improve another skill based on this approach. To get the best results, the instructor had to teach each student carefully and then assess their skills. Students were allowed to practice each task three times and the instructor recorded the student's final score at the end of the four practice sessions. Students who failed to achieve the minimum score had to participate in the exercise again the following week.

Traditional training

In traditional education, the instructor typically guided and taught the students. However, the learning of the skills was not assessed, and if the students made a mistake, they still participated the following week.

The week after they had completed the training and learned the skills, they had to give an objective test. For this test, the OSCE procedure was used, which is described in the data collection tool section.

Data analysis

The Shapiro-Wilk test indicated that the data were not normally distributed. Therefore, non-parametric statistical tests were used to analyze the data. The Mann-Whitney test was employed for between-group comparison (comparison of Mastery Learning groups with traditional training). Significant results were determined with a significance level of 0.05 and a confidence of 95%. Qualitative data were also analyzed quantitatively. In this study, the systematic review by Diamond et al. was used to determine consensus, which suggested 75% as the mean threshold for defining consensus (22). A group consensus of more than 75% on each question was considered acceptable for the baseline. For this study, panel participants were carefully selected, including cancer unit lecturers, experienced nurses, and supervisors. Data were collected in three rounds of the Delphi study between January and March 2018.

Results

For the first round, the checklist was shortened from 52 items to 45 items by removing or merging 7 items. Multiple settings were represented in the study and the sample size was large enough to allow for appropriate sub-classifications. In round II, only 2 items were removed, and the confidence intervals of the regression analyses and the competency checklist were investigated as the purpose of round II was not to terminate items. The final round resulted in summary scores where 5 of the items did not meet the a priori consensus requirements and were removed. The revised competency checklist consisted of 7 criteria and 41 items, each worth one point. Table 1 presents the percentage of agreement for each item. Accordingly, the scoring range was from 0 to 41

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points, and students were eligible to take the test if they scored 35 points (85%). Of the students in the Mastery Learning training group, 8 achieved more than 35 points through Mastery Learning and 2 others repeated the clinical activities until they achieved Mastery.

The results of the quantitative EAM face validity assessment showed an agreement rate of over 80% and an impact score of over 1.5, indicating that the item was easy to interpret and could be used effectively in the survey. It was expressed in a way that they could easily comprehend by the sample group. The results of test anxiety are tabulated in Tables 2 and 3. In the group of students who received Mastery Learning training, nine students had moderate anxiety about the OSCE exam, and one student had low anxiety (Table 2). In contrast, nine students in the traditional learning group reported high anxiety levels and one student reported moderate anxiety levels (Table 3).

The pre-test results indicated that the skill levels of the two groups were similar (P=0.631) (Figure 3A). The results of the post-tests between the Mastery Learning and traditional groups were significantly different (P<0.0001) (Figure 3B). In addition, the Mastery Learning group had a lower level of anxiety, which may improve their performance.

Table 1. Design and develop the clinical competency checklist by the Delphi team

Criterion	Activity	Fully meets the requirements (1)	It does so relatively (0.75)	With full guidance, they perform these tasks (0.50)	It performs imperfectly (0.25)	The work is beyond her capabilities (0)	Agreement percentage
Cognitive skill	Drug knowledge (usage, prescribing, and side effects)						89%
	Routine tests interpretation						94%
	Knowledge of malignant diseases						86%
	Knowledge of the type of nursing care associated with the disease						92%
Principles of ethics	Privacy of patient information						85%
	Participating in the decision-making process related to care and treatment						83%
	Error reporting capabilities						88%
Principles of professionalism	Fulfillment of obligations and responsibilities in a timely and complete manner						85%
	The ability to cooperate and feel responsible towards others within the group						94%
	Interest and satisfaction in the performance of tasks						80%
	Being active and seeking new experiences						91%
	A well-planned approach to completing assigned tasks						87%
	Prioritizing tasks to achieve success						84%
	Maintaining accuracy in the performance of tasks						95%
	Acknowledging criticism and resolving problems through determination and effort						96%
	Participation in the internship environment in a cooperative and respectful manner with the instructor, staff and fellow interns						94%
	Assisting clients with patience and respect, and providing them with the necessary guidance as necessary						88%
	Empathizing with the patient and providing support						87%
	Having patience						93%
	Having bravery						85%
	Inform the instructor or head of the department of any special cases						82%
Safeguard and control the health of patients	Safeguarding personal safety and health in the hood room						89%
	Assuring that the oncology unit is in compliance with infection prevention and control principles						81%
	Preparation of chemotherapy drugs in accordance with safety principles						88%
	The proper disposal of chemotherapy equipment and waste						86%
	Ascertaining the patient's environment for safety and implementing any necessary security measures						82%

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General characteristics	Maintain a professional appearance (etiquette, clothing, makeup)	95%
	Punctuality in attending training	94%
	Attending training sessions regularly	83%
Possessing confidence	Expression of opinions in challenging situations	80%
	Accomplish assigned tasks without anxiety	90%
Clinical tasks	Venous opening in chemotherapy	87%
	Treatment with fluids and drugs prior to and following chemotherapy	85%
	Adequate vein care and appropriate action to be taken in the event of a drug leak	93%
	Transfusion of blood and its management	88%
	Reporting and investigating complications associated with chemotherapy drugs and managing their side effects	81%
	BMA preparation and maintenance	84%
	Inclusion of reports in the patient's medical record	87%
	Rapidity of clinical action	91%
	Performing patient examinations	80%
	Provide education to the patient (nutrition, infection control, chemotherapy and side effects, disease, and care)	83%

Table 2. The results of the anxiety questionnaire for the group participating in the mastery learning program

	Item	St 1	St 2	St 3	St 4	St 5	St 6	St 7	St 8	St 9	St 10
1	I feel apprehensive while preparing for a test.	2	3	1	1	1	2	2	1	2	3
2	I feel tense when I am studying for a test or exam.	2	2	2	3	1	2	1	2	1	2
3	I am calm when I am studying for a test.	5	4	3	5	5	4	5	4	5	4
4	I feel peaceful when I am studying for a test.	5	5	4	5	5	5	5	5	5	4
5	I feel fear and uneasiness when taking an exam or being evaluated.	3	2	1	3	2	1	2	2	1	2
6	I feel self-assured when taking an exam.	4	5	5	4	5	4	5	5	5	4
7	I feel fearful when preparing for a test.	2	1	2	2	1	2	2	1	2	3
8	I feel ruffled when the test is handed to me.	2	2	2	2	1	1	1	1	1	1
9	I am jumpy and nervous while taking a test.	2	1	1	3	2	3	2	2	2	1
10	I feel composed and in control while taking an exam.	5	4	5	4	5	5	5	5	5	4
11	I am bothered and tense when I am being evaluated.	3	2	2	1	1	2	1	2	1	1
12	I feel satisfied when my exam is completed.	5	5	4	5	5	4	5	5	5	5
13	I feel safe during evaluative situations.	5	5	4	3	5	5	5	4	5	5
14	I feel flustered and confused when I start a test.	1	2	3	3	2	1	2	2	2	1
15	I am cheerful after I turn in my test.	5	4	5	5	5	4	5	4	5	4
16	I feel happy about how I did in evaluation situations.	5	5	5	4	4	5	5	5	4	5
17	I feel dejected and humiliated an hour before an exam.	1	1	2	3	2	2	1	1	2	1
18	I feel pleased and comfortable while taking a test.	5	4	5	4	5	5	5	5	4	3
19	I feel confident while taking a test.	5	5	4	5	5	4	4	4	4	5
20	I feel unhappy throughout an exam period.	1	3	1	2	1	2	2	1	1	2
Final Score		30	32	33	39	25	33	27	29	28	34
Conclusion		M	M	M	M	L	M	M	M	M	M

H: High, M: Moderate, L: Low

Table 3. The results of the anxiety questionnaire completed by the traditional training group

	Item	St 1	St 2	St 3	St 4	St 5	St 6	St 7	St 8	St 9	St 10
1	I feel apprehensive while preparing for a test.	4	4	5	4	3	5	5	5	4	4
2	I feel tense when I am studying for a test or exam.	3	4	4	5	3	4	5	5	4	5
3	I am calm when I am studying for a test.	2	2	3	1	1	2	2	1	2	1
4	I feel peaceful when I am studying for a test.	3	1	2	3	2	2	1	2	1	3
5	I feel fear and uneasiness when taking an exam or being evaluated.	5	4	5	4	5	5	4	3	5	5
6	I feel self-assured when taking an exam.	2	3	2	1	1	2	3	2	1	2
7	I feel fearful when preparing for a test.	4	4	5	4	5	4	5	5	4	3
8	I feel ruffled when the test is handed to me.	5	4	5	5	5	3	4	5	4	5
9	I am jumpy and nervous while taking a test.	5	5	4	4	5	5	4	4	5	4
10	I feel composed and in control while taking an exam.	2	3	2	2	3	1	2	2	1	2
11	I am bothered and tense when I am being evaluated.	3	5	5	5	4	4	5	4	5	5
12	I feel satisfied when my exam is completed.	2	3	1	2	2	1	2	3	1	2
13	I feel safe during evaluative situations.	2	2	1	3	2	1	2	3	2	2
14	I feel flustered and confused when I start a test.	5	3	5	4	5	4	5	4	3	5
15	I am cheerful after I turn in my test.	2	1	3	2	2	1	3	2	1	2
16	I feel happy about how I did in evaluation situations.	1	2	3	3	2	1	2	3	2	1
17	I feel dejected and humiliated an hour before an exam.	5	4	4	3	5	4	5	5	4	3

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18	I feel pleased and comfortable while taking a test.	2	4	2	1	3	2	2	3	2	3
19	I feel confident while taking a test.	1	3	1	2	3	3	2	1	2	2
20	I feel unhappy throughout an exam period.	4	5	4	5	4	3	5	4	5	5
Final Score		84	78	91	83	83	85	86	82	88	84
Conclusion		H	M	H	H	H	H	H	H	H	H

H: High, M: Moderate, L: Low

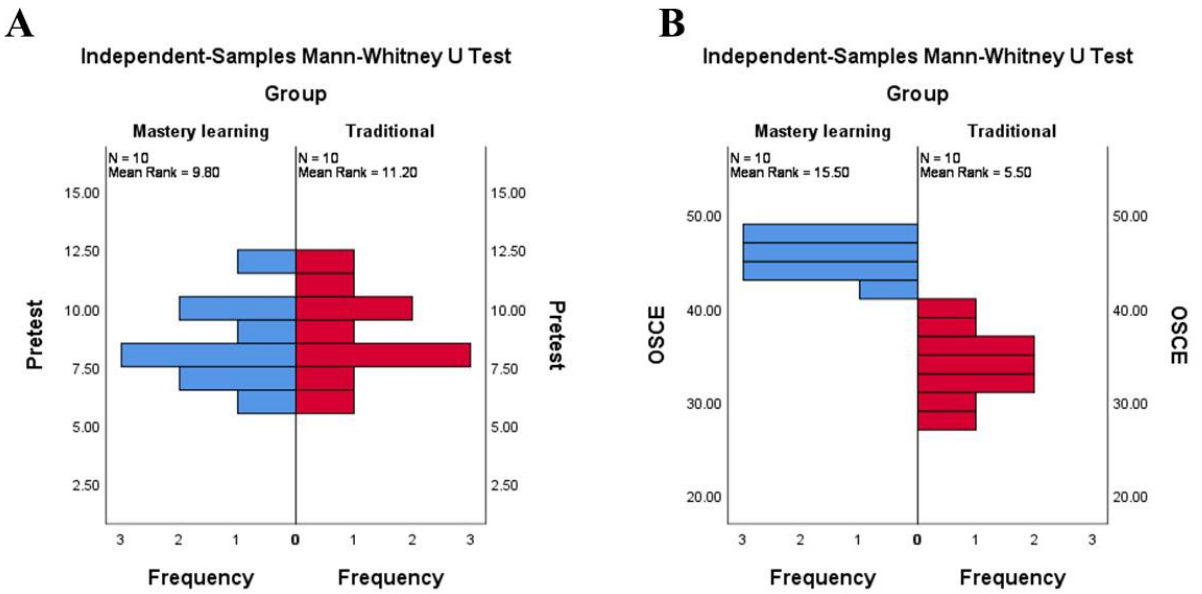


Figure 3. Results of the pretest and posttest. A) It illustrates the results of the pretest and the homogeneity between the two groups. B) It shows the results of the OSCE test.

Discussion

We conducted this study to evaluate the clinical competence of nursing students in the oncology unit. To determine clinical competency, the Delphi method was employed. One instructor used a Mastery Learning model to teach clinical competence in one of the groups, while another instructor used a traditional training method in the other. According to the OSCE test results, teaching through Mastery Learning could improve the learning of clinical skills and enable students to gain mastery. Furthermore, the group of students who were trained through Mastery Learning had less anxiety when attempting to perform the skills. There was a correlation between the reduction of anxiety and the score obtained in the OSCE exam, as the findings of studies show that higher levels of anxiety have a negative impact on the score of the exam (23). The OSCE exam is very stressful and can be a source of anxiety for students. If students are able to decrease their anxiety before the exam, they will be able to focus better on the exam and have a better chance of achieving a higher score. The literature review found no articles related to Mastery Learning in the oncology unit; therefore, this study represented the first study in this area.

According to the results of a study by Alnajar et al., nurses need to be more competent in managing cancer pain; a skill that requires appropriate training and experience (24). The concept of Mastery Learning is an approach to education based on game elements. This approach focuses on providing students with multiple opportunities to practice and master a concept or skill. It encourages learning through exploration and experimentation, giving students the chance to practice and refine their skills. Among the components of gamified training, one can mention determining the minimum level of mastery, breaking the outcome down into goals, achieving the mastery level, moving on to the next unit, and providing additional training if necessary (25). By providing rewards for completing objectives, gamification encourages learners to complete the course while monitoring their progress (26). It also helps to motivate learners, giving them a sense of accomplishment, and ultimately leading to increased learning. Masoumian et al. examined the behavioral fluency of nursing students in crises using game

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elements, the results of which revealed that mastery-based teaching could enhance learning retention (27). Morgan's study redesigned a baccalaureate nursing course on health assessment to include detailed rubrics, sample instructor videos, and time to practice. Student-produced physical assessment videos served as formative assessments for each body system. To master the physical assessment, all students participated in Mastery Learning training while practicing their skills, receiving feedback, and gaining confidence (28). A mastery learning program for undergraduate nursing skills was developed and tested by Park. During the course of the mentioned study, 50 senior nursing students were randomly assigned to a non-synchronized, single-blinded, non-equivalent control group. Each group was evaluated before and after the program to assess their level of achievement and performance on the selected nursing skills. Results from the study suggested that Mastery Learning programs for undergraduate students might improve the performance of essential nursing skills (29).

This study can provide valuable insights into how Mastery Learning can be adopted to improve patient care in the oncology department by focusing on the specific needs of oncology patients. Furthermore, it can provide a benchmark for future studies that aim to evaluate the effectiveness of Mastery Learning in the oncology department.

It is noteworthy that this study had some limitations, including the small number of participants, which might have affected its reliability. In addition, due to the small sample size, the study's results cannot be applied to the general population. However, this can be compensated for by further replication of this study with a larger sample size to obtain more reliable results. Assessing skills based on the OSCE requires a significant amount of time and planning; in this regard, the pretest was conducted in the form of a session with open-ended questions. The purpose of the pretest in the present study was to assess homogeneity between the two groups; therefore, the pretest was not compared with the posttest. In this study, the clinical competencies were established in accordance with the educational background of Iran as a result, they may differ from the culture of other countries. Therefore, it is necessary to consider the local culture when determining the clinical competencies of a particular region.

Conclusion

The findings of this study demonstrated that Mastery Learning led to a reduction in test anxiety and an increase in clinical competence. Mastery Learning is a teaching practice that allows students to learn at their own pace and master one concept before moving on to the next. This allows students to feel more confident in their abilities and be better able to tackle tests without feeling overwhelmed. This approach emphasizes the development of knowledge and skills, rather than memorization and repetition. Furthermore, it allowed nursing students to develop a deeper understanding of their subject material, leading to better long-term recall and retention.

Ethical considerations

The Institutional Review Board of Neyshabur University of Medical Sciences, Neyshabur, Iran, approved the study (IR.NUMS.REC.1398.019). Students were informed of the structure of the intervention (i.e., objectives, tests, and study procedure) before participating. Finally, all students who were willing to participate in the study provided written informed consent. Confidentiality of the data was maintained, and only the research team and the Institutional Review Board had access to the data. The analysis was conducted in groups, preventing any direct link between the results and any individual participant. All methods were conducted in accordance with the Declaration of Helsinki.

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Disclosure

The authors have no conflicts of interest.

Author contributions

M.M.H, Ak.G., and T.M.H were responsible for the study's conception and design and supervised the study's content design. The article was critically reviewed by Az.G. H.R., and V.M., who were in charge of implementing and data collecting. It is worth noting that

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M.M.H. performed the statistical analysis of the data. All authors not only read and approved the content of the manuscript but also participated in its preparation. The results of this manuscript do not reflect the dissertation results and were approved by the research team.

Data availability statement

Upon a reasonable request, the corresponding author can provide the data set that was analyzed in this study.

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