CHAPTER 5

SUMMARY, CONCLUSIONS AND DISCUSSIONS
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5.1 INTRODUCTION

In this chapter the background and need for the study, a description of the objectives and hypotheses, as well as research procedure, findings of the study, conclusions are summarized. Discussion regarding educational implications, limitations of the present study and recommendations for further research are also presented.

5.1.1 Background: Nurses are equipped with a professional qualification and possess skills to provide wide spectrum of nursing services. Nursing services encompass autonomous and collaborative care of individuals of all ages, families, communities, sick or well in all health care settings. Nurses provide nursing services to promote health, prevent illness, restore health and facilitate coping with disability. For providing these nursing services nurses rely on essential components such as knowledge, as well as technical, interpersonal and ethical skills. A fine blend of these components is required to perform various nursing procedures for effective and quality nursing care. Some of these important procedures are health assessment and monitoring, which includes physical examination and carrying out simple laboratory investigations; to assist sick individuals to carry out daily activities; to provide treatment for minor ailments; to provide preventive and curative services such as immunization and to carry out prescribed treatment orders such as *administration of prescribed drugs.*
5.1.2 Need for the study: The researcher carried out an extensive review of literature in the area of healthcare. From the review, the researcher found that drug administration is one of the most vital clinical skills. The administration of injections has become a common nursing intervention in clinical practice. This activity is perceived as fundamental to patient care. Injections are among the most frequently used pharmacological administrative procedures, with an estimated 12 billion injections administered throughout the world on an annual basis. (Altun, Dede, Özlem, & Barin, 2010).

To enable the nurse to perform her vital role effectively and efficiently an elaborate education system has been designed. Clinical training is the heart of professional teaching in the field of nursing education. Hence more than 50% of their training has a clinical base so that they can acquire the required professional skills. Presently, nursing education is more or less imparted traditionally, where topics are taught by lecture method and clinical skills are demonstrated in the demonstration laboratory by the teacher. Clinical skills are then practiced by students in the hospital settings. However, it seems that something is missing in the present day training of nurses, since many research studies have found that errors do occur in nursing care. For instance, Balas et al. (2004) have found that over one quarter of the randomly selected 502 nurses had made at least one error. Total number of errors was 574, amongst which errors in drug administration were found to be most common (56.7%). These errors can become fatal to the patient. (Balas, Scott, & Rogers, 2004) . Wolf et al. (2006) investigated the rationale for medication errors that occurred during the administration phase by over 1,300 nursing students by doing a secondary analysis on MEDMARX, a database operated by the United States Pharmacopeia through the
Patient Safety Program. The authors revealed that the most common error was omission of a medication followed closely by a wrong dosage and a wrong route followed by not abiding with procedures or protocol. The main reasons found were deficient knowledge and lack of communication. (Wolf, Hicks, & Serembus, 2006).

In Indian settings, the situation is not very different from those stated above. Reddy et.al (2009) conducted a study to identify drug errors. Authors explored in their study, that 38% errors are due to performance deficit. Untrained nurses were another major cause accounting for 13% of adverse medication events. The study revealed that prescription and administration was a root cause for drug administration errors. (Reddy, Modi, Choudhary, Modi, & Patel, 2009).

Such research studies pose a question about traditional teaching method and examination system in training nursing students for clinical skills. Hence the researcher decided to assess whether a Mastery Learning Model would be more effective as compared to the conventional method in training the nursing students for performance of clinical skills. As stated earlier, drug administration is a most commonly required skill in nursing services and hence, the researcher decided to take a clinical teaching of three modes of parenteral drug administration namely intramuscular, subcutaneous, and intradermal, for the present investigation.

**5.1.3 Problem statement:** The researcher defined the problem and carried out investigation in search of the answer to the problem. The problem statement is: “To study the effect of Mastery Learning Model on the performance of nursing students with respect to selected drug administration.”
5.1.4 Conceptual framework: In this study, the researcher has used conceptual framework of Mastery Learning Model given by Bloom.

5.1.5 Objectives of the study: The main objectives of the present investigation were as follows:

- To plan various activities to teach the students belonging to the experimental group by Mastery Learning Model.
- To assess the effectiveness of Mastery Learning Model through comparison of the performance of the students from the experimental group and the control group in the summative tests (cognitive based and psychomotor based).
- To assess the effectiveness of Mastery Learning Model, in retaining knowledge and skills acquired, through the comparison of the performance of the students from the experimental group and the control group in the retention (short duration and long duration) tests (cognitive based and psychomotor based).

These main objectives were further divided into the following sub-objectives:

- To prepare lesson plans and different instruction tools to implement Mastery Learning Model.
- To prepare different tools for evaluation at various stages.
- To collect base line characteristics of second year basic B.Sc. nursing students in the experimental group and the control group for the purpose of finalising the sample.
- To quantify and to measure the prerequisite knowledge for learning of new unit of parenteral drug administration of second year basic B.Sc. nursing students in the experimental group and the control group.
• To assess the performance of the students from the experimental group in formative tests (cognitive based and psychomotor based).

• To determine the time taken (measured in terms of number of attempts required to obtain 80% marks in cognitive based tests and 100% marks in psychomotor based tests) by students in the experimental group to reach mastery level during the treatment phase.

• To quantify and to measure the summative performance (cognitive based) in parenteral drug administration of second year basic B.Sc. nursing students in the experimental group and the control group.

• To quantify and to measure the summative performance (psychomotor based) in parenteral drug administration of second year basic B.Sc. nursing students in the experimental group and the control group.

5.1.6 Operational definitions: In order to make clear the title and the objectives of the research the main terms used in the title and the objectives are defined as follows:

**Effect:** Effect is a change in the knowledge and psychomotor skills of second year basic B.Sc. nursing students with respect to drug administration.

**Mastery Learning Model:** According to Bloom (1968), Mastery Learning Model is Learning For Mastery (LFM), which is based on the Mastery Learning Model proposed by Carroll in 1963. Both, Carroll and Bloom have defined mastery in terms of achievement of particular educational objectives. In this, model students have to attain mastery of each unit before proceeding to the next unit. An ungraded diagnostic progress test is administered at the completion of each unit to provide feedback on the
adequacy of the students’ learning. The performance in the test either indicates
mastery, usually set at a level of 80%, or highlights the material the student still has
to master. For the student who has not attained mastery, original instruction could be
supplemented with appropriate remedial materials, so that he/she can obtain a score
reaching the mastery criterion. (Bloom, 1968)

In this study, Mastery Learning Model is stated synonymously as Mastery Learning
Strategy, Mastery Learning Approach or Mastery Learning Method. In this study,
Mastery Learning Model is used as described here: A subject matter is split into small
and convenient units that have predetermined learning objectives. Students learn each
unit in groups. After learning of each unit, all the students have to appear for a
formative test on that unit. All these tests are criterion referenced tests based on
learning objectives. Students must demonstrate mastery through performance in a
formative test after each unit, by achieving minimum score of 80% for cognitive
based test, and 100% score for psychomotor based test before moving on to learning
of a new unit. Students get feedback on their achievement and performance. Students
who do not achieve mastery receive remediation through individual guidance, peer
monitoring, small group discussions, or additional practice. Additional time for
learning is prescribed for those requiring remediation. Students continue the cycle of
learning and assessment until mastery is achieved.

**Performance:** Scores achieved in the tests (cognitive based and psychomotor based)
administered.
Second year basic B. Sc. nursing student: Student nurse who is taking training in the second year basic B.Sc. nursing programme of Maharashtra University of Health Sciences (MUHS) and from the institutes, which are affiliated, to Indian Nursing Council. (INC). In the present investigation this further means that a student who is studying in the second year of the course in the academic year July 2011- June 2012.

Selected drug administration: In the prescribed syllabus of second year basic B.Sc. Nursing course of MUHS there is a topic on parenteral drug administration. This topic includes different modes of drug administration. The researcher has selected three modes namely intramuscular, subcutaneous and intra dermal drug administration for the present investigation.

Short duration retention and long duration retention: Retention means permanence of what is learnt. The retention is measured in terms of scores in retention tests (cognitive based and psychomotor based) conducted with the time gap of 15 days (short duration) and 6 months (long duration) after summative test.

5.1.7 Variables in the study: Present study was based on teaching-learning process. The variables in the study were classified into the independent variables, dependent variables, controlled variables and extraneous variables.

- Independent variable was Mastery Learning Model of teaching.
- Dependent variables were summative test (cognitive based) scores. Summative tests (psychomotor based) scores and retention tests (cognitive based and psychomotor based) scores.
Controlled variables were prerequisite knowledge, topic taught parenteral drug administration, class of students - second year basic B.Sc. nursing students and teacher.

Extraneous variables were mother tongue, scores in H.S.C. exam, scores in first year basic B.Sc. nursing university exam.

5.1.8 Statements of hypotheses: The central question addressed in this investigation was “Is the ‘Mastery Learning Model’ of teaching an effective way of teaching the topic parenteral drug administration to nursing students?” To investigate the same, two central hypotheses were formulated. These hypotheses are stated below:

1. The Mastery Learning Model of teaching is more effective than conventional approach of teaching in enhancing the cognitive and psychomotor competencies of second year basic B.Sc. nursing students, in three modes of parenteral drug administration.

2. The Mastery Learning Model of teaching is more effective than conventional approach of teaching in retaining the cognitive and psychomotor competencies acquired by second year basic B.Sc. nursing students, in three modes of parenteral drug administration.

These central hypotheses were further broken in to alternative hypotheses and corresponding null hypotheses for statistical testing. These alternative hypotheses are listed below:

H₁₁: Samples in the experimental and the control group are equivalent as far as prerequisite knowledge test (cognitive based) scores of the students are considered.
H12: There is significant difference between the experimental group and the control group as far as summative test (cognitive based) scores of the students are considered.

H13: There is significant difference between the experimental group and the control group as far as summative test [psychomotor (intramuscular drug administration skill) based] scores of the students are considered.

H14: There is significant difference between the experimental group and the control group as far as summative test [psychomotor (subcutaneous drug administration skill) based] scores of the students are considered.

H15: There is significant difference between the experimental group and the control group as far as summative test [psychomotor (intradermal drug administration skill) based] scores of the students are considered.

H16.1: There is significant difference between the experimental group and the control group as far as short duration (15 days) retention test (cognitive based) scores of the students are considered.

H16.2: There is significant difference between the experimental group and the control group as far as long duration (6 months) retention test (cognitive based) scores of the students are considered.

H17.1: There is significant difference between the experimental group and the control group as far as short duration (15 days) retention test [psychomotor (intramuscular drug administration skill) based] scores of the students are considered.

H17.2: There is significant difference between the experimental group and the control
group as far as long duration (6 months) retention test [psychomotor (intramuscular drug administration skill) based] scores of the students are considered.

H18.1: There is significant difference between the experimental group and the control group as far as short duration (15 days) retention test [psychomotor (subcutaneous drug administration skill) based] scores of the students are considered.

H18.2: There is significant difference between the experimental group and the control group as far as long duration (6 months) retention test [psychomotor (subcutaneous drug administration skill) based] scores of the students are considered.

H19.1: There is significant difference between the experimental group and the control group as far as short duration (15 days) retention test [psychomotor (intradermal drug administration skill) based] scores of the students are considered.

H19.2: There is significant difference between the experimental group and the control group as far as long duration (6 months) retention test [psychomotor (intradermal drug administration skill) based] scores of the students are considered.

5.1.9 Assumptions:

- All students are at par as far as aptitude is concerned.
- All students have same degree of motivation.
- Instructional strategies used in the study are qualitative in nature.
• All students have ability to acquire knowledge and skills suppose to be acquired through learning of the topic parenteral drug administration.

• Knowledge and skills acquired can be measured through the scores obtained in the criterion-referenced tests administered.

• Formative evaluation and immediate feedback will be motivating factor for the students in the experimental group.

5.2 REVIEW OF RELATED LITERATURE

Keeping in view the main aim and objectives of the study, the researcher has organized the reviewed literature in the following five sections.

• Evolution of Mastery Learning Strategy.

• Studies related to effectiveness of Mastery Learning Strategy in cognitive domain at college level.

• Studies related to effectiveness of Mastery Learning Strategy in psychomotor domain.

• Studies related to effectiveness of Mastery Learning Strategy and retention.

• Research studies related to Mastery Learning Strategy for training nurses & health professionals.

A very brief summary of the reviewed literature is presented below:

Mastery Learning Model of teaching was first proposed by Carroll in 1963 and brought in to practice by Bloom in 1968. After that, many researchers studied the effect of this model of teaching on different types of groups of students and in a variety of scenarios. Many studies have been conducted to assess the effect of
‘Mastery Learning Model’ on the success of students at school level of education. On the other hand there are very few studies at collegiate level. All these studies have reported Mastery Learning Model as an effective strategy for enhancing the student’s knowledge and abilities. During the literature review it was also noticed that there are very few studies conducted to assess the effectiveness of Mastery Learning Approach on psychomotor domain. Findings of these studies suggested that mastery based corrective strategies had a positive effect on student achievement in transposition and psychomotor skills. (Bloom, 1968).

Some of the important references related to Mastery Learning Approach used for training the nurses and health professionals are presented below in table 5.1.
### TABLE 5.1: LIST OF IMPORTANT REFERENCES ALONG WITH PURPOSE AND FINDINGS OF THE STUDY MENTIONED IN THE CONCERNED REFERENCE

<table>
<thead>
<tr>
<th>Source, Year</th>
<th>Purpose</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathur (1988)</td>
<td>To investigate the effects of mastery level learning programme in statistics on the achievement, self-concept and attitude towards statistics of nursing students.</td>
<td>Majority (75% or more) of the nursing students had demonstrated mastery learning achievement on summative test in each of the study years.</td>
</tr>
<tr>
<td>Wayne et al. (2006)</td>
<td>Studied the effect of ‘Mastery learning of advanced cardiac life support (ACLS) skills by internal medicine residents using simulation technology and deliberate practice,’</td>
<td>Finding of this study indicates, 33 of 41 participants (80.5%) achieved mastery within standard 8 hours training while remaining 8 participants (19.5%) needed extra time to reach mastery.</td>
</tr>
<tr>
<td>Rahmani et al. (2008)</td>
<td>To compare the effect of mastery learning and composed clinical teaching method on performance of nursing students in intensive care unit.</td>
<td>With independent t-test, no significant difference was found between control and experimental groups in age (p = 0.89), average of diploma (p = 0.35) and average of previous university semesters (p = 0.23). Effect of mastery learning on clinical performance of nursing students, the mean differences of pretests and posttests of control and experimental groups were calculated in four selected procedures. The average score of experimental groups in all procedures was greater than that of control groups (p = 0.001).</td>
</tr>
<tr>
<td>Wayne et al. (2008)</td>
<td>To assess mastery learning of thoracentesis skills by internal medicine residents using simulation technology and deliberate practice.</td>
<td>Study observed that performance improved 71% from pretest to posttest on the clinical skills examination.</td>
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<tr>
<td>Authors</td>
<td>Title</td>
<td>Details</td>
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<tr>
<td>Barsuk et al. (2009)</td>
<td>To investigate the effect of Mastery learning on temporary hemodialysis catheter insertion by nephrology students using simulation technology and deliberate practice.</td>
<td>Traditionally trained fellows was poor (mean 53%) and only 17% met the minimum passing scores. Performance of simulator trained first year fellows improved from mean of 29.5% to a mean of 88.6% after simulator training (P=0.002) which is significantly higher than traditionally trained students (P=0.001).</td>
</tr>
<tr>
<td>Barsuk et al. (2010)</td>
<td>To evaluate skill (hemodialysis) catheter insertion transfer from the simulated environment to actual clinical care and skill retention.</td>
<td>After 1 year retention of skill was reassessed. However, at 1 year after SBE, simulated THDC insertion scores were significantly lower than at immediate posttest M = 73.4% SD=22.2% vs. M=93.5% SD = 5.3%, p =(0.01)</td>
</tr>
<tr>
<td>Barsuk et al. (2009)</td>
<td>To study the simulation-based mastery learning to improve the quality of central venous catheter placement in a medical intensive care unit.</td>
<td>No resident met the minimum passing score (MPS) (79.1%) at baseline Mean (M) (IJ) = 48.4%, standard deviation (SD) = 23.1, M(SC) = 45.2%, SD = 26.3. All residents met or exceeded the MPS at testing after simulation training: M(IJ) = 94.8%, SD = 10.0, M(SC) = 91.1%, SD = 17.8 (p &lt; 0.001)</td>
</tr>
<tr>
<td>Butter et al. (2010)</td>
<td>Assess the effect of Simulation-based Mastery learning to improve cardiac auscultation skills in medical students</td>
<td>At baseline, third-year students (M=67.3%, SD=18.85) scored similar to fourth-year students (M=73.9%, SD=14.1%) [p=.067]. After simulation training, third-year students improved their scores significantly to 93.8% (SD=11.6%) [p&lt;0.001] and performed better than traditionally trained fourth year students [p&lt;0.001]. Four of the third-year students (5.2%) did not achieve the MPS at post-test and required additional practice. Thirteen fourth-year students (41.9%) did not achieve the MPS</td>
</tr>
</tbody>
</table>
These research studies revealed that deliberate practice and mastery learning causes strong positive effect on student’s learning abilities. A few studies have been conducted to find out whether Mastery Learning Approach of teaching helps in the retention of knowledge or not. The results of the study were affirmative. The students who learnt through Mastery Learning Approach were found to retain whatever they had learnt. However, to the best of the researcher’s knowledge, there are no studies in Indian setup amongst health professionals for clinical training by Mastery Learning Approach. Thus the researcher got motivated to undertake the present investigation to study the effect of Mastery Learning Model on the performance of the nursing students with respect to selected drug administration.

5.3 RESEARCH METHODOLOGY

5.3.1 Research approach & research design: Review of literature helped the researcher to select and implement the research design. For the present study, the researcher adopted quasi-experimental, pre-test, post-test, control group design.

5.3.2 Setting of the study: The study was conducted in two colleges in Pune, namely, Maharshi Karve Stree Shikshan Samstha’s Smt. Bakul Tambat Institute of Nursing Education (MKSSS’s BTINE) and Tehmi Grant Institute of Nursing Education (TGINE).

5.3.3 Population and sample: The population of the present study comprised of second year students of basic B.Sc. nursing course. The sample was drawn by non-probability incidental sampling technique. In this technique, the sample comprises of
the students who are easily accessible to the researcher and who meet the sampling criteria of the study. 38 students from MKSSS’s BTINE were considered as the constituents of the experimental group and 38 students from TGINE were considered as the constituents of the control group.

5.3.4 Tools and techniques used for collection of data: In this investigation, the tools used for data collection were criterion referenced tests (CRTs) which were developed to assess the cognitive based competencies and psychomotor based abilities of the students. Various CRTs used are as below:

- Prerequisite knowledge test (cognitive based)
- Formative tests (cognitive based and psychomotor based)
- Summative tests (cognitive based and psychomotor based)

5.3.5 Development of tools: The said tests were developed by going through the following steps: 1) Selection of content 2) Analyzing content 3) Listing down the specifications (expected behavior) 4) preparing blueprint 5) Constructing test 6) Preparing marking scheme 7) Deciding Cut Score 8) Deciding time limit 9) Establishing content validity and 10) Testing reliability of the tests.

5.3.6 Data collection process: The data collection was carried out through three phases namely, pre-treatment phase, treatment phase and post-treatment phase. The data was collected in the academic year July 2011- June 2012. The data was collected from the students studying in the said academic year in the second year basic B.Sc. nursing programme.
• **Pre-treatment phase:** During this phase, the researcher collected information about students’ achievements such as scores in higher secondary certificate examination, scores in first year basic B.Sc. nursing university examination, from all the students in the experimental group and the control group. This data was used to check whether a particular student is meeting the inclusion criteria or not, which in turn helped in finalizing the sample. The prerequisite knowledge test was administered to both the group. The scores of this prerequisite knowledge test were used to check whether the two groups are statistically equal as far as prerequisite knowledge base is considered.

• **Treatment phase:** This phase was started in the month of August in academic year 2011-2012. During this phase the units of intramuscular drug administration, subcutaneous drug administration and intradermal drug administration were taught to both the groups. The control group received training by conventional method; while the experimental group received training by Mastery Learning Model. The researcher used different teaching strategies. The instructional strategies used to deliver the knowledge to students were interactive teaching techniques, demonstration of procedures by the researcher and re-demonstrations by the students, work sheets, audiovisual aids etc. The students were also given hands-on practice on mannequin with individual guidance.

• **Post-treatment phase:** Post treatment phase started after the completion of teaching. The students of both the experimental group and the control group were tested for cognitive aspects as well as psychomotor aspects of the contents learnt during treatment phase through the summative tests (cognitive based and
psychomotor based). The students from both the groups were given the short duration and long duration retention tests. Short duration retention test was given after a gap of 15 days after summative test and long duration retention test was administered after a gap of 6 months.

5.4 DATA ANALYSIS AND INTERPRETATION OF THE RESULTS

All the data obtained from prerequisite knowledge test, formative tests, summative tests (cognitive based and psychomotor based) and, short duration & long duration retention tests were organized and presented according to the three steps followed during data collection.

The data analysis carried out in the present investigation had two aspects namely quantitative analysis, and qualitative analysis.

The quantitative analysis was done manually and cross checked by using data analysis tool pack provided by Microsoft Office. The results which cannot be achieved by this tool pack were obtained by using Statistical Package for the Social Sciences (SPSS) tool kit. The quantitative analysis done had two components namely descriptive statistics and inferential statistics.

The brief summary of the results of the analysis and findings are presented below:

5.4.1 Description of base line characteristics of sample: There were 76 students in the sample, 38 were in the experimental group and 38 were in the control group. The data such as age, scores in higher secondary certificate examination, and scores in
first year basic B.Sc. nursing university examination was collected from all the students in the experimental group and the control group. From the data obtained, it was found that sample of both groups were meeting inclusive criteria decided by the researcher.

5.4.2 Comparison (descriptive and inferential statistics) of pre-requisite knowledge test scores of students in the experimental group and the control group: The students from both the experimental group and the control group were given prerequisite knowledge test. The scores of this prerequisite knowledge test were used to check whether the two groups are statistically equal or not, as far as prerequisite knowledge base is considered. The data of prerequisite knowledge test scores were tested by applying the test of normality, critical ratio (CR), Fisher’s $F$ test ($F$), and independent sample $t$ test. It was found that the data of both the experimental group and the control group are normally distributed. The calculated critical ratio CR (CR = 1.58) was found to be smaller than the table value 1.96, implying that there is no significant difference between the means of the two groups and the independent sample $t$ test also confirmed the result. Also, the calculated Fisher’s $F$ ($F = 1.11$) was found to be smaller than the table value 1.52, implying that there is no significant difference between the two variances.

The findings of all these statistical tests taken together led to conclusion that the two groups are homogeneous and do not differ in their previous knowledge level; and the experimental group and the control group are statistically equivalent as far as prerequisite knowledge level is considered.
5.4.3 Description of achievement of mastery in formative tests: The investigator administered a series of formative tests prepared for each unit and analyzed the scores obtained by the students. After the completion of each unit, Formative Test (FT-1) was administered and grouped the students as masters or non-masters based on whether they attain the mastery level criterion or not. Remedial measures were provided to the non-masters and were later tested for attainment of mastery using Formative Test-2 (FT-2); and Formative test -3 (FT-3) if they do not gain mastery in FT-2. Number of attempts required to attain the mastery by individual student were noted and considered as time required for attaining mastery by her. From the analysis of data on formative tests, it can be concluded that the maximum number of attempts required by any individual were two for unit numbers 1, 4, and 5; and were three for unit numbers 2, 3, and 6. It was also observed that the number of students attaining mastery in first attempt was on rise with advancement of the teaching.

5.4.4 Comparison of the summative test (cognitive based) scores: The experimental group and the control group were given summative test (cognitive based) to assess the level of knowledge gained during the treatment phase. The visual inspection of the data of the two groups revealed that the scores of the students from the experimental group were significantly higher than the scores of the students from the control group. These scores of the two groups were then compared statistically. The calculated $t (t = 9.83)$ was found to be greater than the table value 2.00 at 0.05 level of significance, corresponding to df =74; implying that the null hypothesis $H_02$ gets rejected or in other words the hypothesis $H_12$ gets accepted.
So it was concluded that Mastery Learning Strategy is more effective than the conventional approach in terms of enhancing cognitive achievement.

5.4.5 Comparison of summative test (psychomotor based) scores: The experimental group and the control group were given summative test (psychomotor based) to assess the level of skills acquired during the treatment phase. During the treatment phase, three different skills, namely, intramuscular drug administration, subcutaneous drug administration and intradermal drug administration were taught and hence students were assessed by conducting three separate tests. The visual inspection revealed that the scores of the students from the experimental group were significantly higher than the scores of the students from the control group. The findings from the inferential statistical analysis of the scores of the students in these tests which are summarized below, confirmed this result.

For intramuscular drug administration, the calculated $t$ ($t = 11.14$) was found to be greater than the table value 2.00 at 0.05 level of significance, corresponding to $df = 74$, implying that the null hypothesis $H_03$ gets rejected or in other words the hypothesis $H_13$ gets accepted. This shows that there is significant difference between the means.

For subcutaneous drug administration, the calculated $t$ ($t = 9.81$) was found to be greater than the table value 2.00 at 0.05 level of significance, corresponding to $df = 74$, implying that the null hypothesis $H_04$ gets rejected or in other words the hypothesis $H_14$ gets accepted. This shows that there is significant difference between the means.
For intradermal drug administration, the calculated $t (t = 14.09)$ was found to be greater than the table value 2.00 at 0.05 level of significance, corresponding to df = 74, implying that the null hypothesis $H_{05}$ gets rejected or in other words the hypothesis $H_{15}$ gets accepted. This shows that there is significant difference between the means.

*Hence, it was concluded that Mastery Learning Model of teaching is more effective in imparting psychomotor skills involved in selected drug administration when compared to conventional approach of teaching.*

### 5.4.6 Comparison of retention tests (cognitive based) scores:

Knowledge retention is an essential component of learning. Knowledge retention ability of a student means his/her capability to store the knowledge gained, in retrievable manner, so that the same can be recalled as per the need, after a lapse of time. The researcher has hypothesized that the Mastery Learning Model of teaching will help the students in retaining the acquired knowledge and the difference seen in the two groups’ performance in the summative test (cognitive based) will be seen again in the summative tests (cognitive based) given after a specified time gap. The short duration retention test was given after a gap of 15 days after the date of last summative test and the long duration retention test was administered after a gap of 6 months. The short duration (15 days) retention test (cognitive based) scores of the students in the experimental group and the control group revealed that the calculated $t (t = 10.26)$ is greater than the table value 2.00 at 0.05 level of significance, implying that the null hypothesis $H_{06.1}$ could be rejected or in other words the hypothesis $H_{16.1}$ could be accepted i.e. *There is significant difference between the experimental group and the control group as far as short duration (15 days) retention test (cognitive based)*
scores of the students are considered. In the comparison between the long duration (6 months) retention test (cognitive based) scores of the students in the experimental group and the control group, it was found that the calculated $t$ ($t = 9.33$) is greater than the table value 2.00 at 0.05 level of significance, hence the null hypothesis $H_06.2$ could be rejected or in other words the hypothesis $H_16.2$ could be accepted i.e. There is significant difference between the experimental group and the control group as far as long duration (6 months) retention test (cognitive based) scores of the students are considered.

5.4.7 Comparison of retention tests (psychomotor based) scores: In nursing profession, there are many situations that require application of acquired skills in real life. This necessitates that nursing students not only master the skills but also retain what they have acquired. The researcher has thus hypothesized that the Mastery Learning Model of teaching will help the students in retaining the acquired skills and the difference seen in the two groups’ performance in the summative test (psychomotor based) will be seen again in the summative tests (psychomotor based) given after a specified time gap. From the comparison between the short duration (15 days) retention test [psychomotor (intramuscular drug administration skill) based] scores of the students in the experimental group and the control group, it was seen that the calculated $t$ ($t = 10.78$) is greater than the table value 2.00 at 0.05 level of significance, implying that the null hypothesis $H_07.1$ could be rejected or in other words the hypothesis $H_17.1$ could be accepted i.e. There is significant difference between the experimental group and the control group as far as short duration (15 days) retention test [psychomotor (intramuscular drug administration skill) based] scores of the students are considered. From the comparison between the long duration
(6 months) retention test [psychomotor (intramuscular drug administration skill) based] scores of the students in the experimental group and the control group, it was seen that the calculated $t (t = 11.93)$ is greater than the table value 2.00 at 0.05 level of significance, implying that the null hypothesis $H_{07.2}$ could be rejected or in other words the hypothesis $H_{17.2}$ could be accepted i.e. There is significant difference between the experimental group and the control group as far as long duration (6 months) retention test [psychomotor (intramuscular drug administration skill) based] scores of the students are considered.

In the comparison between the short duration (15 days) retention test [psychomotor (subcutaneous drug administration skill) based] scores of the students in the experimental group and the control group, and the long duration (6 months) retention test [psychomotor (subcutaneous drug administration skill) based] scores of the students in the experimental group and the control group, it was seen that calculated $t$ values for short duration and for long duration were $(t = 9.97)$ and $(t = 10.23)$, respectively. Both of these $t$ values were found to be greater than the table value 2.00 at 0.05 level of significance, corresponding to df =74, implying that both the null hypotheses $H_{08.1}$ and $H_{08.2}$ could be rejected and the hypotheses $H_{18.1}$ and $H_{18.2}$ could be accepted i.e. There is significant difference between the experimental group and the control group as far as short (15 days) duration and long (6 months) duration retention test [psychomotor (subcutaneous drug administration skill) based] scores of the students is considered.

In the comparison between the short duration (15 days) retention test [psychomotor (intradermal drug administration skill) based] scores of the students in the
experimental group and the control group, and the long duration (6 months) retention test [psychomotor (intradermal drug administration skill) based] scores of the students in the experimental group and the control group, it was seen that calculated $t$ values for short duration and for long duration were ($t = 13.35$) and ($t = 13.03$), respectively. Both of these $t$ values were found to be greater than the table value 2.00 at 0.05 level of significance, corresponding to df =74, implying that both the null hypotheses $H_{0.1}$ and $H_{0.2}$ could be rejected and the hypotheses $H_{1.1}$ and $H_{1.2}$ could be accepted i.e. **There is significant difference between the experimental group and the control group as far as short (15days) duration and long (6 months) duration retention test [psychomotor (intradermal drug administration skill) based] scores of the students is considered.**

*Thus, it could get conclusively established that the feature of the better performance in the summative tests (cognitive based and psychomotor based) by the students in the experimental group over the students in the control group remains intact even after a gap of six months.*

*The researcher also found that the $t$ values obtained in all the summative tests and the retention tests are not just greater than the table value corresponding to 0.05 level of significance but beat the table value by large margin. Rather, the $t$ values obtained are greater than the table value corresponding to more stringent 0.01 level of significance.*
5.5 CONCLUSIONS

1) The samples in both the experimental group and the control group are meeting the inclusion criteria.
2) Both the groups are equivalent in terms of prerequisite knowledge level.
3) The students from the experimental group required on an average 1 or 2 attempts to reach mastery level.
4) Mastery Learning Strategy is more effective than the conventional approach in terms of enhancing cognitive and psychomotor abilities of nursing students.
5) The feature of the better performance by the students in the experimental group over the students in the control group remains intact even after a gap of six months.

5.6 DISCUSSIONS

5.6.1 Implications: The findings of this study have many implications in significantly uplifting the quality of education in the nursing faculty. Both, teacher from the nursing colleges and authorities who frame the curriculum for various courses in nursing education can take cognizance of the findings of the present study for betterment of nursing education.

• Teachers from nursing faculty: The findings of this study proved that the Mastery Learning Strategy is effective in enhancing cognitive and psychomotor domain of students. This has important implication in teaching of nursing science as it
can be used to lower down the number of under achievers and to reduce number of errors, some of which can be fatal for patients, in clinical practices.

In nursing education, nursing students need to learn many courses and also need to transform this acquired knowledge into practice while taking care of patients. In the present investigation, the researcher found that Mastery Learning Model of teaching provided opportunities for almost all students to attain mastery of the content and getting a chance to pass through successful and rewarding learning experiences. Hence, this model, if implemented, will be of a great help for students to learn several core courses in nursing.

To implement Mastery Learning Strategy, teachers should get acquainted with the details of Mastery Learning Approach and should get motivated to implement this strategy.

Formative testing and feedback are essential components of Mastery Learning Model. In the present study, the researcher found that the formative tests after each unit helped the researcher to identify difficulties encountered by the students during learning of that unit. It was also observed that the students can overcome these difficulties with the help of proper feedback to students on their deficiencies and providing them with the relevant corrective measures. Hence, the researcher recommends that every nursing teacher should prepare small follow up test to be administered at the end of each unit, and available test results should be used to determine the learning deficiencies of students which should be corrected immediately by giving relevant, encouraging, confirmative feedback.
Besides formative testing and feedback another important element of Mastery Learning is quality instructions. To use this element effectively, a teacher should be creative enough to produce relevant instructional teaching strategy that can be used to enhance instructional delivery, so that behavioral objectives set for instructions can be achieved. From the experience gathered in the present study, the researcher feels that the learning strategies such as effective audiovisual aids with interactive teaching and hands on practice on mannequin play an important role in training nursing students for skills.

The findings of this study have established positive effects of Mastery Learning not only in cognitive domain but also in psychomotor domain. It has also been established that knowledge and skills acquired are retained for longer duration such as a period of 6 months. In the light of this, the researcher suggests that teachers in nursing colleges should use this method as one of their clinical teaching methods; because nursing students have to learn and perform these learnt clinical skills with 100% accuracy. This will enable nursing students to perform their professional responsibilities effectively in their future career.

At this juncture, the researcher would like to mention one incidence that occurred during university practical exam of the students who were taught by Mastery Learning approach. After the exam one of the hospital staff and one of the examiners made the remark that the students were appearing as robots designed for parenteral drug administration. In the opinion of the researcher, this remark is a certificate that the Mastery Learning Approach has brought the students to the level of 100% perfection.
• **Authorities in nursing faculty:** Educational planners and authorities in nursing faculty always think and attempt to provide curriculum that enhances the ability of nursing students to effectively develop knowledge and practical skills so that they can implement learnt knowledge into practice with perfection.

The perfection in learning is at the core of Mastery Learning Model. Also, the findings of present investigation have established that the Model of Mastery Learning can be employed effectively in higher and professional educational programme of nursing education. Hence the researcher suggests that curriculum planning authorities, initially on experimental basis, should consider Mastery Learning Model as important teaching method for some courses. For this purpose, the curriculum should spell out the specification (behavioral learning outcome) for each learning unit and should set up minimum mastery level for these learning outcomes. This will help the teacher to plan and provide instructional activities that foster the mastery.

In Mastery Learning Model, criterion referenced tests (CRTs) are used to assess the performance of the students at various stages of learning. The researcher feels that CRT is very useful when public safety or other considerations demand that certain tasks be performed only by those who are fully qualified to perform that particular task. Hence the curriculum planners should insist on assessment through CRT’s. As well as the curriculum should include a continual assessment of learning in the form of formative criterion referenced testing. These types of tests are directly based on instructional objectives in case of knowledge testing and psychomotor tests are based on task analysis. Hence this type of tests will be useful to assess the effectiveness of
instructional strategy as well as for the diagnosis of deficiency in learning which may be taken care of immediately.

Noting that teaching by Mastery Learning Strategy may be first time experience for many nursing educators, the researcher suggests that workshops for teachers should be designed and arranged to train them.

5.6.2 Limitations of the study: The researcher is fully aware of the limitations of the present study. These limitations are as follows:

- In the present study, formative tests were prepared on each of the units. These units were the units of only one topic, namely, parenteral drug administration. Hence the units were small in content size. This small content size of all the units did not allow the researcher to prepare separate forms of formative tests.

- In this study, every effort was made to control as many variables as possible that might affect the outcome. However, certain extraneous variables like students’ aptitude, intelligence were beyond the control of the researcher.

- In this study the samples were second year basic B.Sc. nursing students, these samples were selected from two different institutes of nursing education of Pune city. The intake of both the institutes was 40-50 students. Hence, with consideration of inclusion criteria, the researcher could get only 76 students as the study sample.

5.6.3 Recommendations for further study: The researcher would like to make the following recommendations for future studies:
• As mentioned in the title of the thesis, the present study checked the effectiveness of Mastery Learning Model in the selected drug administration. Hence the findings of present study may be valid only for the specified topic. By taking more such topics or even the full courses, the findings can be generalized to entire syllabus of nursing. Choosing full courses will also allow having bigger units for framing the formative tests which in turn will allow use of separate forms of formative tests. The findings in such cases will be more reliable.

• The studies on a larger sample may be carried out to arrive at more reliable results.

• It may be also be interesting to explore the correlations, if any, between the performances of the students taught by Mastery Learning Model, and the affective and personality variables such as aptitude for nursing, emotional quotient.

• The researcher suggests that study should be undertaken to ascertain if number incidences of drug error is lower amongst people who have learnt through Mastery Learning Model as compared to those who have not.