Appendix- 1

Pre-test questionnaire Date: 26-11-2011

Dear Students,

This questionnaire is a part of my M.Ed dissertation work Titled “Effectiveness of a Science Laboratory Management Programme for Pre Service Teachers” The information that you give will be used to purely for academic purpose.

Thank you for your support

Chandana Singh.

Name of Student teacher _____

Name of College _____

Please read the following Question and answer them in the space provided.

1. What is a science laboratory?

2. Why do you think science laboratory is important?

3. What are the types of activities that are done in secondary school science laboratory?

4. What points do you think you will keep in mind when you organize a laboratory session?

5. What problems do you think a teacher faces in laboratory and while managing a laboratory?

6. Which topic in science from std.IX and X do you think can be taught through laboratory work?

7. What is laboratory method?

8. Is there any difference between experiment, demonstration and task?

9. Which types of laboratories have you visited?

10. Have you conducted any laboratory sessions?

11. What records do you think are maintained in the laboratory? Who maintains them?

12. What points will you keep in mind, when you plan laboratory session for your students?

13. What type of help/support will you give to the students in the laboratory?

14. According to you what type of training should be a given to the teacher to use laboratory effectively?

15.What do you mean by effective use of the laboratory?

Appendix 2

Post - test questionnaire Date: 05-11-2011

Drear students,

This questionnaire is a part of my M.Ed dissertation work titled "Effectiveness of a Science Laboratory Management Programme for Pre service Teachers" the information that you give will be used to purely for academic purpose.

Thank you for your supports.

Chandana Singh.

Name of student teacher _____

Name of college _____

Please read the following question and answer them in the space provided

1. What is your experience about the topic that were taught to you?

2. What were your learning values?

Appendix 3

Course on Laboratory Management

Day/Date	Time Hour	Theme of session and overall response of student teachers	Teaching points
Day1, 26.11.2011	1 hour	The investigator conducted a session from 2:40pm to 3:30pm. The focus of session was to administer the pre-test on the student teachers to find the laboratory exposure and information they have about laboratory work and management.	
Day2, 28.11.2011	1 hour	The investigator conducted a session from 2:40pm to 3:30pm. The focus of the session was to teach concept of laboratory and there activities: Meaning of laboratory and importance of laboratory. The student teachers were involved in the following activities: The student teachers said that they learnt definition, meaning and importance of laboratory in science education.	Concept of Laboratory Importance of laboratory: Develop scientific attitude, some values like, punctuality, regularity vis-à-vis laboratory work
Day3, 29.11.2011	1hour	The investigator conducted a session from 2:40pm to 3:30pm. The focus of the session was to teach the advantages of laboratory and also conduct cum demonstrate experiment on the topic diffusion. The student teachers were involved in the following activity: discussion, observing the experiment. The student said that we learnt how to hold beaker and other apparatus during demonstrations, give instructions and also	Advantage of laboratory: Experiment on diffusion. Materials used Beaker, water, test tube, test tube stand, ink.

		learnt to conduct experiment.	
Day4, 30.11.2011	2 hours	The investigator conducted a session from 2:40pm to 4:30pm. The focus of the session was to teach the types of laboratory and given task to conduct experiment on the topic osmosis to a group of student teachers with the help of a given instruction cum experimental sheet. The student teachers were involved in the following activity: conducting experiment, scooping potato, making sugar solution etc. The student teachers said they learnt to conduct experiment and demonstrate the same by giving suitable instructions. They also learnt how to arrange materials, equipment, apparatus and all things needed in the laboratory room.	Used OHP to show general laboratory room or all purpose of laboratory. Experiment on Osmosis. Materials used: Potato, spoon, sugar solution for conducting experiment osmosis.
Day5, 01.12.2011	1 hour	The investigator conducted a session from 2:40pm to 3:30pm. The focus of the session was task of conduct experiment in group work, and then they are conducting experiment chemical combination, combustion. The student teachers were involved in the following activity: discussion with others, asking different questions and observing experiment. The student teachers said that they learnt theoretical knowledge through laboratory work and arrangement of laboratory	Arrangement of Laboratory Experiment on chemical combination and combustion. Materials used: Glass, water and calcium carbonate for chemical combination, glass, candle, and match box for combustion.
Day6,	1	The investigator conducted a session from	Lecture cum

02.12.2011	hours	2:40pm to 3:30pm. The focus of the session was to demonstrate lecture cum demonstration method used in laboratory. The investigator used lecture cum demonstration to teach parts of flower (china rose). The students were involved in the following activity: observing, drawing the parts of flower and discussion. The student said we learnt demonstration about parts of flower.	Demonstration Method Parts of flower Demonstration Skills among Student teachers
Day7, 03.12.2011	2 hours	The investigator conducted a session from 2:40pm to 4:30pm. The focus of session was to teach role of a teacher in laboratory, record keeping in laboratory and experiment done by students in the pair work, the topic focused was Newton's third law of motion, acid (ascorbic acid) The student teachers were involved in the following activity. They were busy observing and doing experiment. The student teachers said we leant role of the teacher in laboratory.	Role of teacher in laboratory Record keeping in laboratory Experimental work Balloon, wire, nail For Newton's third law of motion. Blue litmus paper, tomato and lemon for acid(ascorbic acid).
Day8, 05.12.2011	1 hour	The investigator conducted a session from 2:40pm to 4:30pm. The focus of session was to administer the post-test and take feedback from student teachers. S	-

Appendix 4

Reaction Scale for the Student Teachers

Name of student teacher: **Roll No:**

Sr. no.	Statement	Not at all	Rarely	Sometimes	Most of the time	Always
1.	The tasks given by teacher during the Laboratory sessions help me develop my practical skill.					
2.	During the tasks I was able to understand the organisation of Laboratory work.					
3.	The tasks given by investigator during the Laboratory session help me to work in group.					
4.	I am now able to demonstrate certain experiments in science					
5.	The Laboratory sessions and guidance by researcher helped me understand demonstration/experimental skills.					
6.	During the laboratory sessions I was able to understand the how to keep the record.					
7.	I was able to understand importance of laboratory.					
8.	I don't like the tasks given by the researcher.					
9.	The tasks given by the researcher were appropriate.					
10.	The instructions given by the researcher were appropriate.					

Appendix 5

Pictures








Appendix 6

Materials used during Laboratory Management Course

Day 1

The researcher had given pre-test on student teachers at 2:40pm to 3:30pm in way made collage of Education.

Day 2

The researcher had taught concept of laboratory and there activities at 2:40pm to 3:30pm, in concept of laboratory they have to discussed is meaning of laboratory and they explain through discussion method, and researcher try to get students idea about meaning of laboratory, definition and importance of laboratory and writing on the board in a systematic way. They write like this about-

Meaning of laboratory:

- It is a place where you do practical's, experiments/ demonstration.
- To develop process skills.
- Laboratory means, it is a place where process skills are developed among learners through practical exposure.
- Laboratory is a place where theory is linked with practice.
- It is student cantered place or student oriented and teacher guide them.
- Laboratory method to each theory and practice.
- Scientific attitude is developed among students.
- Joyful and experience based learning.
- It is based on principal of constructivism.
- Freedom to learn and experiment.
- It is cooperate collaborative learning approach-pair work or group work.

Definition of laboratory:

Laboratory is a placed equipped for the performance of test, experiments and investigative procedures and for the preparation of reagents, chemical reaction. Laboratory is a place equipped for experimental or for testing and analysis.

Thus, Laboratory is a place providing opportunity for experimentation, observation or practice in a field of study. Laboratory is a room or building equipped for scientific research, or chemicals.

Importance of laboratory:

- Construct their knowledge.
- Develop scientific attitude.
- To develop the process skills.
- To develop some values like, punctuality, regularity etc.
- Hand on learning.
- For effective learning and collaborative learning/ cooperative learning.
- Learning becomes long lasting.
- It is easy to understand scientific facts.
- To develop creative thinking.
- Students are made to thinks logically and critically.
- To develop self-esteem/ self-confidence.

Day 3

The researcher had conducted a session from 2:40pm to 3:30pm.The focus of session was to teach the advantage of laboratory and also had conducted cum demonstrate experiment on the topic diffusion, this experiment researcher had used material beaker, water, test tube, test tube stand, ink etc. The student teachers were involved in the following activity: discussion, observing the experiment. The student teacher said that we learnt to hold beaker and other apparatus during demonstration, give instructions and also learnt to conduct experiment, and researcher also had explain organisation of experiments.

Organisation of experiments:

Wehave discussed generally what type of experiences you should provide for your students in your laboratory. We hope that you will provide many of them, so in this section we'll suggest some techniques which may help you manage a full lab schedule. First of all, no matter how experienced you are, you should always run

through a new experiment. Frequently, you will need to make adjustments in the time allowed, in the materials, or in the techniques required. Second, you must teach your students basic skills so that they may proceed independently. This aspect is crucial if you are using one of the individualized curricula in which each student may be progressing students learn basic techniques and procedures and follow simple rules, they are able to conduct investigations independently. Third, you must formulate and follow. We suggest establishing the following two rules in your science laboratory.

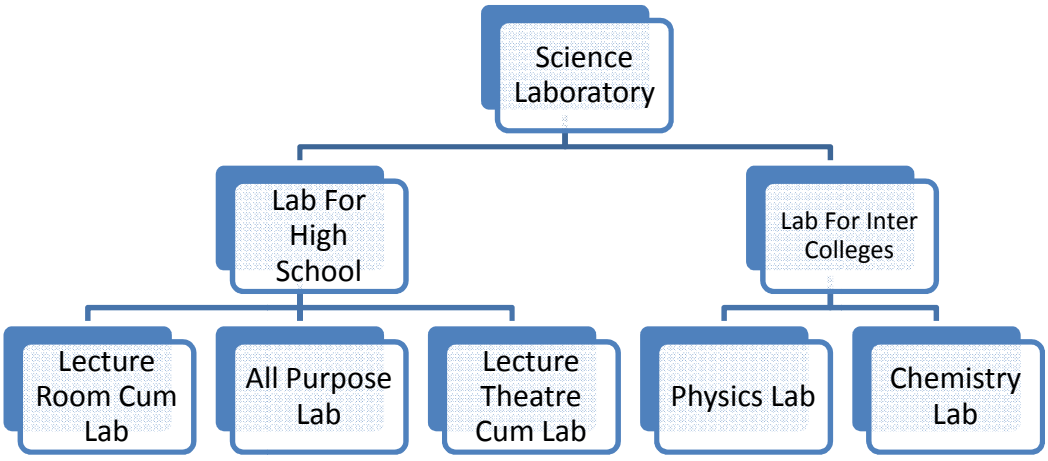
1) No student interferes with the learning of another; that is, there is no borrowing of equipment (without asking), no "goofing off" which might destroy another group's work, etc.
2) No student leaves the lab without cleaning up and checking out with the teacher. In just five minutes another group of students needs to use the facility!

In addition to the above ground rules, you and your students also need to establish some basic step or procedures for conducting investigations.

Day 4

The researcher had conducted a session from 2:40pm to 4:30pm. The focus of session was to teach the types of laboratory. In types of laboratory they have to discussed general laboratory and they have used OHP to show general laboratory room after that researcher had given task to conduct experiment on the topic osmosis is to a group of student teachers with help of a given instruction cum experimental sheet. The student teachers were involved in the following activity: conducting experiment, scooping potato, making sugar solution etc. Researcher try to get student teachers idea about what are the things needed in general laboratory and writing on the board in a systematically,

Types of laboratory:



General laboratory or all-purpose laboratory:

- Electricity
- Water supply
- Demonstration table
- Working table
- Equipment's, glass wares, apparatus- subject requirement
- Specimen, models, charts, chemicals, indicators/stains.
- Air, sink are also needed
- Gas line, refrigerator
- Distilled water etc.

Lab for high school:

- Safety measures
- Requirements
- Depth knowledge
- Specific aim an environment

Day 5

Theresearcher had conducted a session from 2:40pm to 3:30pm.The focus of session was task of conduct experiment in group work, and then student teachers were conducting experiment topic on chemical combination and combustion. The student teachers were involved in the following activity: discussion with others, asking

different type of questions and observing experiment. The student teachers used material for chemical reaction- glass water and calcium carbonate and glass, candle and match box for combustion.

Day 6

The researcher had conducted a session from 2:40pm to 3:30pm. The focus of the session was to demonstrate lecture cum demonstration method used in laboratory. The researcher used lecture cum demonstration to teach parts of flower (China rose). The students were involved in the following activity: observing, drawing the parts of flower and discussion. The student said we learnt demonstration about parts of flower.

Day 7

The researcher had conducted a session from 2:40pm to 4:30pm. The focus of session was to teach role of a teacher in laboratory, record keeping in laboratory and experiment done by students in the pair work, the topic focused was Newton's third law of motion, acid (ascorbic acid) The student teachers were involved in the following activity. They were busy observing and doing experiment. The student teachers said we leant role of the teacher in laboratory. In role of the teacher in laboratory, researcher taught lecture cum discussion, because researcher try to get student teachers idea and writing on the board.

Role of a teacher in laboratory:

- Instructor, guide, motivator, researcher, evaluator, manager.
- Manage laboratory: -
- Maintain records of the laboratory or record keeping.
- Teacher has to manage the learners.
- Prepare the time table.
- Make students in pairs or pair work/group/batches.
- Teach, demonstrate.
- Manage learning resources- pre-planning, setting up the lab, books, procedure.

- Evaluator- evaluates learning outcome.
- Evaluates the progress of the students.

Record keeping:

Records are important in so many ways that pupils should know how to keep them well. Science laboratory work may be used to acquaint pupils with several different ways of keeping records. Such a from May results in boredom for a large number of pupils. However, it should be recognized that certain pupils like to follow set patterns in their work, possibly feeling more secure than when they have to make decisions about forms to be used. Simple experiments need only simple records. Indeed, in some cases, written records are superfluous. There would be little point in requiring pupils to make notes on an experiment to find out whether pumice can float on water. Labeled diagrams are often sufficient for recording experiments. Arrows drawn on a diagram of a beaker of water being heated along one side show the convection currents set up by the unequal beating. Labels indicate the apparatus used. Procedures are self-evident. No broad conclusion is possible from this limited experiment. Graphs and tables often serve as satisfactory records either with or without additional notes. An experiment that shows variation of heart rate after exercise and rest needs only a table of the data collected. The headings on the chart indicate the purpose, the materials used and the procedures. The reader draws his own conclusions from the data.

Except when special materials are used, diagrams or pictures are more effective than words in describing apparatus. Itemization of the component parts of an assembly is rarely needed. Commonplace items such as funnels and gas burners are generally assumed to be used in familiar processes such as filtration and heating. Procedures need elaboration when they cannot be inferred from diagrams, charts, and graphs. An experiment to discover the effect of air circulation on transpiration rate may require an explanation of how the twig is prepared to maintain an unbroken column of water in the xylem tubes. Duplicated sheets for use when collecting a large amount of data can be great time savers. Sometime these sheets may contain directions for gathering the data as well. Such records sheets insure uniform organization of data and are helpful in carrying out discussion of the results. However, these sheets encourage mechanical procedures and may discourage

individual initiative. Before prepared sheets are may discourage individual initiative. Before prepared sheets are adopted for any particular experiment, the advantages and disadvantages should be carefully weighed. A form of record keeping that is little used but that seems to have value is an exhibit of materials actually used. Dried and pressed leaves showing the effects of starch test in phototropism experiments may be mounted on charts as a class project or notebooks for individual records. Nails that show the factors affecting rust formation may be exhibited with appropriate labels.

Some points is there-

- Register
- Students register
- Unbreakable apparatus
- Equipment
- Infrastructure of the lab
- Resource materials
- Book for chemicals(consumable register)
- Glass apparatus.
- It maintained in daily bases, monthly bases and yearly bases-manager, audits/stock checking.

Day 8

The researcher had conducted a session from 3:40pm to 4:30pm. The focus of session was to administer the post-test and take feedback from student teachers.