M.Ed., (SEMESTER-II)

COURSE - FUNDAMENTAL OF RESEARCH METHODOLOGY

COURSE CODE - (CC-6)

UNIT-IV; QUANTITATIVE METHODS OF RESEARCH

ESSENTIALS OF EXPERIMENTAL RESEARCH

Treatment and Control Groups:

In experimental research, some subjects are administered one or more experimental stimulus called a treatment (the treatment group) while other subjects are not given such a stimulus (the control group). The treatment may be considered successful if subjects in the treatment group rate more favorably on outcome variables than control group subjects. Multiple levels of experimental stimulus may be administered, in which case, there may be more than one treatment group.

Treatment Manipulation:

Treatments are the unique feature of experimental research that sets this design apart from all other research methods. Treatment manipulation helps control for the "cause" in cause-effect relationships. Naturally, the validity of experimental research depends on how well the treatment was manipulated. Treatment manipulation must be checked using pretests and pilot tests prior to the experimental study. Any measurements conducted before the treatment is administered are called **pretest measures**, while those conducted after the treatment are **posttest measures**.

Random Selection and Assignment:

Random selection is the process of randomly drawing a sample from a population or a sampling frame. This approach is typically employed in survey research, and assures that each unit in the population has a positive chance of being selected into the sample. Random assignment is however a process of randomly assigning subjects to experimental or control groups. This is a standard practice in true experimental research to ensure that treatment groups are similar (equivalent) to each other and to the control group, prior to treatment administration. Random selection is related to sampling, and is therefore, more closely related to the external validity (generalizability) of findings. However, random assignment is related to design, and is therefore most related to internal validity. It is possible to have both random selection and random assignment in well-designed experimental research, but quasi-experimental research involves neither random selection nor random assignment.

Threats to Internal Validity:

Although experimental designs are considered more rigorous than other research methods in terms of the internal validity of their inferences (by virtue of their ability to control causes through treatment manipulation), they are not immune to internal validity threats. Some of these threats to internal validity are described below,

"within the context of a study of the impact of a special remedial math tutoring program for improving the math abilities of high school students"

- **History Threat** is the possibility that the observed effects (dependent variables) are caused by extraneous or historical events rather than by the experimental treatment. For instance, students' post-remedial math score improvement may have been caused by their preparation for a math exam at their school, rather than the remedial math program.

- **Maturation Threat** refers to the possibility that observed effects are caused by natural maturation of subjects (e.g., general improvement in their intellectual ability to understand complex concepts) rather than the experimental treatment.

- **Testing Threat** is a threat in pre-post designs where subjects' posttest responses are conditioned by their pretest responses. For instance, if students remember their answers from the pretest evaluation, they may tend to repeat them in the posttest exam. Not conducting a pretest can help avoid this threat.

- **Instrumentation Threat**, which also occurs in pre-post designs, refers to the possibility that the difference between pretest and posttest scores is not due to the remedial math program, but due to changes in the administered test, such as the posttest having a higher or lower degree of difficulty than the pretest.

- **Mortality Threat** refers to the possibility that subjects may be dropping out of the study at differential rates between the treatment and control groups due to a systematic reason, such that the dropouts were mostly students who scored low on the pretest. If the low-performing students drop out,

the results of the posttest will be artificially inflated by the preponderance of high-performing students.

- **Regression Threat**, also called a regression to the mean, refers to the statistical tendency of a group's overall performance on a measure during a posttest to regress toward the mean of that measure rather than in the anticipated direction. For instance, if subjects scored high on a pretest, they will have a tendency to score lower on the posttest (closer to the mean) because their high scores (away from the mean) during the pretest was possibly a statistical aberration. This problem tends to be more prevalent in non-random samples and when the two measures are imperfectly correlated.