PEDAGOGY OF BIOLOGICAL SICENCE PART – 2

(PONDICHERRY UNIVERSITY)

STUDY MATERIAL

UNIT -6

Dr. THANDAVAMOORTHY. M,

ASSISTANT PROFESSOR,

VASAVI COLLEGE OF EDUCATION,

MADAGADIPET, PUDUCHERRY,

CONTACT: 9489391166.

UNIT – 6

RESEARCH IN SCIENCE EDUCATION

Syllabus :Types of Educational research – Status of research in science education in India – Educational research and innovation committee – utilization of science educational research

Introduction

Research purifies human life. It improves its quality. It is search for knowledge. If shows how to Solve any problem scientifically. It is a careful enquiry through search for any kind of Knowledge. It is a journey from known to unknown. It is a systematic effort to gain new knowledge in any kind of discipline. When it seeks a solution of any educational problem it leads to educational research.

Curiosity, inquisitiveness are natural gifts secured by a man. They inspire him to quest, increase his thirst for knowledge / truth. After trial and error, he worked systematically in the direction of the desired goal. His adjustment and coping with situation makes successful in his task. Thereby he learns something‘s, becomes wise and prepares his own scientific procedure while performing the same task for second time.

Research is the voyage of discovery. It is the quest for answers to unsolved problems. Research is required in any field to come up with new theories or modify, accept, or nullify the existing theory. From time immemorial it has been seen so many discoveries and inventions took place through research and world has got so many new theories which help the human being to solve his problems. Graham Bell, Edison, JC Bose, John Dewey, Skinner, Piaget and many others have given us theories which may cause educational progress research needs expertise.

Educational Research

Educational research refers to the systematic collection and analysis of data related to the field of education. Research may involve a variety of methods and various aspects of education including student learning, teaching methods, teacher training, and classroom dynamics.

Characteristics of Educational research

- Educational research attempts to solve the problem.

- Research involves gathering new data from primary or first-hand sources or using existing data for a new purpose.
- Research is based upon observable experience or empirical evidence.
- Research demands accurate observation and description.
- Research generally employs carefully designed procedures and rigorous analysis.
- Research emphasizes the development of generalizations, principles or theories that will help in understanding, prediction and/or control.
- Research requires expertise—familiarity with the field; competence in methodology; technical skill in collecting and analyzing the data.
- Research attempts to find an objective, unbiased solution to the problem and takes great pains to validate the procedures employed.
- Research is a deliberate and unhurried activity which is directional but often refines the problem or questions as the research progresses.
- Research is carefully recorded and reported to other persons interested in the problem.

Types of Educational Research

a) Fundamental Research

The word fundamental itself indicates that new theories are created and old theories are examined in this type of research. The purpose of fundamental research is to gain knowledge and not to solve practical problems. Hence fundamental research is not undertaken to solve the human and social problems. The basic purpose of this research is to gain knowledge. Fundamental research is usually carried on in a laboratory or some other sterile environment, sometimes with animals. This type of research, which generally has no immediate or planned application, may later in further research of an applied nature.

b) Applied Research

The research undertaken for practical use is called 'Applied research'. Since findings of this research are used to solve the practical problems in day to day life. The basic purpose of applied research is to gain knowledge for the practical use. The main objective of applied

research is to judge the usability of the knowledge gained from the research and use to solve different problems faced by the human in his day to day life and other objective is to gain additional knowledge to solve the specific problem.

c) Action Research

Action research is a research which a functionary conducts to find the solution of a problem; he/she is facing for his/her own benefits. The solution so found by applying the systematic procedure is the solution of his/ her particular problem and may or may not be generalisable. Action research is done by the practitioners themselves rather than professional researchers.

In education this movement has had its goal the involvement of both research specialist and class room teacher in the study and application of research to educational problems in a particular classroom setting. Action research is focused on immediate application, not on the development of theory or on generalization of applications. It has placed its emphasis on a problem here and now in a local setting. Its findings are to be evaluated in terms of local applicability, not universal validity. Its purpose is to improve the practices to combine the research processes, habits of thinking, ability to work harmoniously with others, and professional spirit.

Methods of Educational Research

The basis for educational research is the scientific method. The scientific method uses directed questions and manipulation of variables to systematically find information about the teaching and learning process. In this scenario questions are answered by the analysis of data that is collected specifically for the purpose of answering these questions. Hypotheses are written and subsequently proved or disproved by data which leads to the creation of new hypotheses. The two main types of data that are used under this method are qualitative and quantitative.

1. Qualitative research

Qualitative research uses the data which is descriptive in nature. Tools that educational researchers use in collecting qualitative data include: observations, conducting interviews, conducting document analysis, and analyzing participant products such as journals, diaries, images or blogs.

Types of qualitative research

- Case study
- Ethnography
- Phenomenological research
- Narrative research
- Historical research

2. Quantitative research

Quantitative research uses data that is numerical and is based on the assumption that the numbers will describe a single reality. Statistics are often applied to find relationships between variables.

Types of quantitative research

- Descriptive survey research
- Experimental research
- Single-subject research
- Causal-comparative research
- Correlational research
- Meta-analysis

Status of research in science education in India

As the Indian society is reinventing itself, it is going through a massive change. To ensure sustainable growth, we need to move from service economy to knowledge economy. In this context, we are ushering a new education system in science and technology to bring Indian intelligentsia into knowledge production.

Indian education system, like in many other spheres of our society, is at the cross-roads trying to find a way to enhance the number and quality of future academic as well as industrial researchers of the country, while still maintaining a socialist approach to educate large masses of relatively underprivileged people.

According to the modern source of all knowledge, Wikipedia, education is the process by which society deliberately transmits its accumulated knowledge, skills and values from one generation to another. India is one of those rare civilizations, which had formal education since time immemorial. Indian education was founded with strong emphasis on logic and mathematics.

British brought the Greco-Roman system of knowledge to India in early 19th century, which is the foundation for modern science. India quickly picked this up and many Indians significantly contributed to science and mathematics. Now, very large number of accomplished scientists and technocrats are available to pursue a number of options to meet the aspirations of the people. It may sound cliché. India is a country of enormous diversity. No single model of science education and research would cater to the needs and aspirations of the entire nation. Still, a consensus seems to have emerged on the need to integrate high quality research with undergraduate teaching to improve science education in India and to enhance the number and quality of future academic as well as industrial researchers in the country. By dedicating certain amount of time for teaching, faculty is also expected to improve the quality of their research.

Since the beginning of this century, several new initiatives are being explored such as, Establishment of large number of broad education centers: Central Universities, IISERs, NISER, IITs, NIPERs and Establishment of specialized centers of research and education in space technology, defense technology, translational research, biotechnology and stem cell biology and Expansion of existing institutes such as IITs, IISc and TIFR. The latter two would soon be initiating undergraduate education programs.

Only time will tell what would be the outcome of these initiatives. Most decisions in historical contexts would look either very good or bad, but at the time of making the decisions, we would be dabbling with only hypothetical situations. Any decision would be based on some logical thinking that suggests that a particular hypothetical scenario would be better than the other hypothetical one. Here, we could learn something from evolution. More the genetic diversity betters the chances that a species survives and proliferates. This is because we could always find few individuals carrying genetic variants that would help them to adapt (better than their ancestral population) to a new environment. This is precisely what we need to do. Wiser the nation if it invests on a broad-based education system, which nurtures both curiosity and creativity amongst its citizens. Such education system would create amongst the people the skills

and competence in diverse fields and thereby improves the overall preparedness of the country in the long run.

Irrespective of diversity in the opinion on what and how to research and teach, there is no argument that on the three conceptual foundations, on which any scientific enterprise should be built. (i) Strong emphasis on basic science: When it comes to science, "no national scientific enterprise can be sustainable in the long term if it does not contain generous room for curiosity-driven research. While the technological outcomes and social benefits of basic science are almost always long-term and rarely predictable, such science creates and consolidates overall competence and intellectual diversity"

(ii) Excellent academic ambiance: Success of any creative endeavor is dependent on large number of excellent people working in the same organization. This creates a threshold level of academic excellence and provides necessary forum for cross-fertilization of ideas, internal collaborations and unbiased internal criticism. A critical level of academic excellence is also necessary to pursue bigger questions in science, most of which would require interdisciplinary efforts. If we read the history of most academic places in India and other countries, an ambiance described above has been the foundation for success.

Only way to create such an ambiance is by carefully choosing faculty for their research accomplishments, promise, teaching proficiency and mentoring abilities. Ideally, faculty should have the ability and courage to challenge dogmas, inculcate concepts of scientific and mathematical inquiry in their research and teaching and promote critical thinking and reasoning amongst their students. Equally important is to ensure that our faculty upholds highest standards of integrity and ethics in their professional and personal life. (iii) Free and fair organizational system: Academic freedom, a democratic and consultative administrative set up, unbiased periodic review of performance and strict accountability to the support provided are equally important for maintaining highest standards of academic excellence.

Educational research and innovation committee (ERIC)

NCERT projects take up specific projects in educational research. It also promotes and supports through funding and providing academic support to professionals working in the field. A standing committee of NCERT called Educational Research and Innovations Committee (ERIC) acts as a catalyst to promote and support research in priority areas of school and teacher

education. The ERIC members include eminent researchers in education and allied disciplines from universities and research institutions and representatives of SIEs/SCERTs. The Department of Educational Research and Policy Perspectives (DERPP) acts as the Secretariat of ERIC and coordinates other activities for promoting educational research.

ROLES AND FUNCTIONS OF ERIC

The National Council of Educational Research and Training (NCERT) was established in 1961 as an autonomous organization fully funded by the Ministry of Education and Social Welfare (now Ministry of Human Resource Development), Govt. of India. Research and Development, Training and Extension are three inter-woven functions of the NCERT. One of the Principal functions of NCERT has been to undertake, promote and coordinate educational research on various aspects of school education and teacher education.

In operational terms the scope of this objective is:

- To initiate, promote and direct programs and activities designed to bring about desirable changes in the educational system through research and innovations
- To promote quality in research having relevance to the educational system.
- To provide and develop leadership in educational research in the country
- In addition to promote educational research in its institutional networking, the NCERT has been taking measures to create and sustain interest in educational research amongst the researchers, both within the NCERT and outside.

In order to promote research, a Standing Committee known as Educational Research and Innovations Committee (ERIC) was set up in the year 1974 with the following objectives:

- ❖ To lay down from time to time priority thrust areas in educational research
- ❖ To take such measures which are necessary to initiate, sponsor and coordinate research activities in the field of education
- ❖ To scrutinize and recommend grants to proposals related to research and innovation projects received from the constituent units of the NCERT as well as from outside agencies and individuals

- ❖ To disseminate research findings and to promote their implementation in the educational system To promote activities in the development of leadership and expertise in research
- ❖ To exercise proper control over the conduct of research projects and utilization of research
- ❖ grants To take such other measures as may be required from time to time to help the Council in meeting its objectives of promoting and disseminating educational research The ERIC Standing Committee consists of eminent educationists from various disciplines and institutions.
- ❖ It comprises of eight eminent educationists nominated by President, NCERT, two Directors from SCERTs, invitees nominated by the Director, NCERT, five Heads of NIE Departments, Principals, Deans of NCERT Hqs. and Joint Directors of the Council and its constituent units. Term of a Standing Committee is for three years.

APPROACHES OF RESEARCH

In order to make educational research relevant, effective and meaningful, ERIC shall give priority to the following research approach :

- Policy Research in Education
- Development of policy concerns
- Effectiveness of policy issues
- Dissemination of findings related to policy issues Qualitative and participatory approaches involving triangulation of methodologies
- Case Studies
- Inter-disciplinary, Collaborative, Multi-centric, and Pan-Indian researches
- Studies involving use of quantitative and qualitative approaches
- Collaborative Action Research Projects involving several agencies/organizations
- Innovations related to qualitative improvement of content and process of school education

Utilization of science educational research

- ❖ Students are encouraged to actively engage with ideas and evidence.

- Students are challenged to develop meaningful understandings.
- Science is linked with students' lives and interests.
- Students' individual learning needs and preferences are catered for.
- Assessment is embedded within the science learning strategy.
- Science is represented in its different aspects.
- The classroom is linked with the broader community.
- Learning technologies are exploited for their learning potentialities

<><><><><>