CONTRIBUTION OF ALLIED DISCIPLINES (ECONOMICS AND STATISTICS) TOWARDS EDUCATIONAL RESEARCH (WITH SPECIAL REFERENCE TO RESEARCH METHODS)

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Introduction

Education system is changing throughout the world. Many innovations are taking place especially in the area of teaching, curriculum framing, and evaluation pattern. The constant changes in educational system give wider scope to researchers to conduct studies on various aspects. Research helps to find out what worked and what did not, nature of various problems and their effects on the system, and possible solutions.

Research means careful examination of an object or situation for the purpose of improvement. According to Kerlinger (1973:11), 'Scientific research is systematic, controlled, empirical and critical investigation of hypothetical propositions about the presumed relations among natural phenomena.' It comprises defining, and redefining of problems, formulating hypothesis or suggested solutions, collecting, organising, and evaluating data ; making deductions and reaching at the conclusions and at last, carefully testing the conclusions to determine whether they fit in the formulated hypotheses or not.

Meaning of Research

Research is a scientific and systematic search for pertinent information on a specific topic. The Advanced Learner's Dictionary of Current English (1952), defines research as "a careful investigation or inquiry especially through search for new facts in any branch of knowledge." According to John W. Best and James V. Khan (1993), 'research is considered to be the more formal, systematic, intensive process of carrying on the scientific methods of analysis. It involves a more systematic structure of investigation, usually resulting in some sort of formal record of procedures and a report of results or conclusions.' They defined research as 'the systematic and objective analysis and recording of controlled observations that may lead to the

development of generalizations, principles, or theories, resulting in prediction and possibly ultimate control of events.' (Best, Khan, 2004:20)

D. Slesinger and M. Stephenson (1930) in the Encyclopaedia of Social Sciences define research as "the manipulation of things, concepts or symbols for the purpose of generalising to extend, correct or verify knowledge, whether that knowledge aids in construction of theory or in the practice of an art." Research is, thus, an original contribution to the existing stock of knowledge making for its advancement. Broadly, research involves selecting a problem, formulating a hypothesis, collecting the facts or data, analysing the facts and reaching certain conclusions either in the form of solutions(s) towards the concerned problem or in certain generalisations for some theoretical formulation. Research involves in-depth enquiry/examination, exhaustive investigations/experimentations to arrive at certain conclusions. This may add to the existing knowledge and/or theory or may create a new one.

According to Pandya (2010:1), research implies the discovery of truth. It is an intellectual activity undertaken with the ultimate aim of scientific and systematic creation of knowledge.

Growth and Development of Research in Education

Research, originally, referred to activities related to the acquisition of basic knowledge in arts, humanities and sciences. It was not until the 19th century that educators gave serious thoughts to education as a fertile area for thorough scientific investigation. However, the growth of educational enquiry has greatly depended on the growth of such contributory disciplines such as sociology, history, psychology and philosophy. Thorndike, an American psychologist, conducted systematic experimental studies into animal learning behaviour. This contributed immensely to education in the future. It was, however, Rice (1897), who first conceived the idea of planned research in education. Growth and development of educational research can be categorized into following four periods namely:

i. **Initial period** (Before 1900)-Pestalozzi, a Swiss educator proposed the scientific study of pedagogy in 1803, which was the foundation for the scientific study of education. In 1861, Wilhelm Wundt, a German psychologist (father of experimental psychology) attempted to analyse human experiences. In 1869, Francis Galton published his work on 'Heredity Genius: An Enquiry into Laws and Consequences'. He devised the method of questionnaire.

ii. **The Discovery Period** (period between 1900 and 1920)- It was a period of exploration. In this initial phase, attempts were made to find out the exact role of education in the development of human personality. During this period, necessary measuring instruments needed by researchers were developed. Edward Lee Thorndike (1904)

published theory of learning. His 'law of effect' became basic principle in the Behaviourism. This era added various instruments of measurements in the field of research namely- Binet-Simon General Intelligence Scale, achievement tests, and performance test, etc. This era was also marked by school surveys to promote the scientific study of education.

iii. **The Expansion Period** (period from 1920-1945)- This period was mostly devoted to refinement of research designs and techniques. It witnessed a rapid expansion of educational research. Educators became more aware of effective appraisal of teaching-learning situations. There were also additions to the measuring instruments and new investigations.

iv. The Period of Critical Appraisal/Re-evaluation (After 1945)- Number of attempts were made to re-appraise educational research in the light of achievements so far made in educational systems. After the World War II too many changes took place in all the fields throughout the world including educational systems. The scope for educational research expanded during this period. Many new methods of data collection and analysis have been devised. Usage of technology in the field of education has brought various changes and challenges in the field of educational research. (Aggarwal, 2002)

Educational research

Education helps to develop to a person's full capacity of body, mind and spirit; with the provision of opportunities for discovering the world and for learning to be a useful member of the society. Education is a complex phenomenon. It is made up of several fields of learning, which are interwoven and overlap with one another. Hence, while talking about educational research, one has to consider the contribution of other disciplines such as psychology, philosophy, sociology, economics of education, management and administration of education, and educational technology, etc.

Educational research incorporates an element of basic research, but for the most part, it is a form of applied research. It is a systematic attempt to gain a better understanding of the educational process, generally with a view to improve its efficiency. The research provides quantified answers to problems and will also allow the potential users to evaluate the findings by providing a detailed description of how the results were obtained.

Educational research depends on ideas, concepts, techniques and skills drawn from many different disciplines. Philosophy, history, economics, psychology and sociology all play important parts in clarifying different aspects of educational problems. For example, take the question of discipline. What do we mean by discipline in the educational setting? Is it ethical to

use punishment at all? Philosophers have a considerable contribution to clarify our thinking about such a controversial topic. Historians enable us to understand the roots of current practices in schools. The rewards and punishments applied today in some schools inevitably reflect, to some extent, the ideas of past generations of educators. Are these practices in tune with changes in current society? The study of sociology will provide another perspective. It analyses authority structures in contrasting societies and in different types of institutions. It links discipline with the role of the teacher in a closed social system-the school. How do children react to different types of discipline-the authoritative, the submissive, and the democratic? Experiments conducted by psychologists will have some different answers to such questions. Thus, to maintain discipline in school will require a range of different skills. (Entwistle, 1973) Teacher, with the background of various disciplines, will be able to take right decision in a particular situation. Each of these academic disciplines has its own characteristic approach to research. The techniques overlap to some extent, but their contribution to the field of education is important.

Educational research helps to improve instructional techniques and management of educational institutions. Educational research is interdisciplinary in nature. Findings of researches do contribute in planning various educational strategies to bring changes. Educational research has impact on teachers and classrooms. For example innovative teaching method, need based changes in curriculum (which is constantly undergoing changes), reforms in examinations. There is still a need to do more research in the area of science of teaching.

Hoke (1963) sees the objectives of educational research as theoretical, factual and for solving practical problems. According to Hoke, the factual nature of research is the accumulation of facts relevant to what the researcher wants to do and an avenue to solve practical problems. The findings of such research are of enormous significance to the person involved in the exercise.

The results and findings of educational research, if incorporated into the policy formulation and its implementation, it helps to bring changes in the field of education. People who are closely associated with education (Principals, teachers, and School administrators) should make special attempts to apply the findings of research and contribute to the development of education field.

Thus, educational research refers to a systematic attempt to gain a better understanding of the educational process, generally with a view to improving its efficiency (Koul, 2009:10). Educational research helps to make the process of education more effective. To do this, it

adopts various methods and techniques from various disciplines. Contribution of economics and statistics as disciplines in educational research is explained in following paragraphs.

Contribution of discipline of Economics

Economics is the science of scarcity. It has a large influence on education field. Individuals and government invest in education. It is necessary to understand the returns. Economics helps in understanding the impact of education on individual and the economy of a nation. This return may be in the form of money or non-monetary (for example education helps to increase sense of self-worth). How education helps in getting jobs which are more paid, getting more salary/wages? Economics gives answers to various questions related to education. For example, how early investments (pre-primary and primary education) in education system are more valuable than those made in later in adulthood, impact of smaller class size (no. of students) on students' achievements, impact of teachers' qualifications/qualities on achievements of students.

The discipline of economics has theoretical and methodological contribution in educational research. It tells about how best to allocate scarce resources in education. It helps us in understanding investment in education and its output. Economic impact of education on individuals and society can be studied well with the help of cost-effect relation. Various key ideas from economics are used in both research and policy making. For instance, education and economic returns can be studied from labour market outcomes or employments in various sectors, cost-effectiveness of education policy, etc. Economics is used in quantitative methods of policy oriented researches. In majority of the countries, economics has significant influence on policy making.

Historical background

Review of literature shows that Adam Smith in his 'Wealth of Nation' (1776) has mentioned the principles of the economics of education. He talks about the idea of investment in education to increase the productive capacity of society. The 'Human Capital Theory' has become and remained dominant paradigm in the economics of education. In twenty first century, the principles of the economics of education have been applied on a large scale in making education policy.

In empirical researches, causal impact of education on earnings is an area, which helps in developing various strategies to be adopted in education system.

Another area of research is economic evaluation of education, which helps in bringing reforms in education. This helps in bringing changes in academic activities. The introduction of market principles into education in India started in late 1990s. Application of principles of economics

helps to know the market trends, demands of various jobs especially in corporate sectors. This helps us in framing curriculums at various degree levels.

The contribution of discipline of economics in the area of quantitative education policy evaluation is significant. Demand and supply can be tested through quantitative research method. By applying robust theoretical models, one can find answers to whether investment in education really helps in development of a nation.

Economics can generate testable hypothesis in the field of education. They can be tested through quantitative research methods. It provides answers in quantifiable terms, which helps in policy framing. This also helps in allocating resources to various heads, with clear justifications. For instance, allocation of 1% of total budget of education for providing transport facilities to girl children studying in secondary schools in rural and tribal areas, as secondary schools are located at far distance.

Economics also helps us to understand non-cognitive skills and its relationship in achievements. For example, study of implication of marketization of education helps us to find out solutions for equity in education. Findings of these researches in these areas are of great importance in framing various policies. In short, the discipline of economics helps us to produce quantifiable evidences.

Quantitative research method- (causal impact) quantitative research method has been used in educational research since ages. Economics has further contributed in it. It provides various techniques that improve the quantitative rigour of analysis particularly. It places emphasis on establishing causality in analysis. For example, what is the causal impact of education policy? In other words, what is the outcome, if a child receives primary education versus the outcome if s/he does not? Establishment of causal impact helps us to draw correct policy conclusions. Another example will be study of stubborn student and its impact on student's achievement. One can also find out the relationship between small size of the classroom (less number of students), students' behaviour and achievement. By allocating a bigger size of classroom, one can observe whether there is any change in behaviour of students, change in performance of students.

One can also study whether additional resources in school lead to better students' achievement. To establish causal relation between resources and students' achievement, quantitative research can be undertaken. Researches in the area of cost benefit analysis of education budget, rate of return analysis, cost effectiveness analysis, economics of teachers' provisions are other areas, where one can contribute to policy decisions.

Causal relationship technique can also be used to evaluate a particular educational programme. For example, Mid Day Meal (MDM) is introduced in schools by the government. One of the objectives of this programme is to retain students in the school. To evaluate how this programme has helped in enrolment and retention of students in school, one can use statistical and econometric methods. Other examples include usefulness of scholarships to students belonging to scheduled caste and scheduled tribe, contribution of freeships in enrolment of students belonging to other backward castes in higher education. The causal impact will help us to assess the true costs and benefits of these policies/interventions. This further helps in modifying the policies (policy decisions).

By applying various methods of research in economics, one can find out the achievement and welfare of children occurred due to various policies such as Education for All, Right to Education Act, etc. There are certain questions which are non-answerable. For example, how do we raise students' achievement?, what strategies will be useful for students in remedial class?. Various researches carried out by economists show that there is a need to improve the quality of teacher, as they are at the centre who can improve the quality of education. Teachers' salaries play a vital role in maintaining the quality of a teacher workforce. There is an utter need to understand clearly the link between teacher, teaching and students' achievement. Cost-effectiveness of education and achievement will help in bringing reforms in education system. Government is investing crores of rupees in education, still inequality in education exists, and quality of education is deteriorating. Economics can help us to find out reasons for these questions. Government of India wants to increase the Gross Enrolment Ratio (GER) in higher education upto 20% by 2020. Will this policy provide economic benefits to graduates?, will they get quality jobs? or this will simply increase number of degree holders (qualification inflation) or after getting their degree, will they work in unorganized sector for less paid jobs? Answers to these questions can be obtained by using various techniques of research in economics. Economics can predict whether these investments will be useful in long term. Economics provides a range of methods that can be applied in a non-experimental setting.

Contribution of Statistics

Statistics is a major part of educational research. Various statistical techniques are used to interpret the data in quantitative method. Use of statistical techniques differs according to the objectives of the research. There are multiple interpretations of single event and situation. Statistics allows the researcher to select a specific method for data analysis. In other words, researcher can use both-qualitative and quantitative approaches.

Use of statistical techniques is in an integral part of research. It starts as early as the phase of sampling in research. Selection of sample, items to be collected and its quantitative analysis is done by applying statistical techniques. Sampling errors can be eliminated by applying statistical formulas. The amount of sampling error depends on the nature of population. Sampling errors will be less if the population is homogeneous. It also depends on the size of population. Larger the sample size, the magnitude of the sampling error will be lower. By using following formula, error can be measured.

Standard Error (SE) of the mean=SD/vN

Sampling Error=1.96 x SE at 0.95 level of confidence

= 2.58 x SE at 0.99 level of confidence

Sampling Error=Value of Population parameter-Value of Sample Statistic

This includes errors arising on account of sampling frame, response errors and chance errors. (Pandya, 2010:311)

One can also use various formulas to calculate sample size.

Statistics is widely used in educational surveys. For example, survey of achievement of students, administrative problems of schools, etc. By using various techniques of probable sampling or non-probable sampling, one can choose the final sample for educational research. By using standard deviation, one can estimate value of achievement of students in various subjects. One can also find a mean score from a frequency distribution table. One can study yearly changes in achievements, comparison of performance of government schools and private schools, influence of geographical conditions on students' performance, etc. These results may help in policy framing regarding curriculum, providing facilities in different areas, use of technology in teaching, etc. Results of these studies can also help to decide strategies for organizing remedial classes, improvement in teaching methods to help the challenged students.

In quantitative research, statistics helps to describe and explore relationships in various variables or differences among groups. With the help of statistics, researcher can make quantitative predictions in terms of probability and ultimate control of events. It also helps to assess cause and effect relationships more credibly.

By applying various Statistical techniques, one can establish correlation between one or more quantifiable variables. The degree of relationship is expressed in terms of coefficient of correlation. If the relationship exists between variables, it implies that scores on one variable are associated with or vary with the scores on another variable. The exploration of relationship between variables provides insight into the nature of the variables themselves as well as an

understanding of their relationships. If the relationships are substantial and consistent, they enable a researcher to make predictions about the variables. (Pandya, 2010: 89)

Statistics is used more widely in Correlational research in education. Correlational research aims at determining the nature, degree and direction of relationships between variables. This helps in making predictions about certain phenomena. For example study of students' achievement in various subjects. Study of anxiety of students can be studied by using Taylor Manifest Anxiety Scale.

Statistics is also useful in comparative research studies. By applying various statistical techniques, the researcher can compare two or more groups. It helps to study relationships between two or more variables. Comparative study provides information on how two or more groups differ on some phenomenon. (dependent variable). For instance, a study of gender based academic achievement of students in rural area. By using comparative research method, one can study the academic achievements of girls' and boys' studying in rural schools. In this study, academic achievement is dependent variable, whereas gender is the independent variable. Researcher can compare academic achievements of students from one school and same class or may select two schools and students of same class (say Std. V or Std. VII, etc). In comparative research, the most common statistical techniques used are t-test and ANOVA. For comparing two groups, t-test is used and when more than two groups are to be compared, ANOVA technique is used. t-test can be used to compare the Mean Academic achievements of girls' and boys', IQ of girls and boys.

In causal-comparative research, which is a descriptive research, one can use statistical techniques. In causal-comparative research, the researcher does not have any direct control over independent variable, as they are non-manipulable. When the researcher wants to identify the reasons or causes of differences in groups' achievements, s/he can use causal-comparative research method. It involves comparison. The researcher cannot make any direct interventions. For example, the researcher observes that there is a difference in academic achievement of students in a particular class. The cause may be gender, socio-economic background of the students' family, caste, intelligence, educational background of the parents, etc. (these are independent variables). Achievement of students, which is effect, may be due to various factors, has already occurred.

Causal-comparative research is mostly used to establish the relationship between cause and effect. It involves two or more groups and one independent variable. Topics such as effects of teachers' personality on students' achievements, birth order and achievement in school, affiliation of schools to various boards (State Board, CBSE, ICSE, etc), teaching methods,

infrastructure of schools, provision of scholarships, etc can be studied by using causal-comparative method. In this research method also, one can use t-test for comparing two groups or ANOVA for comparing more than two groups on a single variable. According to Pandya (2010), technique of ANCOVA may also be used in case some other variables likely to influence the dependent variable which needs to be controlled statistically. Analysis of Covariance (ANCOVA) is used to adjust initial group variances on variables used in causal-comparative and experimental researches. ANCOVA adjusts scores on a dependent variable for initial differences on some other variables related to performance on the dependent variable. For example, a researcher wants to study the effective teaching methods. Which method is more effective- lecture method, discussion method, case study method, demonstration method or experimental method? By applying Covariate analysis technique, one can compare and draw a conclusion.

Chi-square is another statistical test commonly used to compare observed data with data we would expect to obtain according to a specific hypothesis. It tests null hypothesis. Chi-square can also be used to compare group frequencies, or to see if an event occurs more frequently in one group than another.

Statistics helps to establish correlation between cause and effect in terms of degrees and not in dichotomies. It deals with problems in terms of many variables and reflects the variation of many factors at once. Correlations range over a scale from a perfect negative correlation to no correlation and to a perfect positive correlation (Aggarwal, 2002). Correlation can be used to measure the strength of an institution, predict teaching success, predict the number of students, who can score above 70%, etc. Statistics is also widely used in experimental research, cost analysis of education (economics).

Conclusion

The disciplines-economics and statistics- have immensely contributed to educational research. Educational research is beneficial to teachers in choosing various methods for implementation of curriculum. It is useful for administrators in deciding structures and to the government in framing policies. Education is a multidisciplinary endeavour. It cannot be imparted in isolation; hence it cannot be studied in isolation. We have to take into consideration the related disciplines of psychology, sociology, economics, philosophy, and statistics in educational research specially while evaluating its importance.

References

Aggarwal, J.C. 2002. Educational Research:An Introduction. New Delhi: Arya Book Depot: 39-42

Best, John W. and Khan, James V. 2004 (7th ed).). Research in Education. New Delhi: Prentice Hall of India Pvt. Ltd.

Cohen, Louis, Manion, Lawrence and Morrison, Keith. 2013. Research Methods in Education. London and New York: Rutledge.

Creswell, John W. 2007. Qualitative Inquiry and Research Design (2nd ed) New Delhi: Sage Publications India Pvt. Ltd

Entwistle N. J. 1973. The Nature of Educational Research. Great Britain: The Open University Press. Walton hall Bletchley Bucks, Buckinghamshire: 14-24

Hoke, A. H.1963. Elements of Educational Research.New York: McGraw-Hill Book Co. Inc

Kerlinger, F.N. 1973. Foundations of Behavioural Research. New York: Holt, Rinehart and Winston.

Koul, Lokesh. 2011. Methodology of Educational Research. New Delhi: Vikas Publishing House Pvt. Ltd: 35

Oad, L.K. 1983.Shiksha Ke Darshanik Prishthbhumi.Jaipur:Rajasthan Hindi Granth Academy

Pandya, Shefali. 2010. Educational Research. New Delhi: APH Publishing Corporation

Rao, M. Satyanarayana and Yadagiri, R. 1984. Processing of Data, Research Methods in Social Science. New Delhi: Sterling Publishers

The Advanced Learner's Dictionary of Current English, Oxford, 1952:1069.

The Encyclopaedia of Social Sciences. 1930.Vol. IX, MacMillan