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T. Husén

### Educational Research, History of

Educational research as disciplined inquiry with an empirical basis was first known as "experimental pedagogy". This term was analogous to that of "experimental psychology", an expression coined by Wundt in Leipzig around 1880. Experimental pedagogy was founded around 1900 by Lay and Meumann in Germany; Binet and Simon in France; Rice, Thorndike, and Judd in the United States; Claparède in Switzerland; Mercante in Argentina; Schuyten in Belgium; Winch in England; and Sikorsky and Netschajeff in Russia. Some years earlier, three publications—*The Mind of the Child* by Preyer, a German psychologist, in 1882; *The Study of Children* by Stanley Hall from America in 1883; and articles by an English psychologist, Sully, in 1884 concerned with children's language and imagination—marked the beginning of the child study movement. Although progress was slow during the 1880s the foundations were laid through this movement for research into related educational problems. From 1900 onwards,

the study of educational questions developed rapidly and three movements can be identified: (a) the child study movement, where educational research was associated with applied child psychology; (b) the New Education or progressive movement where philosophy took precedence over science, and life experience over experimentation; and (c) the scientific research movement with a positivist approach. This article is primarily concerned with the third movement which involves empirical research.

In the first major identifiable period (1900-1930), Cronbach and Suppes (1969) speak of a "heyday of empiricism", empirical educational research focused on rational management of instruction, challenging the concept of transfer of training, psychology of school subjects, development of new curricula, psychological testing, administrative surveys (school attendance, failure rates, etc.), and normative achievement surveys. Descriptive statistics were already well-established and in the 1920s and 1930s inferential statistics and multivariate data analysis developed rapidly (see *Statistical Analysis in Educational Research*).

In the second period (1930 to the late 1950s), however, the strict scientific approach to education lost impetus to make room, practically all over the developed world, for the more philosophically oriented and innovative progressivism. Behind this shift were three factors: (a) the atomistic character of most educational research; (b) a questioning of the scientific approach to the management of education at a time when there was an economic crisis soon to be followed by war; and (c) the charisma of the progressive movement with its combination of empirical research and a social and political philosophy merging the free enterprise, liberal spirit with humanistic socialism.

Nevertheless, during this period interest in cognitive development and language studies continued with the work of Piaget in Switzerland, and Vygotsky, who died in 1934, and his associates Luria and Leontief in the Soviet Union. In addition, a new strand of enquiry was opened up in the field of the sociology of education with the publication in 1944 of *Who Shall be Educated* by Warner, Havighurst, and Loeb in the United States. These authors brought together a substantial body of research to establish that schooling in the United States favoured white children from an urban middle-class background. Other studies into adolescence and adolescent development soon followed.

In the third period (1960s and 1970s) the knowledge "explosion" took place and its applications to technology really began (see *Knowledge Explosion*). Educational research was soon influenced by this dynamic development. Challenged by the Soviet technological advance (e.g., Sputnik) and being economically affluent, United States governmental and private agencies supported educational research

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to an unprecedented extent. A similar development, although not so spectacular, occurred in other highly industrialized countries. During the 1960s the computer added a new dimension to educational research leading to the introduction of sophisticated experimental design since data processing and data analysis were no longer limited by calculation time as in the precomputer era. From this, new ways of thinking about educational issues developed, which were concerned with assessing probabilities, the interaction of the influences of many factors on educational outcomes, and the introduction of mathematical and causal modelling to predict and explain educational phenomena (see *Models and Model Building*).

The Anglo-Saxon world led the field in educational research followed by the Scandinavian countries, while West European countries tended to move more slowly. The profound impact of the Anglo-Saxon research methodology has been felt all over the world since the 1960s. But the 1960s were also marked by the beginning of an epistemological debate in the social sciences, perhaps a reaction to the strident empiricism which had developed. It is now fully realized that the rigid scientific ideal, embodied in the neopositivist approach, cannot take into account the multifaceted aspects of human behaviour and all its environment-bound subtle nuances (see *Research Paradigms in Education*).

Confrontation took place. Just as the student movement and revolt can now be considered as part of an emerging, new human culture, the positivistic versus the anthropological or hermeneutic debate can be conceived as a new era in the social sciences. The answer of educational researchers of the 1980s is not either-or, but both. The research community has come to realize that sound inquiry develops in a spiral way combining methods or approaches that some would earlier have considered as incompatible: the scientific or hard data approach is seen to be complementary to the anthropological, historical, phenomenological, or soft data approaches.

Thus, it took empirical educational research approximately a century to reach its present status of maturity. For the first time in the history of humankind, the art of education can rely upon a sound and increasingly comprehensive basis.

In tracing the development of educational research this article will examine the successive periods: pre-1900 era, 1900 to 1930s, 1930s to late 1950s, the 1960s and 1970s, and developments in the 1980s.

### 1. Pre-1900

It is certainly not incidental that within a period of about 25 years empirical educational research was born and began to tackle most of the pervasive educational problems which are today still under study throughout the Western world. The foundations for this sudden rise were laid during centuries of edu-

cational experience and philosophical thinking, and were inspired by the explosion of the natural sciences during the nineteenth century. More specifically, longitudinal observations of individual children were recorded during the nineteenth century and attained a high-quality level with the pioneering study, in 1882, by Preyer, *Die Seele des Kindes* [The Mind of the Child]. This was the first textbook on developmental psychology. The idea of an experimental school and of experimentation in education is present in the writings of Kant, Herbart, and Pestalozzi, but this idea implied field experiences and not experimentation according to an elaborated design.

In the second part of the nineteenth century, several signs show that developments in the natural sciences slowly began to influence psychology and education. In 1859, in *The Emotions and the Will*, Bain considered the construction of aptitude tests. Five years later, G. Fisher proposed, in his *Scale-book*, a set of scales for the rating of ability and knowledge in major school subjects including handwriting. Fisher also introduced statistics into educational research by using the arithmetic mean as an index of achievement of a group of students. In 1870, Bartholomai administered a questionnaire to 2,000 children entering primary school in order to know the "content of their mind" at that moment. Three years later, the first experimental study of attention was published by Miller in Göttingen. In 1875, James opened the first psychological laboratory of the United States at Harvard in order to carry out systematic observation, but not experimentation. The year 1879, saw the publication of Bain's *Education as a Science*.

It is clear that the immediate origin of modern educational research (and of experimental psychology) is not to be found in the emerging social sciences, but in the natural sciences. With his *Origin of Species* (1859), Darwin linked research on humans with physics, biology, zoology, and geography. Six years later, Bernard published his *Introduction to the Study of Experimental Medicine*, the guide to modern scientific research. In 1869, Galton suggested, in *Hereditary Genius*, applying statistics to the study of human phenomena and began work on the concepts of standardization, correlation, and operational definition. Carroll (1978) saw in Galton's *Inquiry into Human Faculty and its Development* (1883) the invention of the concept of mental testing.

Experimental psychology—soon to be followed by experimental pedagogy—was created in German physics laboratories by scholars with a strong philosophical background. Wundt, a student of one of these scholars, Helmholtz, founded the first laboratory of experimental psychology in 1879. Wundt's laboratory had a considerable impact, and the scientific leadership of the German universities at the end of the 1800s must be recognized in order to understand what happened between 1880 and 1900.

At that time, many students, particularly from the United States, completed their advanced education at the universities of Berlin, Leipzig, Heidelberg, or Jena. This explains the extraordinarily rapid dissemination of Wundt's ideas: Cattell, Hall, Judd, Rice, and Valentine were among his students. His work was immediately known in France by Ribot and Binet, in Russia by Netschajeff, in Japan by Matsumoto, in Santiago, Chile by Mann, and in Argentina by Mercante. Psychological laboratories were soon opened on both sides of the Atlantic.

In the meantime, certain key events were associated with the birth of modern educational research:

- 1885 Ebbinghaus's study on memory drew the attention of the education world to the importance of associations in the learning process.
- 1888 Binet published his *Études de Psychologie Expérimentales*; at that time he was already working in schools.
- 1890 The term mental test was coined by Cattell.
- 1891 Stanley Hall launched the review *Pedagogical Seminary*.
- 1894 Rice developed a spelling test to be administered to 16,000 pupils. He published the results of his testing in his *Scientific Management of Education* in 1913.
- 1895 In the United States, the *National Society for the Scientific Study of Education* was founded (initially called the National Herbart Society for the Scientific Study of Teaching).
- 1896 In Belgium, Schuyten published a report of his first educational research study on the influence of temperature on school children's attention. Dewey, a student of Stanley Hall, opened a laboratory school at the University of Chicago.
- 1897 Thorndike studied under James at Harvard and there discovered the works of Galton and Binet. Ebbinghaus published his so-called completion test to measure the effect of fatigue on school performance. This can be considered to be the first operational group test. In the same year Binet began to work on his intelligence scale.
- 1898 Lay suggested distinguishing experimental education from experimental psychology. Binet and Henri condemned traditional education in their book *La Fatigue Intellectuelle* and indicated the need for experimental education.
- 1899 Schuyten opened a pedagogical laboratory in Antwerp (Belgium) to study experimentally, among other things, group teaching methods.

Who is the father of "experimental pedagogy"? The answer to this question differs whether the activity covered by the term or the term itself is considered. Empirical research in education definitely existed before 1900. Many American authors regard Rice as the founder because of his research on the effect of spelling drills (1895-1897), but other names: Binet, Lay, Mercante, or Schuyten, could also qualify. As for the term itself, it was coined by Meumann (Wundt's former student) in 1900, in the German *Zeitschrift für Pädagogik* where he dealt with the scientific study of schooling. In 1903, Lay published his *Experimentelle Didaktik* where he made his famous statement about "... experimental education will become all education". In 1905, Lay and Meumann together published the review *Die Experimentelle Pädagogik*. Subsequently, Meumann's three-volume work *Einführung in die Experimentelle Pädagogik* (1910, 1913, 1914) emphasized both the strict scientific and quantitative side of the laboratory, while Lay continued to emphasize both quantitative and qualitative approaches (empathy, intention) in classroom research.

When did modern educational research appear in France? There is no doubt that Binet inspired it. In his introduction to his book *La Fatigue Intellectuelle* (1898), he wrote:

Education must rely on observation and experimentation. By experience, we do not mean vague impressions collected by persons who have seen many things. An experimental study includes all methodically collected documents with enough detail and precise information to enable the reader to replicate the study, to verify it and to draw conclusions that the first author had not identified. (Simon 1924 p. 5)

It is obvious throughout the whole psychological work of Binet that he had a strong interest in education. In 1905, he founded the School Laboratory in rue Grande-aux-Bettes in Paris. With him were Vaney, who in 1907 published the first French reading scale and Simon, the coauthor of the *Intelligence Scale* (1905) and later author of the *Pédagogie Expérimentale*. Binet and Simon's *Intelligence Scale* presented in Rome at the 1905 International Conference of Psychology was the first truly operational mental test covering higher cognitive processes. Like Wundt's ideas, Binet's test became known throughout the world within a very few years. But beyond its intrinsic value, this test had a far greater historical significance. It was now acknowledged that a test could be a valid measurement instrument both in psychology and education.

In 1904, Claparède, a medical doctor, founded the Laboratory for Experimental Psychology at the University of Geneva with his uncle Flournoy. In 1892, Claparède had visited Binet in Paris and in the following year was, for a short time, Wundt's student in Leipzig. In 1905, he published the first version of

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his *Psychologie de l'enfant et pédagogie expérimentale* that was the only French educational research methods handbook until 1935 when Buysse published his *Expérimentation en Pédagogie*. In 1912, Claparède established the J. J. Rousseau Institute in Geneva which over the next 50 years was to make a marked contribution to child study and education through the work of Jean Piaget. However, Claparède remained mostly psychologically and philo- sophically oriented. With his theory of functional education, he was the European counterpart of John Dewey. Together they were seen as the two main leaders of progressive education.

Among many interesting features in the work of Claparède (following Dilthey's work in 1892 on *Verstehen* vs. *Erklären*) is his analysis, in 1903, of the explaining (positivist, nomothetic approach) versus the understanding (hermeneutic) approach. This elicited a debate which still lasts today.

At the end of *Les Idées modernes sur les enfants*, Binet (1924 p. 300) mentioned that "it is specially in the United States that the remodelling of education has been undertaken on a new, scientific basis". In fact, at the beginning of the century, education research advanced at an extraordinarily quick pace in the United States.

At Columbia University, Cattell, who had obtained his Ph.D. under Wundt and had known Galton in Cambridge, had, in 1890, as mentioned above, coined the term mental test in the philo- sophical journal *Mind*. In 1891, he established his psychological laboratory just above the laboratory for electricity. Under his supervision Thorndike completed his Ph.D. in 1898 on animal intelligence. Like many psychologists of the time he soon developed a keen interest in education. In this period, so much attention was focused on objective measurement that the experimental education movement was some- times called "the measurement movement" (Joncich 1962).

Thorndike can be considered as the most charac- teristic representative of the scientific orientation in education. During the following decades, he dealt with all aspects of educational research. He was the first person to conceive of teaching methods in terms of an explicitly formulated and experimentally tested learning theory. In so doing, he opened a new teach- ing era. The influence of Thorndike in the field of educational research can probably be compared with the influence of Wundt in experimental psychology.

## 2. The Flourishing of Quantitative Research, from 1900 to 1930

During this period, most educational research was quantitatively oriented and geared to the study of effectiveness. For a while, Taylorism and the study of efficiency, became a component of educational thinking. The behaviouristic and antimentalist study

of human behaviour was regarded as the best weapon against the formalism of the past.

The following aspects of research activities, although not comprehensive, are representative illus- trations of the era.

### 2.1 Statistical Theory

It has sometimes been said that there is an incon- sistency between the limitations of measurement in the social sciences and the rapidly increasing sophis- tication of the statistical techniques resorted to. How- ever, it can be argued that many statistical advances were achieved by researchers in education precisely because they were aware of the complexity and the instability of most phenomena they had under study and had to look for increasingly sophisticated methods to obtain sufficient validity of measurement or else indicate the limitations of their conclusions.

The applicability of the Gaussian probability curve to biological and social phenomena was suggested at the beginning of the 1800s by Quetelet, who coined the term statistics. Galton was the first to make extensive use of the normal curve to study psycho- logical problems. He sometimes preferred to express the same distributions with his ogive because this representation gave a better picture of the hierarchy of characteristics. Galton also suggested percentile norms. In 1875, he drew the first regression line, and developed the concept of correlation in 1877. In 1896, Pearson, who worked under Galton, published the formula for the product-moment correlation coef- ficient. In the first decade of the 1900s, the essentials of the correlational method, including the theory of regression, were well-developed, especially by Brit- ish statisticians, Pearson and Yule. In the same period, Pearson developed the chi-square technique and the multiple correlation coefficient. Reliability was measured with the Spearman-Brown Formula. In 1904, Spearman published his analysis of a cor- relation matrix to sustain his two-factor theory and factor analysis began to emerge.

Researchers were also aware of the statistical sig- nificance of differences. They used rather crude methods indeed, but did not take many chances. Carroll has written:

Fortunately, American psychologists in the early days, tended to employ such a conservative standard in testing statistical differences (a "critical ratio" of four times the probable error, corresponding to  $p < .007$ ) that at least it can be said that they only infrequently made "Type 1 errors." (Carroll 1978 p. 20)

In 1908, under the name of Student, Gossett showed how to measure the standard error of the mean and the principle of the t-test was formulated.

Experimental design was also used. In 1903, Schuyten used experimental and control groups. In 1916, McCall, a student of Thorndike and probably the first comprehensive theorist of experimentation

in education, recommended the setting up of random experimental and control groups. In a research study with Thorndike and Chapman (Thorndike et al. 1916), he applied  $2 \times 2$  and  $5 \times 5$  latin square designs. This was 10 years before the work of R. A. Fisher in England.

The contribution of Sir Ronald Fisher was critical. With the publication of his *Statistical Methods for Research Workers* in 1925, small-sample inferential statistics became known, but were not immediately utilized. In the same work, Fisher reinforced Pearson's chi-square by adding the concept of degrees of freedom, demonstrated the *t*-test, and explained the technique of analysis of variance. In 1935, Fisher crowned his scientific career with his famous *The Design of Experiments*, originally conceived for agriculture, and not widely applied in educational research before the late 1940s.

A look at some of the statistical texts available in the 1920s is often a surprise for today's students: Thorndike (1913), McCall (1922), Otis (1925), Thurstone (1925) in the United States; Yule (1911), Brown and Thomson (1921) in the United Kingdom; Claparède (1911) in Switzerland; Decroly and Buyse (1929) in Belgium had a surprisingly good command of descriptive parametric statistics and also a keen awareness of the need for testing the significance of differences.

## 2.2 Testing and Assessment

It has been shown that both mental and achievement tests already existed at the turn of the century. Between 1895 and 1905 tests were administered in schools in the United States, Germany, France, Belgium, and many other countries. Perhaps the critical moment was the appearance in 1905 of Binet and Simon's test, the first valid and operational mental measurement instrument. Group testing began in England in Galton's laboratory in 1905, and Burt and Spearman assisted him. In 1911, the United States National Education Association approved the use of tests for school admission and final examinations. A breakthrough occurred with the development and wide-scale, efficient use of tests by the United States Army, which were quickly constructed in 1917 mostly by drawing upon existing mental tests. Soon after the war, these tests were modified for school use (Carroll 1978).

The 1918 *Yearbook* of the National Society for the Study of Education was entirely devoted to the measurement of educational products. In 1928, about 1,300 standard tests were available in the United States. By the 1930s, normative-test construction techniques could be considered to be fully developed: item formats, order of items, parallel forms, scoring stencils and machine scoring, norms, reliability, and validity. The psychometric advance of the United States, at that time, was such that standardized tests were often referred to as "American tests".

Mental tests were soon used in all industrialized countries. In particular, Binet's scale was used in Europe, North and South America, and Australia, and was tried out in some African countries. This was far from being the case with achievement tests. Some fairly crude tests were used as research instruments but frequently remained unknown to the classroom teacher. It is, for instance, surprising to observe the lack of sophistication of the achievement tests developed in France after Binet and Simon. This continued until the 1940s, and the situation is particularly well-illustrated in the book by Ferré, *Les Tests à l'école*, a fifth edition of which appeared in 1961. It is all the more surprising since in the 1930s traditional examinations (essay and oral tests) were sharply criticized in England and in France where Piéron coined the French word *docimologie*, meaning "science of examinations". Lack of validity, of reliability, and sociocultural bias were denounced with documented evidence. In Continental Europe, standardized achievement tests were not extensively used in schools.

## 2.3 Administrative and Normative Surveys

Among educational research endeavours, surveys are the oldest. In 1817, Marc Antoine Jullien de Paris became the founder of comparative education by designing a 34-page national and international questionnaire covering all aspects of national systems of education. The questions were posed, but unfortunately not answered, at that time.

The modern questionnaire technique was developed by Stanley Hall at the end of the 1800s to show, among other things, that what is obvious for an adult is not necessarily so for a child. This observation has, of course, direct educational implications.

In 1892, Rice visited 36 towns in the United States and interviewed some 1,200 teachers about curriculum content and teaching methods. Subsequently he carried out a spelling survey (1895-1897) on 16,000 pupils and found a low correlation between achievement and time invested in drill. This survey was repeated in 1908 and in 1911 (Rice 1913). Thorndike's 1907 survey of dropouts was followed by a series of other surveys of school characteristics: differences in curricula, failure rate, teaching staff qualifications, school equipment and the like. The most comprehensive survey of the period was the Cleveland Schools Survey undertaken in 1915-16 by L. P. Ayres and a large team of assistants. The study was reported in 25 volumes each dealing with different aspects of urban life and education.

In Germany, France, Switzerland, and Belgium, similar but smaller surveys were carried out by "pedotechnical" offices such as that opened in 1906 in the Decroly School in Brussels.

Several large-scale psychological surveys were undertaken: the Berkeley Growth Study (1928), the Fell's Study of Human Development (1929), and the

Fourth Harvard Study (Council for Research in first *Mental Survey* on which provided a baseline determining the representative population of the same

A landmark in the history of education was the *Eight-year Study* conducted in the United States by the National Education Association (see *Principles of Curriculum Development*). The purpose of the study, a survey research method, was to determine to what extent the college curriculum had prepared the reform of the secondary school to demonstrate the relevance of progressive ideas at the time. The study students from 30 states were admitted to college irrespective of whether they had studied in high school. They were probably more impulsive than average. Tests covering higher cognitive outcomes were developed. The study was directed by Ralph Tyler and influenced by the educational objectives of the *Eight-year Study*. *Principles of Curriculum Development* presented his model for curriculum development. It was followed by Bloch (see *Objectives, Evaluation, and Development*) which marked the beginning of the definition of curriculum development and evaluation (*Evaluation*).

## 2.4 Curriculum Development

Curriculum was one focus of educational research from the article, in 1900, in which "experimentelle Pädagogik" with the scientific study of curriculum development afterwards, Thorndike in terms of "methods in terms of branches", and by demonstration on the transfer of learning prevailing theories of psychology it ignored the needs of a psychological approach with the new pragmatic to rationalize work and Decroly and Buyse hoped to save time for education subjects was also dealt with such as Judd. But, as far as in the broad sense of the of Thorndike on content evaluation of material *Curriculum Development*; C

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 curriculum and education.

Germany, and Belgium,  
 carried out by "pedo-  
 gogues" in 1906 in the

ological surveys were  
 in the Hawthorne Study (1928), the  
 Fourth Harvard Study (1929), and the

Fourth Harvard Study (1929). In 1932, the Scottish  
 Council for Research in Education carried out its  
 first *Mental Survey* on a whole school population  
 which provided a baseline for later surveys and for  
 determining the representativeness of samples of the  
 population of the same age.

A landmark in the history of experimental edu-  
 cation was the *Eight-year Study* (1933-1941) con-  
 ducted in the United States by the Progressive Edu-  
 cation Association (see *Eight-year Study*). The initial  
 purpose of the study, which was carried out using  
 survey research methodology, was to examine to  
 what extent the college entrance requirements ham-  
 pered the reform of the high-school curriculum and  
 to demonstrate the relevance and effectiveness of  
 progressive ideas at the high-school level. In this  
 study students from 30 experimental schools were  
 admitted to college irrespective of subjects they had  
 studied in high school. The by-products of this project  
 were probably more important than the project itself.  
 Tests covering higher cognitive processes and effec-  
 tive outcomes were developed by an evaluation team  
 directed by Ralph Tyler. The careful definition of  
 educational objectives was advanced. In 1950,  
 influenced by the *Eight-year Study*, Tyler wrote *Basic  
 Principles of Curriculum and Instruction*, in which he  
 presented his model for the definition of objectives.  
 It was followed by Bloom's first taxonomy in 1956  
 (see *Objectives, Educational, Taxonomies of*), and  
 this marked the beginning of the contemporary think-  
 ing on the definition of objectives and on curriculum  
 development and evaluation (see *Curriculum  
 Evaluation*).

### 2.4 Curriculum Development and Evaluation

Curriculum was one focus of attention of empirical  
 educational research from its very beginning. The  
 article, in 1900, in which Meumann used the term  
 "experimentelle Pädagogik" for the first time dealt  
 with the scientific study of school subjects. Shortly  
 afterwards, Thorndike introduced a radical change in  
 curriculum development by conceptualizing teaching  
 methods in terms of a "psychology of school  
 branches", and by demonstrating through his work  
 on the transfer of learning the lack of validity of the  
 prevailing theories of formal education, and how  
 it ignored the needs of contemporary society. This  
 psychological approach was perfectly compatible  
 with the new pragmatic philosophy and the attempts  
 to rationalize work and labour. Some years later,  
 Decroly and Buyse hoped to "taylorize instruction  
 to save time for education". The psychology of school  
 subjects was also dealt with by other leading scholars  
 such as Judd. But, as far as research on curriculum,  
 in the broad sense of the word is concerned, the work  
 of Thorndike on content, teaching methods, and  
 evaluation of material is second to none (see *Cur-  
 riculum Development; Curriculum Evaluation*).

During the same period, the progressive move-

ment, partly inspired by Dewey, remained in close  
 contact with these specific developments, although it  
 soon rejected—as William James had done earlier—  
 a strictly quantitative experimental approach to edu-  
 cational phenomena. According to Thorndike's sci-  
 entific approach, there could only be one standard  
 curriculum at a given time, the best one that scientific  
 research could produce. Most important to the move-  
 ment was the rejection of formalism for functionality.  
 The main criteria for curriculum content became  
 individual needs in a new society, as conceived by  
 liberal, middle-class educators of the time.

In 1918, Bobbitt published *Curriculum*, soon to  
 be followed by Charters' *Curriculum Construction*  
 (1923). This led to a series of studies with increasingly  
 strong emphasis on a systematic and operational  
 definition of educational objectives. On the Euro-  
 pean side, the Belgian *Plan d'études* (1936), written  
 by Jeunehomme, can be considered as a curricular  
 masterpiece, built on contributions of both strict  
 empirical research and the progressive philosophy.

### 3. From the 1930s to the late 1950s

The economic crisis of the 1930s made research funds  
 scarce. The need for a new social order was inter-  
 preted differently: fascism in some countries  
 (Germany, Italy, Japan); socialism in others (the  
*Front Populaire* in France and Spain). Progressivism,  
 advocated by the New Education movement outside  
 the United States, seemed to be an obvious edu-  
 cational solution in most democratic countries and a  
 guarantee for the future of democracy.

The Second World War and the years immediately  
 following froze most educational research activities  
 in European countries. Freedom of research was  
 (and still is) not acceptable to dictators. In the Soviet  
 Union, the utilization of tests (as incompatible with  
 political decisions) and more generally the "pedo-  
 logical movement" were officially banned in 1936  
 by a resolution of the Communist Party, and this  
 situation lasted until Stalin's death. However, other  
 forms of research continued, arising from the pub-  
 lication in 1938 of *Thought and Language* by L. S.  
 Vygotsky four years after his death in 1934, and the  
 subsequent work of his associates such as Luria and  
 Leontief in the development of Pavlov's ideas. In  
 occupied countries, school reorganization was plan-  
 ned by underground movements which tried to draw  
 conclusions from previous experiments and to design  
 educational systems for peace and democracy. The  
*Plan Langevin-Wallon*, for the introduction of com-  
 prehensive secondary education in France is an  
 example.

Conditions were different in the United States,  
 Australia, and in Sweden. Even if no spectacular  
 advances occurred in educational research in those  
 countries, the maturation of ideas went on and pre-  
 pared the way for the postwar developments. War-



fare had again raised problems of recruitment and placement and the role of military psychology and the development of selection tests is exemplified by the work of Guilford in the United States and Husén and Boalt (1968) in Sweden.

The strong field of interest in the 1940s and 1950s was without doubt in sociological studies. The seminal investigations were those concerned with social status and its impact on educational opportunity. A series of studies in the United States showed the pervasive existence of the school's role in maintaining social distinctions and discriminatory practices. From this research it was argued that schools and teachers were the purveyors of middle-class attitudes and habits. These effects of schooling were particularly evident at the high-school stage, and this trend of research became closely linked to the study of adolescent development. This work spread to England in the mid-1950s and subsequently to other parts of the world and led to challenging the maintenance of selective schools and to establishing comprehensive high schools. This research emphasis on issues associated with educational disadvantage has continued subsequently, with concern for disparities in the educational opportunities provided for different racial and ethnic groups, for inner urban and rural groups and, in particular, for girls.

#### 4. The 1960s and 1970s

During the first part of the 1960s in affluent countries educational research enjoyed for the first time in its history the massive support necessary for it to have a significant impact. This development was particularly marked in the United States. At that time money for research and curriculum development, particularly in mathematics and science, was readily available in the United States. In 1954, federal funds were first devoted through the Cooperative Research Act to a programme of research and development in education (Holtzman 1978). The big, private foundations also began to sponsor educational research on a large scale. The civil rights movement, Kennedy's New Frontier, and Johnson's Great Society continued the trend.

In 1965, the Elementary and Secondary Education Act was passed which authorized funding over a five-year period for constructing and equipping regional research and development (R & D) centres and laboratories. President Johnson implemented developments that had been planned under Kennedy and in 1968, federal support for educational research reached its peak: 21 R & D centres, 20 regional laboratories, 100 graduate training programmes in educational research, and thousands of demonstration projects, represented a total federal investment of close to 200 million dollars per year.

On a much smaller scale, a similar development took place in England. Wall (1968 p. 16) wrote:

In 1958, it was possible to demonstrate that expenditure of all kinds on research relating to education represented no more than 0.1 per cent of all expenditure on education: in 1967 the proportion may well be thirty times as much and will probably grow over the next decade.

A similar expansion took place in the Soviet Union. Between 1960 and 1970 the professional staff engaged in educational research increased considerably. In 1966, the Soviet Academy of Pedagogical Sciences took on its present status. Initially under the name of the Academy of the Russian Republic it was founded in 1943. In 1967, the *Institut Pédagogique Nationale* of France, for the first time, received significant funding for educational research. Girod de l'Ain (1967) considered 1967 as the Year 1 of educational research in France.

By the late 1960s, all highly industrialized countries were in the midst of a cultural crisis which had a deep impact on scientific epistemology and thus affected the research world. There was also talk about a "world crisis" (Coombs 1968) in education which applied in the first place to the imbalance between demand and supply of education, particularly in Third World countries. Deeply disappointed in their hope for general peace, wealth, and happiness, people realized that neither science and technology nor traditional—mostly middle-class—values had solved their problems. An anti-intellectualist counterculture developed, emphasizing freedom in all respects, rejecting strict rationality, glorifying community life. The value of "traditional" education was questioned. "Deschooling", nondirectivity, group experience, and participation seemed to many the alpha and omega of all pedagogy. This trend did not leave socialist countries unaffected. In May 1976, a group of researchers in the Soviet Union regretted a too rationalistic approach in educational research (Novikov 1977).

At the same time, scholars also began to question science, some with great caution and strong argumentation, others superficially in the line of the *Zeitgeist*. Kerlinger (1977) condemned the latter with ferocity: "mostly bizarre nonsense, bandwagon climbing, and guruism, little related to what research is and should be".

This was not the case in the crucial epistemological debate inspired by scholars like Polanyi, Popper, Kuhn, and Piaget. Fundamentally, the world of learning acknowledged both the contemporary "explosion" of knowledge and the still, very superficial, comprehension of natural, human phenomena.

While Piaget (1972) showed in his *Epistémologie des sciences de l'homme*, that nomothetic and historical (anthropological) approaches are not mutually exclusive but complementary, in 1974, two of the best-known American educational researchers Cronbach (1974) and Campbell (1974), without previous mutual consultation, chose the annual meeting

of the American Psychological Association as the arena for a debate against the traditional quantitative methods and in favour of alternative methods of educational research.

Since the 1960s, the scientific revolution has become a daily companion of the modern world. In the history of human knowledge, the complexity of calculating statistical data has already existing statistical techniques such as regression analysis, analysis of variance, and factor analysis for desk calculation were replaced by a few moments. Large-scale data analysis became feasible. Simultaneous data processing techniques were developed. In *Educational Research* (1974),

Huge surveys, such as the Survey of States and the mathematics curriculum of the International Association of Educational Achievement, were unthinkable without the work of Campbell and Starbuck. The experimental and quantitative research in education has become a dominant force in educational research.

Scientific developments in educational research were not only a response to and to powerful trends but also an "explosion" of knowledge in the social sciences, especially in economics, and sociology.

*Economics of Education* (1974) Many scientific achievements in education can be mentioned: on educational objectives, *Taxonomies of Educational Objectives* (1964), *Taxonomies of Educational Objectives* (1964), *Tests* (the most important since Galton's invention of the formative and summative evaluation and *Summative Evaluation* (1964), action analysis, research on compensatory education for disadvantaged children (see Kerlinger's study of cognitive and social aspects of learning experiments, adult education, *An Overview*), the development of an empirical method of development and evaluation of research methodology.

#### 5. Developments in

With the advent of the 20th century, the scientific method has attained a level of maturity in other disciplines. The scientific method of the previous decade clarified

of the American Psychological Association to react against the traditional positivist emphasis on quantitative methods and stressed the critical importance of alternative methods of inquiry.

Since the 1960s, the computer has become the daily companion of the researcher. For the first time in the history of humankind, the amount and complexity of calculation are no longer a problem. Already existing statistical techniques, like multiple regression analysis, factor analysis, multivariate analysis of variance, that previously were too onerous for desk calculation suddenly became accessible in a few moments. Large-scale research projects became feasible. Simultaneously, new statistical methods and techniques were developed (see *Statistical Analysis in Educational Research*).

Huge surveys, such as Project Talent in the United States and the mathematics and six subject surveys of the International Association for the Evaluation of Educational Achievement (IEA) would have been unthinkable without powerful data-processing units. Campbell and Stanley's (1963) presentation of experimental and quasiexperimental design for educational research can be considered to be a landmark.

Scientific developments in the field of educational research were not only stimulated by access to funds and to powerful technology, but also by the "explosion" of knowledge in the physical and social sciences, especially in psychology, linguistics, economics, and sociology (see *Instructional Psychology; Economics of Education; Sociology of Education*).

Many scientific achievements in the field of education can be mentioned for the 1960s: the new ideas on educational objectives (see *Objectives, Educational, Taxonomies of*), the new concepts of criterion-referenced testing (see *Criterion-referenced Tests*) (the most important advance in test theory since Galton's invention of normative testing), formative and summative evaluation (see *Formative and Summative Evaluation*), teacher-pupil interaction analysis, research on teacher effectiveness, compensatory education for socioculturally handicapped children (see *Compensatory Education*), the study of cognitive and affective handicaps, research into the importance and methods of early education, social aspects of learning aptitudes, deschooling experiments, adult education (see *Adult Education: An Overview*), the development of new curricula and of an empirical methodology of curriculum development and evaluation, and developments in research methodology.

### 5. Developments in the 1980s

With the advent of the last quarter of the twentieth century, the scientific status of educational research has attained a level of quality comparable to that of other disciplines. The epistemological debate of the previous decade clarified considerably the respective

strengths and weaknesses of the qualitative and the quantitative approaches. It is now widely acknowledged that no one research paradigm can answer all the questions which arise in educational research.

A clear impact of this scientific maturity can also be spotted in educational practice. Both the scientific quest for the most efficient standard teaching method and the progressivist improvisation (for a while replaced by nondirectivity) have been succeeded by subtle classroom management including careful definition and negotiation of objectives, consideration of student and teacher's characteristics, of cognitive and affective styles, and of economic and social needs. Thanks to the advancement of developmental and educational psychology it is now understood, for instance, how the Piagetian constructivist theory implies that many crucial educational objectives can only be defined by or with the learner, while interacting with his or her environment. The naive concept of individualized teaching (see *Individualized Instruction*) and the dogma of group work is replaced by flexible group structuring and flexible scheduling. Beyond the original model of mastery learning (see *Mastery Learning Model of Teaching and Learning*) now appears the more general concept of a school making sensible use of time and of all human and technological resources available. Opportunities to learn are multiplied. The future appears to belong to a more modular system of education. The new perspectives opened by the computer technology are also more clearly perceived and are probably best illustrated by the "Logo environment" (Papert 1972), which is a challenge to intellectual creativity and development. These new developments, given as examples among many others, still have to be disseminated to the majority of schools, their validity and feasibility in terms of daily practice having been established.

### 6. Conclusion

Like medicine, education is an art. That is why advances in research do not produce a science of education, in the positivist meaning of the term, but yield increasingly powerful scientific foundations for practice and decision making. In this perspective, it can be said that from 1900 to 1980, educational research has gathered a surprisingly large body of knowledge containing valuable observations and conclusions.

See also: Educational Research and Policy Making; Historiography of Education

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G. De Landsheere

## Educational Research, Information for

Information is a valuable resource which is essential to the progress of research and development. In order for information to be effectively utilized, it should be identified, managed, and disseminated in a systematic and efficient manner. Information systems have been devised to store and provide access to data. Modern computer technology together with developments in the telecommunications field have resulted in storage and retrieval services from which the user can obtain information from the computer at low cost with almost negligible delays. In this article, the transfer of education information from source to user will be discussed. Special emphasis will be given to bibliographic information services or systems which have been developed to manage the vast range of information in the field of education together with information exchange arrangements which have been established both internationally and nationally.

### 1. Information Transfer

Educational information or knowledge is presented in a variety of forms which can be categorized into five groups, namely "facts" which are small but true pieces of knowledge; "ideas" or perceptions of existing systems or innovations which can be creative or original as well as developmental and relevant; "methods" by which facts are collected and ideas are implemented; "frameworks" which are complex packages of ideas and methods merged together logically; and "combinations" of other knowledge types which are derived from various groupings of facts, ideas, methods, or frameworks. Information is obtainable from a variety of sources and can also be classified according to these sources. Havelock and Huberman (1977) suggest at least five generic categories of sources, which include "settings", "institutions", "vendors", "knowledge storage centres", and "personal networks". Information storage is assuming greater importance with the need to control the vast quantities of available information. The 1,000 databases in the United States, 600 of which are available online (i.e., by direct interaction with

the computer), are a recent information in control by modern Europe there are no are accessible online or information serv between the user a resources in printed the channels of comm is retrieved and disse mous services hav unbiased, of covering and of affording the freedom to choose hi tively according to hi Finally, information medium before trans lation by the receiv development. Table information.

The *Directory of Information Sources* (1983) Research in the Netherlands view of the main bi databases in the field related areas in the s tries as possible. This lists 293 data files a cational and social s sertations listings, ab bibliographies and dir research institutions. publication in 1983.

### 2. Information Serv

The ERIC (Education ter) is the largest an system in education in Office of Education es