

THE  
SOURCES OF A SCIENCE  
OF EDUCATION

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JOHN DEWEY

THE KAPPA DELTA PI LECTURE SERIES

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EDUCATION

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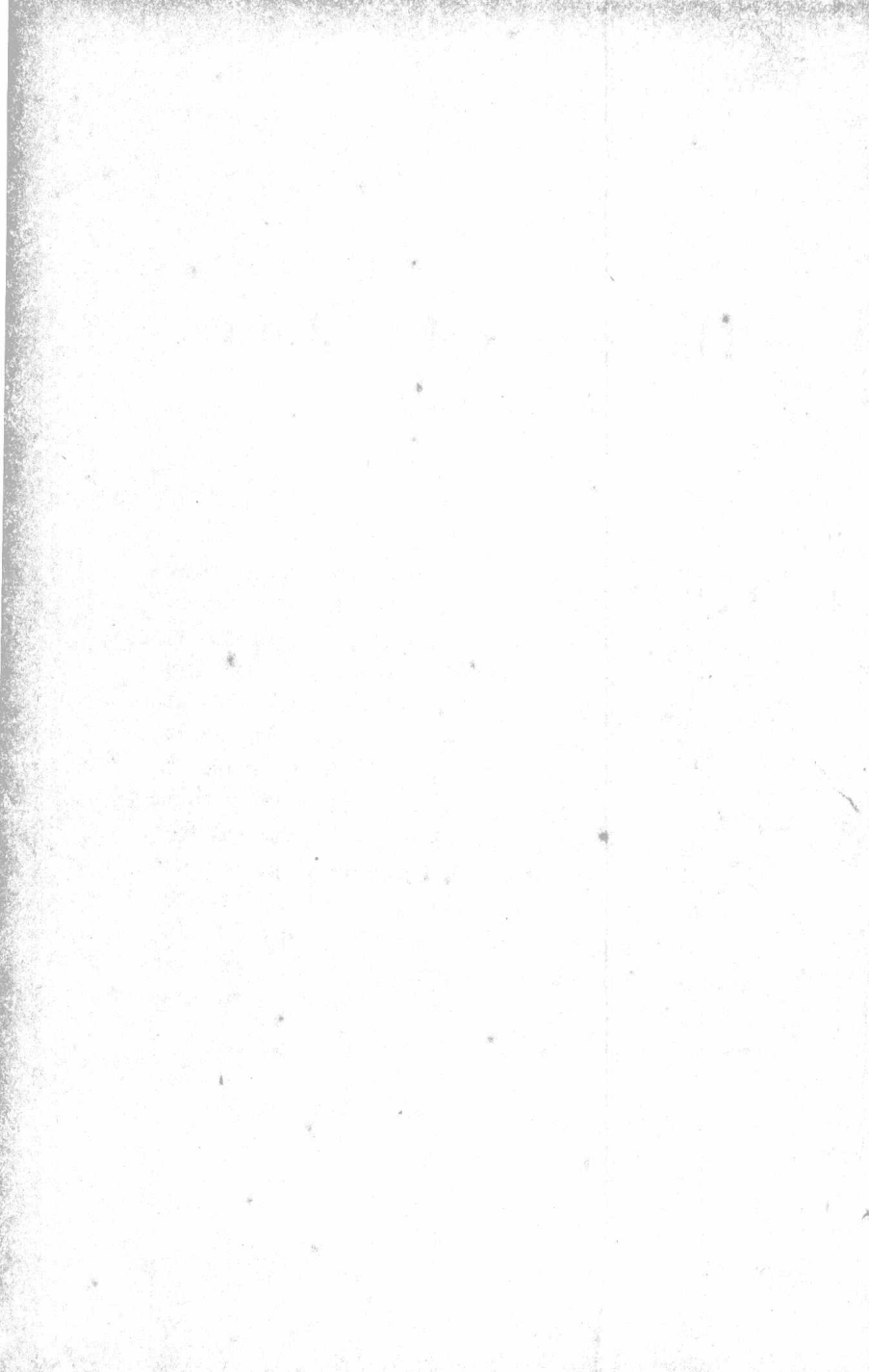
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# The Sources of a Science of Education

[ I ]

## EDUCATION AS A SCIENCE

THE title may suggest to some minds that it begs a prior question: *Is there a science of education?* And still more fundamentally, Can there be a science of education? Are the procedures and aims of education such that it is possible to reduce them to anything properly called a science? Similar questions exist in other fields. The issue is not unknown in history; it is raised in medicine and law. As far as education is concerned, I may confess at once that I have put the question in its apparently question-begging form in order to avoid discussion of questions that are important but that are also full of thorns and attended with controversial divisions.



It is enough for our purposes to note that the word "science" has a wide range.

There are those who would restrict the term to mathematics or to disciplines in which exact results can be determined by rigorous methods of demonstration. Such a conception limits even the claims of physics and chemistry to be sciences, for according to it the only scientific portion of these subjects is the strictly mathematical. The position of what are ordinarily termed the biological sciences is even more dubious, while social subjects and psychology would hardly rank as sciences at all, when measured by this definition. Clearly we must take the idea of science with some latitude. We must take it with sufficient looseness to include all the subjects that are usually regarded as sciences. The important thing is to discover those traits in virtue of which various fields are called scientific. When we raise the question in this way, we are led to put emphasis upon *methods* of dealing with subject-matter rather than to look for uniform objective traits in subject-matter. From this point of view, science signifies, I take it, the existence of systematic methods of inquiry, which, when they are brought to bear on a range of facts, enable us to understand them better and to control them

more intelligently, less haphazardly and with less routine.

No one would doubt that our practices in hygiene and medicine are less casual, less results of a mixture of guess work and tradition, than they used to be, nor that this difference has been made by development of methods of investigating and testing. There is an intellectual technique by which discovery and organization of material go on cumulatively, and by means of which one inquirer can repeat the researches of another, confirm or discredit them, and add still more to the capital stock of knowledge. Moreover, the methods when they are used tend to perfect themselves, to suggest new problems, new investigations, which refine old procedures and create new and better ones.

The question as to the sources of a science of education is, then, to be taken in this sense. What are the ways by means of which the function of education in all its branches and phases—selection of material for the curriculum, methods of instruction and discipline, organization and administration of schools—can be conducted with systematic increase of intelligent control and understanding? What are the materials upon which we may—and should—draw in order that educational activities may

become in a less degree products of routine, tradition, accident and transitory accidental influences? "From what sources shall we draw so that there shall be steady and cumulative growth of intelligent, communicable insight and power of direction?"

Here is the answer to those who decry pedagogical study on the ground that success in teaching and in moral direction of pupils is often not in any direct ratio to knowledge of educational principles. Here is "A" who is much more successful than "B" in teaching, awakening the enthusiasm of his students for learning, inspiring them morally by personal example and contact, and yet relatively ignorant of educational history, psychology, approved methods, etc., which "B" possesses in abundant measure. The facts are admitted. But what is overlooked by the objector is that the successes of such individuals tend to be born and to die with them: beneficial consequences extend only to those pupils who have personal contact with such gifted teachers. No one can measure the waste and loss that have come from the fact that the contributions of such men and women in the past have been thus confined, and the only way by which we can prevent such waste in the future is by methods which enable us to make an *analysis* of what the gifted

teacher does intuitively, so that something accruing from his work can be communicated to others. Even in the things conventionally reorganized as sciences, the insights of unusual persons remain important and there is no leveling down to a uniform procedure. But the existence of science gives common efficacy to the experiences of the genius; it makes it possible for the results of special power to become part of the working equipment of other inquirers, instead of perishing as they arose.

The individual capacities of the Newtons, Boyles, Joules, Darwins, Lyells, Helmholtzes, are not destroyed because of the existence of science; their differences from others and the impossibility of predicting on the basis of past science what discoveries they would make—that is, the impossibility of regulating their activities by antecedent sciences—persist. But science makes it possible for others to benefit systematically by what they achieved.

The existence of scientific method protects us also from a danger that attends the operations of men of unusual power; dangers of slavish imitation partisanship, and such jealous devotion to them and their work as to get in the way of further progress. Anybody can notice to-day that the effect of an original and powerful teacher is not all to the good. Those influenced

by him often show a one-sided interest; they tend to form schools, and to become impervious to other problems and truths; they incline to swear by the words of their master and to go on repeating his thoughts after him, and often without the spirit and insight that originally made them significant. Observation also shows that these results happen oftenest in those subjects in which scientific method is least developed. Where these methods are of longer standing students adopt methods rather than merely results, and employ them with flexibility rather than in literal reproduction.

This digression seems to be justified not merely because those who object to the idea of a science put personality and its unique gifts in opposition to science, but also because those who recommend science sometimes urge that uniformity of procedure will be its consequence. So it seems worth while to dwell on the fact that in the subjects best developed from the scientific point of view, the opposite is the case. Command of scientific methods and systematized subject-matter liberates individuals; it enables them to see new problems, devise new procedures, and, in general, makes for diversification rather than for set uniformity. But at the same time these diversifications have a cu-

mulative effect in an advance shared by all workers in the field.

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### EDUCATION AS AN ART

THIS theme is, I think, closely connected with another point which is often urged, namely, that education is an art rather than a science. That, in concrete operation, education is an art, either a mechanical art or a fine art, is unquestionable. If there were an opposition between science and art, I should be compelled to side with those who assert that education is an art. But there is no opposition, although there is a distinction. We must not be misled by words. Engineering is, in actual practice, an art. But it is an art that progressively incorporates more and more of science into itself, more of mathematics, physics and chemistry. It is the kind of art it is precisely because of a content of scientific subject-matter which guides it as a practical operation. There is room for the original and daring projects of exceptional individuals. But their distinction lies not in the fact that they turn their backs upon science, but in the fact that they make new integrations of scientific material and turn it to new and pre-

viously unfamiliar and unforeseen uses. When, in education, the psychologist or observer and experimentalist in any field reduces his findings to a rule which is to be uniformly adopted, then, only, is there a result which is objectionable and destructive of the free play of education as an art.

But this happens not because of scientific method but because of departure from it. It is not the capable engineer who treats scientific findings as imposing upon him a certain course which is to be rigidly adhered to: it is the third- or fourth-rate man who adopts this course. Even more, it is the unskilled day laborer who follows it. For even if the practice adopted is one that follows from science and could not have been discovered or employed except for science, when it is converted into a uniform rule of procedure it becomes an empirical rule-of-thumb procedure—just as a person may use a table of logarithms mechanically without knowing anything about mathematics.

The danger is great in the degree in which the attempt to develop scientific method is recent. Nobody would deny that education is still in a condition of transition from an empirical to a scientific status. In its empirical form the chief factors determining education are tradition, imitative reproduction, response

to various external pressures wherein the strongest force wins out, and the gifts, native and acquired, of individual teachers. In this situation there is a strong tendency to identify teaching ability with the use of procedures that yield immediately successful results, success being measured by such things as order in the classroom, correct recitations by pupils in assigned lessons, passing of examinations, promotion of pupils to a higher grade, etc.

For the most part, these are the standards by which a community judges the worth of a teacher. Prospective teachers come to training schools, whether in normal schools or colleges, with such ideas implicit in their minds. They want very largely to find out how to do things with the maximum prospect of success. Put baldly, they want recipes. Now, to such persons science is of value because it puts a stamp of final approval upon this and that specific procedure. It is very easy for science to be regarded as a guarantee that goes with the sale of goods rather than as a light to the eyes and a lamp to the feet. It is prized for its prestige value rather than as an organ of personal illumination and liberation. "It is prized because it is thought to give unquestionable authenticity and authority to a specific procedure to be carried out in the school room." So



conceived, science is antagonistic to education as an art.

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### *Experience and Abstraction*

The history of the more mature sciences shows two characteristics. Their original problems were set by difficulties that offered themselves in the ordinary region of practical affairs. Men obtained fire by rubbing sticks together and noted how things grew warm when they pressed on each other, long before they had any theory of heat. Such everyday experiences in their seeming inconsistency with the phenomena of flame and fire finally led to the conception of heat as a mode of molecular motion. But it led to this conception only when the ordinary phenomena were reflected upon in detachment from the conditions and uses under which they exhibit themselves in practices. There is no science without abstraction, and abstraction means fundamentally that certain occurrences are removed from the dimension of familiar practical experience into that of reflective or theoretical inquiry.

To be able to get away for the time being from entanglement in the urgencies and needs of immediate practical concerns is a condition