

A critical look at

Problem Solving as Teaching Method

MANY curriculum theories for elementary as well as secondary education exemplify a primacy of method within the proposed school program. This method usually consists of some form of problem solving procedure as the basis for most, if not all, teaching-learning activities.

The purpose of this article is threefold: (a) to describe the source of problem solving as a teaching method; (b) to explore some of the significant contributions of this teaching method to education; and (c) to raise some questions concerning the applications or limitations of this method in organizing learning activities throughout the curriculum.

Dewey's Analysis

In the famous book, *How We Think*, Dewey wrote that learning is learning to think. Although Dewey recognized the existence of many ways of thinking, he insisted, "The better way of thinking is reflective thinking."¹ This reflective thinking, according to Dewey, involved a process of translation "from a situation in which there is experienced obscurity, doubt, conflict, disturbance of some sort

into a situation that is clear, coherent, settled, harmonious."²

Dewey made a logical analysis of this concept of reflective thought by describing five phases that he considered essential functions of this particular mental process. However, he drew cautions about interpreting these phases as discrete steps following each other in a set order.³ Furthermore, contrary to some popular journalistic interpretations of Dewey, he considered intellectual curiosity and perseverance the most important attitudes to be formed by learners. Along with reflective thought, "the desire to go on learning" was central to Dewey's concept of an educational experience.⁴

It is difficult to understand whether Dewey intended his logical analysis of reflective thought to become the Titan of method that exists in many curriculum proposals today. However, six years after the original edition of *How We Think*, the classic *Democracy and Education* was published in which Dewey stated:

While we may speak, without error, of the method of thought, the important thing

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² *Ibid.*, p. 101.

³ *Ibid.*, p. 106-118.

⁴ John Dewey. *Experience and Education*. New York: The Macmillan Company, 1938. p. 49.

¹ John Dewey. *How We Think*. Revised edition. Boston: D. C. Heath & Company, 1933. p. 3.

Problem Solving

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is that thinking is the method of an educational experience. The essentials of method are therefore identical with the essentials of reflection.⁵

Furthermore, Dewey translated his five phases of reflective thought into more pedagogical language, making them sound like a prescription for educational method. These essentials of method were described as follows:

1. That the pupil have a genuine situation of experience, that there be continuous activity in which he is interested for its own sake. —

2. That a genuine problem develop within this situation as a stimulus to thought.

3. That he (the learner) possess the information and make the observations needed to deal with it.

4. That suggested solutions occur to him which he shall be responsible for developing in an orderly way.

5. That he have opportunity and occasion to test his ideas by application, to make their meaning clear and to discover for himself their validity.⁶

Interpretations

Thus, Dewey's writings opened the door to a variety of interpretations related to problem solving as a teaching method. Subsequent developments in cognitive learning theory seemed to add support to the refinement and application of this teaching method. Perhaps it was inevitable that educators would try to derive new teaching techniques by their inferences from Dewey's philosophy and from gestalt psychology.

Dewey had many middlemen who interpreted or spelled out his ideas for prac-

tical application in education. Among the more distinguished and influential interpreters of Dewey was William H. Kilpatrick. With combined intellectual and emotive appeal, Kilpatrick's ideas concerning "The Good Life" and "The Project Method" excited the imagination of many educators. In a sense, Kilpatrick was providing a do-it-yourself kit for teachers ready to react against stagnant teaching methods that existed in the schools. It is interesting to note the similarity between Dewey's problem solving and a teaching unit outline suggested by Kilpatrick. This unit, according to Kilpatrick, is an "instance of child living" which includes the following five phases:

1. The individual (or group) faces a situation. He has no satisfactory way of responding to it and is hence perplexed both as to what aspect of it he should respond and how he should respond.

2. He continues to face the situation; begins to analyze it so as to locate details that might be of help in deciding what to do and how to do it.

3. Out of his past experiences and his present analysis of the situation he makes plans for resolving his difficulty and chooses, on the basis of careful thought, the plan he prefers to try out.

4. He tries out the plan selected, revising it whenever it seems desirable to do so.

5. If the plan works, the perplexity is resolved. If the plan does not work, he may go back through the various activities again and again until some solution has been reached or else the individual abandons the situation.⁷

In addition to Kilpatrick's project method and "instance of child living," Dewey's phases of reflective thought have manifested themselves in many other educational proposals. For example, Alberty has transformed these phases of reflective

⁵ John Dewey. *Democracy and Education*. New York: The Macmillan Company, 1916. p. 192.

⁶ *Ibid.*, p. 192.

⁷ William H. Kilpatrick. *Remaking the Curriculum*. New York: Newson and Company, 1936. p. 1-47.

thought into a type of group problem solving which he considers "the emerging concept of general method" in education.⁸ Klausmeier, Dresden, Davis and Wittich outline a general pattern of teacher-pupil planning for the elementary school which is similar to Dewey's concept of reflection.⁹ The implication behind these proposals appears to be that all learning evolves from the method of problem solving.

Not Confined to Teaching Method

Thorpe and Schmuller write that Dewey's insistence upon the identity of reflection and educative experience eventually altered the very concept of learning.¹⁰ Taking a somewhat eclectic view in formulating some tentative principles of learning, Thorpe and Schmuller point out the significant impression that Dewey's problem solving has stamped upon these principles.¹¹

Sometimes Dewey's problem solving has been equated with "the" method of science. Many elementary and high school science textbooks contain descriptions of "the scientific method" which bear a remarkable resemblance to Dewey's phases of reflective thought. In addition, Dewey's problem solving steps have been cited as representing the elements of design for all applied research in education.¹²

⁸ Harold Alberty. *Reorganizing the High-School Curriculum*. Revised edition. New York: The Macmillan Company, 1953. p. 267-96.

⁹ Herbert J. Klausmeier, Katherine Dresden, Helen C. Davis and Walter Arno Wittich. *Teaching in the Elementary School*. New York: Harper and Brothers, 1956. p. 420.

¹⁰ Louis P. Thorpe and Allan M. Schmuller. *Contemporary Theories of Learning*. New York: The Ronald Press Company, 1954. p. 362.

¹¹ *Ibid.*, p. 451-63.

¹² See, for example: Stephen M. Corey. *Action Research to Improve School Practices*. New York: Bureau of Publications, Teachers College, Columbia University, 1953. p. 40.

Dewey's problem solving is the general teaching method in education. It is a significant part of learning theory. It is the design of applied research in education. It is the scientific method. This makes one wonder what other claims could be made in its name.

Questions Should Be Raised

Undoubtedly the applications of Dewey's problem solving method did much to revitalize the nation's classrooms. Problem solving as a teaching method even in its most stylized form was a procedure for improving upon the cut-and-dried classroom techniques that largely involved an assign-study-recite sequence. The new methodology also gave educators some hope for helping children learn to deal with a variety of problems and situations as an important part of their education in a rapidly changing culture. Interdisciplinary experience in dealing with significant problems is an important educational function that often gets lost in the present debate regarding curriculum improvement.

Without attempting to negate these important contributions to education, perhaps some questions should be raised concerning the omnipotence of the problem solving method. Should all learning depend upon a student's exposure to problematic situations? Does all learning involve conscious inquiry? Even if it is assumed that the better kind of thought process involves elements found in Dewey's concept of reflective thought, should these elements be translated into a general teaching method? What limitations would the use of a general problem solving method as "the" teaching pro-

Henry J. Hermanowicz is Assistant Professor of Education, Illinois State Normal University, Normal, Illinois.

cedure impose upon learners? Does a general scientific method exist?

A General Scientific Method?

It is conceivable that a collection of scientists might debate both pro and con the question, "Does a general method of science exist?" However, as an area of knowledge and as a human enterprise, describing "the method of science" in terms of problem solving steps must be viewed as a rather naive interpretation of the nature of science. Representing these steps (i.e., recognizing that a problem exists, stating the problem in specific terms, formulating hypotheses, and so on) as the method of science at best offers misleading information to students of science. Writing as a scientist, James Bryant Conant states:

The usual descriptions of "the scientific method" are descriptions actually of the very limited procedure by which a person can improve a particular practical art.¹³

Other scientists have criticized the concept of a general method of science. The following is a summary of criticisms directed at this doctrine:

First, there is not one scientific method, but several, differing certainly from field to field, and even, in many cases, from problem to problem.

Second, . . . a single doctrine is misleading or meaningless unless taken in conjunction with a number and variety of examples—this can indicate limitations of the doctrine by exhibiting exceptions to it.

Third, no one doctrine on the nature of scientific method, known to us, is sufficiently complete and multidimensional so as to include all others.¹⁴

¹³ James Bryant Conant. *Modern Science and Modern Man*. New York: Columbia University Press, 1952. p. 21.

¹⁴ Earl McGrath, Editor. *Science in General Education*. Dubuque, Iowa: William C. Brown, 1948. p. 74-75.

Cautions from Psychology

In discussing the importance of problem solving in learning, Lee J. Cronbach states that it is usually not possible to teach a definite procedure for dealing with a problem.¹⁵ While Cronbach does not minimize the significance of having learners deal with problems, he also describes a procedure for teaching concepts which does not involve a problem solving approach. This procedure is:

1. Adequate realistic experience to provide a basis for understanding. Such understanding can come only if the experience is reflected upon.

2. Formulation of generalizations in explicit terms.

3. Application of the generalization by the student to a variety of concrete or visualized situations.

4. Consideration by the student of systematic relations between concepts.¹⁶

There is some experimental evidence which seems to indicate that it is possible for negative learnings to result when students learn to follow one procedure to solve a variety of problems. This possibility represents a serious indictment against transforming Dewey's phases of reflective thought into a form of teaching method even on a general level. Of course, other experimental studies have been supportive of the application of a problem solving teaching methodology. Curriculum literature often displays this supportive evidence creating unequivocally positive impressions of a problem solving teaching procedure. It is desirable for those interested in curriculum to be cognizant of the negative aspects of this teaching method.

¹⁵ Lee J. Cronbach. *Educational Psychology*. New York: Harcourt, Brace and Company, 1954. p. 33.

¹⁶ Lee J. Cronbach, Editor. *Text Materials in Modern Education*. Urbana, Illinois: University of Illinois Press, 1955. p. 80.

A study by A. S. Luchins indicated that students taught to follow a particular method or procedure were actually being taught not to think in their problem solving. The students in the experiment usually applied the same procedure when given a different type of problem. Furthermore, giving these students instructions to generalize a method of solution had a tendency to increase their "set" or inflexibility toward attacking and solving problems.¹⁷

An experiment by Schroeder and Rotter demonstrated that students who worked on a variety of problems where no single attack was successful learned to be flexible. On the other hand, those students who had continued success with one method used it rigidly even where it was incorrect.¹⁸

To think of problem solving as a general method may be a mistake insofar as the learners themselves are concerned. In an article summarizing recent research on problem solving as classroom teaching method, Gross and McDonald state:

When the focus of interest in investigation has been on the general methodology of the problem solver, it has been consistently found that the subjects tend to use a variety of general methodologies.¹⁹

Some Curriculum Implications

The rationale behind "the problem solving method" as a classroom procedure usually is given in the form of cognitive learning theory, democratic principles, and Dewey's philosophy of

¹⁷ A. S. Luchins. "Mechanization in Problem Solving—The Effect of Einstellung." *Psychological Monographs*. No. 54, 1942.

¹⁸ Harold M. Schroeder and Julian B. Rotter. "Rigidity as Learned Behavior." *Journal of Experimental Psychology* 43:141-50, 1952.

¹⁹ R. E. Gross and F. J. McDonald. "Classroom Methods: The Problem-Solving Approach." *Phi Delta Kappan* 39:259-65, March 1958. p. 261.

instrumentalism. You might say that the teaching method of problem solving has been derived or synthesized from three or more different sources. Derivation of any specific or general classroom technique from a learning theory, philosophy, and democratic principles is a hazardous process. While the rationale behind the final educational product (in this case the problem solving teaching method) may give it connotations of intellectual respectability, neither the rationale nor the sources of derivation can make the final product reliable or valid.

Perhaps those of us in education interested in improving teaching methods should use the field of teaching itself as the basis for developing more promising teaching procedures. There is a fundamental distinction between a psychologist viewing all learning as problem solving and an educator organizing content and teaching technique in the form of problems-to-be-solved in the classroom. However, just as a psychologist develops theoretical constructs to help analyze and explain learned behavior, the educator can develop theories to help explain and gain knowledge about teaching. It is rather strange that we continue to "derive" teaching methods from a variety of sources other than teaching itself. This seems to be part of the dilemma inherent in an analysis of the problem solving method as teaching technique.

In view of the foregoing information, it may be unwise to consider all learnings as a form of problem solving in organizing content or potential learning experiences in the curriculum. This writer's professional prejudices are such that he believes that a significant function or emphasis of a school program should be to help students learn to deal with a wide variety of important problems. However, it is questionable to assume that the total

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curriculum should be organized around problematic situations or as problems-to-be-solved.

In addition, the function of problem solving in the school program might not best be implemented in terms of "a" general teaching method. Despite the apparent built-in flexibility of "the problem solving method" as classroom technique, it has dangers of being an orthodox procedure in itself. A wide variety of teaching methods should be employed to help students develop their own abilities in decision making. The teacher's role is to help students seek relevant knowledge, understand important values, analyze possible alternatives, and project probable consequences involved in dealing with different problems. This will foster the type of critical thinking that was Dewey's original goal in emphasizing the development of reflective thought.

The trouble with using Dewey's problem solving as a step-by-step teaching method is that the application of the method can defeat the purpose for having students deal with problems. The

gradual passing of the recitation as "the" method in educational practice should not result in another orthodoxy to act as a replacement. The mechanized application of problem solving as teaching method can become a thought inhibiting rather than a thought provoking device; whereas, problem solving should help develop originality and diversity in student thinking.

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