

Teaching Strategies: Is Discovery One of Them?

J. Douglas Stewart
university of regina

De plus en plus, les professeurs d'école sont demandés à développer des stratégies dans leur enseignement. Ce papier présente un début d'analyse du concept "stratégie d'enseignement." Les critères pour l'usage de cette expression sont développés. Ces critères sont utilisés pour montrer comment une stratégie d'enseignement peut différer d'une méthode d'enseignement. Il est démontré que "stratégie d'enseignement" est utilisée abusivement avec le résultat que certaines activités d'enseignement, telles que les conférences, sont faussement identifiées comme stratégies. D'un autre côté, la découverte semble rencontrer les critères pour "stratégie." C'est à voir si d'autres activités d'enseignement rencontrent les critères et ceci exige davantage des enquêtes.

There seems to be some legitimate concern on the part of co-operating teachers in the schools that student teachers are not always sufficiently adept at such things as planning lessons, assessing pupil readiness, using audio-visual aids, clarifying learning objectives, motivating students, disciplining, and evaluating. These deficiencies have been called, in the current educational jargon, weaknesses in the "skills and strategies" component necessary for intending teachers. Our graduating teachers, it is argued reasonably, simply must know how to do these sorts of things (though this is not all that they must know, by any means). The result has been an increasing emphasis in teacher education programs on the development of what are called teaching strategies. To this end, for example, a recent publication by Gilstrap and Martin (1975), entitled *Current Strategies for Teachers: A Resource for Personalizing Instruction*, is being used in elementary teacher education programs in some Canadian and American universities. The book identifies an array of different strategies for teachers beginning with the lecture and ending with a strategy which is called "do-look-learn"; other strategies involve discovery, simulation, and behavior modification.

Despite the seeming popularity of "strategy" among many educators, it is not at all clear what is meant by calling something a "teaching strategy," let alone how a teaching strategy might differ from, say, a teaching method. The authors of the publication quoted are content to pass over this problem simply by citing what they claim is "the formal definition of a strategy" without providing any discussion of the conceptual points involved. In fact, the definition of "strategy" which they offer, namely,

“patterns of teacher behavior that are recurrent, applicable to various subject matters, characteristic of more than one teacher, and relevant to learning” (p. 1), turns out, under investigation, to be just the definition given to the expression “teaching methods” in the fourth edition of the *Encyclopedia of Educational Research* (Ebel, 1969). Now, if the authors really mean the same thing by “teaching strategy” as by “teaching methods,” what reasons have they for such a persistent use of the former expression to the neglect of the latter, which has such a long-standing acceptance in the language of education? On the other hand, if the authors do not really mean the same thing by these expressions, what warrants their defining the terms in the same way, and what do they really hold the difference between them to be? The authors have no answers to these questions.

The usage of “strategy” in educational contexts has become altogether too loose, resulting in yet another example of a decline in the precision of the language of education. To the extent that it is important to conserve some precision in this language, this paper attempts a limited analysis of the concept of strategy in order to uncover some of the criteria which may be said to govern the use of “strategy” in educational contexts, and to demonstrate that a teaching strategy is not necessarily the same as a teaching methodology. The reason for the limitation mentioned is that the analysis is partly subservient to a broader objective of the paper — namely, to question in what sense, if any, it is meaningful to call “discovery” a teaching strategy. There is, of course, more at stake here than just the dilution of educational language, important though that is. For the current widespread usage of terms like “strategy” (and perhaps “discovery”) may lull one into believing that what professional teachers are doing in classrooms is somehow more effective or scientific now than ever before, and that, therefore, significant progress in the instruction of students has come about; or believing that in calling one thing (e.g., a teaching method) by a more pretentious name (e.g., a strategy), classroom instruction is taking place at a more sophisticated level than it actually is.

STRATEGIES

A little etymological research indicates that the original meaning of “strategy” comes from the notion of leading an army. The term “strategus” referred to a general or a military commander among the ancient Greeks. Today, Oxford and other dictionaries typically define “strategy” as the art of directing military movements or manoeuvres in some theatre of operation. It might be asked how, on this interpretation of the term, the expression “teaching strategy” can have a satisfactory meaning. Perhaps, by some analogy to the art of directing military movements, a meaning for “teaching strategy” could be articulated, but a little reflection

would soon indicate the moral and educative inadequacy of the analogy. Following a Wittgensteinian (1963) principle, it will be helpful to ask not what the meaning of the term “strategy” is but, rather, what are its different uses in ordinary language on the assumption that different uses of the same term are sometimes found to be governed by different criteria or at least partially different criteria. Because “strategy” means the art of directing military operations in one of its uses, e.g., “naval strategy,” it does not follow that this is what it means in its other uses, such as “political strategy,” “game strategy,” and so on. On the other hand, there are some features which these different uses of “strategy” appear to share. For example, one of these is that throughout the different uses of the term, the notion of a sequence of related actions forming some overall pattern or development seems to prevail. These actions, typically, are carried on in a “broad front,” though they need not be carried on simultaneously. A political strategy would entail such a sequence of actions no less than would a game strategy.

Another feature in common to these uses is that the actions referred to are considered actions. They are actions for which there has been planning and for thought whereby a large number of relevant aspects of a situation have been taken into account. Consider, for instance, the wide range of factors a political strategist must take into account to plan strategy — factors not only associated with the campaign of his opponent, but with the larger social-economic climate prevailing, available financial resources, the impact of media, and so on. A tactic, by comparison, is a much more circumscribed affair than is a strategy. We speak of tactics used in a particular battle, for example, but of a strategy for an overall campaign. A third common feature of the uses of “strategy” is that the actions referred to are engaged in for some specific purpose, objective, or end. The point in having a military strategy is to gain an advantage over the enemy; in having a political strategy, to be elected to office; in a game strategy, to win the game. In general, the end or objective associated with “strategy” typically is that of securing an advantage against one’s opponent. This is what gives point or purpose to the sequence of actions engaged in and relevance to the considerations of which the strategist takes account. Strategies, then, have instrumental value, essentially; they function as a means to desired ends. That the ends also be desirable is not a necessary factor. Strategies can be used to bring about worthy or unworthy ends.

The three features just identified may be called criteria governing uses of the term “strategy,” though this is not to suggest that the list of criteria is complete. The significance of calling these features “criteria” is just this: that unless one can say of something that it is (a) a sequence of related actions covering a “broad front,” (b) based on a wide range of relevant factors of a situation, and (c) for the purpose (typically) of gaining an advantage against an opponent, then it would be implausible

to call the thing in question a strategy. These criteria, in other words, constitute some of the necessary conditions for the uses of "strategy." They may be sufficient for some one use of "strategy."

To call something a teaching strategy suggests at least that these three criteria be met. Thus a teaching strategy would minimally consist of a set of actions on the part of a teacher which are sequential in nature — that is, actions which unfold in some order and have some sense of development to them rather than being random, hit-and-miss discontinuous affairs, or merely unco-ordinated movements. Writing on a black-board does not of itself constitute a teaching strategy. An educational example of what might meet this first criterion is given in the discussion on "discovery" later in this paper. Second, a teaching strategy would consist of a sequence of teacher actions based upon a wide range of relevant factors in a classroom setting. These factors might well include the present experience and attitudes of the pupils, their present capabilities, the arrangements and nature of particular topics, the availability of equipment and other resources, seating arrangements, and so on. Narrowness of considerations is ruled out. A person who taught a lesson without taking into account considerations of the above kind, it seems, could not be said to have a teaching strategy. Third, a teaching strategy would include some desired end or objective giving direction to both the sequence of actions and the type of factors taken into consideration. However, the difficulty here is that this criterion of "strategy" picks out a rather specific objective, the gaining of an advantage against one's opponent; and in an educational or teaching-learning context it is strange almost to the point of being unintelligible to speak of gaining advantages against one's adversary. Evidently this criterion governing uses of "strategy" does not fit well into an educational setting. The trouble is not that teachers do not have objectives *qua* teachers but that the objective they have — to bring about an increase in learning and understanding in pupils — is incompatible with the objectives that are typically associated with "strategy."

Can teachers then really be said to have strategies at all, *qua* teachers? Does this not mean that the expression "teaching strategy" constitutes a misuse of language since it fails to meet the intentionality (third) criterion of "strategy"? Or, on the other hand, is it that "teaching strategy" constitutes some quite new or different meaning (use) of "strategy"? The answer appears to lie somewhere between these two rather extreme options. There need be nothing unintelligible, as Wittgenstein has suggested, about a use of a term or expression being governed by criteria which are not wholly identical with the criteria which normally govern other uses of the same term. That "teaching strategy" is governed in part by a radically modified criterion (c), where the objective is not one of outwitting one's opponent but rather of bringing about learning in pupils, may be sufficient to deny that "teaching strategy" constitutes a misuse of

language. Moreover, that “teaching strategy” shares criteria (a) and (b) with other common uses of “strategy” may be sufficient to deny that it picks out some quite new meaning.

The upshot of this is that the concept of teaching strategy is cognitively richer than appearances might first suggest. In using the expression properly the first two criteria governing the uses of “strategy” in general, and the third modified criterion governing the use of “teaching strategy” in particular, must all be met. Since conceivably many instructional activities which go on in classrooms fail to meet at least one of these three conditions, the current wide and relatively free usage of “teaching strategy” is unwarranted. Accordingly, one of two things must happen. Either the use of this expression in education must be curtailed to pick out only those activities meeting at least all three criteria, or more classroom activities must be made to conform to the criteria, in which case the expression can be frequently but appropriately employed.

TEACHING STRATEGY AND TEACHING METHOD

Some of the criteria covered in the foregoing can be further illuminated by considering one or two ways in which a teaching strategy can differ from a teaching method. To call something a teaching strategy, “s”, implies an overall sequence of related actions $s_1, s_2, s_3 \dots s_n$, which are based on a wide range of considerations relevant to a teaching-learning situation with the intention of bringing about learning in pupils. Perhaps, on the face of it, there appears to be little difference between “teaching strategy” and “teaching method.” The fact is, however, that some of the above criteria can serve to distinguish between these two expressions. The one criterion which cannot so function is, of course, the third one, since the intention to bring about learning in another person is common to both “teaching strategy” and “teaching method.” The burden of demonstrating a distinction between these two expressions lies with one or the other (or both) of the first two criteria. What has to be shown is that a developing sequence of teacher actions based upon a broad range of considerations of a teacher-learning situation need not be a feature of something which nonetheless is properly said to be a teaching method.

To illustrate, consider the *locus classicus* of the Socratic method of teaching found in Plato’s *Meno*. There Socrates undertakes to teach a young slave boy the solution to the mathematical problem of doubling the square. The method consists of Socrates putting a series of leading questions to the boy in fairly rapid succession — questions designed to lead the boy to giving the correct answer to the problem. One significant aspect about this episode is that Socrates knew virtually nothing about his pupil. He did, of course, know that the boy could speak and understand Greek and he also knew that the boy had never before been taught mathematics. But beyond this Socrates knew nothing about him and,

moreover, he did not believe that having any knowledge of his pupil in any significant sense was essential to teaching him. In other words, no broad range of factors in the teaching-learning situation were taken into consideration. A second point is that Socrates did not engage in anything which could significantly be called an overall sequence of actions in his teaching. Rather, what he was engaged in essentially was a single, one-dimensional, extended activity of questioning the boy, getting answers from him and following these with further questions until the final correct answer had been elicited. But this is simply a series of linear activities carried out on a repeating basis. This may be a kind of sequence, but it does not square with the notion of sequence and broad development of related actions as implied by "strategy." Yet one cannot deny that what is given in the *Meno* is an example of a teaching method.

Now if the foregoing analysis of "teaching strategy" is correct, Socrates cannot readily be referred to as using a strategy because two of the criteria of "teaching strategy" are not well met. There is nothing which could significantly be called a sequence of actions and nothing which could be called a broad range of considerations of the teaching-learning situation. There is, on the contrary, a narrowness of actions and considerations. So something which is called a teaching method is not necessarily by that account to be known also as a teaching strategy. The expression "teaching method" can be used in contexts or situations where the use of "teaching strategy" would be unwarranted. The question "What teaching method are you using?" is not equivalent to the question "What teaching strategy are you using?" Whereas a simple response like "question-answer" can answer the first, it would not do as an answer to the second. Whatever answer is given in the second case it must at once be more complex, more wide-ranging, and more comprehensive in order to meet the criteria of "teaching strategy."

DISCOVERY

Does it make sense to call something like discovery a teaching strategy? If the main point about discovery in an educational setting is that the student learns by investigating on his own, independently of his teacher, and that therefore the teacher does not really teach, then how can discovery reasonably be called a teaching strategy?

Early proponents of discovery learning, such as the child-centered educators, saw it to be a very satisfactory (and satisfying) alternative to the more traditional way of learning (memorizing) material directly presented to students through didactic instruction. For such instruction, it was argued, was unsound on a number of points. It was said to be too adult-centered and so it was objected to on the moral grounds that it denied students certain of their rights, such as the right to have their views heard and respected in the classroom. Also it was claimed (and

feared) that because didactic instruction would lead to rote memorization of received materials student learning would be neither very effective nor very lasting. Moreover, didactic instruction was said to be psychologically unsound because it seemed to destroy or, at least, not stimulate student interest in learning. From a motivational point of view is it not better to learn something by first-hand experience rather than to be told it by the teacher — to learn actively by engaging in some investigation rather than passively receiving transmitted material? To the enthusiasts, learning by discovery meant freeing students from the constraints of traditional instruction to explore, inquire, and find out things on their own. Learning would be transformed from something burdensome to something exciting, and students, thereby, would have a much better grasp and understanding of what they had learned by discovery.

There are, of course, a number of valid points being made here all of which secure a place for learning by discovery in the classroom. For example, there appear to be certain aspects of discovery learning that would rule out indoctrinating pupils. Bruner (1961) points to the skills and attitudes of inquiry developed in discovery learning which are of benefit to solving problems in later life situations. Scheffler (1965) claims that discovery learning leads to knowing something in the strong sense of “knowing” wherein the pupil has, by discovery, the evidence for that which is uncovered. What is unacceptable, however, to these and other thinkers is the extreme view of the enthusiasts that the essence of discovery consists of freeing pupils from formal instruction altogether so that they may venture forth into some domain of inquiry where, quite independently, they will, through first-hand experience, come upon worthwhile learnings. The fallacies of this position have been well brought out elsewhere (Ausubel, 1963; Dearden, 1967; Dearden, 1976; Friedlander, 1965). Suffice it to add here a few further comments as a way of showing that not only is discovery learning tied to teaching (in a sense of “tied” which shall be made more explicitly shortly) but that it is meaningful to speak of discovery as a teaching strategy.

Consider the following uses of “discovering.” One speaks of: (1) Robinson Crusoe discovering footprints in the sand; (2) Galileo discovering spots on the sun and Archimedes discovering why an object floats in water; (3) a doctor discovering that his patient has cancer; (4) a child discovering an egg in the robin’s nest or a sand dollar on the mud flats; (5) a student discovering that the next member of the series 0, 3, 8, 15 . . . , is 24; (6) an adolescent discovering that he is in love (or that his teacher dislikes him); and so on. A preliminary point about these examples is that they pick out at least two different senses of the term “discovery,” namely a strong sense as illustrated by (2) and a weak sense as illustrated by (4) and (6). In the strong sense, what has been discovered is unmistakably novel not only to the discoverer but to the world. In this sense of “discovery,” something has been found out or uncovered

for the first time ever. It thus constitutes a contribution or addition to the stock of human knowledge. In the weak sense of "discovery," that which is found out is novel only to the discoverer and so this sense of "discovery" does not constitute an addition to what is known. In the weak sense, "X discovered Y" implies not that Y had been unknown but only that it had been unknown to X. When speaking of discovery learning in an educational setting it is normally the weak sense of the term that is being used. What is said to be discovered by the student is novel to him but not the teacher and what is discovered by the student does not constitute new knowledge.

The making of discovery claims like those found in (1) to (6) implies that a number of conditions necessarily obtain. For example, if it is correct to say that Crusoe discovered footprints in the sand, that Archimedes discovered why an object floats, etc., it must be the case that there were footprints in the sand and that the propositions explaining flotation are true. In other words there cannot logically be false discoveries. "X discovered Y" implies Y is the case or that Y is true depending on whether Y is an object or a proposition. This condition may be called the objective condition of discovery. But there is a "subjective" condition as well, related to the discoverer necessarily having the relevant concepts. To claim that Billie discovered an egg in the robin's nest, Billie must be said to have the concepts of egg, nest, and robin. For unless he understands that what he has come upon is an egg and not some other object and unless he recognizes that it is a robin's nest and not some other thing, one could not say that what he has discovered is an egg in the robin's nest; and the same may be said, with appropriate changes, of the other examples of discovery above. In *The Philosophy of Science*, Stephen Toulmin (1960) notes that the "discovery that light travels in straight lines — the transition from the state-of-affairs in which this was not known — was a double one: it comprised the development of a technique for representing optical phenomena which was found to fit a wide range of facts, and the adoption along with this technique of a new model, a new way of regarding these phenomena, and of understanding why they are as they are" (pp. 20, 29). Unless a person already has the concepts of light, shadows, darkness (the familiar phenomena of which Toulmin speaks), and some understanding of optical phenomena (witness also Galileo and his perfecting the telescope), it would not be possible, Toulmin suggests, to even conceive of light in a new way, namely as the sort of thing which can be said to travel. And without this conceptual development and relevant understanding the "discovery" that light travels in a straight line could not have been brought off at all.

These examples illustrate the crucial but presumably obvious point of Bruner's succinct claim that discovery favors the well-prepared mind, that the making of discovery claims of oneself or others presupposes prior

conceptual development and appropriate understandings on the part of the person who is said to have discovered.

This makes the relation between teaching and discovery a purely contingent one. Prior learning is logically necessary for discovery but teaching is not logically necessary for such learning, since there can be learning without teaching. Still, as a matter of contingent fact, a good deal of conceptual learning and development comes about as a result of teaching, and normally learning is enhanced by teaching. Thus, teaching can be seen to have a most useful role to play in the development of the “subjective” condition necessary for discovery. Billie must have a concept of egg, etc., and this means that somewhere in his background experiences someone has drawn Billie’s attention to instances of eggs, nests, and robins such that he was able to get some hold on these concepts and some knowledge of when to use them. Thus some structure had to be provided for in his experiences, and it is extremely unlikely that such a structure just simply “happened.” The pointing out to Billie of instances that fall under a concept may not count as formal instruction, but it is instruction of a sort, and all such instruction certainly has the aim of bringing about these kinds of learnings in another.

In the case of discovery learning in the classroom both objective and subjective conditions of “discovery” have to be met. Since it is not logically possible to discover “false propositions,” the teacher must ensure that what pupils are set to uncover “on their own” is indeed discoverable. Here students must be given some idea, some suggestion or outline, rough though it may be, of the sort of thing of which they are in search. Moreover, pupils cannot be set to discover what is the case without a background of understanding and skills to draw upon. And so the teacher must ensure that the student’s conceptual development and grasp of related facts and skills are adequate to the task. For example, if it is Archimedes’ Principle that is to be “discovered,” the prior question to be determined is whether the students have sufficient grasp of concepts like force and mass and of the relevant mathematical operations, and whether they have an adequate facility with the equipment to enable discovery learning to occur. A deficiency in any of these matters warrants further preparatory instruction by the teacher. Also, certain dispositions and abilities have to be developing for inquiry and discovery to take place meaningfully — a point well brought out by Dewey (1961) in his chapter, “Thinking in Education,” in *Democracy and Education* — such as predilections to be curious, to observe accurately, to be disciplined in bringing inquiry to a close; and abilities in formulating ideas to explore, in foreseeing consequences of actions, in extracting relevant data from given or collected information, and so on. These dispositions and abilities are developed principally in having students working with and mastering subject matter to some degree at least. Thus the teacher’s role in discovery in the classroom is a crucial one, for it is the teacher who must provide

sufficient structure in which prior appropriate kinds of learning must take place so that discovery, thereby, has a chance to succeed.

To the extent, then, that these teaching activities are at least contingently related to discovery; and to the extent these actions can be seen to form an overall developing sequence based on a broad range of considerations of what students need to know, what concepts, facts, and skills they need to have mastered, what dispositions and abilities to have developed to be able to proceed in their learning by discovery; and to the extent that such a sequence of actions is engaged in with the intention that students learn "on their own" (i.e., discover), there is justification in calling discovery a teaching strategy. At least the three criteria of teaching "strategy" have been met. The significance of such an appellation is that it underscores the existence of the relationship between the achievement of learning something by discovery, on the one hand, and of cognitive preparation of students in which the teacher plays an instrumental role making discovery possible, on the other.

It does not follow that all uses of the term "discovery" in a school setting are tied to the notion of "teaching strategy." One may speak of a student "discovering" some fact of history by reading a text, or of an elementary school child "discovering" who stole the king's cookies by reading a story book in the school library. But insofar as it is the teacher's conscious objective to have students discover in the more formal setting of a classroom period, a connection with "strategy" seems warranted.

In discussing discovery in education, David Hawkins (1968) once said, "I react negatively to it, partly because I have already seen it used as a defense against a lack of subject content and as a way of minimizing the importance of preparation — plowing, sowing, cultivating, irrigating — as against harvesting" (p. 10). Hawkins, to be sure, is right that the idea of discovery has been misused in the classroom partly because it has been misunderstood or romanticized (or both). And his analogy is to the point too, for neither discovering nor harvesting is possible without the prior sequence of a wide range of preparatory activities by teacher, learner, and farmer alike.

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J. Douglas Stewart is Chairman of Educational Foundations in the Faculty of Education at the University of Regina, Regina, Saskatchewan S4S 0A2.