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INSTRUCTIONAL PROGRAMMING AS A MODEL FOR CLASSROOM TEACHING*

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The reasons why teachers commonly adopt an intuitive approach to classroom events and problems are examined The dependence upon a model which has its roots in the 'teaching as an art' approach is specified as one major reason The scientific approach advocated by McDonald is suggested as a viable alternative and programmed instructional procedures presented as a concise model which incorporates McDonald's approach The strengths of this model and its usefulness to the classroom teacher in approaching classroom events lend support to its use as a basis for teacher behaviour

In his discussion of interviews with fifty 'exceptional' teachers, Jackson (6) presents four aspects of what he calls 'the conceptual simplicity' of the teachers interviewed, one such aspect was that the teacher's approach to classroom events was intuitive rather than rational

> When called on to justify their professional decisions, for example, my informants often declared that their classroom behaviour was based more on impulse and feeling than on reflection and thought In other words, they were more likely to defend themselves by pointing out that a particular course of action *felt* like the right thing to do, rather than by claiming that they *knew* it to be right (6, p 144)

The purpose of this paper is twofold firstly, to suggest why an intuitive approach is the common manner with which classroom events are dealt and secondly to present an alternative approach as well as a model for implementation

TEACHING AS AN ART

James (7), in his lectures to teachers, expressed the idea that had long been in existence and continues to maintain its own when he said that psychology is a science, and teaching an art In spite of the emphasis upon science in the last decade, the attitude that teaching is an art has prevailed The position has been stated strongly by Highet

> Teaching is not like inducing a chemical reaction it is much more like painting a picture or making a piece of music, or on

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> a lower level like planting a garden or writing a friendly letter You must throw your heart into it, you must realize that it cannot be done by formula or you will spoil your work, and your pupils and yourself (4, p 11)

As defined by *Webster's Third New International Dictionary*, an artist is 'one who professes and practices an art in which conception and execution are governed by imagination and taste' Further, an artist is ' the producer of beautiful things' (10) It is true that art is also defined as 'the power of performing certain actions especially as acquired by experience, study, or observation', however, the important element seems to be the source of the artist's inspiration That is, the work of the artist comes to life through the process of internalized activities—emotional impulses—of the artist Art may be a skill born out of knowledge and practice, but it is the source and strength of intuition that is particularly important to the artist and his approach to his work And the artist's work (art) ' is good for nothing except the reference to that value which we call beauty' (3 p 7)

In short, the artist is seen as one who depends upon affective responses His is not an analytical approach but an approach based upon feeling His artistic creations are the expressions of that which comes from within 'The artist is born, and art is the expression of his overflowing soul' (5, p 62) Art is an exercise in intuitive expression

An intuitive approach in the classroom by the teacher is a parallel of the artist's dominant affective approach Jackson reflected this intuitive attitude with the following comment by one of his teachers 'I like to do what I want to do when I want to do it If something interesting comes up, a butterfly flies in the window, we talk about the butterflies' (6, p 131) There is a remarkable similarity between the position of the teacher and the position of the artist as expressed by Feibleman 'the work of art leads a life of its own just as the artist does, it has its own values and validity, and engages upon its own adventures' (1, p 6)

While it has been almost three-quarters of a century since James remarked that teaching is an art the evolution of science has been remarkably slow in its effects upon the conception of the teacher as an artist and the teacher's role in the classroom There are certain deficiencies inherent in the artistic approach to classroom events Teaching should be more than an expression of beauty While it may be beautiful, an instructional act or sequence of acts or the teacher's reaction to any event in the classroom should have use other than inherent beauty Furthermore, an intuitive approach is a myth-perpetuating approach A myth, as a symbol, can be an expression of beauty in the fine arts, but myths in

education need to be systematically removed and replaced It can be a risky business when each teacher engages every butterfly that flies by that appears more interesting or meaningful than the previous one Indeed in that case, the butterfly is mistakenly a moth

As a result of operating on intuition we often find that teachers are unable to state the reasons they do what they do Likewise, they have difficulty in stating what they expect the results of their actions to be or what in fact the results are All this is to say that teachers generally have only a vaguely formed untested set of notions about teaching and learning which provide a source of direction for action and reaction, but which is not an adequate base for the important task of teaching

THE TEACHER AS AN HYPOTHESIS BUILDER

The untested notions of teachers need to be tested, augmented, and at last joined together to form a more adequate base This may be brought about by the teacher adopting an approach to classroom events as characterized by the scientific method The purpose of any science is to organize our experiences into a logical system Through this process not only are our observations organized but the range of our experiences is extended It should become evident upon close inspection that as one compares the philosophy of art with the philosophy of science the tasks of the teacher are more appropriately approached from an empirical frame of reference than from one characterized by the artist's intuition The systematic search for order and regularity is suitable to classroom events and the teacher should be taught this approach rather than an intuitive one based on the subtle but commonly held idea of the 'teacher as an artist'

McDonald (8) encourages the teacher to behave as an experimental psychologist by adopting not only scientific procedures but the scientist's critical attitude Unless the teacher learns to challenge conventional practices, educational myths, and his own set of notions about teaching, improvement in teaching skills will come about only as outside forces, technology, curricula, etc, influence conventional practice or the nature of the teacher's own notions The approach suggested by McDonald to implement the empirical philosophy in the classroom is both simple and flexible Basically, the teacher is to be a hypothesis maker and tester Three basic steps are involved First of all the teacher should know specifically what his teaching objectives are, secondly he should use his general knowledge about learning as a basis of hypothesizing—that if he has his students do these things, then he can expect these other things to

happen and thirdly, he should test the hypothesis instead of merely guessing how well the students succeeded in achieving these objectives

Teachers often ask questions about the level at which they need to specify educational objectives Myriad rules and guidelines can be set up For this model, however, it is clear that the instructional objectives need to be specific and expressed in behavioural terms so that it is possible to determine if they have been reached

The second step in this approach involves several considerations First, it is necessary that the teacher develop testable hypotheses A hypothesis relates two variables and to test the hypothesis it is necessary to define the variables involved in such a manner that they can be measured, and to develop reliable and valid measures This usually means that the variables are defined in behavioural terms

There are two general processes by which hypotheses are developed induction and deduction An inductive hypothesis is formulated as a generalizing from observed relationships it proceeds from the specific to the general On the other hand deductive hypotheses are more specific hypotheses drawn from and consistent with some more comprehensive generalization Ideally, teachers should be familiar with generalizations about human behaviour from which to deduct hypotheses related to specific objectives

In practice, it is unfortunately the case that there are just not enough empirically validated generalizations available to serve as a basis for appropriate deductions Furthermore teachers are often not sufficiently aware of the generalizations which have a demonstrated validity

The third aspect of this approach involves the testing of the hypotheses The formal testing of hypotheses requires a knowledge of experimental design and technical skills which the classroom teacher seldom has This could possibly be remedied by training but even then the teacher would not have time to conduct formal research Does this mean that this approach breaks down? According to McDonald it need not The crucial thing is that teachers carry out some kind of evaluation by systematically observing effects

> Suppose for example, that a teacher predicts that a new spelling method will work more effectively A strict test of this hypothesis would require that we set up two comparable groups of students, one of which learns by the new spelling method and the other by the old method, we would first test the spelling performance of both groups under the old method and then, after a period of time during which one group is

taught by the old method and the other by the new one, we would compare the performance of the two groups This design would provide a reasonably careful test of the hypothesis

Although the teacher may not be able to implement such a design he can observe the effects of using a new method While using a new method, he can ask Have the pupils improved? Are they learning to spell quickly and easily? Do they seem to be interested in spelling?

We are not suggesting simply that teachers try something to 'see if it works' We are suggesting that teachers attempt to gather data systematically *to find out if predicted* effects do occur Gathering and using factual data on behaviour change eliminates some of the inaccuracies inherent in general impressions of student performance A teacher can keep a record of the 'successes' and 'failures' of an educational practice With such a record, he is better equipped to ferret out possible reasons for the relative success or failure of this procedure, and to revise and retest them accordingly (8 p 697-698)

INSTRUCTIONAL PROGRAMMING AS A CLASSROOM MODEL

How does the teacher become a hypothesis maker and tester? What model is followed? These questions can be answered by examining the process used in instructional programming Indeed the process of instructional programming can provide a model which suitably implements if followed by the teacher the elements of an empirical philosophy

Green (5) outlines six steps in the process of instructional programming While all the steps are not necessary they provide an outline of the usual process The six steps are (a) definition of terminal behaviour, (b) development of criterion tests (c) definition of initial behaviours (target population), (d) behaviour analysis and sequencing (e) frame construction and (f) publication

Glaser (2) proposed a model of instruction which encompasses the major steps of Green's analysis His four categories are (a) instructional objectives (b) entering behaviour (c) instructional procedures, and (d) performance assessment At least three of these steps are a minimum for a model of informal theory building based on a rational rather than an emotional point of view These three steps (a) instructional objectives (b) instructional procedures and (c) performance assessment will be

considered in a discussion of how the model of a rational empirical approach to classroom events might be implemented

In specifying instructional objectives, the teacher would be required to state in detail the behaviour that is expected to occur as a result of instruction This is the first and foremost step in developing the attitude and method of the empirical or scientific philosophy If a teacher states his instructional objectives clearly, then he is in a position to frame hypotheses concerning the kind of instructional procedures that are most likely to bring about the behaviour specified by the objectives These hypotheses can then be tested by assessing the pupils' performance, which is the fourth step of the model

The model also emphasises mastery It is interesting to note that in the process of instructional programming, the development of criterion tests is not only connected logically to the objectives which are stated but is also closely aligned to the sequence of production This differs from the typical sequence followed by teachers where the instruction is carried on *before* the criterion tests are developed One can only hypothesize, but it would seem likely that in the one case the criterion test influences the instruction, while in the other case the instruction influences the type of criterion test developed If the objectives are going to be assessed in the criterion test, we would want the development of this test to be relatively uninfluenced by the instructional process Too often teachers test for what they taught, even when the teaching is not directly getting at the objectives which were originally envisioned Much of what is taught in teacher training is based on the idea of graded evaluation, that is, that only a certain proportion of pupils are going to learn 100 per cent of the material specified in the objectives Programmed instruction with its insistence upon 100 per cent mastery for instruction would change the framework for the teacher who used it as a model

An emphasis on mastery is also reflected in an attempt to define the initial characteristics of the group to be taught Teachers very often tend to define these characteristics in terms of grade level rather than in terms of ability or performance In programme development two strategies which are useful to the teacher are used, the characteristics of the students for whom the programme is intended are carefully defined, and then pre-programme sequences are developed which establish prerequisites in order that the students may move on to the programme It is the second of these that has many times been ignored in teacher training and consequently in teaching If it were not so we would not find examples of students in high school who are reading at the fifth-grade level but are still trying to attack tenth-grade material

The teacher as a hypothesis maker and tester needs to be aware of ways in which instructional procedures can progress Suppose the teacher has as an instructional objective that the students should be able, at the conclusion of the instruction, to identify which words in a set of given sentences are nouns Where does the hypothesis tester proceed from the objective? First, the teacher might establish a list of as many ways as possible to teach that concept He may, for example, include some of the following in the list (a) I could present the rule and then follow it with exemplars, (b) I could present some exemplars followed by the rule, (c) I could present the exemplars and then let them 'discover' the rule, (d) I might not discuss it at all but give them a clearly written account which the students would read on their own The teacher then takes from the list those ways of teaching the concept that seem most feasible, taking into account the given concept and his own particular situation Then he applies the instructional procedures selected At the conclusion of the instructional period, whether it be a day, or a week, or longer the teacher then assesses performance

Did the students perform better on the assessment than did another class or group having a different set of instructional procedures? How effective were the results? Are there specific things that would improve the instructional presentation the next time this unit is taught? Are there generalizations that can be readily made about the kind of instructional procedures presented? Does it appear that some kinds of objectives are better taught with one method than others? If the teacher is asking and answering these kind of questions, then he is developing the attitude of an experimental teacher and the empirical philosophy we have suggested is most appropriate to utilize in dealing with classroom events Edward L Thorndike said it well many years ago when he wrote

> The efficiency of any profession depends in large measure upon the degree to which it becomes scientific The profession of teaching will improve (i) in proportion as its members direct their daily work by the scientific spirit and methods that is by honest open-minded consideration of facts, by freedom from superstitions, fancies or unverified guesses, and (ii) in proportion as the leaders in education direct their choices of methods by the results of scientific investigation rather than by general opinion (9, p 63)

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