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ABSTRACT

A model of the teaching-learning process identifies and describes varied behavioral dimensions of the classroom and how they relate to pupil achievement. The model is based on the assumption that the total amount of engaged time on a particular topic is the most important determinant of achievement and has the components of: (1) quantity of schooling; (2) time allocated to curriculum activities; (3) pupil involvement; (4) content comprehension; (5) achievement; and (6) feedback. The quantity of schooling is defined by length of the school day and year, and pupil attendance. The allotment of time for subjects in the curriculum relates to achievement levels in such subjects as math, language, and reading. The pattern of time allocation for various subject areas is an important consideration when planning and implementing instruction. Pupil involvement is particularly important in achievement and consists of attention, task persistence, active learning time, and engagement on task. Constant and supportive feedback from the teacher is a factor in improving pupil involvement, comprehension, and achievement. The effectiveness of this model, which was derived from empirical research on classroom teaching and learning, has several implications for effective teaching of curriculum planning, classroom organization, curriculum organization, and feedback. (JD)

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TIME TO TEACH: TEACHING-LEARNING PROCESSES IN PRIMARY SCHOOLS

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Abstract

An empirical model of teaching-learning processes is presented to allow a coherent ordering and synthesis of the findings of recent research on teaching from both the United States and Britain. Following the review of research findings their implications for teaching are considered. These include curriculum planning, classroom organization, curriculum organization, and feedback. Areas that might profitably be studied in the future are also delineated.

TIME TO TEACH: TEACHING-LEARNING PROCESSES IN PRIMARY SCHOOLS[1]

Neville Bennett[2]

The path of educational progress more closely resembles the flight of a butterfly than the flight of a bullet (Jackson, 1968). In the specific context of classroom teaching, this has been due in part to the differing conceptions of definitions of "good" teaching. In the earlier part of this century it was generally felt that teaching was an art, the belief being that "a little learning and a way with children sufficed for the teacher" (Bennett, 1917). Good teachers were born not made, or had been lucky enough to stumble on teaching's secrets by chance. This conception was later strongly contested by proponents of the view that teaching was a science. They poured scorn on the analogy of teachers as artists and argued that the content of teacher training resembled the treasured store of traditions passed on by one witch doctor to another, and that the best corrective to such shallow speculation and sentimentality was the development of a body of scientific knowledge relating to children's learning and effective teacher behavior.

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[1]This paper was originally published in May 1980 by the Centre for Educational Research and Development at the University of Lancaster, Lancaster, England.

[2]Neville Bennett is the professor of educational research at the University of Lancaster and director of the Centre for Educational Research and Development at the University of Lancaster, Lancaster, England.

Contemporary thought eschews both these stances. Teaching is now seen to embody both artistic and scientific components. The teacher uses judgment, insight, and sensitivity within a framework provided by the rules and concepts of scientific knowledge. A favored analogy is that of engineering, where, in solving problems, artistry is used in balancing the claims of competing considerations within the context of a strong scientific foundation. Neither engineering nor teaching are true sciences; both use science to achieve useful, practical ends.

This acceptance of a scientific basis for the art of teaching requires the dual development of, firstly, advances towards a science of teaching and, secondly, the design of relevant training in the practical art of teaching. This duality was recognized a long time ago. William James (1899) wrote,

> Knowing science is...no guarantee of good teaching. To advance to that result, teachers must have an additional endowment altogether, happy tact and ingenuity to tell them what definite things to say and do when the pupil is before them. That ingenuity in meeting and pursuing the pupil, that tact for the concrete situation, though they are the alpha and omega of the teacher's art, are things that psychology cannot help to explain.

It is, in fact, to psychology that educators have turned for theories of learning and child development. But despite psychology's central role in the curriculum of teacher training and the continued proliferation of books on educational psychology, it would appear that psychology has had little impact on teachers' classroom activities. Teachers appear to be skeptical of the value of learning theories, and reasons for this skepticism are not hard to find. Typically these theories have been developed from highly controlled laboratory experiments on the acquisition of relatively simple skills among college students and the white rat, whereas teaching and learning take place in contexts quite unlike these. Teaching

is an opportunistic process that takes place in a setting marked by multidimensionality, simultaneity, and thus unpredictability (Doyle, Note 1). In restricting themselves to laboratory settings, psychologists have seriously neglected the social character of learning.

Many educators now consider that the only road to a scientific basis for teaching is to the classroom.

> Traditional psychological theory cannot be of any significant value until the investigators of classroom behavior have themselves produced significant theoretical explanations of classroom events. The need is not for further adaptation and stretching of old theory but for the creation of new theory which arises directly from the natural grain and details of the behavior it is intended to explain. (Nuthall, 1968)

In short, the demand is for the identification, description, and understanding of the varied behavioral dimensions of the classroom and how these behaviors relate to pupil achievement. A small but growing band of educational researchers have accepted this challenge over the past decade, concentrating in particular on mathematics and language in the primary school. The task now is to develop models or theories that allow a meaningful ordering of the findings of these research efforts in order to ascertain the possibility of generalizations, implications, and further hypotheses. What follows is the presentation of a model of teaching-learning processes that attempts to fulfill this task.

The Model

"No matter how constructed and arrived at every model serves to bring order of some kind to nature, or rather our understanding of her" (London, 1949). This particular model (see Figure 1) is based on recent empirical research on teaching and learning undertaken in classrooms. Following a brief overview of the model as a whole, each element of the model will be

considered separately prior to an assessment of its implications for teaching practice.

The perspective adopted parallels that of Carroll (1963) and Harnischfeger and Wiley (1974) who regard the pupils' behaviors and activities as central to their learning, and regard the total amount of engaged time on a particular topic as the most important determinant of achievement of that topic. It is recognized that the amount of time different pupils need to achieve the same level of achievement on the same topic will vary enormously. The teacher, on the other hand, is seen as the manager of the attention and time of pupils in relation to the educational ends of the classroom (cf. Westbury, Note 2). In other words the teacher manages the scarce resources of attention and time.

Quantity of schooling is the total amount of time that the school is open for its stated purpose and is defined by the length of school day and school year. The nominal amount may not be the actual amount since the school may be closed for a number of reasons--extra holidays, teacher strikes, or building alterations. The actual amount will also be reduced for a particular pupil by his/her absences. This time is allocated to various curricular activities, curricular used here in its broadest sense to include administration and transition time between activities as well as time devoted to content. The curriculum emphasis or balance achieved varies from school to school and class to class. This element of the model is termed "curriculum allocation." The amount of time allocated to a given curriculum activity is, however, unlikely to match the actual amount of time a pupil will spend on it.

Disruptions, distractions, lack of interest in the task, or poor persistence are all factors likely to reduce the use a pupil makes of the

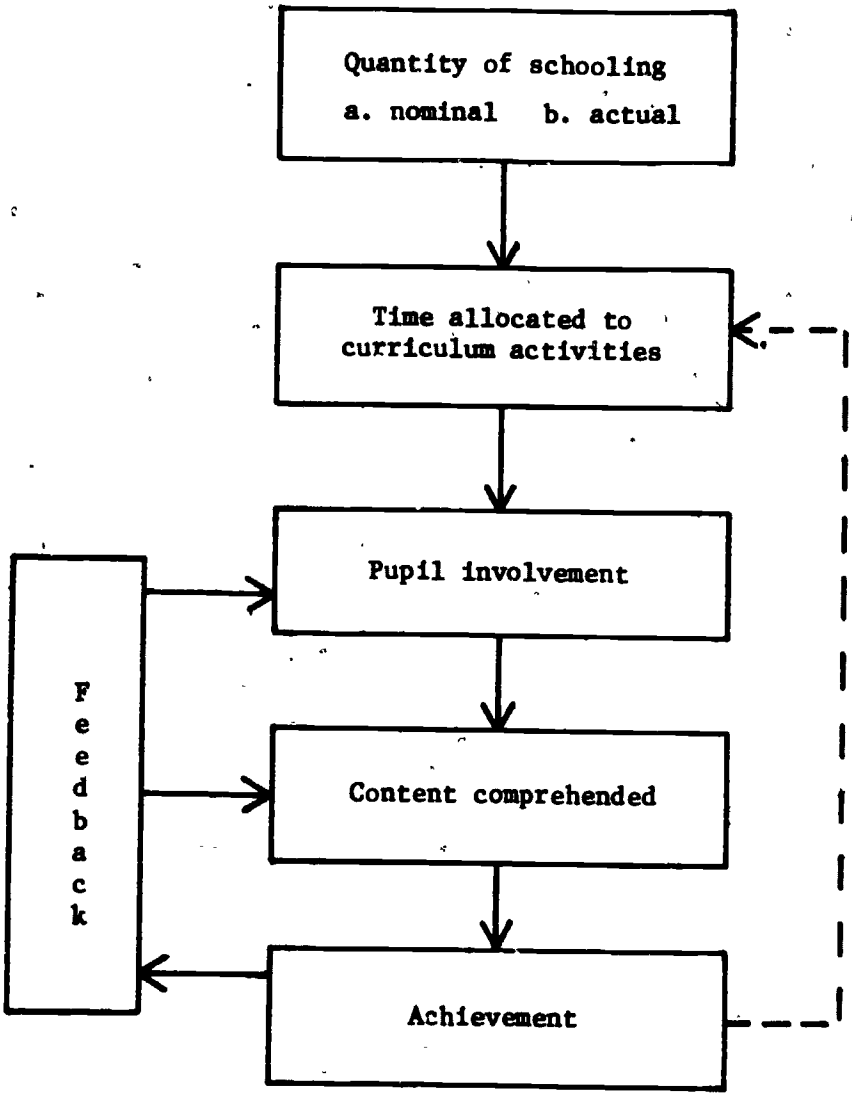

Figure 1. A model of teaching-learning processes.

opportunity to study a given content. The next element, termed "pupil involvement," acknowledges this. The underlying assumption here is that only the active portion of the time assigned to a task is effective for learning that task. But whether this active portion is achievement-relevant will depend upon a number of other variables subsumed under "comprehension." According to this model, achievement-related time is mediated by a number of factors, including the aptitude and prior achievement of the pupil, clarity of instructions, task difficulty, and pacing. Thus only that portion of time during which a pupil is actually comprehending the task is effective for its acquisition and thus has a direct link to achievement on that task. The remaining element is feedback since this is assumed to influence both involvement and comprehension and thereby achievement.

Quantity of Schooling

The exposure of pupils to schooling depends in the first instance on the nominal quantity of schooling defined by length of school day and school year. The length of the school year in Britain is fixed at 190 days but more flexibility is possible. The regulations lay down a minimum of three hours per day for infants and four hours for juniors, although in practice primary schools work for longer hours than these regulations require.[3] The evidence available indicates marked variations across schools. A study in Surrey (Hilsum & Cane, 1971), recently replicated in Lancashire (Lane, Note 3), found that the amount of time the schools were open varied from 22 to 27 hours per week. When lunch times, breaks, assemblies, and administration are deducted, the amount of time remaining for teaching varied from a little

[3] In the British education system, infants are school children up to age 7, and juniors are school children aged 8-11.

over 19 to 24 hours per week. At the extremes, therefore, some children are exposed to schooling for five hours per week more than others, effectively a gain of one day per week. Over the school year this difference amounts to six school weeks.

These nominal amounts of time are likely to be differentially decreased by such events as teacher or caretaker strikes, structural repairs, use of schools as polling stations, and so on. The actual amount of schooling for any individual pupil will also depend on his/her absences from school. These differences are important. A number of studies have now related school-day length to pupil achievement and have found positive and significant relationships (Stallings, Note 4; Wiley & Harnischfeger, Note 5). Further, studies which have related pupil absence to achievement have typically reported negative relationships (cf. Bennett, 1978). The latest large-scale study of pupil-absence effects examined the relationship between children's school attendance at ages 7 and 15 and their reading and mathematics achievement at age 16. Their conclusion was that "children with high attendance levels obtain on average higher scores on tests of reading, comprehension and mathematics" (Fogelman, 1978). There was also a low but positive link between attendance at age 7 and later achievement at age 16, which could suggest that the effect of early absence persists into secondary school.

Curriculum Allocation

Within the constraints of the actual amount of schooling available, the primary teacher sub-divides the time by curriculum area and plans and implements corresponding allocations of pupil time either in class, group, or individual activities.[4] The curriculum emphasis in primary classrooms is

[4] In Britain, primary schooling encompasses the age range 5-11 (akin to American elementary schooling).

often determined by the classroom teacher and mediated by school policy, attitudes, and aims based on perceptions of the children's needs and achievement levels. The lack of central control of curriculum in Britain is reflected in the large variations found in curriculum emphasis.

A number of recent studies have investigated this, and despite differences in methodology and definitions, the results are surprisingly consistent (Ashton, Kneen, Davies, & Holley, 1975; Bennett, 1976; Bennett, Andreae, Hegarty, & Wade, 1980; Lane, Note 3; Bassey, Note 6). I will discuss two of these studies in greater detail. The first comprised interviews of 900 teachers in Nottinghamshire, and the second used direct observation of pupils and teachers in a national sample of open-plan[5] primary schools.

Figure 2 shows the results of the 900 interviews (Bassey, Note 6). The number in the enclosed horizontal column of Figure 2 is the average amount of time per week devoted to the subject area for all teachers (e.g., five hours per week to mathematics, seven hours per week to language). The length of the column denotes the variations found. Thus in mathematics, some teachers stated that they spend less than one hour per week, whereas others devote eight hours to this subject. An identical variation is true of thematic studies, here defined as covering what is conventionally known as environmental studies—an integration of history, geography, nature study, and science. The discrepancies in the opportunity to study language are greatest, varying from less than one hour per week to 10 hours.

The second example emanates from a national study recently completed on open-plan primary schools (Bennett et al., 1980). One year of this study

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[5]Open-plan schools are the same as open-space schools.

was dedicated to the direct observation of teachers and pupils in schools in England and Wales. The averages in Figure 3 are very similar to those of the Nottingham Survey, although there is somewhat less variation in mathematics (from 2.5 to 7 hours per week). The variation in language is four to 12 hours, and in environmental studies zero to seven hours.

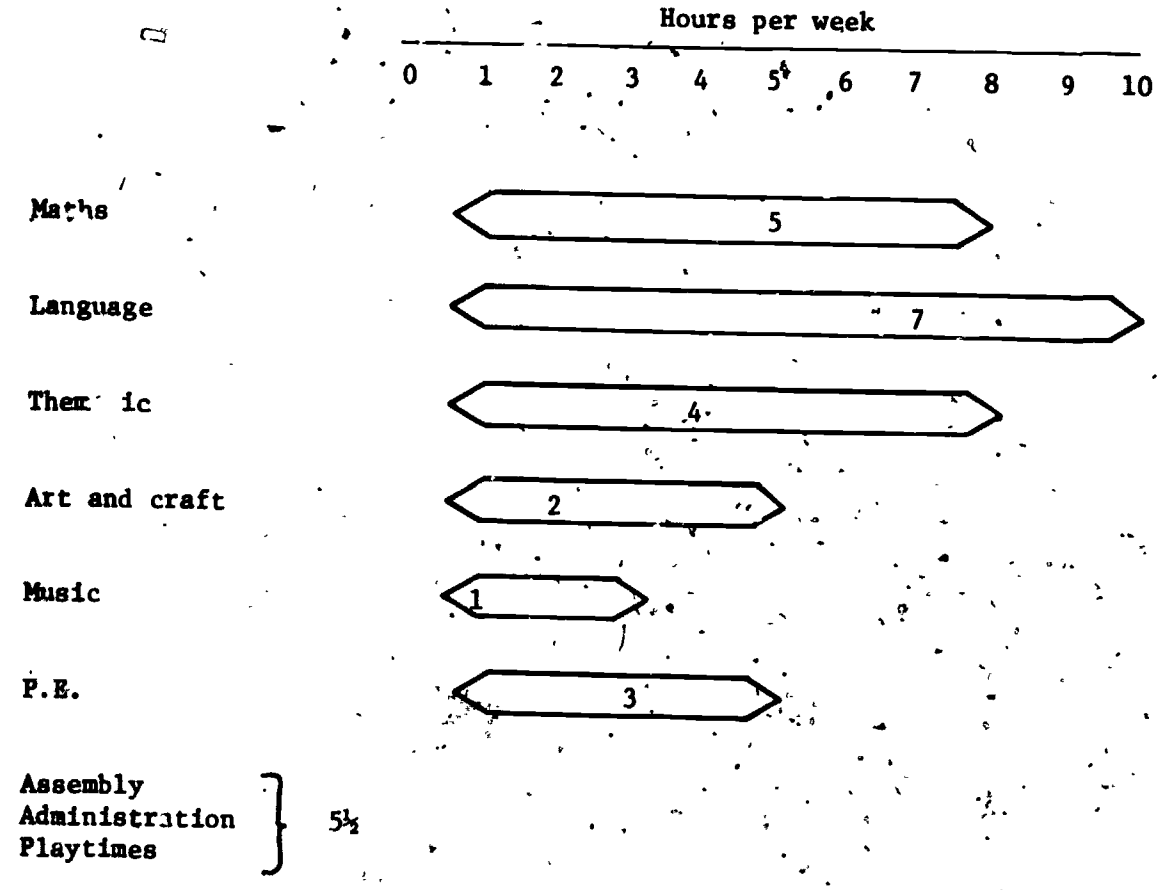

Figure 2. Curriculum allocation (Bassey, Note 6).

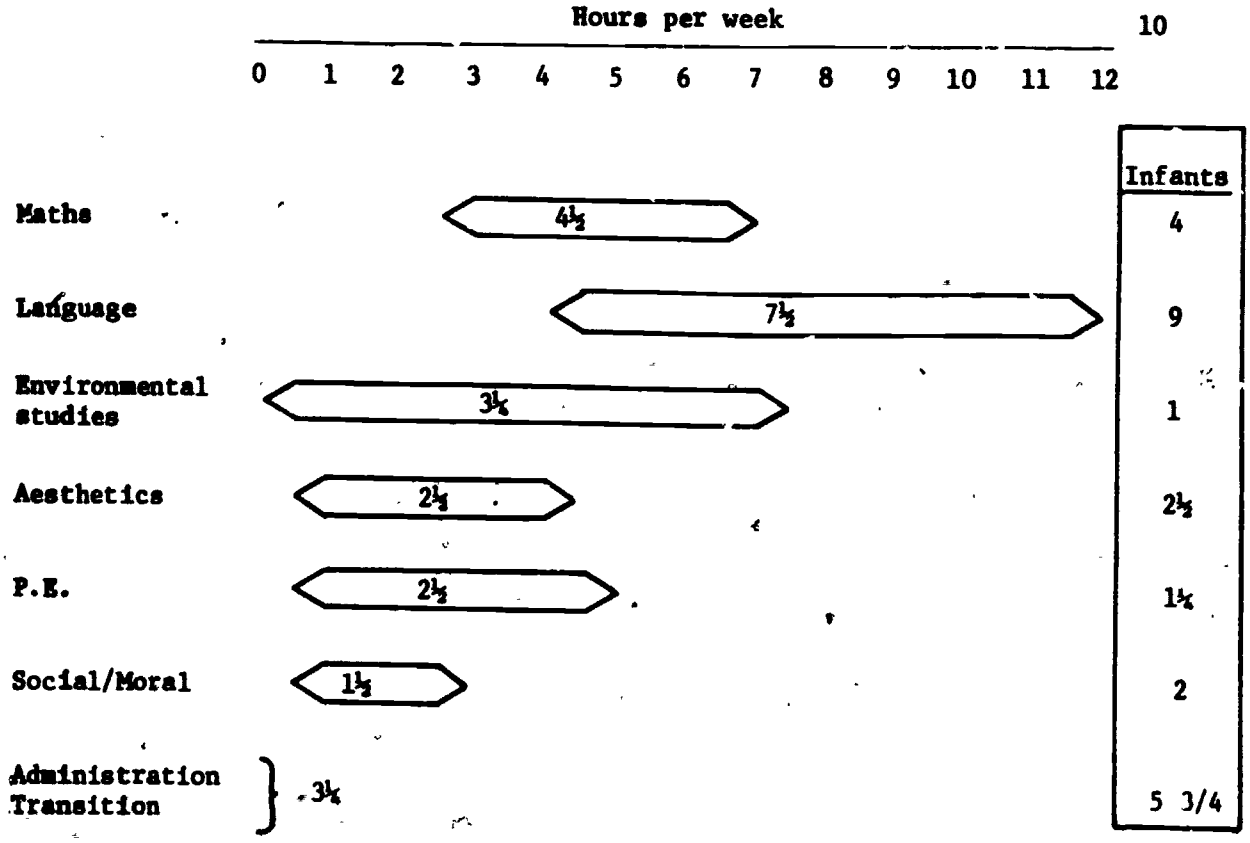

Figure 3. Curriculum allocation (Bennett et al., 1980).

These observations also allowed a comparison of time allocations in junior and infant classrooms. As might be expected, there is more emphasis on language with the younger children. But perhaps the most significant finding is the large amount of time spent on administrative and transitional activities. Most of the 5.75 hours is, in fact, spent in transition, here defined as that time between activities--clearing up, waiting, moving to a new location, and so on. The fact that such non-curricular activities consume over 20% of the week is of concern, and accords with similar findings in the United States.

Other findings of interest from this body of research are that the number of subjects comprising the primary curriculum varies from more than

eight to five or less, and that the pattern of time allocation across days of the week differs across classrooms. Some teachers felt that mathematics, for example, should be taught daily, others felt that four days per week was enough, whilst a minority group felt that no regular commitment to maths was necessary and it should be taught as and when necessary.

What is clear is that children are receiving quite different educational diets dependent on the school they happen to go to, and, as in other areas of human functioning, diet relates to growth. The limited number of studies that have investigated this link have shown positive relationships. The largest study concluded that "time allocated to instruction in a content area is positively associated with learning in that content area" (Fisher, Filby, Marliave, Cahen, Dishaw, Moore, & Berliner, Note 7). This was consistent at both infant and junior levels and in both mathematics and reading. Thus the pattern of time allocation to various subject areas is an important consideration when planning and implementing instruction.

Pupil Involvement

If curriculum allocation is conceived of as the opportunity that teachers give pupils to study a given curriculum content, then pupil involvement can be conceived of as the use that pupils make of that opportunity. Here too, there is evidence of wide variation. The problem is that the answer gained crucially depends on the question asked.

Some researchers have computed a proportion of the time that pupils are actively engaged on a task in relation to the length of the school day. The question posed in this instance is "For what proportion of the school day is the pupil involved?" and this inevitably includes administration and transition time, which serve to depress the size of the

proportion gained. Other researchers have posed the question "For what proportion of an identifiable lesson is the pupil involved?" and this obviates the inclusion of transition time.

In the open-plan study we computed both. Here the average proportion of the school day spent involved was 66% for juniors and 61% for infants, but these averages mask marked divergences across schools. Some schools managed to average over 80%, others only 50%. And if the individual pupil is taken as the unit of analysis, the variation was from approximately 20% to nearly 90%. In other words, some teachers were able to keep their pupils involved for 19 hours per week, others for only 13 hours.

If transition time is removed the proportions increase substantially to over 75%, and when these data were further broken down it became evident that involvement was lowest in mathematics and language. That which is allocated most time apparently generates least involvement.

The variable here labeled pupil involvement has numerous synonyms--attention, task persistence, active learning time, and engagement; but irrespective of nomenclature the central question is whether this variable relates to achievement. Was William James correct when he argued in 1902, "whether the attention comes by grace of genius or by dint of will, the longer one does attend to a topic the more mastery of it one has"?

The short answer is yes. There is clear support for such a view from investigations at all levels of schooling. At nursery and reception level it has been reported that the effect of harnessing and focusing children's attention is dramatic (Tyler, Foy, & Huff, 1979), and that interest and task orientation in kindergarten are the best predictors of achievement in infant school (Perry, Guidubaldi, & Kehle, 1979). Studies of the

attention-achievement link among six-year-old children (Samuels & Turnure, 1974), seven-year-old children (Fisher et al., Note 7), eight-year-old children (McKinney, Mason, Perkerson, & Clifford, 1975), and eleven-year-old children (Cobb, 1972; Fisher et al., Note 7), and twelve-year-old children (Lahaderne, 1968) have all demonstrated positive and significant relationships. And in the secondary field, an analysis of several international evaluation studies on achievement delineated time and opportunity to learn as the most important factors to emanate from these studies (Postlethwaite, 1975).

The evidence would indicate that the involvement-achievement link is valid for all ages of schooling. Indeed, researchers have been criticized in a recent review by Faw and Waller (1976) for not showing more concern with this area. The authors concluded,

> our contention is not that time is the complete explanation of all observed test differences...it is simply being maintained that in the absence of clear evidence that different procedures are in fact associated with different treatments, time differences potentially and parsimoniously account for much of the observed data.

But time is not the complete explanation of test differences. It has, in fact, been called an "empty box" (Gage, 1978) that must be filled with comprehensible and worthwhile content.

Comprehension

Comprehension and feedback are considered separately in the model as it stands but could be joined to provide a more general element relating to structuring the conditions for learning. The cluster of variables of concern here includes the manner of presentation of task, sequence, level, and pacing of content, and the teachers' levels of expectations of pupils as judged by the tasks and activities provided. Unfortunately, classroom

researchers have tended to neglect this area. There are one or two reports of positive relationships between the clarity of teachers' instructions and pupil achievement, but no classroom-based research on sequencing content.

Despite this, instructional theorists continue to regard sequencing as central, and some experimental studies have shown that content structure can make a difference in terms of performance and the rate of concept acquisition (Tennyson & Tennyson, Note 8). But a recent review of this area contended that despite long debates on the issue no satisfactory answer has been developed, and no adequate prescriptions should be expected in the near future. The conclusion was that "we have very little information based on hard data regarding the consequences of alternative content sequences and will need a good deal more research effort before we are able to satisfactorily report how the content should be sequenced" (Posner & Strike, 1976).

Of current concern is the nature of the match between the demands of the task or activity set and the pupil's capacities to undertake it. This is variously referred to as the match or level of difficulty. It was highlighted in a recent survey of primary education undertaken by Her Majesty's Inspectorate. It was their judgment that the top third of pupils in any class were doing work that was insufficiently challenging. Teachers were underestimating these pupils' capacities.

Evidence of poor matching is also available from the United States where, for example, it is claimed that the failure to adjust the material and the instruction to the range of reading capabilities found within the classroom is probably the single most important cause of reading disability (Bond & Tinker, 1973).

These assertions about the effect on achievement of poor matching gain limited support from recent classroom-based studies. Support from the survey done by Her Majesty's Inspectorate itself was indirect. The Inspectorate found that exploratory or progressive teaching practices were related to poorer achievement in maths and reading and that matching was least satisfactory there. Direct support is only available from American studies at this stage. One approached the problem by rating the number of errors children made in their work and found that the proportion of time spent on tasks where children have low error rates is positively associated with learning (Fisher et al., Note 7). More significant perhaps, in terms of its implications, is the finding of an interaction effect with pupil ability. The evidence would indicate that the lower ability pupils learn more by having less taught to them, and by having it taught redundantly to the point of overlearning, proceeding in small steps that they can master without undue cognitive strain. In contrast, higher ability children can cover the same material more quickly and, furthermore, will learn optimally by being challenged with slightly more difficult questions and assignments (Brophy & Evertson, 1976).

The extent to which children are challenged by the teacher appears to be important. There is research to indicate that increasing the demands made on pupils increases involvement and performance (Block & Burns, 1976). This notion of the more you demand the more you are likely to get is supported by other studies. One investigated teachers who consistently gained higher achievement in maths and compared them with those who tended to gain low achievement. They found that the teachers who gained high achievement typically pushed pupils through text books at a much faster rate, covering on the average of 90 pages of text in 80 days compared to 56 pages covered by the teachers who gained low achievement. Incidentally, attitudes toward maths

were also more favorable in the faster paced classes (Good, Grouws, & Beckerman, 1978). A similar conclusion was reached in a large-scale comparative study of the mathematics achievement of British and Californian children. The much better performance of British children was interpreted in terms of differing requirements or expectations.

> In California much less was expected of pupils in arithmetic, more limited objectives were formulated for children of primary-school age, and less emphasis was placed on rapid progress in mechanical arithmetic than was customary in England and Wales. (Pidgeon, 1970)

Classroom-based research on the variables included within the comprehension category is fairly limited. Nevertheless it appears to be consistent in indicating that these factors do have an effect on learning outcomes and that interactions can be expected with pupil ability and attitude.

Feedback

> Feedback confirms correct responses, telling the student how well the content is being understood. It also identifies and corrects errors, or allows the learner to correct them. This correction function is probably the most important aspect of feedback, and, if one were given the choice, feedback following wrong responses probably has the greatest positive effect. (Kulhavy, 1977)

The effectiveness of the correction function can be shown in recent classroom research. Opportunities for immediate practice of skills, together with opportunity for immediate corrective feedback have been found to be important particularly with the low-ability pupil. One report concluded that

> the most successful teachers, in terms of pupil gains conducted group lessons by giving initial demonstrations and then quickly moving around having each student try out what has been demonstrated and providing feedback on an individual basis. (Brophy & Evertson, 1976)

An aspect of feedback that has attracted considerable research is the relative utility of verbal praise and criticism. Until the early seventies it was thought that praise was preferable, but research since that date has tended to modify this. The focus or topic of feedback has been shown to be more important than the type of feedback (Stallings & Kaskowitz, 1974), and interactions with pupil ability have also been found. These would indicate that the most successful teachers of low-ability children motivate primarily through gentle and positive encouragement and praise, while the most successful teachers of high-ability children motivate through challenge and a critical demandingness that involves communicating high expectations and criticizing pupils for failing to meet them (Brophy & Evertson, 1976).

Symbolic as well as verbal feedback would seem to be effective. It has been found that the use of symbolic rewards such as gold stars and "smiling faces placed upon papers to be taken home and shown to the parents, or placed on charts in a room, showed consistent positive association with learning gains" (Brophy & Evertson, 1976). Classroom-based experiments on material incentives supports their efficacy (cf. Benowitz & Busse, 1976).

Summary

On the basis of the evidence currently available, it would seem that the elements of the model have empirical support. Nevertheless, more research is clearly needed. Many of the studies that bear directly on the verification of the model have been limited in size and achievement criteria. Much of the evidence is American and based on the reading and mathematics achievement of predominantly low-ability pupils. Such studies leave unanswered the wider applicability of the model to curriculum areas such as music, art, or social studies. Little is known about optimal time allocations or involvement rates

and whether these vary in relation to pupil characteristics. No research has yet been undertaken to assess the amount of achievement variance accounted for by the elements in the model. These are but a few of the new and interesting research questions suggested by the model. But no model of the teaching/learning process would be of value unless it allowed implications for teaching practice to be inferred.

Implications

Quantity of Schooling

Length of school day is related to pupil achievement; by inference, a longer school year might also be expected to lead to enhanced performance. This, of course, is outside the control of the individual head (school principal) or classroom teacher. The fixed length of the school year at 190 days is a central policy decision, although I suspect an adequate rationale for this would be difficult to find. Neither, I suspect, would a demand for a longer school year be well received by the teaching profession, even though there is evidence of a falling off of achievement levels over the summer holidays. However, the length of the school day is under the control of the school, and the apparent marked variations, even within the same local education authority, indicate that a closer examination of the factors bearing on this may be warranted.

One approach to increasing the actual quantity of schooling is to assign homework, a practice that is not widespread at the primary level in England. The reason for this is not clear. The Plowden Report (Note 9) did not discourage it, stating that "homework should be a matter for discussion and agreement between home and school and the school should give thought to the

form of homework most suitable to children's varying circumstances." There has been little research on this topic although an international study on mathematics (Husen, 1967) found moderate positive relationships between homework and mathematics achievement. This would suggest a re-thinking of homework's possible uses, such as for remedial work (cf. Coulter, 1979, for review).

Actual quantity of schooling is often decreased by pupil absence. It follows from the evidence that this is likely to depress achievement. The studies carried out so far do not appear to have taken into account the length of absence, or what strategies teachers employed to combat such absence. The relationship between absence and achievement is also likely to be mediated by teaching approach. For example, it has been reported that although direct or formal teaching engendered greater pupil learning gains, the open or informal approaches were associated with less pupil absence (Stallings & Kaskowitz, 1974). In other words, informal approaches achieve less with greater actual time. Nevertheless, the implication is that teachers should attempt to compensate for pupil absence. Strategies that could be used include personal tutoring or increasing time allocation both within and without the classroom.

Curriculum Allocation

A consideration of curriculum allocation leads into the realms of curriculum planning. The evidence indicates that what knowledge the pupil acquires depends on the coverage and emphasis of the curriculum adopted. This evidence, together with that drawn from the field of curriculum evaluation (cf. Walker & Schaffarzick, 1974), indicates that, other things being equal, one curriculum is neither better nor worse than another, rather

that different curricula result in different patterns of knowledge acquisition (Berliner & Rosenshine, Note 10). The primary teacher, who, in Britain, has considerable influence on curriculum emphasis, is thus faced with a set of critical questions. Should the emphasis be on the development of the basic subjects or should there be equal concern with creative expression and aesthetic appreciation? What amount of time should be devoted to each? Should equal time be allocated to pupils irrespective of ability or previous achievement? Such decisions result in quite diverse emphases and balance even within a given school unless team teaching or school-based schemes (in which the whole school decides on a common scheme for math, for example) are in operation.

The basis on which such decisions are made deserves a study in its own right, but in the absence of direct evidence it would be expected that such decisions are mediated by aims, and it has been shown that there is little consensus about aims at the primary level, (Ashton et al., 1975). Some teachers stress academic aims such as the development of competence in the basic skills and a high level of academic achievement. Others stress social and emotional aims, feeling that the happiness and well-being of the pupil are most important. Others attempt to stress both. Evidence on the link between aims and decision making is provided by two recent studies that found moderately high relationships between aims and teaching approach, (Ashton et al., 1975; Bennett, 1976). Teachers who stressed social and emotional goals placed less emphasis on basic skills and more on aesthetic and creative activities, and tended to teach informally. Those who stressed academic goals devoted more time to basic skills and tended to teach formally. On the basis of this evidence,

it would appear that, in general, aims are reflected in practice. Clearly, teachers and student teachers should have the necessary knowledge and conceptual skills to think clearly and critically about aims and their relation to practice and possible outcomes.

Aims may thus relate to time allocation in terms of general curriculum balance, but a further, and equally crucial decision to be made by teachers is how to allocate time within content areas. This is where the teacher becomes a manager of scarce resources. S/he has to decide how much time to allocate to one topic or activity and how much to another. Since the amount of time is fixed, time allocation to one activity necessitates limitations or postponements of time on others. To complete the economics analog, a major part of teacher decision making should be in deciding how best to use the limited amount of time available.

Such decision making is further complicated by the fact that providing equal amounts of time to each pupil will not produce equal learning. Some pupils require up to nine times the amount others do to achieve at the same level (Bloom, 1976; Gettinger & White, 1979). Thus the teacher faces difficult procedural, organizational, and even ethical judgments in relation to his/her objectives. If, for example, a teacher's objective is to maximize the average achievement of his/her class, the most efficient way would be to allow more time for the high-ability children, allowing them to progress to their potential. But the effect of this will be to maximize differences between the slow and fast learners, and such an objective has been branded by some as elitist (Keisling, 1977-78).

If, on the other hand, the objective is to minimize the variation between fast and slow learners within the class, then time for high achievers is reduced, and more time is devoted to low ability children.

This has been labeled a compensatory objective. A third approach might be to attempt to maximize the average achievement of the class whilst maintaining the initial differences between the high and low achievers. In this instance, time for the higher achievers is manipulated to ensure maintenance of the initial differences; this has been termed the equality of opportunity objective. Only the compensatory and equality-of-opportunity approaches are deemed by some to be consistent with the ethical foundations of democracy (Kiesling, 1977-78). Maximizing the potential of each child within the time available would, in terms of this argument, be elitist because it would increase initial differences.

Pupil Involvement

Pupil involvement or attention has been consistently shown to relate to achievement. Marked variations have also been found within and between classrooms, within different content areas, and across ability levels.

The implications for classroom practice are primarily to be found in the area of classroom management since relationships between teacher behaviors and involvement levels have been traced both in relation to whole-class teaching and small-group work (Kounin, 1970). In the former context, the most salient teacher behaviors in maintaining involvement were awareness in monitoring classroom events; the ability to maintain a smooth flow of events, particularly at points of transition; maintaining the attention of non-responding pupils; and the ability to deal with two or more things at the same time.

The effects of these abilities have been supported in recent classroom research. In the largest of the recent studies (Brophy & Evertson, 1976), it was reported that the most successful teacher managers spotted

possibly disruptive behavior early and dealt with it appropriately and calmly. This quality was also related to increased student learning gains. The reason for this is obvious.

> Teachers who have few discipline problems have most of their time available for teaching and are more likely to teach successfully compared to teachers who spend significant amounts of time fighting for attention or trying to deal with severe disruptions and discipline problems. (Brophy & Evertson, 1976)

Brophy and Evertson found that the more successful teachers maintained a smooth flow of events by a system of well-thought-out monitor systems and a good set of classroom rules. This was particularly obvious during transitional periods between activities. In well organized classrooms transitions lasted only a short time, and the children seemed to transfer to another activity automatically. In contrast, transitional periods in less well-organized classrooms tended to be chaotic, with children wandering about, bumping into one another, confused and needing to ask the teacher what to do. The authors concluded the following:

> Student engagement in lessons and activities was the key to successful classroom management. Successful teachers ran smooth, well-paced lessons with few interruptions and their students were consistently at their seat work...it was clear that the seat work of the more successful teachers was more individualized and more appropriate for each particular student. (Brophy & Evertson, 1976)

The general principle that increased control of organization and content by the teacher is associated with increased involvement and/or achievement is now well established (Rosenshine, 1976; Bennett, 1976; Department of Education and Science, Note 11; Morrison, 1979), but differences have been found in what is optimal for pupils at different ability levels. In one study, for example, high ability children were more capable of assuming independent responsibility and of exercising choice of assignment and working independently and these privileges were allowed by more successful teachers. On the other hand, the more successful teachers in low-ability

classrooms were more restrictive and provided more structure (Brophy & Evertson, 1976). There is also evidence that the degree of structure imposed by the teacher has differing effects on pupils dependent on their personality. One of the most consistent findings has been that anxious, insecure, and timid children prefer, and perform better in more structured settings (Bennett, 1976; Grimes & Allinsmith, 1961; Minuchin, Biber, Shapiro, & Zimiles, 1969; Trown & Leith, 1975; cf. Cronbach & Snow, 1977, for review; Leith & Bossett, Note 12).

The efficacy of teacher or adult supervision has also been shown at pre-school and infant levels. Here low intervention has been found to be associated with lowest task persistence (Krantz & Scarth, 1979) and the latest British study attests to this. They argued that the effect of the adult in nursery and reception class is dramatic in harnessing and focusing children's attention.

> Learning cannot take place unless attention is paid to the relevant stimuli. Thus the adult plays a fundamental role in enabling the child to deploy his/her attention most effectively. In view of this the traditional practice of leaving children to learn through their own efforts seems a questionable one. (Tyler et al., 1979)

As was stated earlier, different managerial skills have been found to be important in small-group teaching. Additionally, there is evidence to suggest that pupil involvement (i.e., time on task) in groups may be lower (e.g., than pupil involvement in individual or whole-class teaching), (Kounin, 1970), which could indicate that unless groups are well managed, working in them could depress pupil achievement. This is an important consideration since one of the significant movements in primary teaching in the last decade has been from whole-class to small-group organization.

Children are often grouped within the class on the basis of similar ability or attainment (Bennett et al., 1980; Department of Education and

Science, Note 11), and the Plowden Report (Note 9) expressed approval of such practices. The report claimed that children learned to get along together, to help one another, and to realize their own strengths and weaknesses. Children make their meanings clearer to themselves by having to explain them to others. The report commented on apathetic children affected by the enthusiasm of the group, able children caught in the thrust and counterthrust of conversation, and children gaining the opportunity to discuss and thus understand more clearly what their problem was. Theory and practice may differ, however, since, like many other things in education, effective group work is probably more easily talked about than achieved. One study pointed to three factors that operated against the theory: In junior schools girls tend not to talk to boys, and vice versa; only half the talk in groups is concerned with on-going work; and conversation tends to be relatively short (Boydell, 1975; Galton, Simon, & Croll, 1980). This lack of sustained conversation casts doubts about the extent to which children do explain and develop their ideas.

However, research on the utility and operation of groups in natural classroom settings is rare. A picture that emerges is that groups tend not to be associated with academic achievement, possibly because of the associated increase in off-task behavior. There may be benefits to be gained in social and communication skills, but this has yet to be demonstrated empirically. The major problem may be that groups are not explicitly set up for pedagogic purposes. This indicates that more thought and research needs to be undertaken on group-management skills.

The final teacher management competencies considered here relate to transition and queuing.[6] It will be recalled that in the study on open-plan schools (Bennett et al., 1980), infants spend over a fifth of the week, on average, in transitional activities. The amount of transition is regarded by some as a reflecti.. of teacher management competencies as a whole (Arlin, 1979).

Many investigators have commented on the extent of such time (Arlin, 1979; Brophy & Evertson, 1976; Gump, 1974), and the limited evidence would suggest that it tends to be higher in open-plan schools and where the teacher does not have a clear set of rules or a clear signaling system. What must be kept in mind is that time spent in transition means less time on curricular content. This is also true of queuing, a fairly typical problem, which is again brought about by inappropriate classroom management strategies.

Comprehension

Implications emanating from the comprehension category are few, not only because of lack of research, but also because of the cautions expressed concerning prescriptions on sequencing. Such reservations tend, however, to relate to considerations of optimal sequencing strategies rather than about the efficacy of sequencing per se. Curriculum packages are increasingly sequence-based and are readily accepted by teachers, as can be seen in the increasing adoption of Fletcher maths and SRA laboratories in England. Whether teachers use this strategy in the development of their own

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[6] "Queuing" means lining up at the teacher's desk and awaiting her/his attention.

curriculum materials, such as work cards, is more difficult to say. Evidence emanating from a study on mixed-ability teaching at the secondary-school level would indicate not. One factor that may operate against the efficient use of sequencing by the primary teacher is lack of content-area knowledge. Concern has been expressed about the lack of expertise or qualification of primary-school teachers in the area of mathematics. Indeed, one researcher of infant schools claimed that the teachers observed regarded mathematics as esoteric knowledge (King, 1978). Unless teachers are thoroughly familiar with content, it seems unlikely that effective sequencing can be achieved. The question must also be raised about whether, or how, adequate sequencing is maintained by teachers using project-based approaches (attempts at integration of content through topics or projects).

Here the question of individual differences is raised again since one assumption of most advocates of sequencing is that it is equally appropriate or effective for all pupils. The lack of research makes such generalizations impossible, and it is worth considering the comments of Bruner (1966):

> The fact of individual differences argues for pluralism and for an enlightened opportunism in the materials and methods of instruction...no single ideal sequence exists for any group of children.

The problem of the match has a long history in the theory of education. But here, as in so many areas, practice does not match with theory. The studies carried out so far would indicate that the difficulty or the requirements of curriculum materials are often not commensurate with the ability or competence of the pupils. Many teachers, it would seem, underestimate the progress that their pupils are able to make (Department of Education and Science, Note 11).

The efficacy of a slow pace and small steps for low-ability pupils is supported by a number of sources. The implications of this for curriculum organizations are straightforward, although the opposite finding for high-ability children confounds the position for those teaching mixed ability groups--the most typical form of organization at the primary level. Such findings appear to undermine the value of large amounts of classroom teaching and open up the possibility of changes over time. Once the pupil has grasped the fundamentals, a change in pacing and level must become appropriate. "Matching instruction to pupils needs to be an evolutionary, constantly changing, challenging process" (Brophy & Evertson, 1976). Because of the lack of relevant research, perhaps the most apt conclusion is that written by Carroll in 1963.

> The job of the teacher...is to organize and present the task to be learned in such a way that the learner can learn it as rapidly and efficiently as he is able. This means first, that the learner must be told, in words that he can understand, what he is to learn and how he is to learn it. It means that the learner must be put into adequate sensory contact with the material to be learned...it also means that the elements of the learning task must be presented in such an order and with such detail that...every step of the learning is adequately prepared for by the previous step. It may also mean that the instruction must be adapted for the special needs and characteristics of the learner, including his stage of learning.

Feedback

The implications of research on feedback are clear in one reviewer's mind. Kulhavy's (1977) recommendations for teachers are,

> First make sure the learners have appropriate entry skills for the lesson; second, structure the material in such a fashion that the response precedes the feedback.... Finally, provide feedback as often as possible during the course of the lesson. If teachers follow those guidelines they should reap the best that feedback has to offer and more importantly their students will have a better chance of learning what is put before them.

Research in classroom settings has also attested to the efficacy of immediate feedback and opportunities to practice, but many of these studies have examined praise as the primary mode of feedback rather than diagnostic information. The relationship of praise to achievement is no longer as clear as earlier reviews suggest. To have pay-off in achievement terms, praise must (1) relate clearly to the topic under consideration, (2) be genuine and credible rather than perfunctory, and (3) be used judiciously in relation to individual differences. There is much evidence to suggest that criticism can be as effective as praise with certain types of pupils.

A gap that exists in this type of research is knowledge about the quality of the information fed back. An informal assessment of the types of marking in exercise books or work books would indicate that the "tick, good" or "four out of 10" is still endemic, a practice which is less than useful in terms of feedback. The provision of feedback, even if the feedback is given in an informative way, is insufficient for optimal learning. A pupil must also be given some description of what (s)he can do to correct unsatisfactory results (McKeachie, 1974).

Feedback is a two-way process as indicated in the model. Assessment of the pupils not only indicates degree of mastery and, conversely, areas where mastery has not been achieved. It also indicates to the teacher the degree to which (s)he is meeting his/her aims and objectives. The value of this can be summed up in the words of one headmistress who maintained that assessment and the documentation of assessment in school record-keeping systems was kept "in order for us to set further objectives, to improve and redefine our policies."

Conclusion

I have presented a model of teaching-learning processes and assessed its implications. Although clothed in complexity, some of the underlying ideas are, one might perceive, unremarkable--that what is taught is reflected in what is learned, that a pupil's performance on a topic is likely to improve the more time (s)he spends on it, and so on. Indeed, one may even dismiss such findings as no more than common sense. But it would be dangerous to do so, as Rutter, Maughan, Mortimore, and Ouston (1979), authors of a recent influential study on secondary schools, pointed out. Their findings were that children benefit from attending schools that set good standards, where the teachers provide good models of behavior, where children are praised and given responsibility, where the general conditions are good, and where the lessons are well conducted. The authors concluded,

> Indeed this is obvious but, of course, it might have been equally obvious if we had found that the most important factors were attending a small school in modern purpose-built premises on one site, with a particularly favorable teacher-child ratio, a year-based system of pastoral care, continuity of individual teachers, and firm discipline in which unacceptable behaviors were severely punished. (Rutter et al., 1979)

In fact *none* of the items was significantly associated with outcomes, however measured.

Common sense is not always common practice; it is culture bound. What is regarded as common sense in one era or cultural milieu is dismissed as irrelevant in another. A prime example of this is the concept of pupil involvement. In the earlier part of this century much research effort was expended on this topic but interest in it died for almost 40 years until taken up again recently. As Jackson (1968) argued,

> In education courses and in the professional literature involvement and its opposite, some forms of detachment are largely ignored. Yet, from a logical point of view, few topics would seem to have greater relevance for the teacher's work. Certainly no educational goals are more immediate than those that concern the establishment and maintenance of the student's absorption in the task at hand. Almost all other objectives are dependent for their accomplishment upon the attainment of this basic condition. Yet this fact seems to have been more appreciated in the past than it is today.

He explained the disappearance of interest as a sign of the times. In the progressive era that followed the second world war, when classrooms were billed as democratic settings, pupil involvement was regarded as an authoritatian issue and dismissed.

There is a tide in the affairs of issues reflecting changes in the economic, cultural, and social ethos. Hearings given to social evidence and attention paid to concepts thus depends on the times. No doubt the cycles of fashion evident in educational practice reflect this as does the educator's penchant for re-discovering the wheel. This can also be illustrated by the following quotation, which I feel adequately summarizes the argument thus far:

> The art of teaching...comprehends all of the means by which the teacher sustains the attention of his class. By attention, we do not mean the mere absence of noise and trifling; or that inert passive state in which the class, with eye fixed on the teacher, it may be, given no symptom of mental life; not that intermittent and almost unconscious attention bestowed on some casual topic which strikes their fancy; not the partial attention given by a few who may be in the immediate neighborhood of the pupil addressed. The only satisfactory attention is that which is given voluntarily and steadily by all during the entire instruction, and in which the mental attitude of the class is actively engaged along with the teacher in working out their own instruction. (Currie)

But that was written in 1884.

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