40490

National Library of Canada | Bibliothèque nationale du Canada

CANADIAN THESES ON MICROFICHE | ***THÈSES CANADIENNES SUR MICROFICHE***

NAME OF AUTHOR/*NOM DE L'AUTEUR* SMYTH, William John

TITLE OF THESIS/*TITRE DE LA THÈSE* AN ECOLOGICAL ANALYSIS OF PUPIL USE OF ACADEMIC LEARNING TIME.

UNIVERSITY/*UNIVERSITÉ* ALBERTA

DEGREE FOR WHICH THESIS WAS PRESENTED/ *GRADE POUR LEQUEL CETTE THÈSE FUT PRÉSENTÉE* PhD

YEAR THIS DEGREE CONFERRED/*ANNÉE D'OBTENTION DE CE GRADE* 1979

NAME OF SUPERVISOR/*NOM DU DIRECTEUR DE THÈSE* DR. D.A. MACKAY

Permission is hereby granted to the NATIONAL LIBRARY OF CANADA to microfilm this thesis and to lend or sell copies of the film.

The author reserves other publication rights, and neither the thesis nor extensive extracts from it may be printed or otherwise reproduced without the author's written permission.

L'autorisation est, par la présente, accordée à la BIBLIOTHÈQUE NATIONALE DU CANADA de microfilmer cette thèse et de prêter ou de vendre des exemplaires du film.

L'auteur se réserve les autres droits de publication; ni la thèse ni de longs extraits de celle-ci ne doivent être imprimés ou autrement reproduits sans l'autorisation écrite de l'auteur.

DATED/*DATÉ* 19/2/79 SIGNED/*SIGNÉ*

PERMANENT ADDRESS/*RÉSIDENCE FIXÉ*
c/o. DEAKIN UNIVERSITY
P.O. Box ~~[illegible]~~ 125
BELMONT 3216
VICTORIA
AUSTRALIA

NL-91 (3-74)

National Library of Canada

Cataloguing Branch
Canadian Theses Division

Ottawa, Canada
K1A 0N4

Bibliothèque nationale du Canada

Direction du catalogage
Division des thèses canadiennes

NOTICE

The quality of this microfiche is heavily dependent upon the quality of the original thesis submitted for microfilming. Every effort has been made to ensure the highest quality of reproduction possible.

If pages are missing, contact the university which granted the degree.

Some pages may have indistinct print especially if the original pages were typed with a poor typewriter ribbon or if the university sent us a poor photocopy.

Previously copyrighted materials (journal articles, published tests, etc.) are not filmed.

Reproduction in full or in part of this film is governed by the Canadian Copyright Act, R.S.C. 1970, c. C-30. Please read the authorization forms which accompany this thesis.

THIS DISSERTATION
HAS BEEN MICROFILMED
EXACTLY AS RECEIVED

AVIS

La qualité de cette microfiche dépend grandement de la qualité de la thèse soumise au microfilmage. Nous avons tout fait pour assurer une qualité supérieure de reproduction.

S'il manque des pages, veuillez communiquer avec l'université qui a conféré le grade.

La qualité d'impression de certaines pages peut laisser à désirer, surtout si les pages originales ont été dactylographiées à l'aide d'un ruban usé ou si l'université nous a fait parvenir une photocopie de mauvaise qualité.

Les documents qui font déjà l'objet d'un droit d'auteur (articles de revue, examens publiés, etc.) ne sont pas microfilmés.

La reproduction, même partielle, de ce microfilm est soumise à la Loi canadienne sur le droit d'auteur, SRC 1970, c. C-30. Veuillez prendre connaissance des formules d'autorisation qui accompagnent cette thèse.

LA THÈSE A ÉTÉ
MICROFILMÉE TELLE QUE
NOUS L'AVONS REÇUE

NL-339 (3/77)

THE UNIVERSITY OF ALBERTA

AN ECOLOGICAL ANALYSIS OF PUPIL USE OF ACADEMIC LEARNING TIME

by

WILLIAM JOHN SMYTH

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES
AND RESEARCH IN PARTIAL FULFILMENT OF THE
REQUIREMENTS FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY

DEPARTMENT OF EDUCATIONAL ADMINISTRATION

EDMONTON, ALBERTA
SPRING, 1979

THE UNIVERSITY OF ALBERTA

FACULTY OF GRADUATE STUDIES AND RESEARCH

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research, for acceptance, a thesis entitled An Ecological Analysis of Pupil Use of Academic Learning Time submitted by William John Smyth in partial fulfulment of the requirements for the degree of Doctor of Philosophy in Educational Administration.

Supervisor

R. G. McIntosh

External Examiner

Date 16-2-79

ABSTRACT

This study focused upon the on-going classroom learning pursuits of four grade 6 pupils in the basic skill areas of reading and mathematics. The major purposes of the study were to investigate how pupils utilized their learning time, the settings in which learning occurred, and the associated teacher behavior. Observational recordings were made of time allotted to learning, time actually spent learning, content covered during learning, and meaningfulness to pupils of the content covered.

Pupils were observed in a natural classroom setting for seven full school days. Quantitative aspects were recorded using a developed observation coding system based on a rotational time sampling procedure, and with specially prepared content covered transcript sheets which provided indications of work assigned, work completed, beginning and concluding times, and success rates for each of the pupils. Qualitative aspects of pupil activity, as well as setting variables and teacher behavior not amenable with the observation system, were recorded in detailed field notes for conversion into narrative specimen records for later analysis. The meaningfulness of pupil time spent in learning was estimated by observer assessment of task difficulty, and confirmed by reference to pupil

retrospective pencil and paper responses at the time of undertaking the task, as well as by an artifact analysis of completed pupil written work.

Reflecting the structured teaching approach employed, little variability was found between pupils in the time allocated to various classroom pursuits. Despite considerable variability between pupils, days and subject matter content, in the matter of task engagement, it was possible to construct learning profiles for each of the pupils. Although effort and success as reflected in these profiles were higher in mathematics than in reading activities, maximal content coverage was found to be associated with higher levels of teacher control over the learning situation.

The meaningfulness of time spent on assigned learning tasks varied noticeably between pupils. When extrapolated over a school year, these differences became particularly evident. Few differences were found between pupils in the type of teaching behavior received or the setting occurrences. Tentative suggestions were proffered as to the likely restraining influence of the ecological factors of class size and physical classroom setting, upon pupil and teacher use of learning time.

Implications for the practice of teaching included the structuring of learning content for both high and low achieving pupils, the use of written pursuits with certain types of pupils, the possibility of pupils completing dossiers on content covered, and the likely impact of ecological variables on classroom productivity.

The significance of the study for pre-service teacher education focused upon the need for increased structured observation of classroom processes directed to what pupils do while learning. In the in-service area, highlighting pupil pursuits in relation to the intentions of the teacher, was considered a useful procedure for supervisors and administrators.

Reflections on the research design and methodology included discussion of the prospects for the extended case study procedure, as well as the possibilities for multiple approaches to the study of classroom processes. Recommendations for further research suggested continued descriptive research, methodological refinement of measurement of task meaningfulness and content covered, and a combination of observational and introspective techniques in the matter of pupil task engagement variability. In the applied realm, a need was expressed to address the issue of how best to design intervention studies aimed at modifying teacher behavior to enhance levels of pupil engagment in basic skill subjects.

ACKNOWLEDGEMENTS

Grateful appreciation is extended to the small group who offered solace, proffered counsel and provided editorial assistance throughout the various stages of this research project. In particular I am indebted to the following:

Dr. D. A. MacKay, my thesis supervisor, for his wise guidance and direction through all phases of the study.

Dr. M. Horowitz, for finding the time in an already crowded schedule, to provide enthusiastic support and encouragement.

Dr. R. G. McIntosh and Dr. T. Kieren, my other committee members, for the perceptive insights which they contributed.

Dr. C. W. Fisher of the Far West Laboratory for Educational Research and Development, for his valuable contribution as external examiner.

Mrs. L. Mireau, for her aid in coding, and Mrs. G. Prokop for her assistance in computer analysis.

The Centre for Research in Teaching, University of Alberta, for support in numerous ways.

My wife Solveiga, whose contribution far exceeded that of her typographical and ancillary support, and our children, Craig and Natalie, for their understanding, tolerance and forbearance during the past two years.

TABLE OF CONTENTS

CHAPTER PAGE

APPENDICES PAGE

LIST OF TABLES

TABLE PAGE

LIST OF FIGURES

FIGURE PAGE

FIGURE PAGE

Chapter I

INTRODUCTION AND STATEMENT OF THE PROBLEM

Overview

This introductory chapter discusses the background to the study, the need for and purposes of, the proposed research. The research questions, the potential significance of the study, and the major operational terms are discussed. The chapter concludes with an outline of the study.

Background to the Study

In an attempt to identify the correlates of effective teaching, research in the past twenty years has focused heavily on trying to isolate and identify teacher characteristics and behaviors which correlated with measured student cognitive achievement gains. As well as concentrating on a narrow range of teacher behavior variables, and often lacking a rationale or framework to guide them in the selection of appropriate variables (Cruickshank, 1976; Borich and Madden, 1977), the majority of these studies related instructional processes <u>directly</u> to student achievement test scores (Filby and Cahen, 1977). The outcome of this line of research, in the 1960's and early 1970's, was a spate of "teacher should" statements which largely ignored the nature of the learning process itself (Rosenshine, 1977a). Since these initial attempts to isolate the prescriptive universals for effective teaching, the research emphasis has shifted from a primary concern with teaching behaviors per se, to a number of other instructional variables.

While not dismissing the importance of teacher behavior in generating pupil effects, a promising line of research has emerged based on the student variables expressed in the work of Carroll (1963) and Bloom (1976). Of particular note is the growing realization that teacher behavior, as such, does not influence student achievement directly (Berliner, 1976; 1978; Harnischfeger and Wiley, 1976; 1978b; Rosenshine, 1977a). Rather, the connection being explored lies at the interface between teacher controllable variables and the behavior of the pupil. Impetus for the recent shift in research emphasis has been provided by Harnischfeger and Wiley (1976), who stated that:

> A fruitful theory of teaching and learning must treat the pupil's activity as causally intermediate between the teacher's implementation of the curriculum and the pupil's learning. Pupil pursuits are therefore

> the focus of our conception of teaching-learning processes (p. 10).

Focusing upon an intervening variable such as pupil behavior, partially alleviates the methodological problems cited by Brooks (1977) as plaguing past researchers of teacher behavior who have used direct observation. The persistent problems indicated by Brooks, include: "which teacher behaviors to record; when to record selected teacher behaviors; and, to whom or for whom (i.e. which students) are the observed behaviors directed towards" (p. 1).

Incorporation of the activities and pursuits of pupils in studies ostensibly directed at isolating teacher effects, is in accord with the need expressed by Dunkin and Biddle (1974) and Borich and Madden (1977), to depart from single criterion studies and move towards the development of conceptual and research strategies that are more in tune with the complex realities of classroom settings.

Need for the Study

Discussing recent research in the study of teaching, Cruickshank (1976) noted an unfortunate absence of knowledge among researchers as to how or why independent variables had been chosen. Part of the reason he attributed to a "lack of rich theoretical bases to assist us in the selection of meaningful variables to guide our research efforts" (p. 58).

While abundant process-product research has related the observed behaviors of teachers to student outcome measures, little research has explored the possibility of pupil pursuits as a mediating variable between teacher behavior and setting variables, on the one hand, and pupil cognitive learning or achievement, on the other. Commenting on the state of knowledge of research on teaching, Flanders (1977) indicated the beginning of a change in research thinking from the exclusive concern with the teacher as the object of concern, when he said:

> As the science (and art) of research on the effects of teaching progresses, it is very unlikely that researchers will remain satisfied with this rigid prescription. Defensible designs in which the unit of sampling is a student, or an encounter, or a single act, or a pattern of acts can and no doubt will be developed (p. 14).

An early indication of the need to use the individual pupil as the unit of analysis in research on teaching, rather than teacher behavior and classroom achievement means, was provided by Rothkopf (1970) when he stated:

> In most instructional situations, what is learned depends largely on the activities of the student. It therefore behooves those interested in the scientific study of instruction to examine these learning activities (p. 325).

In an almost identical stance, Anderson (1970) stated that "the activities the student engages in when confronted with instructional tasks are of crucial importance in determining what he will learn" (p. 349).

Commenting on the narrowness of traditional research designs that emphasized the "how" of teaching, Harnischfeger and Wiley (1976) noted that this research "attends to teacher behavior, but disregards the pupils' activities and the joint action of teacher and pupil" (p. 11). The focal position of pupil pursuits or activities, as the missing mediating linkage in the chain of influences affecting pupil acquisitions, was stated by Harnischfeger and Wiley (1976), when they said:

> All influences on pupil achievement must be mediated through pupil pursuits. No one can gain knowledge or take up new ways of thinking, believing, acting or feeling except through seeing, looking and watching, hearing and listening, feeling and touching. These control what and how one learns. Less proximal influences, whether as general as the district curricula and the school organization or as idiosyncratic as a given teacher's education, personality, planning and activities, directly control and condition these pursuits, and not the pupil's ultimate achievement. The focus on this particular causal linkage is the central uniqueness of our model; most earlier studies, by contrast, have regarded teacher behavior as directly, if mysteriously, influencing achievement (p. 11).

Silberman (1963) alluded to the same point in his analogy of the teacher as a broadcasting station.

He noted that it would be most unlikely for all pupils to be consistently "tuned in," and that a more plausible model might be of the teacher communicating with different pupils for brief sporadic periods, with pupils responding to other stimuli for the remainder of the time.

Berliner (1976) dismissed simplistic models of the teaching-learning process which failed to recognize pupil and teacher pursuits as important intermediate variables. A critical aspect, according to Berliner (1976), was the examination of teacher behaviors that had an impact on the period of time for which pupils were actively learning. Research of the type proposed by Berliner and others, clearly involved the investigator in working on an intensive basis with a small number of students in the natural classroom setting, with a view to gaining insights into the mechanisms by which individual students attended to the task of learning.

This study, therefore, emerges from an expressed need to examine the teaching process via the intermediate variable of pupil in-class activities or pursuits. While acknowledging the need to modify the traditional research approach to teaching to incorporate this aspect, it is equally important to avoid what Harnischfeger and Wiley (1978) described as "the fragmentation of the triad of pupil, teacher and curriculum" (p. 46).

Purpose of the Study

Correlational studies of research on teaching which counted teacher behaviors and related them to measured gains on student achievement tests, left unexplained the mechanism by which pupil learning was influenced. The parsimonious research design of these single variable studies was partially a consequence of an inability to conceive a medium by which to comprehensively capture extensive classroom behavioral events, taking into account the interactive effects of content, classroom, pupils and teacher. The concept of "academic learning time" does provide a metric with which to view the simultaneous actions of teacher and pupil, thereby providing an important linkage between the two sets of activities (Powell and Cahen, 1977).

The notion of time features prominently as a variable in this study. Before discussing how time has been incorporated as an element, it would be prudent to mention two of the perspectives in education that have incorporated time as a component.

The economic perspective on time, conceptualizes time as a resource or input into the educational process (Thomas, 1971) and is concerned primarily with the aspect of productivity. Time is emphasized as a resource having alternative uses, which, when combined with other educational resources optimizes the output of specified school objectives. According to Karweit (1978), knowledge of the impact of allocating time in alternative ways is important for school personnel because of its uniqueness as one of the few variables over which they can exercise discretionary control. Bloom (1974), Garner (1977; 1978), Kiesling (1977) and Winkler (1975) have indicated the potential of time-related variables as indices of classroom efficiency for different instructional techniques. The economic perspective on time shall not, however, be the major concern of this study.

A psychological perspective has developed which features time as a prominent determinant of the process of learning. It was Bloom (1974) who noted that while time has been a variable in the laboratory study of animal and human learning since the turn of the century, it is only recently that time has emerged as important in classroom studies. Current research interest in time as a classroom variable is traceable to Carroll's (1963) "Model of School Learning." Carroll's model had five elements, three of which were time-related -- time needed, time allowed and time spent on learning. According to Bloom (1974), by placing time as a central variable in school learning, Carroll generated a major shift in emphasis in research on teaching and learning.

As a descriptor of classroom events and processes, time has many attractive features for classroom researchers. Marliave (1978) and Fisher (1978) noted the value of pupil academic learning time as a measure of on-going learning. As stated by Marliave (1978):

> It offers immediate feedback on the strengths and weaknesses of instructional events. It pinpoints those student behaviors (or the lack thereof) that obstruct learning. Furthermore, it allows for continuous monitoring of learning events without disrupting or actually displacing those events (as testing does) (p. 20).

Bloom (1974) claims among the advantages of time as a classroom research variable: (1) that time can be measured with the kind of macro (years, months) or micro (minutes, seconds) precision desired by the researcher, and (2) that time-related measurements have qualities absent in other conventional forms of measurement, namely equality of units, an absolute zero, and comparability between individuals. Denham (1978) claims that academic learning time, as conceived in recent research efforts, provides "a vocabulary and a way of seeing what is occurring in the classroom" (p. 5). The use of time-related variables alters the tendency of past research on teaching which considered "the method and manners of the teacher, forgetting to notice whether the students are working" (Denham, 1978, p. 5). Looking to what the student does in his or her daily activities is not a startling revelation. However, the concept of pupil academic learning time serves to remind us of a research variable frequently overlooked.

Research over a number of years (Block and Burns, 1977; Cobb, 1972; Edminston and Rhoades, 1959; Fisher, Filby and Marliave, 1977; Lahaderne, 1968; McDonald, 1975; Marliave, Fisher and Dishaw, 1977; Morch, 1956; Olson, 1931; Stallings and Kaskowitz, 1974; Samuels and Turnure, 1974; Weber, 1976) has consistently shown the proportion of study time students spend actively engaged in learning, to be strongly related to academic achievement.

Even after acknowledging that pupil engaged time in classrooms is not a perfect proxy for school learning because of the obvious omission of learning that takes place outside of the classroom, as well as the technical difficulty of ascertaining pupil engagement, it still appears reasonable to claim, as Harris and Yinger (1977) do, that "time is a useful, measurable and sensible proxy variable for student learning" (p. 8). Referring to the potential for isolating effective teaching practices from such research, Harris and Yinger (1977) claim that despite the fact that time-based variables in schooling are not learning per se, research has established such a high correlation with pupil learning that effective teaching could be discriminated using time variables. Whether it is possible to say as they do, that engaged pupil time is more than a proxy for learning, and that "student behavior that is classified as 'engaged' is the visible evidence of learning taking place," is likely to be open to lively debate. The point, nevertheless, may be valid. Although we cannot directly observe the psychological process of learning as it occurs, it is feasible to observe one of the physical manifestations of it. On these grounds, time on-task, pupil engagement and content covered seem to be potent variables in the attempt to assess effective teaching and learning.

Time, in its various dimensions, is nevertheless a complex variable. As Berliner (1977) stated:

> Our faith in the potency of the variable remains strong. But our belief that the relationship between time and outcomes is very complex is also becoming very strong (p. 5).

Harris and Yinger (1977) in summarizing the recent research on classroom time studies, concluded on a similar note and offered the caveat, that:

> Researching the role that time plays in teaching and learning will not be a panacea for understanding classroom processes, but it should provide at least some understanding of an influential mechanism affecting classroom life (p. 12).

Despite the difficulties inherent in this line of research, the need to pursue the possibilities further has been expressed by Berliner (1976):

> Very little data is available describing the nature of the instructional activities and episodes a child engages in each day. Since instructional time appears to be an important variable in the learning process, accurate records of how time has been allocated to the various instructional activities and episodes is needed (p. 7).

Rosenshine (1977a) was even more precise as to the nature of needed research, when he stated:

> There is a great need for descriptive data on the percentage of engaged time which is obtained in different settings, as well as on the setting variables which may contribute to engaged time (p. 25).

The major purpose of the study was to investigate, explore and describe the learning behavior of four sixth grade pupils. The focus of the study was upon the activities of the target pupils in the content areas of reading and mathematics, in the setting of a natural classroom. Information was obtained on the amount of time spent by individual students in receiving instructional behaviors from a variety of sources and in a number of intra-class settings. The study has emphasized both the quantitative and qualitative dimensions of time allocation and use. The central guiding presumption of the study has been that the nature of the learning task, the setting in which the task is embedded and the actions of the teacher, all have an impact on the proportion of time pupils are productively learning.

Research Questions

The major questions which provided the focus for the study, consisted of the following:

1. How is pupil time allocated between various classroom learning activities?
2. How does the pupil use the available learning time?
3. What is the nature and duration of pupil classroom task settings?
4. What is the character and extent of instructor behaviors as they impinge upon individual pupil recipients?

A detailed analysis of the sub-problems emerging from each of these research questions will be left until the Design section of the study.

Significance of the Study

Ryan and Cooper (1975) noted that anthropologists had an important message for social science researchers, namely, that the humdrum aspects of human existence have cultural significance. As applied to education, Jackson (1968) maintained that if we are to understand what happens in elementary school classrooms, we must look closely at routine events. Given that the average school year is approximately 200 days, of roughly 6 hours in length, it would not seem unreasonable to ask how students spend the 7,000 hours they are in attendance during their elementary schooling, especially those aspects which are ostensibly spent in academic learning pursuits.

Tabulation of the number of hours officially prescribed by school authorities and the number of hours allocated per class by individual teachers to mathematics, science, reading, language arts, social studies, music, art and so on, is an easy task. Of questionable validity, however, is the inference that these statistics represent time productively spent by individual students in learning.

The present position is that we have relatively little research data on the academic engaged time actually occurring in schools (Rosenshine, 1977a). Equally uncertain are the optimal or most desirable engagement rates that might reasonably be expected of students of particular ages, possessing certain characteristics, learning a variety of academic content, at specific grade levels. Likewise, we are only beginning to explore possible connections between teacher behaviors and the generation of desired levels of engagement for designated students in various curriculum areas.

Research so far, although still limited and exploratory, does suggest that time spent by students engaged in relevant content is an essential ingredient in pupil achievement. The exact relationship between content covered, student attention and academic engaged time, has not been established beyond the point that they are a cluster of closely related variables that intervene between teacher-pupil interactive behavior and subsequent pupil achievement.

The major importance of the study is the addition it makes to the small but influential body of research on teaching which recognizes teacher behavior as being most unlikely to have equally beneficial effects upon all students. It seeks to reinforce the belief that classroom instruction can be meaningfully analysed from the perspective of its impact upon what individual pupils do.

In the short term, this study provides descriptive material relevant to the academic pursuits of certain categories of pupils, and hopefully, contributes to the beginnings of a comprehensive knowledge and data base. While data on individual pupils overcomes the deficiency of earlier research which relied on the class as the unit of analysis, the utility of the descriptive protocols of the kind presented here, must rest ultimately upon our ability to generate adequate typologies of students, as undertaken in the exploratory work of Good and Power (1976). The individual student work profiles contained in this study could be used to generate hypotheses for examination in further research.

In the medium term, this study may provide a basis upon which teachers (including trainee teachers) and supervisors might collaborate in analyzing the teaching process, without the perjorative atmosphere that prevails when the teacher's actions are the sole point of focus. As stated by Mosher (1972):

> By focusing on pupil behavior in relation to the intent of the teacher, the supervisor and the teacher will have a baseline against which to gauge the results of changes in the teacher's performance (p. 29).

As a long-term outcome, the study will contribute to the effort already being pursued by other researchers, of endeavouring to establish teacher behaviors, task structures and classroom settings most conducive to high levels of pupil engagement and subsequent learning. The ultimate long-range objective is to devise methods of assisting teachers in generating optimum levels of pupil engagement on learning tasks. This will, of course, first necessitate answering the question of what are reasonable levels of engagement for particular types of pupils.

Definition of Operational Terms

The main terms used in describing the study are defined below. Other terms, employed on occasions, have been defined as the need arises.

Academic learning time: is the time a pupil is engaged with instructional materials or activities that are of an easy level of difficulty (or produces few errors), for that pupil (Berliner, 1978b).

Allocated time: is the instructional time designated or assigned by the teacher for particular learning activities (Marliave, Fisher and Dishaw, 1977).

Content covered: refers to the amount of work assigned by the teacher (problems, pages of reading, or number of work sheets), which are completed by the pupil in the allowed time.

Ecology of the setting: refers to the characteristics of the work environment of the classroom.

Engagement rate: represents the percentage of allocated time the pupil spends actually working.

Instructional grouping: describes whether the activity the pupil is involved with occurs when he or she is a member of the total class, a subgroup of the class, or when the pupil is working alone on seatwork.

Instructor moves: are the teaching behaviors of the instructor, broadly interpreted to include monitoring pupil performance, questioning pupils and providing feedback, as well as the provision of explanations and directions to target pupils.

Learner moves: consist of the engaged and unengaged behavior of target pupils in the context of particular academic content.

Opportunity for learning: is the amount of time permitted by the instructor for learning (Carroll, 1963).

Pupil achievement: is the increase in academic performance of a pupil who has been administered a pre-test, observed or subjected to an experimental condition, and measured again by a post-test. The increase is expressed in terms of "gains scores."

Pupil engaged minutes: is the number of minutes per day of academic engaged time, for target pupils.

Pupil engaged time: is that instructional time during which the pupil is observed to be attending to the task, as evidenced by his or her paying attention, studying and trying to learn (Marliave, Fisher and Dishaw, 1977).

Pupil pursuits: refers to those activities pupils are observed to be doing during the process of learning.

Target pupil: is the individual pupil who has been selected, on the basis of pre-determined criteria, for intensive classroom observation.

Task difficulty: is idiosyncratic for each individual pupil and the specific task he or she happens to be undertaking. It is reflected in the error rate, and can range from excessively easy to impossibly difficult.

Teacher effectiveness: is generally not taken to have a strictly causal meaning, but rather is more loosely taken to mean pupil outcomes that are "influenced by" or "traceable to," certain teacher activities (Floden, Schmidt and Roehler, 1978).

Time on-task: is the time during which the target pupil is observed to be oriented to the learning task and is apparently engaged in learning (Bloom, 1974).

Outline of the Study

This chapter has dealt with the background to, the need for, and purposes of, the study. A general statement of the guiding research questions was followed by an indication of the contribution which the study is expected to make to the theory and practice of teaching. Important operational terms were defined.

Chapter II will review the related research literature in order to provide a theoretical frame of reference for further discussion and reporting of the study. Consideration will be given to those research studies on teaching which reflect the "direct mode of instruction," as a basis for placing into context those studies which have as their prime focus, instructional time in research on teaching. The aspects of observed pupil attention and pupil engaged time, will be reviewed in detail.

In dealing with the design aspect of the study, Chapter III will be concerned with the nature of the study, the sample, an elaboration of the research questions, together with specific assumptions, delimitations and limitations associated with the study. The chapter will conclude with a consideration of data sources, the observation instrument used, the pilot study and observer training, and the various phases in the study.

The fourth chapter on the collection and analysis of the data will consider the preparation and familiarization procedures, prior to the various procedures for gathering information on interactive classroom behavior. The methods of obtaining personal data on the research subjects will also be discussed. The data processing and treatment procedures will conclude this chapter.

While Chapter V will deal with the presentation of the research results, Chapter VI will provide a summary and interpretation of those results as they relate to the research questions, and their implications for teaching and teacher education. The chapter concludes by reflecting upon aspects of the research design and methodology and suggests some avenues for future research.

Chapter II

REVIEW OF RESEARCH AND RELATED LITERATURE

Overview

This chapter places in context the research literature on the topic of pupil academic engaged time. In pursuing that objective a survey is made of recent studies in research on teaching which constitute the basis of a direct model of instruction. Studies supportive of an academic orientation to instruction are discussed as the first component of the model, while research favouring the quantity of academic instruction is discussed as the second element. Research relevant to various sub-components of each is provided in order to clarify specific research questions posed later in the study. Having considered the broad research context, consideration turns to a number of pupil attention studies which form an important theoretical and methodological base for the present study. The chapter concludes by examining the research on pupil academic learning time.

Background Research

To review even a fraction of the research that has been undertaken in the study of teaching, would constitute a monumental task. In selecting their "handful" of 500 studies for consideration, Dunkin and Biddle (1974) noted that the research effort to that time on the study of teaching, exceeded 10,000 studies. It would be conservative to label the number of studies post-Dunkin and Biddle, as being sizable. In view of the prolific nature of the recent research, the particular concern of the next section of the chapter shall be with the implications of a small number of studies since 1970, which Rosenshine (1976) claims as the basis of a direct instruction model. Heed should be paid to Stallings' (1978) and Crawford and Gage's (1977) warning, that, "one cannot infer causality from correlational relationships" (p. 107).

The Direct Instructional Model

The Rosenshine (1976) model is based primarily on the findings of six large-scale correlational studies undertaken by Brophy and Evertson (1974), Soar (1973), Stallings and Kaskowitz (1974), McDonald (1975), Tikunoff, Berliner and Rist (1975), and Good and Grouws (1975), and to a lesser extent on findings of three experimental studies by Ward and Tikunoff (1975), Gall, Ward, Cahen, Berliner, Elashoff, Stanton and Winnie (1975), and the Stanford Program on Teacher Effectiveness (1976). Relying primarily on the findings of the first three correlational studies, Rosenshine (1976) claimed sufficient consistency of results to be able to propose the existence of an empirically based direct instructional model of teaching.

The elements of the direct model are closely related to the concept of academic engaged time and pupil attention. As stated by Rosenshine (1977a), the model consists of "those activities which are directly related to making progress in reading and mathematics and to those settings which promote those activities" (p., 9). Emphasis is, therefore, upon those classroom and teacher behavior variables that produce extensive content covered and high levels of academic time. As conceived, the direct model of instruction applies mainly to low SES elementary school pupils, in the cognitive content areas of reading and mathematics (Rosenshine, 1977b).

If Rosenshine's model is to be considered seriously, however, there is a need to at least acknowledge the matter raised by Flanders (1977) concerning the efficacy of model-building based on the findings of widely differing studies. Flanders (1977) pointed to Rosenshine's failure to provide adequate conceptual and operational definitions from his derivative studies, to an absence of logic for grouping studies, together with the technical problems of "unit sampling" and "replication," which cast further doubts on Rosenshine's reviews. Notwithstanding these shortcomings, research evidence is cited below supportive of the set of instructional procedures, which, at least for primary grade elementary students of low socio-economic status (SES), have a positive correlation with achievement in reading and mathematics. SES is considered here, as in the research literature (Brophy and Evertson, 1976), as a proxy variable which stands for a complex of ability, achievement, and motivation.

In synoptic form, the components of the direct model of instruction as synthesized by Rosenshine and Berliner (Rosenshine, 1976; 1977a; 1977b; Rosenshine and Berliner, 1978; Berliner, 1978b; Berliner and Rosenshine, 1977) from the research on teaching, are discussed below.

Goal setting, or structuring behavior by the teacher, together with the communication of these explicit expectations to pupils, is a prominent feature of the direct mode of instruction. Clearly, when pupils are well informed as to what they should be doing, where, and for how long, there is a minimum of lost time due to confusion or students having to wait for further directives. Teacher pacing of instructional sequences in this model is such that advancement through learning materials is primarily in the hands of the teacher, rather than at the discretion of the student. There is an emphasis upon teacher monitoring of pupil classroom performance, together with a marked orientation towards the academic content of reading and mathematics, rather than upon other subjects such as music and art. The teachers chooses instructional materials having regard to the pupil's ability level, while questioning is factual and concrete rather than abstract in nature. Feedback to students is immediate and focuses upon academic content, rather than on student behavior. All of this occurs in a classroom environment which is warm and convivial.

The academic emphasis apparent in the preceding brief discussion, will be considered in detail in the research studies to be discussed below.

Academic Orientation to Instruction

A cluster of variables which have been found to consistently and postively relate to pupil learning, fall into the category of the academic character of the instruction. This approach is reflected in the goal-directed structuring behavior of the teacher, with a concern over task structure and difficulty, questioning and feedback technique, and in the management of the learning situation. Particular modes of classroom grouping and organization of pupils, together with certain ecological variables which are peculiar to the classroom setting as a workplace, act to reinforce enhanced pupil cognitive learning. Research findings relevant to some of the above will be discussed before considering the literature on the quantity of academic content.

Goal-directed and Structured Behavior

Crawford and Gage (1977) defined structure to mean "the teacher's taking the initiative in deciding on class activities, [with] an emphasis on academically-related questioning sessions and on pencil and paper activities, and the use of drill-type instruction for fostering basic academic skills" (p. 115). Structuring behavior has also been taken to include the teacher preparing the students for the lesson by reviewing, outlining, explaining the objectives and summarizing.

Soar (1977) found that "a relatively high amount of gentle, unobtrusive structuring behavior" (p. 102), was functional for low SES pupils but dysfunctional for high SES pupils. Research by Stallings (1977) showed that low SES students at the lower elementary levels learned reading and mathematics more effectively through "systematic instructional patterns." These patterns consisted of the teacher providing the information, asking questions relevant to that material, obtaining a student response, and providing appropriate feedback. Commenting on the four correlational studies undertaken by Brophy and Evertson (1974), Stallings and Kaskowitz (1974), McDonald and Elias (1976), and Soar (1973), Crawford and Gage (1977) concluded that "the attainment of academic objectives in the early elementary grades is best facilitated by a certain degree of control and 'structure' in teaching style" (p. 114).

Researching a mixed sample of high and low SES pupils, McDonald (1976b) produced similar evidence. Teachers who maximized direct instruction produced the largest learning gains in their students. There was found to be a need, however, in focusing upon learning objectives, to have regard to the requirements of individual students. McDonald envisaged this as occurring through the use of group procedures, by closely monitoring pupil performance, and through the provision of correctional feedback.

Individual pupil differences and the nature of the instructional objectives being pursued, have appeared as interacting variables influencing goal-directed and structured behavior. Where students were involved in learning that emphasized low cognitive level objectives, Soar (1977) found tightly structured, closely focused learning conditions were more effective. This was particularly apposite to low SES students in the lower elementary grades. For more complex kinds of learning, Soar (1977) noted that a more flexible, more freely structured approach was related to higher achievement gains. McDonald (1977) supported this when he found, that, for fifth grade reading, greater student gains were associated with "discussing, explaining, questioning, and in general stimulating cognitive processes" (p. 133). Stallings' (1977) finding of higher problem-solving scores being related to more flexible programs, is further confirmatory evidence.

Research findings, therefore, indicate that goal-directed and [illegible]uctured teacher behavior tends to be associated with greater student achievement. The evidence suggests, for lower elementary grades or low SES students, that systematic, structuring teacher behavior is more appropriate for learning material involving low cognitive level objectives. However, with grades above the lower elementary level, or with high SES students, more flexible less structured teacher behavior is a better procedure where higher learning objectives are involved.

While structure appears to be most effective for certain types of students when related to a specific academic task, a student's success or otherwise at that task is to a large extent influenced by the difficulty experienced in the performance of that task. Research relating to the issue of task difficulty is reported in the following section.

Task Difficulty

The "meaningfulness" (Floden, Schmidt, and Roehler, 1978; Roehler, Schmidt, Floden, Yinger and Hill, 1978) or "appropriateness" (Marliave, Cahen and Berliner, 1977) of instruction, is an issue that is only beginning to receive serious research attention in naturalistic classroom settings. Bennett's (1978) commonsense observation that large amounts of pupil time spent on "incomprehensible content" is unlikely to be productive of learning, has not been easy to operationalize. Although quality of instruction was a key component in Carroll's (1963) Model of Teaching, conceptual and methodological issues have plagued researchers in their attempts to pursue this variable.

Marliave, Cahen and Berliner (1977) admitted, even after allocating modest resources and two years of time and effort in attempting to develop the concept of appropriateness of instruction, that:

> We are not very much closer to understanding this phenomenon of appropriateness than when we started. We continue to recognize the importance of the concept, and we continue to be confused about how best to incorporate concerns about appropriateness into research designs for studying teaching and learning in classroom settings (p. iii).

In respect of two matters, they remain adamant; that the student should be the starting point in any endeavour to study the appropriateness of instruction, and that this should be ascertained by behavioristic means (p. 4).

Research that has been undertaken on the appropriateness of instruction has occurred largely in response to the earlier proliferation of correlational studies in teaching, which, while they counted teacher behaviors, failed to show any consistent connection to student outcomes. The element repeatedly overlooked was the qualitative nature of the interactions occurring in the learning setting. Researchers at the Far West Laboratory for Research and Development in Education, in particular, believed that "appropriate" instruction should not be narrowly conceived in terms of the actions and functions of the teacher, but rather should be judged in terms of the impact those actions had upon students. In conceptualizing learning as an on-going behavioral event (Marliave, 1978), student responses to the difficulty level of encountered tasks, has emerged as a salient indicator of the appropriateness of instruction received by individual students.

Research by Brophy and Evertson (1976) emphasized that learning will be most effective when presented at the optimum difficulty level. Learning was found to proceed most effectively when new material was "relatively easy" to assimilate. While Brophy and Evertson suggested optimal levels of difficulty occurred when 75 per cent of questions were answered correctly, they added that "there is undoubtedly no exact magic percentage" (p. 64). In arriving at this conclusion, a trade-off was necessary. Whereas researchers in achievement motivation (Smith, 1977; Weiner, 1974) claimed an expectancy rate of success of 50 per cent as being optimal, classroom researchers such as Brophy and Evertson maintained that excessive "cognitive strain" would be imposed upon students in classrooms with such a low rate of expectancy. While there is a need to avoid undue cognitive strain caused by a low expectancy of success, there is also a need to ensure that learning involves at least some new challenges if advancement beyond mere repetition is to occur. Brophy and Evertson concluded that there was a curvilinear relationship between the difficulty level of instruction and the value of the learning experience to the pupil. If material was either too easy or too difficult, meaningful learning would not occur.

Marliave, Fisher and Dishaw (1977) adopted the view that task difficulty must be determined for each individual student in each task undertaken. Because of its idiosyncratic nature, task difficulty would be reflected in the error rate demonstrated for that task by the student. Berliner (1976; 1977) and other researchers at the Far West Laboratory hypothesized that the most effective learning occurred when tasks were within an intermediate range of difficulty for the student. Their research produced findings contrary to initial expectations. As stated by Marliave, Fisher and Dishaw (1977):

> The proportion of time spent on tasks of medium difficulty was negatively related to student achievement, while the proportion of easy time was positively related to student achievement (p. 131).

In their revised position, Far West Laboratory researchers (Berliner, 1978b; Fisher, 1978; Marliave, Fisher and Dishaw, 1977) adopted the view that a balance should be pursued between activities which have a low and moderate error rate, with more activities at the low error rate, if enhanced student learning is the objective.

One study that addressed the relationship between difficulty of material, pupil ability level and classroom behavior, was conducted by Jorgensen (1977) with 71 second through sixth graders in one school. The study aimed at testing the unsubstantiated theoretical position of May (1973), that "student reading material at the matched level of difficulty has the more appropriate classroom behavior." Contrary to what had been expected, Jorgensen found that the closer the match between pupil ability and difficulty of reading materials, the more that teachers rated pupil classroom behavior as unsatisfactory on dimensions such as "disturbance," "impatience," "disrespect," "external blame," "external reliance" and "inattentiveness." Furthermore, Jorgensen found for his sample of students, that as material became easier, their classroom behavior improved. The explanation offered for students not becoming bored as the material became easier, was in terms of the dynamics of the classroom reward system. According to Jorgensen, where students interact with material below their ability level, they receive more teacher praise, higher grades and more satisfaction from reading. As Jorgensen concluded:

> It may well be that such reward systems operating in classroom situations work to offset any boredom that may result from material that is too easy (p. 31).

While we must await conclusive research evidence on the issue of task difficulty and how best to measure it, the research available on the teacher's general management of the learning situation, is more comprehensive.

Management of the Learning Situation

An aspect of research on teaching that has demonstrated a consistent relationship with pupil learning gains, is the teacher's capacity to effectively manage the classroom learning situation. Classroom management, as defined by Kounin (1970), Brophy and Evertson (1976), Marliave (1976a) and Rosenshine (1977a), points to teacher planning and sequencing of events in an orderly fashion, such that students are kept actively engaged in lessons and seatwork with a minimum of disruption and disciplinary problems. The emphasis is upon organizing the classroom to avoid the frequency of trouble, rather than on developing skills to deal with problem situations once they have emerged.

Rosenshine (1977a) noted that "classes with poor management usually have low academic engaged time" (p. 13). Research by Brophy and Evertson (1976) found that poor task management procedures led to reduced student engaged time and subsequently to reduced learning gains. The rather obvious reason, according to these researchers, lay in the fact that teachers with fewer discipline problems were able to devote more of their time to instructional purposes, in contrast to teachers who had to battle for student attention and spend much of their time reprimanding recalcitrants.

Research by Kounin (1970) is seminal on this topic. Kounin characterized effective management of the class as a group, as consisting of: "withitness," or an awareness by the teacher of what was happening throughout the classroom even though personally involved with an individual or small group; "smoothness," or moving the class or group from one activity to another in an effective and orderly manner; "group alerting," or devising systems of keeping students on task and participating; and "overlappingness," or the ability to handle two or more things simultaneously.

Good and Grouws (1975) found that less effective teachers had more frequent managerial problems because they issued too many behavioral warnings to students and their students spent substantial periods waiting for teacher directions, or were unclear as to the directions to be followed.

Marliave (1976a) found teachers who spent more time managing the academic task, instead of managing student behavior, obtained higher levels of achievement gain from their pupils. Filby (1978) and Filby and Cahen (1977) reported teacher "task engagement feedback" (or teacher activity directed toward controlling student behavior), as being negatively associated with pupil engagement.

Central to the issue of classroom management is the attainment of high levels of pupil engaged time. Research, to date, has concentrated on the procedural management of pupils during predominantly whole-of-class settings. Given the recent finding of McDonald (1975), Calfee and Calfee (1976) and Good and Beckerman (1978), that most students in self-contained classrooms spend between 50 - 70 per cent of their time working alone in individual seatwork activities, the need according to Rosenshine (1977a), is for research which focuses on "how to manage students when they are working alone" (p. 13). The small amount of research that has been undertaken on this aspect (Stallings and Kaskowitz, 1974; McDonald, 1976b; Powell and Cahen, 1977; Good and Beckerman, 1978), indicates that students in unsupervised settings are less academically occupied than students who are supervised.

Pupil activity during assigned seatwork is a component of a broader area of research which has focused upon the issue of pupil work groups in the classroom.

Work Groups and Seatwork

One noticeable change in the organization of elementary classrooms over the past decade has been from teaching the class as a whole, to small group activities (Bennett, 1978). Recent research has addressed the question of whether or not this practice enhances pupil achievement.

Stallings and Kaskowitz (1974) found at the first grade level, that small groups of 3-7 low SES pupils were most effective in producing learning gains in reading and mathematics. At the third grade level, the same researchers found that for reading and mathematics, large group instruction with eight or more pupils was most effective. Soar (1973), with first, third, fourth, fifth and sixth grade low SES pupils in reading and mathematics, found higher achievement levels when pupils worked under direct supervision in large groups. Kiesling's (1977) study of fourth, fifth and sixth grade reading, found support for the view that "large group instruction was somewhat more effective for students with the lowest level of ability" (p. 18). Good and Grouws (1975) found that the most effective teachers of fourth grade high SES mathematics classes, taught the class as a whole, while allowing for between 1-4 pupils to work independently.

Powell and Cahen (1977), although not concerned with pupil achievement, did find a pupil engagement rate of 80 per cent in small groups and only 10 per cent in independent study situations. Good and Beckerman (1978) found for mixed SES sixth grade students, that pupils on average, were observed to be less involved during whole class and individual activities, with the highest attention levels being in small group (3-5 pupils) and large group (9-15 pupils) situations. Stallings (1978), working with secondary school reading groups, found that students achieved higher reading scores when in large groups or when as a whole class, than in small groups or as individuals. While not discouraging the practice of working specifically with individuals, Stallings pointed to the large amounts of time devoted to individual students which occurred at the expense of instructional feedback to the remainder of the class.

In the context of these findings, the impact of size of instructional work group is dependent upon the grade level and the ability of the pupils. The settings most unproductive of reading and mathematics learning for low ability lower elementary school students, are the whole-of-class and dyad situations. Small and large group instruction appear most beneficial. More able elementary school pupils, at least in mathematics, and secondary pupils in reading, seem able to benefit from whole-of-class instruction.

The pervasiveness of instructional work groups of various sizes, has also been the object of research. McDonald (1975) found that total, or whole-of-class settings, may not be as prevalent as we believe. His study of fifth grade classrooms revealed seatwork occupied between 43 per cent and 62 per cent of students' time. Rosenshine (1977a) defined seatwork in this context as comprising those activities in which students work privately at such activities as reading a book, writing a report, completing exercises from a workbook, or using other special materials. Good and Beckerman (1978) found seatwork amounted to 51 per cent of the time in sixth grade classes. Soar (1973) found that while seatwork without the teacher was productive of higher gains for highly motivated students, it generated lower gains for less motivated students.

Bennett (1978) reflected the primitive state of research knowledge in this area when he stated that: "Children can often be seen working <u>in</u> a group rather than <u>as</u> a group" (p. 140). Bennett added that the value of group activity, in so far as he could determine, lay in the realm of the "social" rather than the "intellectual" domain.

Although the precise mechanism by which settings and classroom instructional groupings influence pupil involvement and thus learning, have yet to be determined, Good and Beckerman (1978) emphasized that "setting appears to have an important influence on pupils' involvement" (p. 195). Bossert's (1977) approach focuses upon the nature of the learning task, and the matching types of control procedures available to the teacher.

Section Summary

Research surveyed so far in this chapter has focused upon one aspect of the direct model of instruction, and in particular on a cluster of teacher controllable variables described collectively as constituting "an academic orientation to instruction." For low ability elementary school pupils, the component elements consist of: a high level of goal-directed teacher behavior; a tendency towards tasks of an easy level of difficulty with some intermediate difficulty tasks; managerial practices which prevent disruptive behavior before it occurs, and; work settings with an emphasis on groups rather than individual seatwork or whole class settings. For more capable elementary pupils, and possibly for pupils at higher grade levels, the model permits; less teacher structuring behavior; a balance in work materials towards more challenging material; less need for managerial practices, and; the possibility of a higher degree of pupil activity in individual and whole-of-class settings.

The other component of the direct model, the quantity of academic instruction, provides the mediating link between the academic orientation of the teacher and subsequent pupil achievement. Research on this aspect is discussed in the remainder of the chapter.

Quantity of Academic Instruction

Instructional Time in Research on Teaching

Although an academic orientation on the part of the teacher towards instruction is an important controllable variable, on its own, this is not sufficient in explaining those in-school variables that contribute towards student cognitive learning gains. The other aspect of Rosenshine's explanatory model focuses on the related elements of teacher structuring of time and pupil use of that allocated time. These components shall be considered here in the context of the recent intensified interest in school-related research on time. While this research has implications at the classroom level for individual teachers and pupils, there are also likely implications at the policy making levels for administrators concerned with issues such as length of school day, length of school week and variation in school year.

Research which aims to relate the quantity of schooling and the amount of time spent in particular academic pursuits, to subsequent pupil achievement, is easier to interpret if analysed within some type of framework. A useful skeleton for discussion purposes might be as follows:

(i) Nominal quantity of schooling
(ii) Quantity of schooling per pupil
(iii) Allocated instructional time per pupil
(iv) Pupil engaged academic time.

Research endeavours have been made at each of these levels, to establish a nexus between the amount of schooling or learning, and pupil achievement. School research studies which have as their focus the aspect of time, shall therefore be discussed first from a macro, and later from a micro viewpoint.

Nominal quantity of schooling

At the level of the nominal quantity of schooling, as measured by the number of school days per year and the length of school day, Wiley and Harnischfeger (1974) found after taking account of student absences, there was a significant positive relationship between the average number of hours of schooling and pupil achievement in the areas of reading, verbal ability and mathematics. Wiley (1976), using the same data, reported a variation in hours per year from 710 to 1150 in sampled schools. This meant that some schools offered 50 per cent more schooling a year than others. Husén's (1967) international study of achievement in mathematics failed to find a consistent relationship between length of school week and mathematics achievement.

Quantity of Schooling per Pupil

As to the likely impact of organizational variables on amount of schooling offered, research by Tikunoff and Ward (1976) suggested that the extent of in-roads into teacher time may be so significant as to reduce the effective school year to as little as 2.5 months of teaching. Research data collected by Conant (1974), revealed that of the total instructional time available in a school day, only 150 minutes were used for actual instruction. Frederick (1977) undertook a study in 184 high school classrooms, 80 of which were high achieving on reading scores, and the remainder of which were rated low. The two groups were compared to ascertain the proportion of classroom time available for student learning. It was found that in the high group, 25 per cent of available student time was wasted by absences, inattention and interruptions, while in the low group 49 per cent was wasted by these same factors.

As to the possible effect of student and teacher absences on pupil achievement, the findings are reasonably consistent. While an early study by Ziegler (1928) reported no effect of absenteeism on the achievement level of black students, a later study by Schultz (1958) did report a small negative effect. Bond and Dykstra (1967), Harris and Serwer (1966), and Harris, Morrison, Serwer and Gold (1968) in a series of studies focusing upon reading achievement in the first two years of schooling, all reported negative correlations between teacher and/or student absences, and achievement. Karweit (1978) concluded that absences may be more harmful for some students than for others, and that there may be a differential effect depending upon the number and distribution of absent days. Douglas and Ross (1965) found that upper middle class children seemed unaffected by absences, while lower middle class children produced lower achievement scores as a consequence. Fogelman (1978), on the other hand, found consistent support for the view that children with high attendance levels obtained higher average test scores on reading, comprehension and mathematics, and that this did not vary with social class. While Levanto

(1973) found a wide dispersion of absent days to be less detrimental than continuous absences, Odell (1923) and Heyns (1976) found absence from school affected achievement only when excessive. Husén's (1972) review of research on the effect of absenteeism on pupil achievement, concluded that an increase in schooling does not result in a proportionate increase in learning.

All the time-related studies cited above have emphasized the connection, at the macro level, between the total quantity of schooling, and pupil achievement. While studies of this type speak to the possible reasons for differing achievement levels between schools, they leave unanswered the question of differing achievement levels between pupils. To attempt to account for differences in individual pupil achievement, the concept of "quantity of schooling" requires refinement down to the micro level of the single classroom and the individual pupil (Harnischfeger and Wiley, 1975).

Allocated Instructional Time

One of the earliest studies to look to the connection between time and pupil achievement, was a study by Rice conducted around 1900. According to Rosenshine (1971), Rice reported finding the amount of class time spent on spelling to be unrelated to student scores on subsequent tests. Another early study (Mann, 1928) of the survey type, reported in respect of a large number of American cities that:

> One of the most striking facts revealed by the analysis of present practice in time allotments in 444 cities is the extreme variation in the total amount of time given to any subject.

A number of investigations in the 1960's which sought a connection between time allocated by elementary teachers to criterion activities such as reading and mathematics, produced inconsistent findings. Studies by Harris and Serwer (1966) and Harris, Morrison, Serwer and Gold (1968) on teacher reports of "time spent on reading activities" and "time spent in mathematics instruction," as it related to student achievement, raised questions about the "predictive value of this form of teacher report" (Rosenshine, 1971, p. 191). From a methodological viewpoint, Rosenshine claimed it likely that teachers are so involved with managing classrooms that they may be unable to accurately assess the amount of time they spend on particular activities.

A study by Welch and Bridgham (1968) also failed to find a correlation between the amount of time spent by the teacher on a unit of instruction, and the adjusted class achievement performance on that unit of instruction. Husén's (1967) international study did find a strong positive relationship between time spent by students on mathematics homework assigned by the teacher, and mean scores on mathematic tests.

A series of recent studies have looked at the amount of time allocated to particular curriculum content in elementary schools. Survey data by Berliner, Fisher, Filby and Marliave (1976) suggested, on the basis of the six second grade classrooms sampled in a 40 day period that, on average, sampled students could expect to receive less than 130 hours per year in reading and mathematics instruction combined. It was also found that some teachers allocated between two and five times as much instructional activity as did other teachers. Filby, Marliave and Fisher (1977) found over an eight week observation period, that some classes received as much as 39 hours more instruction in basic skills, than did others. In other words; some classes received as much instruction in basic skills in six weeks, as others received in eight weeks. Harnischfeger and Wiley (1977) in a study of eight grade 5 reading classes, observed over the 40 day observation, that some classes received 12-fold more instructional time on certain fundamental skills, compared to other classes. Contrary to what might have been expected, this study also revealed classrooms with higher achievement scores in reading in fact allocated more time to reading than classrooms with lower levels of achievement.

While Guthrie, Martuza and Seifert (1976) found a non-significant relationship between pupil achievement in reading and time allocated to reading, Fisher, Filby and Marliave (1977) in the interim report of an extensive study of grade 2 and grade 5 students in reading and mathematics, report qualified support for the hypothesis that "the more time allocated to a content area, the more learning." A study by Smith (1976) of 51 fifth grade social studies classes, on the other hand, found students in classes which were allocated more time, performed no better in social studies than students in classes allotted less time. Despite allotment guidelines set by each county, teachers were found in the Smith (1976) study, to vary widely in the amount of time they allocated to social studies instruction. Felsenthal and Kirsch (1978), in a study of 475 fourth, fifth, and sixth graders in four elementary schools, also reported no significant differences between time allocated and reading performance. Reflecting on their review of a number of similar studies, Rosenshine and Berliner (1978) concluded that, "we find that in studies which consider allocated time, most of the results tend to be non-significant" (p. 6).

Studies on allocated time, or opportunity to learn (Carroll, 1963), should not be interpreted as an indication that time makes no difference. A number of the studies have not been of the classroom observation type, so that the findings may be indicative of teacher inability to record accurately time allocations. In addition, most of these studies have looked at class performance as a group, so that differences between pupils may well be obscured. Perhaps we need to be more precise as to the aspect of time that we measure and specify a little more clearly what it is we seek to relate to it. Jackson (1977) captured the true essence of this teaching/learning variable when he said:

> There has been a lot of talk about the importance of time in the determination of educational outcomes . . . . Certainly, we should take a closer look at how time is being used or misused in our schools. It may indeed turn out to be the culprit that critics claim it is. As we test this possibility, however, we must keep in mind that time itself is valueless. It acquires value chiefly because it marks the expenditure of a precious commodity -- human life . . . let us not seize too quickly at remedies for our educational ailments that call for little more than adding days or hours to our present efforts. The real key lies in making better use of the time we already have (p. 38).

Observed Pupil Attention

The most promising research undertaken in connection with time and pupil achievement, has suggested that engaged time or time spent actively learning (Bloom, 1974) in content areas is more strongly related to pupil achievement than allocated time (Fisher et al, 1977). However, before discussing those studies which relate directly to the current topic of engaged academic time, some consideration should be given to that line of research labelled "pupil attention studies."

Although there is a similarity between studies which have examined pupil attention, and the recent academic engaged time studies in that both have examined pupil learning pursuits in the classroom, a number of distinctions should be noted. Firstly, the attention studies have tended to have more of a group focus and have incorporated all students from within a particular classroom, in contrast to the engaged time studies which have concentrated on a small select number of individual target pupils within a class. Secondly, the attention studies have shown little concern for the academic content upon which student attention is focused. Academic engaged time studies have been much more pre-occupied with the specific content areas of student focus.

Thirdly, attention studies have generally tended to ignore other variables, concentrating instead on the exclusive aspect of pupil attention. Studies of pupil academic engaged time, however, have been concerned with pupil engagement and achievement, pupil engagement and task difficulty, and pupil engagement and classroom settings. Fourthly, the purposes of the two sets of studies have been quite different. Whereas the attention studies were geared to obtaining a direct index for rating teacher performance (despite attempts to disguise this intent), academic engaged time studies have been more modestly concerned with isolating those intervening teacher behaviors that appear to contribute to enhanced pupil achievement. Notwithstanding the substantial differences of purpose, the attention studies are important for the light they cast on some of the methodological aspects of the more recent academic engaged time studies.

Research on group attention and inattention of pupils originated in the era of "scientific management" in the 1920's. The earliest reported study was a masters thesis by French (1924) at the University of Chicago. Reflecting the early concern with teacher effectiveness, French's study of student behavior during recitation classes in high and elementary schools, is closely linked to a series of questions that trainee teachers were urged to be mindful of in classroom observation, contained in the appendix of a book by Charles Judd (1918). French (1924) found a correlation of .82 between principal rating of teacher ability and the group attention of pupils gauged by an independent observer. Median percentages of attention were reported (French, 1924) to be 94 for junior high school and 91 for the upper grades of elementary school.

The most comprehensive contemporary statement of the technique for obtaining class "attention scores" was published by Henry Morrison (1926), a professor of education at University of Chicago. Morrison's technique, used extensively for twenty years, involved the observer positioning himself at the front and to the side of the class so that the faces of all students were visible. The observer scanned the class, row by row each minute, noting on a score card pupils who were inattentive. Although physical posture and student activities were key indicators of attentiveness, Morrison (1926) claimed that: "The most infallible index of [student] attention is the eye" (p. 125). As to the use of this technique, there is little doubt that Morrison had in mind a diagnostic rather than a supervisory or evaluative purpose. He envisaged it as a means of determining the effectiveness of teacher control, with a view to enabling the teacher to restore group attention to 100 per cent (Morrison, 1926, p. 134).

Using visible attention of pupils, Bjarnason (1925) pursued the relationship between class size and group attention in two elementary classrooms where additional numbers of students had been systematically added. Group attention was found to remain at 90 per cent and 81 per cent respectively. In one class, attention remained as high with 50 pupils as with 23. Given the limited scope of Bjarnason's study, his findings must be regarded as very tentative. A study by Symonds (1926) involved the observation over a period of 30 hours, of 10 ninth grade students, five of whom were described as being able to "study well," and the remainder of whom were labelled "poor" on this attribute. While unable to differentiate between the groups on the basis of attentiveness, Symonds (1926) did find the more studious group better able to adjust to changes in classroom activity than their less studious counterparts. Olson (1931) reported a correlation between time off-task (whispering) and the honor point average of 24 high school students, to be -.30.

Increased use of Morrison's technique resulted in a number of studies concerned with the methodological aspects of measuring pupil attention. Blume (1929) undertook a study to check the reliability of Morrison's technique. Using paired observers in 17 eighth grade classes, Blume (1929) concluded that "once the technique has been learned, the attention scores thus obtained have a high degree of reliability" (p. 43). Barr (1926), although using attention scores for teacher evaluation purposes, disagreed with Blume and dropped them from his measures of teacher effectiveness.

Questions were being raised as to the validity of the research material collected in attentiveness studies. A study of Winnetka Plan students by Washburne, Vogel and Gray (1926) questioned whether student eyes on the teacher or the book, were necessarily accurate indicators of attention to academic tasks. Very little serious attempt seems to have been made to obtain answers to this question. Knudsen (1930), for example, claimed that student "faking" of attention did not constitute a serious problem as long as this was consistent from class to class. Brueckner and Landenberg (1933) studied another methodological aspect in their investigation of 78 junior and senior high school classes. They experimented with extending the length of Morrison's observation cycle from one minute to three and five minutes and found that observation once every three minutes produced data that were just as reliable as that procured in a one minute cycle.

Shannon's contribution to this line of research is interesting. Using 14 of his graduate students at Indiana State Teachers College, Shannon (1936) evaluated the classroom performance of a sample of 111 teachers using three techniques -- a score-card check-list, subjective informal judgments, and group attention scores. The finding of a substantial match between score-card measures and informal judgments of teacher performance, led Shannon to reject attention scores as an indicator of teacher effectiveness. A second study by Shannon (1941) of two junior high schools, one of which grouped pupils on the basis of ability (reflected by IQ) and the other of which had no such grouping, produced a finding of no significant difference in pupil attention scores between schools. Shannon's (1942) third, and most perplexing study, was experimental in nature and involved two seventh and two eighth grade classes. The purpose was to test the validity of Morrison's attention score technique as a measure of pupil achievement. Shannon's (1942) procedure required the classroom teacher to read a ten minute story to the class on an unfamiliar topic. Twenty multiple-choice questions had been prepared in advance on key aspects of the passage, although pupils were unaware of the impending test. Pupils were closely observed for their attentiveness at the exact instant keyed ideas were presented. Students were tested at the conclusion of the reading, with subsequent correlations between achievement and attention being .67 for boys and .34 for girls, the lower correlation for girls possibly being explained by the nature of the topic which held more interest for boys. Based on the finding that inattentive students obtained correct responses to questions on which they were observed to be inattentive at the moment of presentation of the learning material, Shannon (1942) concluded that, "the evidence is damaging to the validity of attention measurement" (p. 631).

In his comprehensive review of the literature, Jackson (1968) notes the virtual disappearance of attention studies from the professional literature, after the publication of Shannon's findings. Rather than attributing this to the impact of Shannon's criticism of the technique of gauging pupil attention by visible means, Jackson attributed the disappearance to a more general "sign of the times." In a progressive era in which classrooms were viewed as democratic settings, it is not surprising to find a de-emphasis of the authoritarian perspective implicit in the study of pupil attention. As a researchable topic, therefore, pupil attention seems to have been largely ignored until revived by Bloom and his students, Gaier (1952) and Schultz (1951), at the University of Chicago in the 1950's.

Bloom's revival of interest in this research was accompanied by a novel modification. His (Bloom, 1953) study of university students involved sound-recording the dialogue of classroom activities, replaying these to students afterwards, and asking them at critical points to indicate their thoughts at the time. By using this stimulated recall technique, it was hoped that an indication could be obtained of the proportion of relevant student thoughts during lessons. For his sample, Bloom (1953) found 64 per cent of student thoughts in lectures to be on-task, compared with 55 per cent in discussion sessions. These percentages are certainly at variance with the 90+ per cent of Morrison and colleagues. Nevertheless, as Jackson (1968, p. 99) points out, comparability between the two sets of studies is difficult because of the very different contextual settings in which they were undertaken -- university versus elementary and secondary schools. While Morch (1956) found for air-force trainees, a correlation between the amount of off-task behavior (looking around, slumping and whispering) and predicted test score behavior of -.58, Edminston and Rhoades (1959) reported a zero order correlation between time on-task and standardized achievement test scores of high school students, of .58.

A study by Hudgins (1967) of nine classes in a junior high school, used a type of stimulated recall technique to check attention scores gathered by observers. The technique required observers to interrupt the lesson and have students fill in paper and pencil recalls of their thoughts in the preceding interval. This was repeated up to five times during the lesson. Hudgins (1967) reported negative correlations between observed attention scores and student self-reports of between -.52 and -.70 in five of the nine classes. A study by Taylor (1968) reported observer ratings of students' apparent attention to the teacher to be inconsistent with students' own reports of their attention, and with recall tests of the lesson material administered the following day.

A series of studies in the late 1960's and early 1970's, by Bloom and his students, reaffirmed the belief in the importance of visible attention studies. Lahaderne (1968), using Morrison's technique, observed four sixth grade classrooms for 9 hours each over a three month period. Lahaderne's concern was to test the correlation between visible attention in class, and pupil attitude to school and academic achievement. Lahaderne (1968) reported a low (.10) correlation between pupil attention and school attitude. Correlations of between .37 and .53 were found between attention and pupil achievement. After statistically controlling for intelligence, the relationship between attention and achievement still existed.

Anderson (1976) and Özcelik (1973), also students of Bloom, looked at overt and covert activities of pupils in learning and found the amount of time pupils actually spent on-task to be highly predictive of student learning achievement. As reported by Bloom (1974), correlations with time on-task accounted for three fifths of the achievement variation of pupils. Samuels and Turnure (1974) with first graders found increasing degrees of pupil attention to be related to superior word recognition. McKinney, Mason, Perkerson and Clifford (1975) found a similar relationship with eight-year olds. Cobb (1972), with eleven-year olds, found attentiveness to be the most significant in-class behavioral predictor of arithmetic achievement, but not reading achievement.

Indicative of a move towards broadening the scope of attention studies, was an investigation by Hess, Takanishi and others (1973) of 24 teachers in third and fourth grades of nine elementary schools undertaken in 1971-2 in low income areas of the San Francisco Bay area. In that study, large differences were found in the level and mode of pupil engagement depending upon the time of year in which the observation was made. In particular, Hess et al. (1973) noted that the mean percentage of students engaged rose significantly during the course of the year. Furthermore, the level of engagement also varied according to the size of the instructional group, with significantly lower levels of engagement being reported for larger groups than for small groups or dyads. There was no apparent connection between level of engagement and the use of particular classroom instructional strategies.

The most recent attempts to relate learning time to pupil achievement have commenced from the premise that teacher allocations of time to particular content areas represents the upper limit of student classroom exposure (DeVault, Harnischfeger and Wiley, 1977). The further presumption is made that individual students cannot reasonably be expected to be attending or fully occupied for all of that time. After allowing for content difficulty, it has been hypothesized that the amount of time an individual spends actively learning will be a strong predictor of academic achievement. As Marliave, Cahen and Berliner (1977) have indicated, where the pupil is actively involved in the task at hand, then it is assumed that "appropriate motivational and attitudinal conditions could account for this involvement" (p. 11). Likewise, if the student disregards or actively shuns the task, then the inappropriate behavior may be interpreted as an absence of motivational factors.

In the section which follows, a number of studies will be discussed which focus on the aspect of "engaged time" or "active learning time" in specific content areas.

Pupil Engaged Academic Time

The current increased research interest in instructional time is directly traceable to Carroll's (1963) "Model of School Learning." Carroll's model had five elements, three of which were time-related:

1. Aptitude: the amount of time needed to learn the task under optimal conditions;
2. Ability to understand instructions;
3. Perseverance: the amount of time the learner is willing to engage actively in learning;

4. Opportunity: time allowed for learning;
5. Quality of instruction: a measure of the degree to which instruction is presented so that it will not require additional time for mastery beyond that required in view of aptitude.

A significant aspect of Carroll's model because of its relationship to time, is "student opportunity to learn." It seems almost trite to say but students will only learn content if the material is taught. As McDonald (1975) notes, "If students have not been taught . . . . some . . . content or procedure, they simply do not do well on those portions of the test relevant to that topic" (p. 27). However, Rosenshine (1976) and Rosenshine and Berliner (1978) have noted that relatively little research has been directed at this aspect.

Studies that have focused on "content covered," such as pages of the textbook covered (Good, Grouws; and Beckerman, 1978), content of textbooks (Pidgeon, 1970), number of words taught per lesson (Beez, 1970), number of mathematics problems covered (McDonald, 1975) or books read (Harris, et al. 1968), show significant relationships between content covered and pupil achievement gains. Studies by Rosenshine (1971) and Armento (1977) have noted that correlations between content covered and pupil achievement were greater than for any observed teacher behavior variables. Rosenshine (1971) and Shutes (1969) found material covered in a short presentation prior to testing students, to be correlated with student test performance. The need to measure and account for content covered in studies relating to pupil achievement, has been emphasized by Porter, Schmidt, Floden and Freeman (1978).

Given the apparent importance of content covered and pupil attention or engagement in influencing pupil achievement, recent research has pursued an amalgam of these two variables -- the operative concept has been labelled, "academic engaged time", or "academic learning time" (ALT).

According to Rosenshine and Berliner (1978) there is a close connection between studies which have focused on "attention" and the present interest in "engaged time," such that "many of the studies of attention are really studies of academic engaged time" (p. 6). It may be well to keep the conceptual distinction clear. Berliner (1978b) defined academic learning time (or ~~academic~~ engaged time) in terms of, "the time a student is engaged with instructional materials or activities that are of an easy level of difficulty for that student" (p. 1). Fisher (1978) defined the same concept somewhat differently as, "the amount of time a student spends engaged on a task that produces few student errors and which is directly related to a defined content area" (p. 1). Fisher's definition, therefore, highlighted the three components of Academic Learning Time (ALT) as consisting of: (a) student engagement, (b) student error rate, and (c) task relevance to an academic outcome.

As indicated earlier, the concept of academic engaged time is more restrictive in meaning than student attention. Perhaps most significant in the distinction is the aspect of task difficulty. Implicit in this notion is the belief that for pupil on-task engagement to be of any consequence, the activity in which the pupil is engaged must be cognitively meaningful. In other words, activities should not be so excessively easy as to constitute mere repetition, or so difficult as to be meaningless to the student. The term academic engaged time is also restrictive in that it encompasses academic activities only. The same constraint was not present in the attention studies which covered a much broader spectrum of classroom activities and events.

Research on the relationship between time on-task and pupil achievement is still relatively new. Nevertheless, Block and Burns (1977) in their review of the research stated that: "The proportion of study time that students spend actively engaged in learning has been found to be very strongly related to student achievement" (p. 40). Harris and Yinger (1977) noted that specific findings on the relationship between time on-task and pupil outcomes were somewhat sparse.

Two correlational studies have produced results on academic engaged time. The Stallings and Kaskowitz (1974) study of third grade low achievers in mathematics, found a high positive correlation between time on-task and mathematics achievement. As part of Phase II of the Beginning Teacher Evaluation Study (BTES), McDonald's (1975) study of 95 classes in grade 5 mathematics and grade 2 reading, found a negative correlation between observed pupil attentiveness and pupil productivity in grade 5 mathematics, and a positive correlation between observed pupil attentiveness and pupil productivity in grade 2 reading. Productivity was defined in that study as "the demonstration of appropriate skills." McDonald (1975), in view of his mixed findings, concluded that attentive and productive behavior may be necessary but not sufficient to produce learning, and that the connection may be much more complex than we think.

Weber (1976) in a study of 114 high school mathematics students reported significantly different amounts of on-task behavior according to the learning environment (teacher-paced material-responsive; self-paced; teacher-paced teacher-responsive). Optimal on-task conditions for sampled students were found to be significantly related to teacher behavior that was directive with respect to feedback on test performance, and where materials were highly structured to provide immediate feedback.

Reporting the results of Phase III of the BTES study of Academic Learning Time in second and fifth grade reading and mathematics classes, Marliave (1978) concluded that students who spent more time in an instructional activity, at a relatively high level of attention and with a relatively low number of errors, learnt more of the content of that particular instructional activity (p. 19). This study also found that the variables of allocated time, attention and error rates, as a cluster of variables, accounted for an average of 11 per cent of residual variance in pupil learning, after controlling for pupil pre-achievement differences.

A number of classroom observation studies, while not exclusively pursuing the pupil-engagement-pupil-achievement connection, have nevertheless produced some disturbing statistics on pupil time on-task.

McDonald(1976b), for example, found that for grade 2 and 5 reading and mathematics, the median engaged time for classrooms in a California sample was usually under 90 hours combined for the entire school year. Berliner et al. (1976) in a study of grade 2 reading and mathematics classes, suggested that students may be engaged for less than 40 hours per year. Filby et al. (1977) revealed that while time allocations between pupils within a class were reasonably constant, considerable variations existed between individuals in engagement rates. At the grade 2 level, the class engagement rate among sampled schools in reading and mathematics, varied from 37 per cent to 74 per cent of the allocated time. As between individual students, Filby et al. (1977) found even greater variations in engagement, ranging from 23 per cent to 91 per cent. Powell and Cahen (1977) looked at the particular classroom settings (small group and independent study) in which pupils were involved and suggested engagement as high as 80 per cent in small groups and as low as 10 per cent in independent study. Likewise, Lambert and Hartsough (1976) found many students who did little work in independent study sessions. Tikunoff and Ward (1976) while finding no significant differences between the percentages of engaged time for high and low achievers, did find significant differences in the types of activities engaged in by the two groups.

Section Summary

Time-related research in the study of schools has been undertaken at various levels ranging from the total amount of schooling received, to the specific individual student engagement on assigned learning tasks. While varying degrees of success have been experienced by researchers in demonstrating a connection between time and pupil achievement, the most recent endeavours at the level of the individual pupil on discrete learning tasks, have displayed the most consistent, albeit limited, research results to date.

Research on the engagement of pupils in academic activities in classroom settings has a chequered history extending back to the beginning of this century. Although many earlier attempts to gauge pupil attention were undertaken with the explicit purpose of rating teacher classroom performance, the recent research on pupil engagement has had the more modest objective of establishing a connection between time spent learning and pupil achievement.

Implications from the Research

As a research variable in the study of teaching, instructional time is unique in that it provides a context within which ~~to~~ simultaneously view the actions of students and teachers. In contrast to many other variables which have been the subject of research investigation in relation to teacher effects, time allocated and actually spent learning, possesses a sound basis for further research. Considered within the framework of a model of teaching such as the direct model advocated by Rosenshine, instructional time provides an important linkage between the behavior of the teacher and the learning activities of the student.

Although the study of time in the school setting and its relationship to pupil achievement has encompassed gross allocations in terms of length of school year, number of weeks and length of school day, it is at the level of the classroom, the teacher and the individual student that the most promising research is beginning to focus. Recent thinking has postulated that the nature of the setting in which the learning task occurs influences what the pupil can and will do and that the specific instructions of the teacher determine the time during which the student can be expected to be engaged on-task. Descriptive research which provides the base data upon which to construct profiles of student on-task and off-task learning behavior and from which testable hypotheses might emerge, has still yet to be undertaken.

Chapter III

DESIGN OF THE STUDY

Overview

This chapter commences with statements about the nature of the study, the school, teacher, classroom and pupils selected for analysis. The research questions are expanded and the assumptions, delimitations and the limitations of the study discussed. The various data sources are mentioned, together with the observation instrument, its selection, development and characteristics. The pilot study, observer training and agreement, and the phases in the study, conclude the chapter.

Nature of the Study

The study was based predominantly on a behavioristic research paradigm. It was founded on a belief in the importance of overt or observable behavior. In an endeavour to understand how and why pupils use time as they do in classrooms and the factors likely to influence this usage, classroom observation was considered a reasonable procedure. Charlesworth and Bart (1976) argued for the observation of naturally occurring human behavior, as an important first step in understanding that behavior. Charlesworth and Spiker (1974) stated: "If one wants to understand the function of behavior, one must conduct careful observations in natural environments" (p. 11).

From the viewpoint of research design, this study may be considered "quasi-clinical" (Fisher and Berliner, 1979) in that it was concerned with a small number of individual cases in a field-based, or classroom setting. It is not a true clinical study because of the omission of a helping phase (Berliner, 1978a). The extant data-base in this type of observational research is too sparse to seriously consider successful intervention activities at the moment.

The study is "naturalistic" in the sense Menzel (1969) used the term, namely, it "aims at discovery and verification through observation" (p. 81). Kounin (1977) noted that while it is impossible to conduct this type of research "in the wild," it does have the merit of considering real-life situations, populated by real people, who enact real roles. Tunnell (1977) described the natural treatments occurring under these conditions, as those which the subject would have experienced regardless of the presence or absence of the researcher. According to Tunnell, it is a form of "non-contrived research" (p. 428).

While studies by Heyns and Lippitt (1954), Webb, Campbell and Sechrest (1966) and, Mercatoris and Graighead (1974), have shown it to be difficult, if not impossible, to assess the impact of outside observers on a natural classroom setting, Medley and Mitzel (1963) came close to the only practical answer to this question, when they said:

> The objection that teachers and pupils may not behave in exactly the same way when observers are present, has no completely satisfactory answer . . . . . To know how teachers and pupils behave while they are under observation seems better than to know nothing at all about how teachers and pupils behave (p. 248).

Observational studies of this type are justified in that they provide a method of access to information about actual events. Tunnell (1977) argued that it is to real-word occurrences that researchers are hopeful of generalizing. Chassan (1961) has argued that generalizing to similar subjects as a consequence of intense research, may be less spurious than generalizing from an experimental sample of dubious randomness, to an entire population. Good and Power (1976) expressed their aspirations for, and stated the limitations of this type of research when they said:

> We suspect that the generalizations deriving from classroom research and theory have a different role from those of the natural sciences. They function not as predictors of future events but as guidelines for understanding particular situations and contexts (p. 47).

The value of this type of research lies in the completeness of the description provided. According to Glaser and Strauss (1967), this necessitates the collection of both quantitative (or measurable) and qualitative (or descriptive) data. Neither is an adequate substitute for the other -- they are complementary. The in-depth situational descriptions of setting inhabitants and events generated in intensive research of this kind, have been considered by Barry McDonald (1975), Magoon (1977), and Tikunoff and Ward (1978), as being sufficient to dispense with the traditional research premise that all types of situations need be included in the research activity. Situational context, as expressed by Tikunoff and Ward (1978) "serves as the vehicle for external validity" (p. 24).

The study was, therefore, designed as a descriptive, observational investigation of a small number of pupils in a single classroom of an elementary school. A trade-off was made between the collection of data from a large number of pupils in different settings, for intensive data on a small number of pupils from within a single setting. While generalizability in the traditional research sense is lost, it was hoped that this would be compensated by the richness of the descriptive protocols obtained.

Based on Shulman (1970), it was believed that from these protocols would emerge hypotheses for further research, and perhaps a contribution towards the emerging grammar or underlying rule system, of effective teaching behaviors.

The Sample

The School

A decision was made that the classroom be at the upper level of an elementary school. The decision to select an elementary classroom in preference to one at the junior or senior high school levels, was based on the belief that pupil behavior at the elementary level generally occurs in a context that has greater continuity and less contextual change than at either of the other two levels. The reasons for selecting a class at the upper level of the elementary school, were two-fold. Firstly, the presumption was made that more of the type of behavior required for observation would be found at the upper elementary level. In this regard, it was presumed that a significant portion of class time at the lower elementary grade levels would be devoted to the development of social, manipulative and motor skills, in contrast to the more "academic" learning at the upper elementary level. A second reason was methodological in nature. For observation and coding purposes, the longer concentration span of more mature students, together with the reduced rapidity with which events could be expected to change at the upper compared with the lower elementary level, were seen as likely to facilitate the collection of more accurate data.

Four elementary schools from within a randomly selected sample of 24 Edmonton Public Schools participating in a larger research project of the Centre for Research in Teaching at the University of Alberta, were selected as possible schools in which to conduct the study. Only one school was required for research purposes.

Consideration was given to a number of criteria in the actual selection of a classroom. The research questions, and the type of observation envisaged, required a classroom that was not architecturally open. A self-contained classroom was considered to be essential for the simultaneous observation and monitoring of multiple target pupils. Because of the connection being sought in the study between certain teacher behaviors and student pursuits, it was important to avoid a classroom utilizing a team teaching approach, or where specialists were used for either reading or mathematics. More accurate data and less strain upon observers were considered likely in a classroom where there was a minimum of overlap or integration between subject matter content. A competent teacher with more than five years of teaching experience was also preferred, to minimize a possible source of bias in pupil behavior. These matters were attended to during the preliminary site visitation made by the researcher prior to settling upon the actual school to be used in the study.

Although it was originally planned to visit each of the four selected schools in turn before reaching a decision regarding suitability, this procedure was not in fact adopted. Instead, the predetermined procedure consisted of a visit to one randomly chosen school from those available, to determine its suitability. In the event of that school not satisfying the above requirements, one of the others was to be approached. This procedure was adopted to avoid the possible delicate situation that may have arisen where a number of fine schools willing to co-operate were eliminated from the study after preliminary investigation on what might appear to them to be fairly arbitrary grounds. Because the selected school came from within a randomly selected sample, it was felt that no unnecessary bias was introduced by using this mode of selection.

The first school selected, while willing to participate in the research, proved to be unsuitable because the class available was taught by subject matter specialists in language arts and mathematics. The one teacher was not with the class for both reading and mathematics.

The second school approached via the principal, had two classes available. However, while one teacher declined to participate on the grounds of an existing involvement in another research-type activity, the other teacher felt that the research would interfere with class activity and therefore was unwilling to participate.

The third school approached fulfilled the predetermined criteria required for the study. The school, which commenced in 1954, had a total pupil enrolment of 178, and a full-time teaching staff of eight. Like many schools in this urban location, this particular school was experiencing a declining enrolment, the number of students having fallen from 200 in the previous year. The clientele of the school was mixed SES with a predominance of middle income families described by one source at the school as being "upwardly mobile."

During the preliminary visitation, the teacher in the selected school was asked to consider a list of Criteria for the Selection of Potential Target Pupils (Appendix A). He was also required to indicate his capacity to isolate pupils with the described characteristics. Teacher permission was also sought and obtained to have pupils compile a Task Difficulty Assessment Questionnaire (Appendix B) during on-going class activities.

The Teacher and the Class

The teacher was male, and classified by the principal of the school as "a most experienced and competent teacher." His total experience as an elementary and secondary teacher amounted to 34 years. He was a self-confessed traditionalist who believed in a structured approach to teaching and learning, but who also admitted to often allocating his time according to how he felt and how well the pupils appeared to be enjoying and responding to the on-going activity.

The classroom was self-contained in organization, and with 33 pupils whole-of-class and individual seatwork were the predominant setting modes. Desks were arranged in rows with little facility for pupil movement. A seating plan of the room is contained in Appendix C. Being the only grade 6 in the school, there was no streaming and a wide spread of ability and achievement were represented.

The Pupils

Four pupils were chosen for the research from within the one grade 6 elementary classroom. The target pupils consisted of two pupils who were considered by the teacher to be high achieving and two who were low achieving, in the content areas of reading and mathematics. Potential target pupils were isolated by the classroom teacher on the basis of known pupil ability and achievement, teacher observations and impressions of the students, and after consultation with other teachers and the principal. In selecting the proposed pupils, [illegible] teacher was asked to have regard to the set of pre-[illegible]ined criteria mentioned earlier.

The teacher was required to compile separate lists of six high and six low achieving pupils, and from each of those two unlabelled lists the researcher made a random selection of two students for actual observation. In arriving at the lists the teacher was asked to avoid selecting the "best" and "worst" pupils, but instead to select groups representative of the range at either end of the continuum for that class. The teacher's point of reference was to be the remaining pupils in that particular classroom.

In recognizing that students may be high achieving in mathematics and not necessarily high in reading, the teacher was asked to select if possible, pupils whose demonstrated ability and achievement in reading and mathematics was consistent across subject areas. The teacher was also asked to avoid the inclusion of pupils who might be considered either under-achievers (performing at a level below what was consistent with their ability), or over-achievers (performing at a level in excess of what might be expected, given their ability). A match was, therefore, sought between low ability and low achievement, on the one hand, and high ability and high achievement, on the other. This congruence was required because two discrete categories of students were needed for observation and comparison, who were internally consistent, yet represented quite different clusters.

The original intention was to have the teacher isolate high and low achievers with equal representations of boys and girls. In reality this proved impossible due to the predominance of boys at the upper and lower levels of the achievement continuum for this class. The lists prepared by the teacher reflected the imbalance favouring boys. A random selection was therefore made from within the submitted samples. Three boys and one girl were selected. The girl and a boy were high achieving, and the remaining two boys low achievers.

As a precaution against one or more of the selected target pupils being absent on a prolonged basis during the study, each selected target was paired with a reserve from the original sample. In the event of a selected target being absent from school, it was decided before observation commenced, that a phantom matched reserve target would be substituted and observation continue with that pupil, if necessary, throughout the remainder of the observation period with additional observation being added on to compensate. The substitute was to be observed immediately it became apparent that a target pupil was absent from class. Observation with the substitute was to continue until the reason for, and the likely duration of, the absence were ascertained. One half day absence of any one target during the seven full days of observation, was considered acceptable without seriously depleting or distorting the data that would be generated in respect of that particular student.

While the teacher was aware of the group of pupils from which the targets were to be chosen, he was not told which specific pupils were to be observed in the research. This procedure was considered appropriate to avoid excessive teacher bias toward actual target pupils. The rationale was that it would be difficult for the teacher to consistently bias his behavior toward a group of 12 pupils in a group of 33.

As a second precautionary procedure, the researcher asked the teacher to ensure that the lists of pupils submitted be unlabelled in terms of the achievement levels of the pupils contained. In this way it would be possible for the researcher to select target pupils from the teacher samples, but not be influenced in subsequent observation by knowing which were high achieving and which were low achieving pupils. This procedure was used in an earlier study by Cobb (1972).

It was hoped that this double-blind would considerably reduce two possible sources of bias in the study.

The teacher was new to the school at the beginning of the school year and his knowledge of the pupils was limited to the four weeks of the school year that had expired. He expressed a wish not to consult any details contained in the pupil's cumulative record files. The teacher believed knowledge of this type to be generative of too much expectancy in subsequent teaching. To check, therefore, that the lists of potential target pupils provided by the teacher in fact satisfied the research requirements, the unlabelled lists were taken to the principal, together with the Criteria for the Selection of Potential Target Pupils. The principal was asked to confirm, by reference to cumulative record cards, whether or not the pupils within each list represented homogeneous clusters on mathematics and reading ability and achievement, while also displaying a marked difference to the other group. The principal confirmed that there was indeed internal consistency within the groups, with the exception of one student who had been incorrectly classified by the teacher. That student was eliminated from the sample. The principal also confirmed that between the two clusters, in reading and mathematics ability and achievement, there was a marked variation.

The Curriculum Content

The study was primarily concerned with student and teacher activity in the areas of reading and mathematics, regardless of how the teacher labelled the activity. This delimitation reflected not only the desire to obtain accurate data in manageable quantities, but it also recognized the importance of reading and mathematics in the total elementary school curriculum. This particular sampling of behavior was based on the belief that learning of basic academic skills or "didactics" (Broudy, 1972), constitutes learning that occurs in a linear, logical and sequential manner, a supposition that does not necessarily apply to those facets of the curriculum in the affective domain, which stress the learning of attitudes and feelings.

The definitions of reading and mathematics used were those adopted in the BTES research. In reading, the guideline adopted (Marliave, Fisher, Filby and Dishaw, 1977) was that "written words must be involved at some point in the activity" (p. B-45). This might cover a variety of situations ranging from writing sentences, spelling and creative writing, oral and silent reading, handwriting, to library skills and answering questions to a film. Reading was recorded as occurring in activities designated as reading by the teacher, as well as in other settings such as social studies, music and science. The guideline for the isolation of mathematics activities was that the activity involve numerical or mathematical concepts, whether that be in standard digital form or as part of some other measurement or manipulative task.

Specific Research Questions

The study focused upon specific problems relating to the following four areas:

1. How is pupil time allocated between various classroom learning activities?

    What is the distribution of pupil time across academic, organizational and non-academic pursuits?

2. How does the pupil use the available learning time?

    What is the pattern of pupil engagement as between written, oral and covert activity?

    What is the extent and nature of content covered by pupils during engagement?

How do levels of engagement vary with curriculum content and task difficulty?

What are the possible longer term implications of continual task engagement with material of demonstrated difficulty levels?

Are there marked variations in the level of engagement according to previously determined pupil achievement levels?

Are there characteristic patterns of pupil work habits?

Is there evidence indicating varying intensities of pupil involvement in learning activity?

3. What is the nature and duration of pupil classroom task settings?

   How does pupil involvement vary with individual seatwork and whole-of-class settings, and across content boundaries?

   Are pupil pursuits influenced by ecological factors resident in the setting?

4. What is the character and extent of instructor behaviors as they impinge upon pupil recipients?

   Do some pupils spend more of their time receiving teacher monitoring, questions, explanations, directions and rebukes, and task feedback from various sources, than other pupils?

Do some pupils spend more time receiving instruction that originates from the teacher, than do others?

Do some pupils spend differing amounts of time receiving instruction from the teacher, other pupils and curriculum sources?

Assumptions

This analysis of pupils' use of academic learning time in a classroom setting was based on the assumptions that:

1. The presence of non-participant observers in the classroom did not grossly distort the naturalness of the setting, and pupils and teacher quickly adjusted to the intrusion.
2. Target pupils were unaware that they were the object of special scrutiny, and hence did not modify their behavior. Likewise, the teacher being unaware of the identity of precise target pupils singled out for observation, did not alter his behavior toward those pupils.
3. Observer bias and expectancy was minimal owing to the disguised manner in which target

pupils were selected.

4. Although error occurred in sampling pupil behavior because of the rotational sequencing used, this sampling error was within the predicted limit of 10 per cent.

Delimitations of the Study

The study was delimited in the following ways:

1. The small number of pupils investigated, came from a single classroom of one school which volunteered to participate.
2. Although the observation system could have examined pupil use of time in any learning content area, in this study it was restricted to reading and mathematics.
3. The sampling of target pupil behavior and generalizing of those sampled moments to the length of the observation cycle, involved sampling error.
4. The study was conducted over a short time span in the early part of the school year.

As a consequence of these design limitations, findings from the study will be circumscribed to the extent indicated in the following limitations.

Limitations of the Study

The primary limitation of the study relates to its generalizability. Because of the research design and the sampling and observation procedures employed, the "universe of generalization" (Rowley, 1976) is restricted to any other universe of data observations that might be collected by a single observer, trained in the same manner and using the same observation, recording and time sampling procedures as the present observer, who might visit a single classroom at the grade 6 level in the Edmonton Public School system and observe four target pupils of the type described, for a continuous period of at least 10 full consecutive school days, in the first half of the fall term.

In focusing only on the classroom pursuits of a small number of pupils, the present study does ignore the academic learning that is likely to occur outside of the classroom. Student time spent on assigned and unassigned homework is one area that may have a substantial effect depending on the class, its grade level and the particular pupils.

The other clear limitation of the study relates to its exclusive concentration on the aspect of pupil cognitive (or academic) learning. This limitation does not suggest that cognitive learning is the only, or indeed, the most important type of learning that occurs in classrooms. The emphasis merely reflects an artifact of the research design that was adopted for the purposes of the study.

Data Sources

A summary of the sources of data employed in the investigation of the research questions, is contained in Table 1 and briefly described below.

Interactive Classroom Behavior

On-going records of target pupil activities in reading and mathematics and the related teacher behaviors and classroom setting variables, were captured by using a developed classroom observation and coding system. Samples of the Coding Sheet and Observational Categories are contained in Appendix D. After a 3 day familiarization phase, observation using this system occurred for seven full continuous school days, providing the equivalent of 28 pupil days of data or approximately 900 coded observations on each target pupil. In addition to data on specific reading and mathematics activities, the observation system enabled the collection of limited data in other content areas and general classroom organizational procedures.

Assessment of Task Difficulty

Data pertaining to the meaningfulness of academic time used by target pupils was obtained by pupils completing a brief Student Assessment of Task Difficulty Questionnaire (Appendix B) at a number of points during lessons. These data were used to cross-

Table 1

Summary of Data Sources

Research Aspects	Methods	Primary Data Sources	Secondary Data Sources
Interactive classroom behavior	Observation of teacher and pupils over 7 full days	.Observation schedule .Observer field notes	.Computer print-outs .Specimen records
Assessment of pupil task difficulty	.Observation of pupils over 7 full school days .Pupil questionnaire responses to 24 activities .Artifact collection of pupil work during observation period	.Observation schedule .Student Assessment of Task Difficulty Questionnaire .Completed student written work activities	.Computer print-outs
Content covered	.Observation of pupils over 7 full school days .Artifact collection of pupil work during observation period	.Content Covered Transcript sheets .Completed student written work activities	
Qualitative nature of engagement	Observation of pupils, teacher and classroom over 7 full school days	Observer field notes	Specimen records
Personal background data	.Interviews conducted at conclusion of 7 days of observation .School records on pupils consulted at conclusion of 7 days of observation	.Teacher interviews .Pupil cumulative record cards	

check observer assessments of task difficulty undertaken as part of the classroom observation system.

Content Covered

Evidence of pupil on-going progress in teacher assigned reading and mathematics tasks, was obtained through direct observation and recording onto Content Covered Transcript Sheets (Appendix E). The nature of the assigned activity, the number of pages or problems set by the teacher, the commencing time and actual concluding time for each target pupil, were recorded. The number of pages read or problems completed by each target pupil in the allotted time, were also noted. A copy was taken of all target pupil written tasks in reading and mathematics undertaken during the 7 days of actual observation (Appendix I).

Qualitative Aspects of Engagement

Further information on levels of target pupil engagement and disengagement not amenable to the coded observation system were recorded as anecdotal field notes in space available for the purpose on the observation coding sheets. Student facial expressions, body movements, overheard conversations, teacher activity and setting occurrences were recorded in this manner. The type of questions guiding the researcher in this aspect are contained in the Guiding Criteria in the Collection of Target Pupil Qualitative Data

(Appendix F). Anecdotal field notes obtained in this manner were used in conjunction with the coded observations, to provide Specimen Records of Observations for Target Pupils (Appendix G). These provided the eventual basis upon which to construct pupil academic work profiles.

Personal Data on Subjects

At the conclusion of the entire classroom observation, the teacher was interviewed concerning target pupil's family background, socio-economic status, and performance on criterion-referenced tests. Questions asked during the interview are contained in the Target Pupil Personal Data Interview Schedule, in Appendix H. Data were also retrieved from the school records in respect of each target pupil.

The Observation Instrument

Instrument Selection

A problem of continual concern to researchers involved in classroom observation is the choice of an observation instrument. As Grady (1975) indicated, "no researcher wants to admit to the selection of an instrument simply because of its availability and then have to shape his investigation around that choice" (p. 173). In the preliminary stage of the study, once the research domain had been mapped out and the nature of the research problems established, a decision had to be taken as to whether to devise an instrument, or look for a suitable one from among those available.

Although several hundred different classroom observation systems exist, a search of Simon and Boyer (1970), Madden and Borich (1977) and other sources, produced only two (Calfee and Calfee, 1976; Marliave, Fisher, Filby and Dishaw, 1977) that were specifically designed to enable the observation of time-based behavior of student academic learning activities in classrooms. Inspection revealed both the Reading and Mathematics Observation System (RAMOS) of Calfee and Calfee (1976), and the observation and coding system developed as part of Phase IIIB of the Beginning Teacher Evaluation Study (BTES) of the Far West Laboratory for Educational Research and Development (Marliave, Fisher, Filby and Dishaw, 1977), capable of yielding data relevant to the stated research problems.

In view of the formidable obstacles in designing and adequately testing a new observation and coding system, originality was abandoned in favour of selecting the existing BTES observation and coding system. Derived as a result of intensive classroom observation and research, and supported by extensive empirical testing (Marliave, Fisher, Filby and Dishaw, 1977), this instrument displayed all the signs of providing access to the type of data sought. In reaching the decision as to which of the two instruments to use, consideration was, therefore, given to the selection criteria suggested by Grady (1975) in choosing a classroom observation instrument, including the suitability of the instrument for the type of behavior being observed, its usability, its capacity for generating valid and reliable measurements, as well as time and cost considerations.

A close scrutiny of the RAMOS method of recording the real time documentation of classroom instruction in reading and mathematics, and discussion with the author (Calfee, 1978), revealed the instrument to be more suitable as a diagnostic device than as a research instrument. No reliability or validity studies of measurements conducted with RAMOS could be located, casting further doubts on its suitability. The reservations held as to the difficulty of recording meaningful data using elapsed, or real time, implicit in RAMOS, were confirmed by Marliave (1976b), along with the results of a pilot study conducted as a preliminary to the present study. By contrast, the BTES instrument and system of coding procedures, satisfied the criteria of appropriateness, usability, reliability in past measurements, and economy.

Instrument Origin and Development

Reference should be made to the origins and development of the observation instrument. Increased concern with time as a research variable in teaching and learning and the development of the BTES time coding instrument, can be attributed to a group of researchers at the Far West Laboratory working under contract to the California Commission for Teacher Preparation and Licensing, with funding from the National Institute of Education. The aim of this multi-year study, which commenced in 1972, was to identify teacher behavior and classroom variables that related to pupil achievement in reading and mathematics. Rosenshine (1977a) attributed credit for the beginning of this line of research as follows:

> The immediate parents of the concept Academic Learning Time are Berliner, Fisher and Marliave of the Far West Laboratory. The grand-parents include Carroll (1963) who originated the idea of "opportunity to learn" and Gage who insisted that I code content covered in my dissertation study (p. 33).

Basic to the BTES time-related research and the observation and coding system was the belief that academic achievement was a function of both student aptitude and student academic learning time (Marliave, Fisher and Dishaw, 1977). While student aptitude referred to the entering characteristics and attributes which the pupil brought with him to the school, the presumption was made by Far West Laboratory researchers that if the particular instructional processes could be ascertained that resulted in increased student academic learning time, then a series of variables would have been identified that were controllable.

The method by which the BTES observation system evolved, is worthy of comment. A number of "promising" variables that appeared to be closely related to effective teaching were isolated by means of extensive clinical observations of classroom settings, as well as from the findings of previous research in the BTES, and by a series of special studies commissioned by the Far West Laboratory. Technical reports bearing on likely observable classroom variables were obtained from Joyce (1975) and Shavelson and Dempsey (1975), while letters were sent to a number of researchers, "nationally known for their studies of teaching" (Marliave, 1976a) seeking their suggestions as to promising variables. From these varied sources, student attention to academic task was consistently mentioned. Likewise, the fact that observation should focus on individual target pupils and for long periods of observation, were also frequent recommendations, as too was the need to observe "patterns of classroom behavior" rather than discrete isolated aspects (Marliave 1976a).

Characteristics of the Instrument

The most significant aspect of the BTES time coding system was the frame of reference for all recorded observations, which was the time-measured pursuits of pupils relative to the instruction received in reading and mathematics. As Filby and Cahen (1977) noted, the coding system had been created to reflect the instruction received from whatever source, by an individual student. The system, therefore, facilitated the collection of information reflecting how much time an individual student actually spent as the recipient of particular types of teacher or other instructor behavior, while also enabling the collection of data related to the amount of time target pupils spent on endogenously determined pursuits. Because of the focus of the observation system on individual target pupils, a complete record of the teacher's time allocation was not obtained, by virtue of its partial expenditure on non-target pupils and other activities.

The BTES time coding system was created to enable a single observer to record the activities of as many as six pupils simultaneously in the one classroom. In order to collect data on a number of target pupils without the bias in sampling error that would have occurred if the duration of every change in student behavior was coded, a time sampling procedure was used. The procedure of time sampling (Repp, Roberts, Slack, Repp, and Berkler, 1976), or momentary time sampling (Powell, Martindale and Kulp, 1975), involved the observer in ignoring the behavior for a relatively long period and upon a given signal, making a quick visual scan of the situation and recording the observed behavior at that moment. Only the behavior exhibited at the moment of observation was actually recorded. Time sampling was, therefore, quite distinct from interval recording (Repp et al., 1976) which involved observation for a period of possibly 20 seconds, followed by 10 seconds for recording, and so on.

In practice, target pupils in the BTES system were placed in a predetermined rotational sequence and the behavior of each sampled once in an observation cycle, which ranged in length from a minimum of three minutes to a maximum of six minutes, depending upon the complexity of the behavior (Marliave, Fisher, Filby and Dishaw, 1977). A coded entry on the observation sheet was made for the specific activity the student was engaged in at the "moment" he was observed in the rotational sequence. Provision also existed (Marliave, 1976b) for categorizing the moment according to the larger sequence of behavior of which the moment was a sub-component. Accordingly, in respect of both learner activity and instructor activity (Marliave, Fisher, Filby and Dishaw, 1977) a hierarchy was established for placing moments into the larger sequences in which they were embedded, prior to the actual coding. The reason for the latter procedure was to ensure that coded behavior represented activities that were meaningfully related to each other over time. The instrument, therefore, satisfied Grady's (1975) selection criteria of preserving the sequence and time, of observed behavior. Data obtained in the BTES research by sampling moments were generalized to the entire period of time (the length of an observational cycle) from which they were sampled. Depending upon the length of the observation cycle, this appears to be a defensible technique (Powell, Martindale and Kulp, 1975).

Pilot Study

Because of the exploratory state of the research on academic engaged time, the developmental state of the observation system, and the inexperience of the researcher in classroom observation procedures, a pilot study was conducted using a grade five class of an urban elementary school, in April 1978. Three familiarization visits were made to the school and the particular classroom, prior to the six full days of observation in the pilot study. The purposes of the pilot study were as follows:

1. To enable the researcher to gain experience in using the observation and coding system.

2. To enable experimentation with the number of students which it was feasible to observe simultaneously.
3. To experiment with a number of time sampling procedures of varying length.
4. To observe the likely effect of the presence of a non-participant observer on the classroom behavior of students.
5. To vary the number of possible locations in the classroom from which observations could be made, with a view to determining the most effective ones.
6. To experiment with the use of a tape recorder and cordless microphone, as a method of obtaining qualitative data on engagement, as well as a record from which to derive data on content covered.
7. To devise a method of tabulating content covered by pupils in respect of pages of texts read, pages of worksheets completed, and mathematics problems finished.
8. To devise a method of verifying the accuracy of observer assessments of pupil task difficulty.
9. To process a small quantity of collected data to ascertain possible methods of treating and processing data in the larger

study.

The pilot study generated valuable information in respect of all of its intended purposes. These were subsequently incorporated into various aspects of the study design.

Observer Training

Three weeks were spent by the researcher in April 1978 learning the observation protocols, procedures and categories of the BTES Time Coding System as described in the Field Test Manual and the Observers' Manual, developed by Marliave, Fisher, Filby and Dishaw (1977). Six complete school days were spent in the pilot study phase obtaining practical experience in the use of the observation system.

A decision was made to train a single second observer to establish reliability of observational data collected. It was considered to be less distracting to pupils and the teacher to have the researcher and one other observer present in the setting, than either having more than two observers at the one time, or increasing the pool of possible observers and rotating their presence in the classroom. Medley and Mitzel (1963) concluded from an experiment that having more than two observers present in a classroom simultaneously, added nothing to the reliability and was wasteful. More reliable results and a more economic distribution of resources occurred in the Medley and Mitzel experiment by increasing the number of occasions on which the second observer was present.

During September and October 1978 a second observer with extensive classroom teaching experience and competent in the use of classroom observation systems, was trained. The trainee observer was allowed two weeks to read the BTES Observers' Manual. Intensive discussion of the categories, protocols and procedures of the observation system, amounting to approximately 12 hours, occurred between the researcher and the trainee observer over a one week period. Familiarity in the use of the system in a classroom with assistance from the researcher, was undertaken in three two hour sessions in a school and classroom that were not the ones used in the study itself.

Interobserver Agreement in Training

Interobserver agreement, or the extent to which two independent observers show relatively high agreement over a number of occasions in scoring the behavior of a subject, is considered an acceptable measure of reliability (Kazdin, 1977; Wright, 1960). Frick and Semmel (1978) have argued that in order to minimize observers as the source of unreliability in observational data, it is necessary for the researcher to demonstrate that observers were adequately trained before data collection commences.

In the current study, interobserver agreement at the conclusion of training was measured for each of the seven categories of the instrument, and was found to exceed the criterion level of 80 per cent agreement eatablished at the commencement of training as being acceptable. This conforms with the level agreed upon (Kazdin, 1977; Romanczyk, Kent, Diament and O'Leary, 1973) as being satisfactory in research of this type.

The procedure for calculating interobserver agreement was based on the percentage agreement formula advanced by Holsti (1969), and used widely. The coefficient of reliability is expressed as:

$$CR = \frac{2M}{N_1+N_2}$$

where M is the number of coding decisions on which the two judges are in agreement, and N_1 and N_2 are the number of coding decisions made by the respective judges.

Results obtained at the conclusion of training are shown in Table 2. The following comments are relevant to these results. One 90 minute assessment was made at the conclusion of training because of scheduling difficulties between observers, and the availability of a suitable class activity at a time mutually convenient to both observers and the

Table 2

Percentage Interobserver Agreement at Conclusion of Training

Mathematics lesson: 90 minute observation

Coding Categories	Number of Decisions	Number of Agreements	Coefficient of Agreement
Content	113	113	1.00
Setting	104	104	1.00
Difficulty	100	90	.90
Learner Moves	101	91	.89
Instructor Moves	70	64	.91
Source of Instructor Moves	70	63	.90
Focus of Instructor Moves	69	65	.94

co-operating teacher. The results obtained, were nevertheless, considered acceptable.

Although interobserver agreement was calculated by comparing results in each of the 33 individual categories, the results are reported by groups of categories rather than individual categories, because of the non-occurrence of observed behavior in a number of categories. On other occasions where behavioral occurrences were low, spuriously high or low percentage agreements would have been reported if separate categories were the basis of reporting.

The unanimous agreement on General Content, Academic Content and Setting groupings, reflects the low inference nature of the decisions involved. Coder agreement in other categories, while not perfect, were acceptable and reflect the Medley and Norton (1971) observation that perfect observer agreement during actual data collection may not be particularly desirable. Medley and Norton argued that because actual teacher and pupil behavior do not always fit into the neatly pre-defined categories of observational systems, some degree of interobserver disagreement is probably more representative of the real world, than perfect congruence.

Phases in the Study

The design aspects of the study discussed in this chapter, and to be pursued in further detail in the subsequent chapter on the Collection of Data, may be briefly summarized by reference to the three operational phases of the research.

Preparatory Phase

1. Pilot study.
2. Observer training.
3. Selection of school, classroom and teacher.
4. Isolation of potential target pupils.
5. Familiarization with the teaching procedures, students and activities in the chosen classroom.

Classroom Observation Phase

1. Classroom observation using the BTES Coding System and procedures.
2. Gauging the meaningfulness of academic tasks according to Student Assessment of Task Difficulty.
3. Charting pupil on-going progress by means of Transcripts of Content Covered.
4. Anecdotal recording of events and activities not compatible with the BTES observation coding system.

De-briefing Phase

1. Teacher interview to obtain personal background details on target pupils.
2. Documentation from school records.

Chapter IV

COLLECTION AND ANALYSIS OF DATA

Overview

The primary concern of this chapter is with the various methods by which data were acquired and analyzed. Changes to the classroom observation instrument, observer location, time sampling, and the density and duration of observation are discussed. Procedures for estimating pupil engagement, the calculation of interobserver agreement, and the assessment of task difficulty are each considered. The methods for recording content covered and site field notes, are surveyed along with the methods of obtaining background data on the subjects. The chapter concludes with a consideration of the data processing and analysis techniques.

Preparation and Familiarization

Preparatory procedures consisting of the pilot study, observer training, selection of the school, classroom, teacher and pupils, have been discussed in the Design chapter. The other preparation procedure essential to the actual classroom observation, involved the researcher in becoming conversant with the teaching procedures and organizational classroom arrangements used by the co-operating teacher.

The researcher spent three days prior to the commencement of observation and coding, in learning the names of pupils in the class, ascertaining the scheduling arrangements, the timing of recess and lunch breaks, the timetabling arrangements, as well as becoming familiar with the curriculum materials used. It was necessary to attend to these matters in advance of observations in order to ensure high quality data, particularly in the early stages of collection. The second observer was briefed on these matters, and in addition visited the setting prior to the commencement of observation and coding. The sample of pupils from which the target pupils were chosen, was selected on the afternoon of the third day of familiarization.

A second reason for the pre-entry of observers into the classroom was to accustom pupils to the presence and movements of outside observers. It was hoped that familiarity would make the observers less obtrusive to the pupils and the teacher. As Tikunoff and Ward (1978) stated:

> Non-participant observers must be present in the setting for more than a single short-term observation if they are to become unobtrusive. If a research effort cannot extend over a minimum of several days, we suggest that the behaviors that are observed may not be natural. The individuals being observed most likely will be 'performing' for the observer (p. 9).

Opinions differ as to the impact of observers on pupil and teacher behavior. Medley and Mitzel (1963) have hypothesized that 10-12 days are necessary for habituation to observer presence. Mercatoris and Craighead (1974) have argued that even if habituation is a demonstrable phenomenon, and this has yet to be shown empirically, it would be uneconomic for most purposes to have observers present for that amount of time. Both Tikunoff and Ward (1978) and Scott (1977) in suggesting 2-3 and 3-4 prior visitations respectively, as being necessary to adjust students and teacher to observer presence, are more reasonable suggestions. Whatever the period of prior exposure before setting inhabitants adjust, there is a need to be aware that observation methods "intrude upon or restrict the potential for natural behavior to occur" (Tikunoff and Ward, 1978, p. 8).

Data Gathering on Classroom Behavior

After formal approval had been obtained from the Edmonton Public School Board and the principal of the school had granted his permission to proceed, the research occurred over seven complete continuous days in October 1978. Observations were of the on-going activities of the pupils in the class at the time. No modifications were required or appeared to have been made to the schedule or the classroom organization, to accommodate the observation. The possible target pupils isolated by the teacher for the research activity were not told that they were the object of special intensive observation. The researcher was introduced as "a teacher from Australia interested in looking at what happens in a Canadian classroom." Throughout the observation it was apparent that the pupils were satisfied with this explanation of observer presence. The teacher was told that the purpose of the study was to observe the various ways in which pupils used their time in reading and mathematics in the course of an ordinary school day. At the debriefing session, the teacher openly admitted to having "no idea who the real target pupils were."

Coded Classroom Observation

Coding was conducted by the researcher alone, except for segments at the beginning, middle and end of the collection phase, when a second trained observer was present to establish interobserver agreement.

As described earlier, the instrument or set of procedures used to record and categorize the behavior of subjects, was essentially the one developed, field tested and used extensively in the BTES by the Far West Laboratory. After exhaustive field testing of the procedures the mentors (Marliave, Filby, Fisher and

Dishaw, 1977) concluded that "based on interobserver reliability results . . . the time-based observation procedures worked well" (p. 23). A synoptic outline of the observational categories is contained in Appendix D.

Instrumentation Changes

One modification to the BTES Time Coding System, considered necessary in the present study, was the deletion of coding categories related to detailed substantive subject matter content in reading and methematics. In place of the eight reading and 11 mathematics sub-categories, the global academic content groupings of "reading" and "mathematics" were used instead. This alteration to the original instrument occurred for two reasons. Firstly, the researcher lacked expertise in the substantive and structural content of reading and mathematics. Secondly, the detailed content categories were irrelevant to the research problems in the study.

Observer Location

Observation commenced when the observer had placed himself in a position where the faces and the activities of all target pupils were visible. Although the Classroom Plan in Appendix C indicates the observer as being located towards the front and at the side of the room, this was not true for all occasions. The nature of the observation system required frequent observer movement to ascertain the nature of pupil interaction with curriculum materials, the level of task difficulty, and the extent of content covered. The designated observation position was therefore a convenient point to start from and return to. Observation of pupil behavior was generally conducted at a distance from the target pupils to avoid distractions and the likelihood of communication. For the assessment of task difficulty, checking on completion of Student Task Difficulty Assessments and content covered, it was necessary to be in close proximity to pupils.

Avoidance of Pupil Communication

A strict procedure of not communicating with pupils, either target or non-target, was followed by both the researcher and the second observer during observation and coding. This procedure was relaxed somewhat outside of the classroom. The pupils accepted that the researchers were present in the classroom with a task to do. Direct eye contact with pupils was avoided as much as possible. Once the moment to be coded had been observed, the observers' eyes reverted to the coding sheet or shifted elsewhere. Student curiosity was minimized by following the Marliave, Fisher, Filby and Dishaw (1977) suggestion of keeping the coding and content covered sheets from student view. The situation where target pupils were likely to become aware of observer interest in them, was avoided by ensuring that adequate attention was paid, and seen to be paid, to non-target pupils for such information as the number of problems or exercises set by the teacher or the nature of the curriculum material.

Time Sampling Procedure

The basic procedure was to sample the behavior of each target pupil in sequence for an instant (or "moment"), during a three minute observation cycle. Coding was facilitated by the observer taking a mental photograph (Marliave, Filby, Fisher and Dishaw, 1977) of the on-going behavior of the pupil, the teacher if appropriate, content and setting. After interpretation, this moment was coded on a single scan row of the coding sheet. Upon completion, the observer looked up and repeated the procedure for the second target pupil. The third and fourth targets were treated likewise. The maximum allowable time from the commencement of observation of the first pupil to the conclusion of observation of the fourth pupil, was 3 minutes.

Where the observation cycle was completed in less than 3 minutes, the remaining time was devoted to making field notes of the setting and charting pupil progress through teacher assigned work. On the other occasions where activity occurred with particular rapidity and complexity, and it became clear that the permissable 3 minutes would be exceeded, the scan row was omitted completely. The time at which the row was missed was noted on the sheet and a shorthand description of the moment made in the field notes for coding later. These occurrences were very infrequent and numbered only one or two occasions throughout the observation period.

The reduction in length of the observation cycle from a minimum of 3 minutes and a maximum of 6 minutes used in the BTES, to a fixed 3 minute cycle used here, warrants mention. This change was based partly on the reduction in the number of target students from six in the BTES to four in the present study. With the reduced number of reading and mathematics coding categories, and thus the complexity of the coding procedure, it was also considered feasible to reduce the length of the observation cycle. The reduced length of the observation cycle was accompanied by a reduction in sampling error, as discussed below.

The rationale behind the procedure of time sampling used in this study and the BTES, was expressed by Marliave, Fisher, Filby and Dishaw (1977) as "a practical necessity if accurate time-based data are to be obtained on a large number of complex variables"

(p. 8). The observation of a "moment" was used to describe, by coded means, the behavioral event occurring at that instant. For example, if the observer sampled a moment during which the pupil was occupied in reading aloud in a total class setting while the teacher listened, then the appropriate codes would be recorded. In the subsequent analysis of data, this sampled moment would be generalized to the population (or on-going behavioral event) from which it came. Since the length of an observational cycle had been arbitrarily fixed at 3 minutes, the population to which that moment would be generalized would be 3 minutes long. Sampling error clearly occurred using this procedure. In the above example, the oral target pupil reading activity occurring in front of the class, may not have persisted for the entire 3 minute period. Marliave, Fisher, Filby and Dishaw (1977) have noted that, "such errors will cancel out when a very large number of moments are sampled and averaged together" (p. B-6). For there to be a sufficiently large population of events to make this a defensible technique, it was considered necessary in BTES research to sum sampled events over complete school days, and a number of these.

Methodological research on time sampling by Powell, Martindale and Kulp (1975) found, as might be expected, that the longer the time sampling interval or observation cycle, the less accurately the observed behavior approximated that obtainable using a continuous recording system. Powell et al. (1975) also found that in time sampling of 2 minutes or less, behavior closely approximated that obtainable using continuous measurement, with the largest error being at the 2 minute level, with an 8 per cent sampling error. As the observation cycle was increased from 2 to 4 minutes, the average sampling error increased to 15 per cent with a range of between 5 and 34 per cent. With a sampling interval of 6 minutes the average error was 12 per cent with a range of between 1 and 27 per cent, but at 10 minutes the discrepancy was as large as 74 per cent. In the light of these findings it was decided in the present study, to use a 3 minute sampling cycle, with the expectation of a likely sampling error of 10 per cent, which is considered acceptable.

Density and Duration of Observation

The related issues of density and duration of observation require mention. As to what constituted a desirable or reasonable period of observation, few helpful guidelines could be obtained from the research literature on instructional time in teaching. Harnischfeger and Wiley (1975) commented that, "The strategy we suggest is one of dense observation over a relatively short period of time" (p. 23). Marliave, Fisher, Filby and Dishaw (1977) reported similarly that:

> Data collection with time coding procedures should sample as much classroom instruction as possible. It was concluded that observation should cover entire school days and as many as possible (p. 7).

Data collection in the present study was dense in that pupil pursuits were observed over complete uninterrupted school days.

An equally important question, according to Filby and Cahen (1977), is whether sufficient days have been sampled to obtain a stable estimate of the phenomenon. Only by sampling an adequate number of days would it be possible to observe the variability noted by Filby, Marliave and Fisher (1977) from day-to-day in the amount of time spent by pupils engaged in reading and mathematics at various levels of difficulty. On the issue of duration of observation there appeared to be some variation in previous studies in the length of observation periods.

Filby, Marliave and Fisher's (1977) study of reading and mathematics instruction in six grade 2 classes, reported observing individual classrooms for 6 or 7 days during a 6 week period. Filby and Cahen (1977) reported a total classroom observation time in a study of second grade reading and fifth grade mathematics, of 5 days during a 6 week period. Tikunoff and Ward's (1976) ethnographic study of four students, involved 4 days of continuous observation. A further

Far West Laboratory study (BTES Report, Dec. 1977) of fifth grade reading, involved classroom observation for one day to check on teacher ability to estimate student engagement.

In view of the lack of clear guidelines from the extant research as to what constituted a reasonable observation period, the empirical findings of Forness and Guthrie (1977) were taken as a guide. The Forness and Guthrie (1977) study of a classroom undertaken early in the school year, was designed to answer the question: "How many successive days of classroom observation are necessary in order to obtain a reliable sample of behavior?" After conducting observations for 15 days and recording pupil behavior, the study concluded that four consecutive days generated data as stable as that collected over 15 days. For the present study, however, Forness and Guthrie's (1977) statement that, "In studies where inter-pupil differences are to be analyzed, a somewhat longer series of 6 or 7 days . . . may be indicated . . " (p. 120), was most apposite. Accordingly, classroom observation was conducted in this study for seven continuous days.

Estimating Pupil Engagement

Evidence cited in Chapter II concerning the consistent relationship between pupil engagement and achievement, underscores the need to persevere with the observational study of pupil attention and related variables, despite criticism from some quarters concerning methodological difficulties (Hudgins, 1968; Taylor, 1968; Brophy and Evertson, 1976).

The problem of determining whether an apparently attentive student in the covert activity of listening to the teacher lecturing to the class, is <u>in fact</u> paying attention and learning, may not be such a critical issue. With passive pupil activity of this kind accounting for as little as 30 per cent or less of pupil time at the upper elementary level (McDonald, 1975; Good and Beckerman, 1978), and with individual seatwork of the applied type amounting to over 70 per cent of pupil time, the increased proportion of overt written and oral responses of pupils makes the task of ascertaining engagement much less difficult than in many earlier studies. Good and Beckerman (1978) noted that it is easier to classify pupil involvement during assigned seatwork than when the teacher is talking or working with the whole class.

Classroom researchers have used a variety of indicators to gauge pupil attentiveness. Morrison, for example, (1926) relied on pupil eye contact, while on other occasions body position was taken as a useful index of pupil attention. Hall, Huppertz and Levi (1977) used the assigned activity of the teacher as the reference point for determining attentiveness. They indicated five categories of attending behavior:

1. looking at the teacher while the teacher is addressing the class,
2. actively attending to an assigned task (reading, working on a notebook),
3. working at the blackboard,
4. working on supplementary materials,
5. helping another student with assigned materials.

Thirteen non-attending behaviors are also listed:

1. blank stare when a presentation is being made to the class (teacher is talking or television is on),
2. blank stare when nothing is being presented to the class,
3. attending to a classroom disturbance,
4. attending to a non-assigned task (looking at the clock or calendar),
5. sitting quietly after assigned task completion,
6. ignoring individual teacher instruction (teacher is talking to individual being observed),
7. working on non-assigned materials,
8. exhibiting finicky mannerisms indicating boredom (yawning, scratching, etc),
9. going to the bathroom or leaving the room,
10. talking with another student about an unassigned task (talking about the teacher, another student, etc.).
11. physically interacting with other children (fighting, swearing, passing notes),

12. exhibiting miscellaneous non-attending behaviors not otherwise covered,
13. hand raising while waiting to be called on (p. 116).

Good and Beckerman (1978) used Kounin's (1970) codes of pupil involvement. "Definitely involved" was used when there was clear evidence that the pupil was engaged on an assigned task; the pupil was writing or had his book in a position consistent with a reading activity. The "definitely not involved" category was used where there was some behavioral indicator to suggest that the pupil was not attending; the pupil was carving on the desk, or looking out of the window. The "can't tell" category, which occupied on average 7 per cent of pupil time, was used where there was no behavioral evidence at all upon which to make a judgment. A "misbehavior" category was used where the pupil's inattention was social in nature and distracting to other class members.

A survey of the reported literature produced the set of attending and non-attending pupil behaviors shown in Tables 3 and 4. Although there is no shortage of studies which have focused on these aspects of pupil behavior, there is a disappointing absence of explicit criteria used in many of the reported studies. Only those studies which actually gave clear indications of criteria used, are included in the tabulation.

In estimating pupil on-task engagement in

Table 3

Attending Behaviors

	Morrison (1926)	Washburne et al. (1926)	Olson (1931)	Moorch (1956)	Lahaderne (1968)	Cobb (1972)	Samuels & Turnure (1974)	Hall et al. (1977)	Marliave et al. (1977)	Good & Beckerman (1978)	Arlin & Roth (1978)
Eyes											
- teacher	X	X				X	X	X	X		
- book	X	X			X		X	X	X		X
- reciting student	X					X			X		
- blackboard	X						X	X	X		
Assigned reading/writing											
- psycially writing					X	X		X	X	X	
- position of book					X	X		X		X	
Question and response											
- raised hand						X					
- oral communication						X			X		
Following directives											
- selecting materials							X				X
- handing in materials							X				
- distributing materials							X				

Table 4

Non Attending Behavior

	Morrison (1926)	Washburne et al. (1926)	Olson (1931)	Moorch (1956)	Lahaderne (1968)	Cobb (1972)	Samuels & Turnure (1974)	Hall et al. (1977)	Marliave et al. (1977)	Good & Beckerman (1978)	Arlin & Roth (1978)
Body position											
- slumping	X			X							
Body movement or play											
- scratching						X	X				
- yawning							X				
- clothing or hair play						X	X				
Eyes											
- looking around	X			X		X		X	X	X	X
- closed							X				X
- blank stare	X					X		X	X		X
Non assigned activities											
- shuffling pages							X		X		
- aimless drawing							X	X	X		
- object play						X	X	X		X	
- student play						X		X			
- eating											
Walking and absences											
- aimless walking								X	X		
- going to bathroom								X	X		
Distraction behavior											
- whispering			X	X				X	X	X	
- talk to neighbor								X	X	X	
- fighting								X	X	X	
- passing notes								X	X	X	

reading and mathematics, a number of guiding criteria were outlined by Marliave, Fisher and Filby (1977):

> Engagement was judged by the observer with the aid of several guidelines. When students were working on tasks which required an overt response, engagement was relatively easy to judge. When students were working on tasks which did not involve overt responses, the situation was somewhat more difficult. In the latter cases, observers used student eye contact and body position as indicators of engagement. If a student was in a discussion group, watching the various speakers in turn and apparently following the discussion then the time was considered engaged time. If the student was discussing an unrelated topic with other students, or was clearly not attending to the task, then the time was considered unengaged time. This distinction was fairly crude; students were considered unengaged only when the situation was unambiguous (p. 23).

Many of the above criteria were incorporated into the BTES observation and coding system used in the current study. One important addition in the BTES system not used in most previous work, was that pupil engagement was determined using pupil activity in reading and mathematics as the exclusive point of reference. For example, where the teacher had assigned a mathematics activity and the pupil was engaged in a drawing activity, the pupil was coded as not engaged. On another occasion, where the pupil pursued a reading activity during an assigned mathematics task, the student would be coded as engaged in reading even though this was in direct violation of the set mathematics learning task. The system was predicated on the basis of the dual primacy of reading and mathematics, even when pupil pursuit of one appeared to be at the apparent expense of the other. In the words of the designers of the system, "engagement in reading or mathematics takes priority over non-engagement in reading or mathematics" (Marliave, Fisher, Filby and Dishaw, 1977, p. B-39). That is to say, while the student may suffer by not engaging in the assigned mathematics task, he is presumed to be benefiting from the self-assigned reading activity he has chosen to adopt in its place. Engagement and non-engagement outside of reading and mathematics, were of no concern in this observation system.

Engaged learner behavior in the current study was classified into four categories (Marliave, Fisher, Filby and Dishaw, 1977). In order of their nearness to substantive reading or mathematics content, the categories were:

1. <u>Engaged - written</u>: any non-oral student response that allows the observer to determine engagement and difficulty directly.

   Examples:

   (a) working mathematical problems
   (b) written responses to a reading passage.

2. <u>Engaged - oral</u>: any oral student response that allows the observer to determine engagement and difficulty directly.

   Examples:

   (a) student asks a question

(b) student gives an answer
(c) student oral reading.

3. Engaged - covert: when the student is engaged but is not showing an observable response that allows the observer to determine both engagement and difficulty directly.

Examples:

(a) listening to a teacher explanation
(b) silently reading or thinking about a problem.

4. Engaged - directions: when the student is listening or carrying out directions that do not involve the academic substance of the task itself.

Examples:

(a) what do I do next? questions
(b) reading instructions
(c) listening to teacher giving directions.

This particular pupil activity is between engagement on substantive content and lack of engagement on that content.

There were three categories of pupil non-engagement. Using substantive academic content in reading and mathematics as the reference point, these categories were as follows:

1. Non Engaged - interim: student activities that are part of a reading or mathematics task, but do not involve the substantive content or directions of the task.

Examples:

(a) sharpening a pencil
(b) handing in and passing out papers
(c) getting books
(d) opening text book to correct page
(e) colouring part of a math exercise.

2. Not Engaged - waiting: student is not engaged in reading or mathematics because he/she is waiting for the teacher or another student.

   Examples:

   (a) waiting in the desk for the teacher
   (b) walking to or from the teacher's desk
   (c) waiting for the teacher to return from a work group
   (d) waiting for the teacher to pass out paper
   (e) waiting while the teacher disciplines another student.

3. Not Engaged - off task: where the student is not involved in a reading or mathematics task in any way, not even in a peripheral task.

   Examples:

   (a) talks to a neighbor
   (b) day dreams
   (c) behaves disruptively
   (d) aimlessly shuffles pages
   (e) goes to bathroom or to get drink.

Whether the pupil was engaged or not, was determined strictly according to the observed behavior of the target pupil at the moment of sampling. The actual categorizing of the moment into one of the four engaged or three not engaged categories, was determined somewhat more liberally by reference to the on-going activity at the sampled moment. Marliave, Fisher, Filby and Dishaw (1977) illustrated the importance of this point in an example:

> A student who is engaged in a written task may, at the moment sampled, pause to think, read a question, erase a mistake, or turn to the next page of problems. Engaged - written would be coded in each case, because written

> answers are the on-going response mode of the task that allows the observer to determine engagement and task difficulty (p. B-62).

Interobserver Agreement

There are a number of possible sources of variability associated with observational research. According to McGaw, Wardrop and Bunda (1972):

> Unreliability can arise when two measures of the same object (person, classroom) tend to differ too much either because the behaviors being observed are too varible or because independent observers cannot agree on what is happening (p. 14).

Weick (1968) claimed that the most common method of ascertaining the extent of the latter was to estimate interobserver agreement. Frick and Semmel (1978) indicated an accepted mode of attending to this when they stated:

> Observer agreement is typically calculated by comparing the observational records of two or more observers with each other or with a criterion when coding the same classroom events at the same time (p. 161).

In the present study, a second observer trained in the use of the protocols and procedures of the observation system and who had been briefed on and visited the setting, made independent observations on three separate occasions. These observations were conducted at the beginning, the middle and the end of the entire observation phase, respectively. Each visit of the second observer was designed to coincide with a peak period of observable data in the morning.

Despite the daily repetition of the class schedule, visits were arranged so that quite distinct and different sets of activities were observed and coded. On the first occasion of 112 minutes a mathematics lesson was observed. On the second occasion of 92 minutes, an oral reading lesson was in progress. In the third interobserver session of 90 minutes, mathematics, spelling and a creative writing exercise were observed. The observation and coding procedures employed by the independent observer were those outlined at the commencement of this chapter.

Interobserver agreements reported in Table 5 were calculated on the basis of the percentage agreement of decisions made by the two observers. Given the complexity of the behavior being analyzed and coded, the results were considered highly satisfactory. One contributing factor was the facility with which the second observer learned the system, due in large to her considerable previous experience in classroom observation in clinical supervision settings. A second contributant was the exhaustive and detailed protocols and procedures of the Field Manual and the Observers' Manual prepared by the Far West Laboratory for Educational Research and Development.

Assessment of Task Difficulty

Three separate methods were used in an attempt

Table 5

Interobserver Agreement

	17.10.78 (112 minutes)			19.10.78 (92 minutes)			24.10.78 (90 minutes)		
	Mathematics			Oral Reading			Mathematics, Spelling, Creative Writing		
	Number of decisions	Number of agreements	Coefficient of agreement	Number of decisions	Number of agreements	Coefficient of agreement	Number of decisions	Number of agreements	Coefficient of agreement
Content	137	137	1.00	114	114	1.00	132	130	.98
Setting	91	87	.95	84	80	.95	102	100	.98
Difficulty	90	68	.75	82	65	.79	60	40	.66
Learner Moves	91	90	.98	84	84	1.00	102	95	.93
Instructor Moves	54	53	.98	61	61	1.00	25	24	.99
Source of Instructor Moves	54	49	.87	61	59	.96	24	23	.96
Focus of Instructor Moves	54	53	.98	61	61	1.00	22	21	.95

to obtain an accurate indication of pupil difficulty of learning tasks. Each method was quite different and provided a useful method of establishing validity in this aspect of the research.

The first method was incorporated as an integral component of the observation and coding system used. The observer assessed the difficulty for each target pupil on a set of tasks, based on pupil oral and written responses. This was done in the on-going setting of classroom activities. Of necessity, observer decisions were sometimes hasty because of the complexity of simultaneous events occurring at the time. When no overt response was available, the observer made an estimate of the difficulty level. The guiding criteria for this observational mode of assessing pupil task difficulty, were those expressed by Marliave, Fish[illegible], Filby and Dishaw (1977), as follows:

> Easy represents work on existing knowledge or skills of the student.
>
> Medium difficulty is the middle range between easy and hard, representing those activities that are generally challenging for a target student, involving some unacquired and some existing knowledge or skills of the student.
>
> Hard is a category consisting of tasks that the target student cannot perform beyond a chance level of correct responses (p. B-51).

The second method was quite different in nature. It required the pupils to indicate their assessment of the difficulty of tasks completed. Teacher agreement and co-operation to proceed with this alternate assessment of task difficulty was obtained prior to the commencement of the study. As part of the preparation and familiarization phase, the researcher discussed with the class and the teacher, the procedures for completing the Student Assessment of Task Difficulty Questionnaire (Appendix B).

All students in the class were distributed a questionnaire and allocated an identification number, which was to be their identifier on their actual questionnaire. This was designed to preserve anonymity of class members in the hope of obtaining more honest responses. Although the researcher was only interested in data from the four target pupils, it was necessary to conduct the exercise for the whole class in order to preserve the disguise of the targets.

Actual completion of the questionnaire involved the researcher cueing the teacher by means of a verbal reminder at points in the lesson as pupils completed assigned reading and mathematics tasks. It was important that this assessment be completed before students were provided with any written or oral feedback as to the correctness of their answers. Upon direction from the teacher, the pupils placed a single check mark against the appropriate box labelled "easy," "medium," or "hard." This involved pupils in thinking retrospectively about the level of difficulty of the set of tasks just completed. The activity occupied only a few seconds of the pupil's time, generally occurred during transitions, and seemed to cause little interruption to the on-going activities of the class. Close attention was paid by the researcher to ensuring that targets, in particular, filled out their responses. Sometimes prompting was necessary. Non-targets were also reminded, on occasions, to preserve the anonymity of target pupils. The researcher keyed the Task Difficulty Activity numbers on the questionnaire into the coded events as recorded on the observation sheets. This was to facilitate later comparisons of the two sets of data.

The third method was a post factum attempt to calculate pupil success rate on assigned tasks. It involved recourse to all target pupil written material during the observation period. Identifying descriptive notations relating to source and nature of material worked upon, number of pages or problems set by the teacher, as well as starting and finishing times, were noted on the Content Covered Transcript Sheets (Appendix E). These were used for later retrieval of the actual written work undertaken during the 7 day observation of target pupils. Copies were taken for further analysis (Appendix I).

Recording Content Covered

In the pilot study the physical arrangement of the room and the smallness of the class made it possible to use a model M30 Letrosonic Wireless Microphone and Voice Projector with a portable tape recorder, for verbally recording target pupil content covered and anecdotal field notes. These were transcribed onto transcript sheets at the end of each day.

A trial of this procedure during the familiarization phase of the study proper, revealed this technique to be impracticable. The noise level of the 33 pupils in the class, the background sound generated by the lighting and air conditioning systems, precluded the researcher from obtaining an audible recording of his own comments. In addition, the crowded nature of the classroom meant that the observer was at no stage more than 3 feet away from any one student. The likelihood of attracting student attention while making verbal notes was considerably enhanced with such close physical proximity to students. Given this set of circumstances, content covered and the start and finish times for target pupils, were noted directly onto the Content Covered Transcript Sheets during observation. Where it was not possible to ascertain number of problems or questions actually completed by a target pupil, identifying notes were made and the missing material retrieved from pupil workbooks at a later stage.

Site Field Notes

Extensive written field notes on aspects of pupil behavior, teacher activities and ecological factors in the setting, were made in the space available at the top, bottom and side of the coding sheet. Notes were made during the coding process where it was felt that a description of classroom and target pupil activity would provide a valuable interpretative supplement to the coded data. The act of making field notes proved helpful to the actual coding itself. Having made a brief written note, the researcher found it much easier to code the moment, immediately afterwards. Field notes were made at points during the observation cycle, other than at sampled moments. On occasions, this was on a minute-by-minute basis. The Specimen Records (Appendix G) generated as a consequence of these field notes was considered to have added to the completeness of the data collected for later analysis.

Personal Data on the Subjects and the Situation

The intensive observation already described in this chapter, resulted in the generation of a considerable amount of data about the interactive work habits of target pupils. Throughout this phase of the study the teacher was unaware of which pupils were being observed, and the observer was unaware of any background information relating to pupil ability and achievement levels. During the de-briefing phase which followed completion of observation, these mutual disclosures were made and background information obtained on each target pupil.

Interview with the Teacher

The informal follow-up interview with the teacher was designed to obtain background information on target pupils, helpful to the development of a more complete profile on each pupil. The nature of the questions asked, is indicated in the Target Pupil Personal Data Interview Schedule (Appendix H). On occasions it was necessary to consult with other teachers and the principal of the school to obtain complete data.

Examination of School Records

School records were examined to obtain information on pupil ability and achievement. A perusal was made of the limited norm-referenced test results available, together with the criterion-referenced test results of the teacher. Written comments on target pupils were noted wherever appropriate.

Data Processing and Analysis

Because of the descriptive nature of the study and the small number of pupils, the use of inferential statistical procedures was considered inappropriate. Instead, statistics have been used in the study to describe and summarize various sets of data. The treatment of both quantitative and qualitative data are described in this section.

Coded Observational Data

Time Coding Sheets were first "cleaned" to reveal inconsistencies in coding procedures. Coded data were then punch-carded and processed with the aid of a specially prepared computer program, to provide frequency summations and cross-tabulations of coded pupil and teacher behavior, as well as content and setting categories.

Task Meaningfulness

Individual pupil assessments of task difficulty, which had been keyed by number to coded observational data, were analyzed to determine the extent of correspondence with observer ratings of task difficulty. Results of these analyses were expressed in the form of a Coefficient of Agreement between Observer and Pupil Assessment of Task Difficulty, a Coefficient of Agreement between Observer Assessment of Task Difficulty and Actual Success Rate, and a Coefficient of Agreement between Pupil Assessment of Task Difficulty and Actual Success Rate. Each of these indices, to be discussed in further detail in the next chapter, were used in interpreting the significance of measured pupil engaged time in reading and mathematics content.

Content Covered

When considered in conjunction with time expended and the difficulty levels of learning tasks, content covered appeared as a useful indicator of on-going learning experiences. Transcripts of maximum content set by the teacher, amount of work actually attempted and elapsed time, were used to compile tabular data for use in the interpretation of coded observations.

Field Notes, Interviews and School Records

Observational records of target pupil behavior obtained during observation, but which were not amenable to incorporation into coded form, were transcribed into a running narrative format. The specimen records obtained in this manner, although not as exhaustive as those of Barker and Wright (1955), Gump (1969) or Grannis (1978), nevertheless fulfilled the important function of providing another form of data for the study.

Teacher interviews and information retrieved from school files relevant to target pupil ability and achievement, were added to the pool of data on the research subjects.

Summary

This chapter has provided a description of the methods by which data for analysis of the research questions were acquired and treated. The methods selected reflected the ecological perspective expressed by Kounin (1977) and the need for completeness of observational description.

Preparation procedures essential to the observational phase, were first discussed. The instrument used and alterations to the original were noted along with the precise methodology of utilization. Satisfactory interobserver agreement was reported for the coded observational data. The techniques for the collection of inter-related information bearing upon task difficulty and content covered, were considered together with the recording of site field notes, teacher interviews and the consultation of school records. The chapter concluded with an indication of the relevant analytical procedures.

CHAPTER V

PRESENTATION OF THE RESULTS

Overview

Considerable diversity was observed in the manner in which four grade 6 pupils used their learning time in reading and mathematics. In demonstrating the similarities and differences found in this descriptive quasi-clinical study, results will be presented separately for each pupil to provide detailed profiles, from which to make limited comparisons.

Biographical details and aspects of past academic achievement are considered as a prelude to the quantitative findings. The allocation of pupil time across a range of academic and non-academic pursuits is presented, prior to a discussion of the use of segments of that time in written, oral and covert activity. The coverage of academic content is considered separately, and in the contexts of task difficulty and pupil engagement. Discussion of each pupil concludes with attention to the incidence of instructor behavior, and a profile of work habits during academic content. The chapter terminates by describing the ecological variables resident in the setting.

Target pupils are fictitiously known as Wayne, Kathy, Robert and Kevin. The more extensive discussion of some procedural aspects of the data analysis of the first pupil, has been undertaken to avoid unnecessary repetition with subsequent pupils, while at the same time facilitating more meaningful discussion of procedures by embedding them in the data.

Wayne

Biographical Description

Wayne is the younger of two children. His older brother attends junior high school. Wayne's father is a tradesman who spends a large amount of time away from home working on projects in the oil-sands regions of northern Alberta. His mother is employed as a sales assistant.

At the time of the study Wayne was aged 11 years 7 months. All Wayne's schooling has been at his present school. School records and interviews with Wayne's teachers revealed a history of school-related difficulties.

Five months after commencing school, Wayne was administered the Stanford Binet Achievement Test, Form L-M, and it was found that "he functions in the average range of intellectual ability." However, a note attached to the report of that test by the school counsellor indicated that, "because of Wayne's difficulty in the area of visual-motor control and in short-term auditory memory, Wayne may experience some difficulty in grade 1." One month later, a report by the class teacher to the school counsellor indicated that, "Wayne has difficulty in keeping up with the average group and has difficulty meeting classroom behavior standards."

In the winter of his third year of schooling, Wayne was referred by the school counsellor for testing by a Reading Project Specialist. The conclusion reached on that occasion was that, "Because of Wayne's great difficulty in focusing his attention on task, specific programming suggestions on tension reduction, muscular-perceptual inhibition and concentration training are being attached to this report." In the following year, Wayne was referred by the school counsellor to the Department of Clinical Services of the University of Alberta. No report was available as to the results of that encounter.

According to Wayne's grade 5 teacher a system was used with him last year, whereby his school day was "blocked" into 15 minute segments and Wayne was given a sticker at the completion of satisfactory application during each segment. Accumulation of a mutually agreed number of stickers at the end of the week, earned Wayne a pre-determined reward from his parents. The teacher indicated that the system generally worked well. This system was not operating this year for Wayne.

School records of administered Stanford Achievement Tests during the past three years, based on standardized Edmonton norms, indicated Wayne as performing between the first and the twentieth percentiles in "word meaning," "paragraph meaning" and "word study skills." Wayne's achievement test record in mathematics over the same period, placed him between the fifth and twelfth percentiles for Edmonton normed data. Wayne's class grades in language arts and mathematics were less than satisfactory on all recorded occasions.

According to the criteria generally used, Wayne could be classified as a low achieving student in the areas of reading and mathematics.

Allocation and Distribution of Academic Learning Time

Wayne was present and available for classroom instruction for a total of 2130 minutes during the 7 days he was observed. This exceeded the scheduled class time of 2065 minutes.

Table 6 reveals 19.1 per cent of Wayne's available class time as being concerned with matters of a general non-instructional nature, such as waiting for class activities to commence, changing

Table 6

Distribution of Learning Time as a Percentage of Available Class Time - Wayne

Activity	%
Wait	3.2
Transition	12.8
Management	3.1
Non-Academic Instruction	18.9
Other Academic Instruction	14.4
Reading	28.4
Mathematics	19.1
	99.9

from one activity to another, or being involved in class organization matters. A third of Wayne's class time was spent in activities which either had an instructional component of a non-academic type such as art, music or story time, or in activities which were instructional but did not have a reading or mathematics aspect, such as social studies and science. The remainder of Wayne's class time, which amounted to 47.5 per cent of the total, was allocated to various forms of reading and mathematics activities. Wayne's total available learning time assigned to reading and mathematics amounted to 606 minutes in reading and 408 minutes in mathematics, over the period he was observed.

Daily variations in Wayne's time allocated to reading and mathematics varied from a minimum of 48 minutes to a maximum of 159 minutes of reading, with a minimum of 42 minutes and a maximum of 72 minutes in mathematics. His average daily exposure to reading and mathematics activities regardless of how they were actually labelled, was 86 minutes for reading and 58 minutes for mathematics.

All other contingencies aside, Wayne could be expected to be exposed to, but not necessarily occupied in, a maximum of 258 hours of reading and 174 hours of mathematics in an average school year of 180 days.

Use of Academic Learning Time

Written, Oral and Covert Activity. Wayne showed a greater tendency to be involved in a reading activity when it was in association with some form of written activity. An analysis of the upper segment of Table 7 indicates that during observations Wayne was engaged for an average of 15 minutes a day in written reading, and for an average of 13 minutes a day following the oral reading of another student, silently reading by himself or listening to some reading-related explanation.

In summary, almost half of Wayne's engaged reading time was accumulated in combination with a written task, and only one third of his reading time was of the passive covert variety. Oral reading constituted a relatively minor aspect of Wayne's total reading involvement. Engaged-Direct, or listening to and executing the teacher's instructions during reading, occupied a significant part of his time.

A similar tendency is apparent in Wayne's engaged activity in mathematics. Table 7 shows half of Wayne's occupied time in mathematics to have been written-related. This observation becomes more significant when it is considered that the predominance of Engaged-Direct activity for Wayne, and for the entire class, consisted of transcription of problems dictated

Table 7

Written, Oral and Covert Activity in Minutes and as a Percentage of Engaged and Available Time in Reading and Mathematics - Wayne

	Reading		Mathematics	
	Minutes	%	Minutes	%
	Engaged Time			
Engaged Written	105	44.8	138	49.5
Engaged Oral	9	3.8	12	4.3
Engaged Covert	93	39.7	66	23.6
Engaged Direct	27	11.6	63	22.6
	234	99.9	279	100.0
	Available Time			
Engaged Written		17.3		33.8
Engaged Oral		1.5		2.9
Engaged Covert		15.3		16.2
Engaged Direct		4.5		15.4
		38.6		68.3

by the teacher. Almost three quarters of Wayne's on-task activity in mathematics was, therefore, associated with written activity. Less than one quarter of Wayne's actively used time in mathematics was devoted to the covert activity of listening to the teacher or other pupils in discussion, or to his thinking about some mathematics task.

It should be emphasized, that the percentages in the top part of Table 7 represent the relative distribution of Wayne's efforts during the time he was in fact engaged. Expressed as a function of the available time in reading and mathematics, the percentages are considerably lower. The lower section of Table 7 shows that when allocated or available reading and mathematics time over the observation period is used as the basis for comparison, then low engagement rates are apparent in all categories, with the possible exception of engaged written activity in mathematics.

Caution should be exercised in interpreting data from the entire observation period, as Tables 8 and 9 indicate. Considerable variability existed from day-to-day, both in Wayne's number of actual engaged minutes for each type of coded activity, as well as for each category expressed as a percentage of engaged time. In reading, in particular, the recorded variations may be as much a reflection of the different nature of

Table 8

Written, Oral and Covert Activity in Reading in Engaged Minutes and as a Percentage of Daily Engaged Reading Time - Wayne

Activity	16.10.78		17.10.78		18.10.78		19.10.78		20.10.78		23.10.78		24.10.78	
	mins.	%	mins.	%	mins.	%	mins.	%	mins.	%	mins.	%	mins.	%
Engaged Written	30	71.4	3	16.7	6	40.0	21	36.8	15	38.4	15	83.4	15	33.3
Engaged Oral	-		-		-		3	5.3	-		-		6	13.3
Engaged Covert	12	28.6	6	33.3	9	60.0	24	42.1	18	46.2	3	16.6	21	46.7
Engaged Direct	-		9	50.0	-		9	15.8	6	15.4	-		3	6.7
	42	100.0	18	100.0	15	100.0	57	100.0	39	100.0	18	100.0	45	100.0

Table 9

Written, Oral and Covert Activity in Mathematics in Engaged Minutes and as a Percentage of Daily Engaged Mathematics Time - Wayne

	16.10.78		17.10.78		18.10.78		19.10.78		20.10.78		23.10.78		24.10.78	
Activity	mins.	%	mins.	%	mins.	%	mins.	%	mins.	%	mins.	%	mins.	%
Engaged Written	33	57.9	21	36.8	27	56.2	6	25.0	24	61.5	18	46.1	9	60.0
Engaged Oral	3	5.3	-		3	6.3	3	12.5	3	7.7	-		-	
Engaged Covert	12	21.0	24	42.2	3	6.3	9	37.5	3	7.7	12	30.8	3	20.0
Engaged Direct	9	15.8	12	21.0	15	31.2	6	25.0	9	23.1	9	23.1	3	20.0
	57	100.0	57	100.0	48	100.0	24	100.0	39	100.0	39	100.0	15	100.0

activities from one day to the next, as they are an indication of Wayne's perseverance with reading tasks. Likewise, the less marked day-to-day variation in the distribution of Wayne's engagement in mathematics, may reflect more about the uniform teaching method used, than about any enduring quality of Wayne. More meaningful discussions of this aspect will emerge as a consequence of later analyses of disaggregated data.

Academic Content Covered. During observation, Wayne's opportunity to engage in reading activity amounted to 606 minutes. For 294 minutes, or almost half of this time, Wayne was expected to be interacting with materials, in which it was possible, for research purposes, to measure the amount of content actually covered by Wayne and his success with those activities. Table 10 shows these activities as ranging from dictated spelling, spelling remediation, copying words from the blackboard or textbook, silent reading and following oral reading, to word recognition and demonstrated capacity to use words in context, and creative writing exercises.

For analytical purposes, assigned content reported in Table 10, consisted of work actually set by the teacher, and excluded the category of free reading in which considerable pupil discretion existed as to the nature and extent of participation. The category

Table 10

Content Covered, Effort and Success in Reading Activities - Wayne

Activity	Content Assigned	Content Attempted	Unadjusted Index of Effort	Content Correctly Completed	Unadjusted Index of Success	Elapsed Time (minutes)
Dictated Spelling	77 words	77 words	1.0	11 words	.14	15
Spelling Remediation	48 words	8 words	.16	8 words	.16	54
Word Transcription	35 words	35 words	1.0	35 words	1.0	18
Silent Reading	36 pages	24 pages	.66	*	*	80
Creative Writing	10 lines	nil	.0	*	*	43
Word Recognition	32 words	16 words	.5	16 words	.5	50
Word Usage	51 words	5 words	.09	2 words	.04	34

*Impossible to assess

of content attempted, represented evidence of the pupil having pursued a task to its conclusion. This was measured mostly in written activity according to the number of lines or words recorded by the pupil. In silent and oral reading, pages observed to have been read, was the unit of measurement.

An indicator of Wayne's investment of effort in reading activities was obtained by expressing reading content attempted as a percentage of assigned reading content. Spuriously high or low indications of true effort may result from an index derived in this manner because of the failure to account for the aspect of reading task difficulty. Refinement of the index shall, however, be deferred until consideration of the element of task difficulty, in the next section. It should suffice to note at this stage, from Table 10, that Wayne's Unadjusted Index of Effort was highest in those reading activities in which there was a high degree of teacher or outside direction and control. Wayne's index was correspondingly lowest when he was left to his own devices in covering assigned work, such as in creative writing.

A similar procedure was used to obtain an indicator of pupil success on assigned reading content. A calculation was made of the percentage relationship between assigned reading content and reading content correctly completed, wherever an indicator of the latter was available. Although also unadjusted for task difficulty, Wayne's Unadjusted Index of Success in dictated spelling activity, in Table 10 represents such a marked variation from his other index that at least part of Wayne's apparent effort in this aspect of his reading, may have been more illusory than real.

Wayne's cumulative opportunity to learn during mathematics instruction amounted to a total of 408 minutes. Written computations accounted for three quarters, or 312 minutes of that available time. With the measurable content available from these activities, analyses similar to those already discussed for reading, were performed.

Wayne's progress through, and success with, assigned computation exercises is shown in Table 11. Most notable among the summary statistics generated from Table 11, and shown in Table 12, was Wayne's relatively low Unadjusted Index of Effort in mathematics of .53 and his Unadjusted Index of Success of .20 in mathematics. The 14.3 per cent of problems not transcribed by Wayne, and the further 11.7 per cent of problems incorrectly transcribed, are noteworthy statistics to reflect upon.

<u>Engagement, Difficulty and Academic Content.</u> During the 1014 minutes of reading and mathematics instruction available to him, Wayne was observed to be

Table 11

Daily Content Covered in Mathematics Computation - Wayne

Date	Maximum Number of Problems	Problems Attempted	Problems not Transcribed	Problems Incorrectly Transcribed	Problems Correctly Answered	Errors in Correction	Elapsed Transcription Time (min)	Elapsed Computation Time (min)	Elapsed Correction Time (min)
16.10.78	11	6	1	1	2	-	9	23	21
17.10.78	11	5	1	1	1	-	9	23	9
18.10.78	11	11	-	2	5	-	12	29	11
19.10.78	11	8	2	1	3	-	8	18	9
20.10.78	11	2	1	[illegible]	1	-	9	31	8
23.10.78	11	4	1	[illegible]	2	-	8	25	5
24.10.78	11	5	6	[illegible]	2	1	10	31	4
	77	41	11	9	16	1	65	180	67

Table 12

Summary of Content Covered in Mathematics Computation - Wayne

Category	Statistic
Problems Attempted	53.2%
Problems Not Transcribed	14.3%
Problems Incorrectly Transcribed	11.7%
Problems Correctly Answered	20.1%
Errors in Correction	1.3%
Average Transcription Time per Problem	.8 min.
Average Computation Time per Problem	2.3 min.
Average Correction Time per Problem	.8 min.
Unadjusted Index of Effort in Mathematics Computation	.53
Unadjusted Index of Success in Mathematics Computation	.20

on-task for 513 minutes. Over 7 days this represented and engagement rate of 50.6 per cent of instructional time in reading and mathematics. Disaggregated according to content, this comprised 234 engaged minutes in reading and 279 engaged minutes in mathematics. As engagement rates, these represent 38.6 per cent in reading and 68.4 per cent in mathematics. On an average daily basis, Wayne was occupied during observation for 33 minutes in reading and 39 minutes in mathematics.

Table 13 shows that for more than three quarters of his allotted time in reading and mathematics, Wayne was involved with academic content considered by the observer to be of a medium or hard level of difficulty for him. Based on observer ratings of task difficulty, these statistics suggest that Wayne was exposed for less than one quarter of his available reading and mathematics time, to content that might be considered easy for him.

Table 14 shows the percentage of Wayne's time in reading and mathematics, spent in activities rated by the observer according to the categories of "easy" "medium" or "hard" for Wayne. In both the reading and mathematics content areas, the concentration for Wayne is clearly at the medium and hard end of the difficulty spectrum. Over the 7 days, therefore, Wayne was occupied for a total of 54 minutes in reading and 63 minutes in mathematics at the easy level of difficulty,

Table 13

Percentage of Allocated Time in Reading and Mathematics According to Level of Task Difficulty - Wayne

Observer Assessment of Difficulty	Minutes	%
Easy	238	23.5
Medium	401	39.6
Hard	375	36.9
	1014	100.0

Table 14

Minutes of Engaged Time and Percentage of Engaged Time in Reading and Mathematics According to Level of Task Difficulty - Wayne

Observer Assessment of Difficulty	Reading		Mathematics	
	Minutes	%	Minutes	%
Easy	54	23.0	63	22.6
Medium	120	51.3	99	35.5
Hard	60	25.6	117	41.9
	234	99.9	279	100.0

the level considered by Berliner (1978b), Marliave (1978) and Marliave, Fisher and Dishaw (1977) as being most conducive to learning. The value to Wayne of the 60 minutes he was engaged in reading and the 117 minutes he was engaged in mathematics at the hard level of difficulty, is open to conjecture.

To remove the exclusive reliance upon observer assessment of task difficulty, Table 15 presents the findings of two alternative methods. Twenty four of Wayne's reading and mathematics learning episodes were subjected to detailed analyses. The primary criteria determining the suitability of a learning episode was whether some form of measurable pupil output was available for analysis at the conclusion of the activity. Invariably this involved some form of written product, although in four episodes, limited analysis was performed without any written output. A measurable product was available for learning episodes associated with 49 per cent of Wayne's available reading time, and for 79 per cent of his mathematics time.

Student assessment of task difficulty as recorded in column (1) of Table 15, represented Wayne's retrospective opinion of the difficulty of each task, immediately it was completed and before any feedback was available indicating correctness of performance. This information was obtained as a result of Wayne

Table 15

Results of Comparative Methods of Assessing Pupil Task Difficulty in Reading and Mathematics - Wayne.

Task Description	Date	Student Assessment of Difficulty (1)	Observer Assessment of Difficulty (2)	Actual % Success on Written Pursuits (3)	Difficulty as Reflected by Success Rate (4)
Math Computation	16.10.78	M	M	18	H
Dictated Spelling	"	H	H	0	H
Library Skill Exercises	"	M	H	*	*
Math Computation	17.10.78	M	H	9	H
Word Recognition	"	E	E	100	E
Silent Reading (Test)	"	H	H	18	H
Silent Reading (Test)	"	H	H	46	H
Silent Reading (Test)	"	H	H	34	H
Math Computation	18.10.78	E	H	45	H
Word Usage	"	M	M	13	H
Silent Reading (Test)	"	E	H	50	H
Silent Reading (Test)	"	E	H	43	H
Silent Reading (Test)	"	M	H	25	H
Math Computation	19.10.78	E	M	27	H
Silent Reading	"	E	M	*	*
Math Computation	20.10.78	M	H	9	H
Dictated Spelling	"	H	H	32	H
Silent Reading	"	M	M	*	*
Creative Writing	"	M	H	0	H
Math Computation	23.10.78	M	H	18	H
Dictated Spelling	"	H	H	26	H
Math Computation	24.10.78	M	H	18	H
Dictated Spelling	"	M	H	0	H
Silent Reading	"	M	M	*	*

E = Easy M = Medium H = Hard * = No Assessment Possible

completing the Student Assessment of Task Difficulty Questionnaire, after selected activities.

Observer assessments of task difficulty recorded in column (2) were completed as part of the BTES observation system, and conformed with the guidelines and protocols established for use with that system.

Percentage success rates shown in column (3), were determined from Wayne's written responses to assigned reading and mathematics tasks. Samples of these artifacts, as they were collected at the conclusion of observation, are provided later, in Appendix I.

Column (4) was a derivative of column (3). Based on the literature surveyed in Chapter II relating to task difficulty, an arbitrary decision was made in this study that a success rate of more than 80 per cent would constitute work that was easy for a particular student, that a demonstrated success rate of between 51 and 80 per cent constituted medium difficulty, and a success rate of 50 per cent or less reflected work that was hard for that student. Using this arbitrary system of classification, percentage success rates were converted into nomenclature comparable with that used in student and observer assessment of task difficulty.

Table 16 shows the comparative reliability of the observer assessment of task difficulty versus student assessment of task difficulty, student

Table 16

Agreement Among Alternative Modes of Assessing Pupil Task Difficulty in Reading and Mathematics - Wayne

Modes	Number of Assessment Decisions	Number of Assessments in Agreement	Percentage Agreement
Observer v Student Assessment	24	12	50.0
Student Assessment v Success Rate	20	7	35.0
Observer Assessment v Success Rate	20	16	80.0

assessment versus actual success rate based on performance, and observer assessment as contrasted with actual success rate. The encouraging aspect emerging from these comparisons is the high relationship of 80 per cent agreement between observer assessment of task difficulty and the actual difficulty as reflected in the success rate for completed student work. The statistics derived in this manner might conveniently be referred to for later reference as the Coefficient of Agreement between Observer and Pupil Assessment of Task Difficulty, the Coefficient of Agreement between Pupil Assessment of Task Difficulty and Actual Success Rate, and the Coefficient of Agreement between Observer Assessment of Task Difficulty and Actual Success Rate. Using unity as the point of reference, these coefficients are respectively .50, .35 and .80. Noteworthy is the fact that the observer was a more accurate assessor of task difficulty, than was Wayne, in activities that involved written output.

Tables 17 and 18 show the considerable daily variability of percentage engagement on-task by Wayne in mathematics and selected reading activities. From these tables it becomes apparent that Wayne's attention to task falls noticeably as the degree of external structure and control associated with the task, diminishes.

Table 17

Percentage Engagement by Activity in Selected Reading Tasks - Wayne

Date	16.10.78	17.10.78	18.10.78	19.10.78	20.10.78	23.10.78	24.10.78
Spelling Dictation	100				100	100	100
Spelling Correction and Remediation	[illegible]				33	50	100
Free Reading		30			0, 50	0	0
Library Skills	[illegible]						
Instructions to Task		29			100		
Word Recognition		25		4			
Word Usage			64		0		
Silent Reading				65			
Word Transcription				47			
Creative Writing					0		24

Table 18

Percentage Engagement by Activity in Mathematics Tasks - Wayne

Date	16.10.78	17.10.78	18.10.78	19.10.78	20.10.78	23.10.78	24.10.78	Mean
Introduction to Task				86				86
Transcription	100	100	100	100	100	87	50	91
Computation	100	74	86	55	32	56	50	65
Correction	74	100	73	77	37	20	66	64
Whole-of-Class Lectures		71				34		53

Task Involvement According to Setting

In reading~~,~~ Wayne's time was distributed three quarters to self-paced or seatwork settings where Wayne had control over the rate at which he worked, and one quarter to group settings where the pace of instruction was set by the teacher or by the other members of the group. For mathematics, Wayne's time distribution according to setting, was approximately equal, between self-paced and other-paced settings.

Table 19 shows the distribution of Wayne's engaged and not engaged reading and mathematics time according to classroom setting. Further inspection of Table 19 reveals two thirds of Wayne's time in self-paced reading settings, to have been not engaged in task-relevant activity. In real terms this represents 50 per cent of Wayne's total available reading time, or 303 minutes, for which he was not engaged in self-directed reading activity. In terms of actual involvement, therefore, Wayne was observed to have been involved in self-paced reading for a total of 145 minutes, representing a daily average of 20 minutes.

For the content area of mathematics, Table 19 indicates two thirds of Wayne's time in self-paced activity to have been on-task. Wayne made use of 143 minutes of available mathematics instruction in settings where he controlled his own rate of work. This activity was almost exclusively written-related.

Table 19

Learner Behavior by Setting as a Percentage of Available Reading and Mathematics Time - Wayne

Learner Behavior	Reading	Mathematics
Other-Paced Settings (Group and Whole-of-Class)		
	%	%
Engaged Written	3.5	-
Engaged Oral	1.0	2.2
Engaged Covert	5.4	15.4
Engaged Direct	4.5	15.4
Not Engaged Interim	.5	1.5
Not Engaged Waiting	1.0	-
Not Engaged Off-Task	8.4	13.2
	24.3	47.7
Self-Paced Settings (Seatwork)		
Engaged Written	13.9	33.8
Engaged Oral	.5	.7
Engaged Covert	9.9	.7
Engaged Direct	-	-
Not Engaged Interim	2.5	-
Not Engaged Waiting	1.0	-
Not Engaged Off-Task	46.5	16.9
	74.3	52.1

A much lower total proportion of available reading and mathematics time was spent by Wayne in settings where others paced the rate at which he worked. Table 19 shows that of the time spent in other-paced reading activity, Wayne was engaged for 58 per cent of the time. This represents a reversal of the position for Wayne in self-paced reading. The provision of external structure and outside pacing, would seem to be associated with higher levels of reading engagement for Wayne.

Table 19 also shows Wayne to have been engaged for 70 per cent of the available time in other-paced mathematics settings. His total engaged minutes of other-paced mathematics, amounted to 134 minutes or a daily average of 19 minutes.

Teaching Behavior

Discussion in this section concentrates upon the nature and quantity of teaching behavior directed to the target pupil. It looks, first, at that behavior regardless of whether from the teacher, other pupils or the curriculum. The total and relative amounts of time spent by the pupil in other-paced and self-paced settings, are considered separately. Secondly, consideration is given to the focus of the teaching behavior and whether the pupil received the behavior as a discrete individual or as a member of a larger collectivity, such as a group or whole-of-class. Finally, in considering the source of instruction, recognition is given to the fact that the teacher may not be the only source of teaching behavior in the classroom.

Substantive teaching behavior focusing upon academic content in reading and mathematics regardless of actual source, was considered by Marliave, Fisher, Filby and Dishaw (1977) to consist of five discrete categories. "Explanation Needed" comprised those teaching behaviors initiated as a consequence of a spontaneous need expressed by a student; "Explanation Planned" consisted of instructional behavior predetermined without reference having been made to any directly expressed student need; "Academic Observation" involved the teacher or other instructional personnel in monitoring or observing student on-going progress; "Academic Question" focused upon propositions requiring some form of response either from students individually, or collectively; and "Academic Feedback" incorporated the use of a source to indicate to a student the correctness of his response to a question. The sequence of the latter three, whether in part or in total, were described by Filby and Cahen (1977) as consisting of "academic monitoring."

Two further interactive categories were used in the BTES research, which did not involve substantive teaching behavior. The first was termed "Structure Direct" and involved instructions or directions necessary to carry out the task. The second, was labelled "Task Engagement Feedback" and incorporated comments to students reflecting approval or disapproval with task-related behavior.

Table 20 provides a descriptive statistical summary of the teaching behaviors directed to Wayne from various sources during individual seatwork and whole-of-class activities in reading and mathematics. The statistics represent percentages of available student instructional time in reading and mathematics.

Wayne was observed to have been exposed to substantive content-oriented teaching behavior in other-paced reading settings for a 7 day total of 98 minutes. This substantive teaching behavior was divided one quarter to explanation of some kind, and three quarters to an aspect of academic monitoring, the sub-components of which were question, observation and feed-back directed toward the pupil. In percentage terms, the relative distributions are shown in the upper part of Table 20.

During Wayne's other-paced mathematics activities, the group of which he was a member was observed to have been the target of substantive teaching behavior for a total of 165 minutes. The relative proportions, as in other-paced reading, were one

Table 20

Teaching Behavior by Setting as a Percentage of Available Reading and Mathematics Time - Wayne

Teaching Behavior	Reading	Mathematics
Other-Paced Settings (Group and Whole-of-Class)		
	%	%
Explanation Needed	1.9	5.1
Explanation Planned	2.5	5.9
Academic Observation	-	1.5
Academic Question	3.9	18.4
Academic Feedback	7.9	9.6
Substantive Teaching	16.2	40.5
Structure Direct	6.9	2.9
Task Engagement Feedback	-	2.2
Total Interaction	23.1	45.6
No Teaching	1.2	2.1
	24.3	47.7
Self-Paced Settings (Seatwork)		
Explanation Needed	3.0	-
Explanation Planned	.5	-
Academic Observation	.5	1.5
Academic Question	-	-
Academic Feedback	2.0	.7
Substantive Teaching	6.0	2.2
Structure Direct	.5	.7
Task Engagement Feedback	3.0	.7
Total Interaction	9.5	3.6
No Teaching	64.8	48.5
	74.3	52.1

quarter devoted to explanation, and three quarters to academic monitoring of some type. As percentages, these are also contained in Table 20.

The high percentage of academic questions in other-paced mathematics, indicated in Table 20, reflects the predominant teaching mode used in this classroom. The teacher dictated questions, and the pupils transcribed them prior to actual computation. The procedure was explained as a means of facilitating enhanced pupil comprehension in decoding oral numerical statements.

The lower segment of Table 20 shows 64.8 per cent of Wayne's total reading time spent in the absence of any type of teaching behavior. For mathematics, the corresponding statistic was 48.5 per cent of the total time available to Wayne. For half of his time in reading and mathematics, therefore, Wayne was without any form of teaching interaction.

Worthy of comment is the percentage of Wayne's self-paced reading time spent by Wayne receiving teacher rebukes and exhortations to remain on-task. At 3 per cent, this category occupied as much of Wayne's time as any of the substantive content-related instructional behavior received by Wayne.

The research design requirement of providing an indication of the extent to which instruction was tailored to meet the needs of the individual student, was incorporated into the aspect concerned with the focus of teaching behavior. Marliave, Fisher, Filby and Dishaw (1977) argued that the student would be more likely to be attentive during that instruction specifically designed for him or her. Table 21 represents the results for Wayne.

Table 21 shows that Wayne spent approximately four times as much time during reading receiving teaching behaviors as a member of a group, than as an individual. In mathematics, the tendency was even more pronounced, with Wayne receiving ten times as much teaching behavior when as a group member than as an individual.

Although it is customary to conceive of teaching behavior as emanating from the teacher, Table 22 shows that other students and curriculum resources need also be considered. Less than ten per cent of teaching behavior originated from Wayne's classmates during reading and mathematics. Where instructional behavior originated from other students in reading, this was invariably in the form of oral reading, while in mathematics it was as academic feedback, in the form patterned responses to teacher requests for answers to computational exercises. Wayne spent more time in mathematics receiving teaching behaviors from the teacher, than was the circumstance in reading. One notable aspect of Table 22 is the insignificant amount

T[illegible]le 21

Group and Individual Focus of Teaching Behavior in Minutes and as a Percentage of Available Reading and Mathematics Time - Wayne

Direction of Teaching Focus	Reading		Mathematics	
	Minutes	%	Minutes	%
Individual Focus	42	6.9	18	4.4
Group Focus	156	25.7	177	43.4

Table 22

Source of Teaching Behavior in Minutes and as a Percentage of Available Reading and Mathematics Time - Wayne

Source of Teaching Behavior	Reading		Mathematics	
	Minutes	%	Minutes	%
Teacher	147	24.3	165	40.4
Other Students	45	7.4	30	7.4
Curriculum	6	1.0	-	-

of academic feedback provided by curriculum text material. Wayne's use of textbooks was restricted to checking on the accuracy of dictated spelling. No text was used at all in mathematics.

Pupil Profile and Work Habits During Academic Content

Using specimen records derived from extensive field notes, detailed segment profiles were devised for most reading and mathematics activities. The technique used was that devised by Morrison (1926). It involved a schematic portrayal of pupil movement into and out of task engagement, with brief anecdotal notes to assist in interpretation. For Wayne, 9 mathematics and 14 reading activities were analyzed in this fashion, a sample of which is presented in this section.

After observing Wayne for 40 hours of classroom activity, and accumulating considerable data, it became clear that the complexity of teaching and learning behavior is not at all conducive to simple representations.

Quantitative data presented so far in this chapter point to Wayne's incapacity to consistently sustain academic pursuits. Qualitative data for discrete segments of activity provide further substance to this claim and indicate possible associated factors.

Figures 1 through 5 provide evidence of learning segment profiles of content covered by Wayne during mathematics self-paced settings. Figures 2, 3, 4 and 5 display a marked similarity and were generally representative of Wayne in this kind of activity. During the computational phase of mathematics, an aspect with a high level of discretionary pupil participation, Wayne's engagement varied from 32 to 100 per cent, with emphasis at the lower levels of the range.

On the occasion represented by Figure 1, where Wayne was observed to have an engagement rate of 86 per cent during computation, he attempted all assigned problems with a success rate of 45 per cent. A higher success rate was marred by the incorrect transcription of two attempted problems.

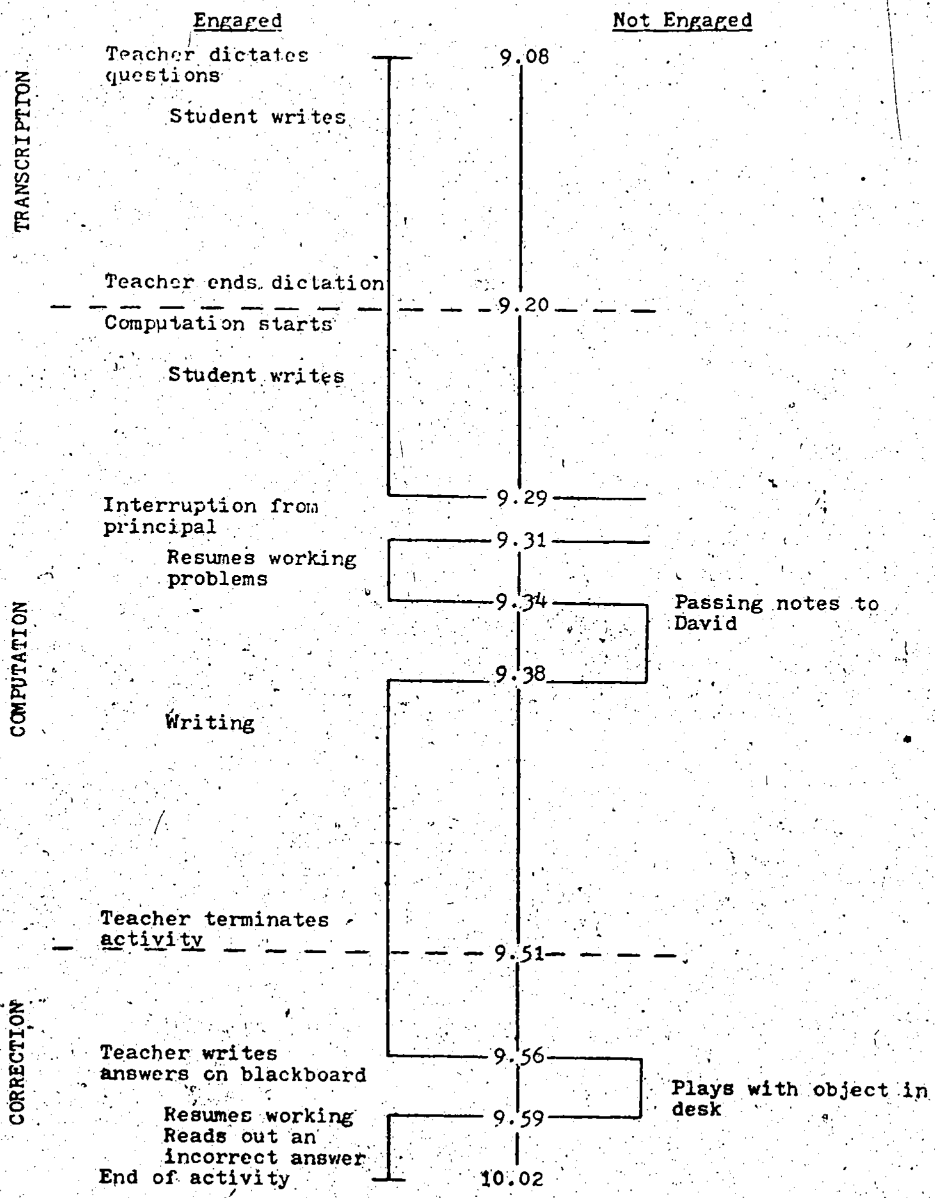
For the other four sample profiles in Figures 2 through 5, it is noticeable that high rates of disengagement were accompanied by low rate of attempted computations, and correspondingly low success rates.

The nature of Wayne's disengagement varied from protracted periods of off-task activity, to an on-again off-again pattern. Although both patterns were evident even within a single learning encounter, Wayne's overall tendency in mathematics seatwork was toward the intermittent work style. Despite his self-initiated forays into off-task activity Wayne generally returned to task, even though the return on occasions was merely a token gesture. The intermittent pattern

Figure 1

Mathematics Computation Activity

18.10.78 Time: 9.08 - 10.02 Wayne



Engagement rate during transcription = 100%

Engagement rate during computation = 86%

Engagement rate during correction = 73%

Maximum number of problems = 11

Problems attempted = 11

Problems correctly answered = 5

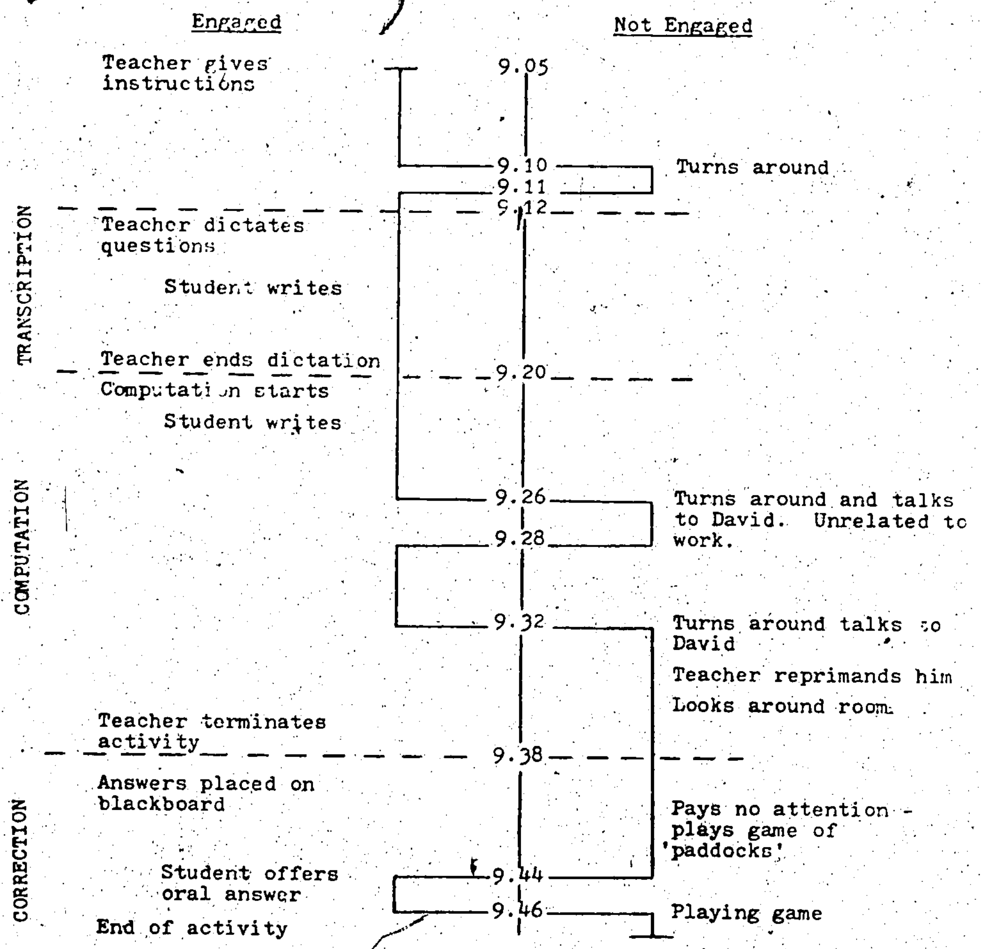
Problems incorrectly transcribed = 2

Engagement rate during free reading = 0%

Figure 2

Mathematics Computation Activity

19.10.78 Time: 9.05 - 9.47 Wayne



Engagement rate during introduction = 86%

Engagement rate during transcription = 100%

Engagement rate during computation = 55%

Engagement rate during correction = 77%

Maximum number of problems = 11

Problems attempted = 8

Problems correctly answered = 3

Problems incorrectly transcribed = 1

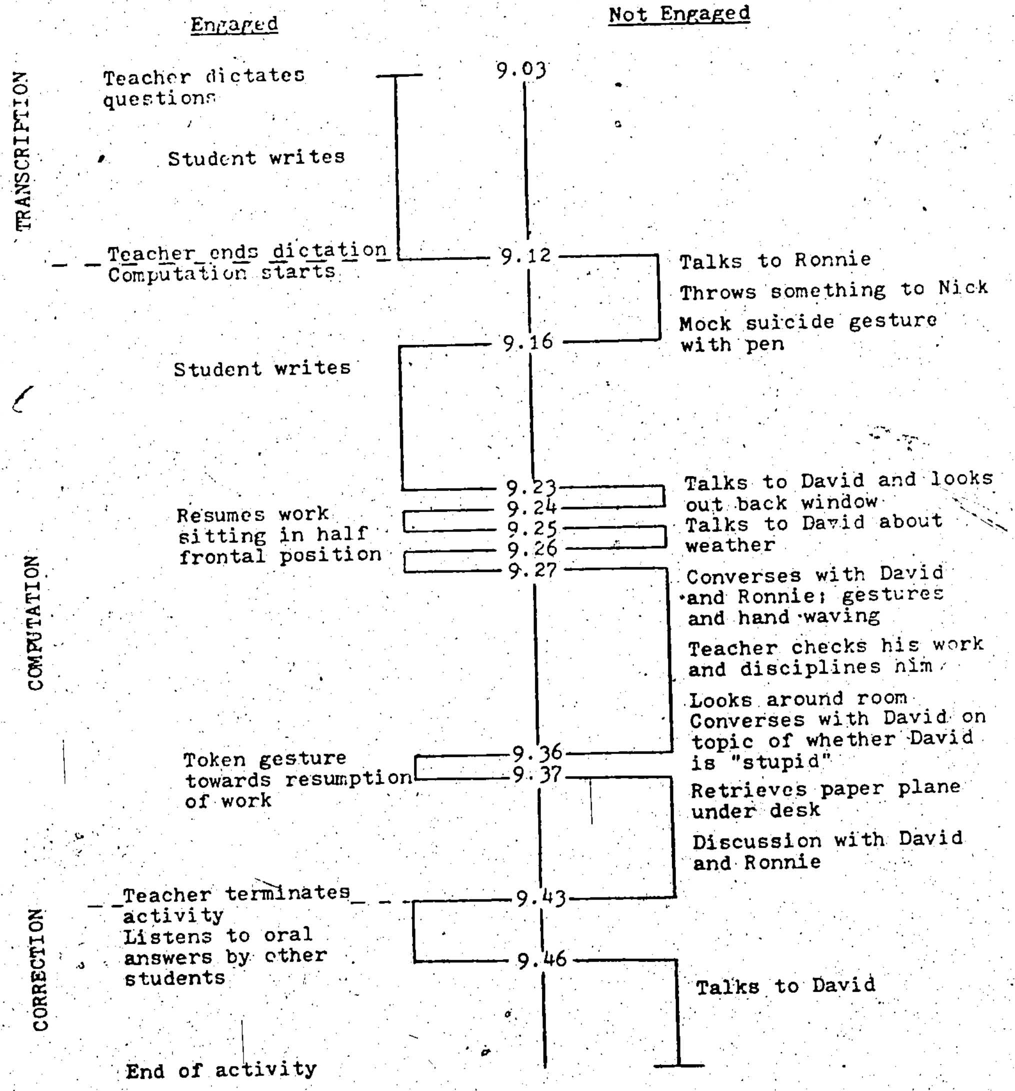
Problems not copied down = 2

Engagement rate during free reading = 0%

Figure 3

Mathematics Computation Activity

20.10.78 Time: 9.03 - 9.51 Wayne



Engagement rate during transcription = 100%

Engagement rate during computation = 32%

Engagement rate during correction = 37%

Maximum number of problems = 11

Problems attempted = 2

Problems correctly answered = 1

Problems incorrectly transcribed = 1

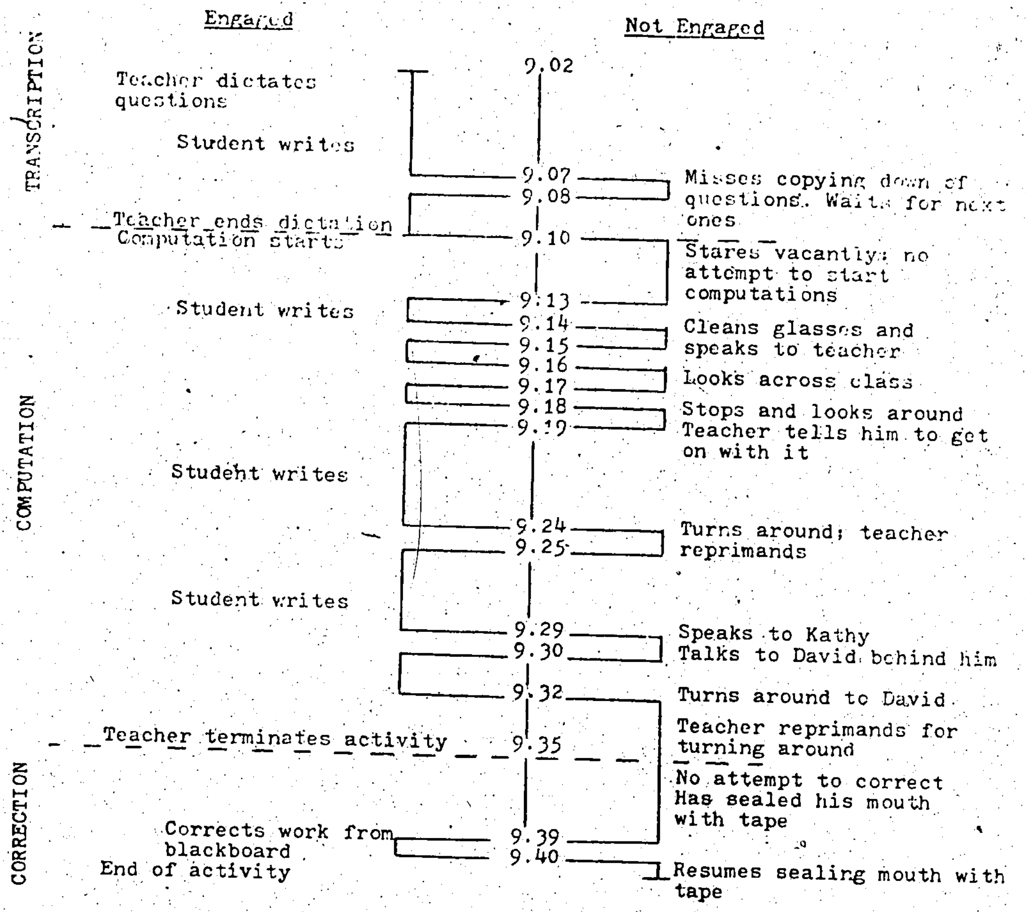
Problems not copied down = 1

Engagement rate during free reading = 0%

Figure 4

Mathematics Computation Activity

23.10.78 Time: 9.02 - 9.40 Wayne



Engagement rate during transcription = 87%

Engagement rate during computation = 56%

Engagement rate during correction = 20%

Maximum number of problems = 11

Problems attempted = 4

Problems correctly answered = 2

Problems incorrectly transcribed = 3

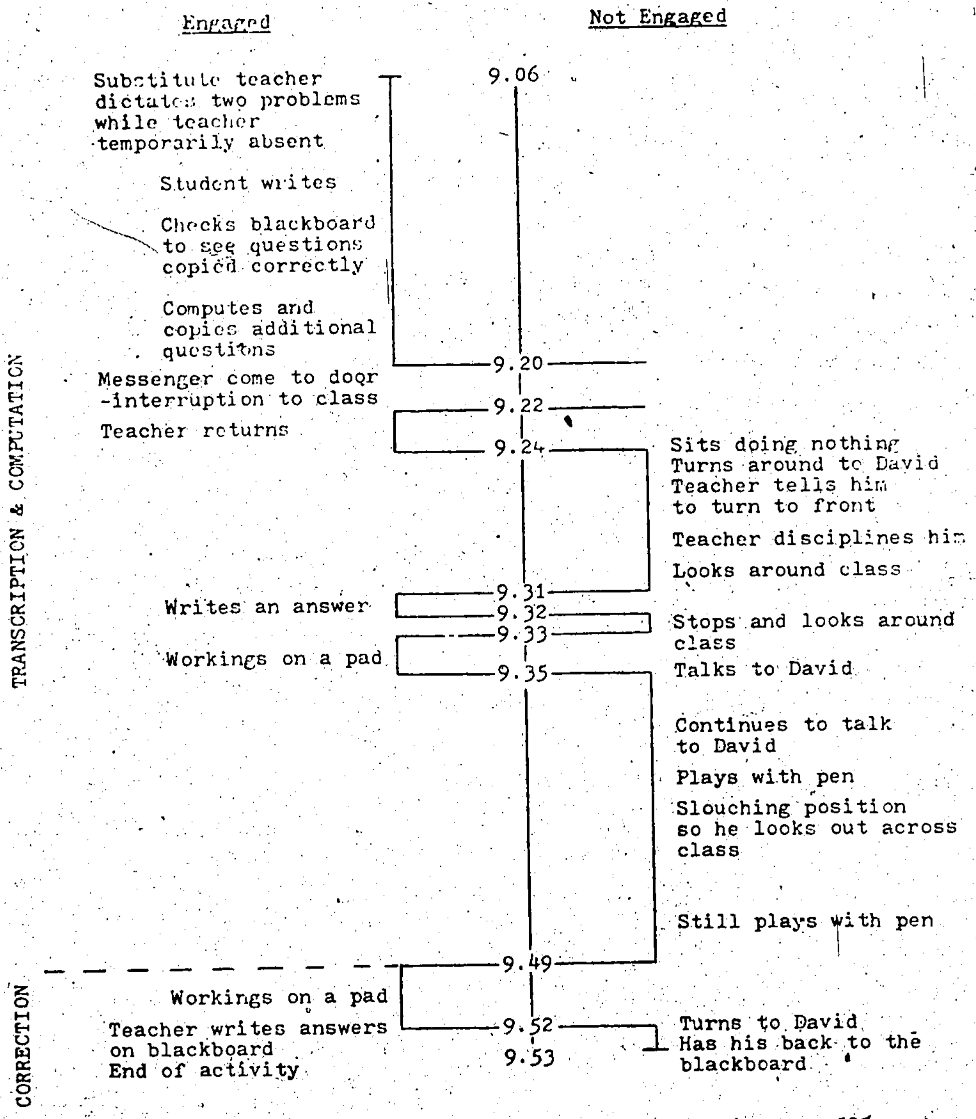
Problems not copied down = 1

Engagement rate during free reading = 0%

Figure 5

Mathematics Computation Activity

24.10.78 Time: 9.06 - 9.53 Wayne.



Engagement rate during transcription and computation = 50%

Engagement rate during correction = 66%

Maximum number of problems = 11

Problems attempted = 5

Problems correctly answered = 2

Problems not copied down = 6

Errors in correction = 1

Engagement rate during free reading = 0%

was no less damaging than the protracted affairs, in that continual interruption effectively prevented Wayne from grasping the sequences necessary to following through tasks to their completion. Wayne was generally the source of his own off-task behavior and his activities in this regard frequently interfered with students seated nearby.

Whether a reflection of his lack of attention during transcription, or as a consequence of a decoding problem associated with oral numeration, Wayne's success on-task was seriously impaired by an inability to complete transcription or to undertake the transcription activity with accuracy. As Figures 2 through 5 indicate, errors and omissions in this aspect amounted to a daily reduction of between 18 and 55 per cent of the work which Wayne had available for successful completion.

Figure 6 illustrates Wayne's activity during whole of class teacher explanations in mathematics.

Representative profiles of Wayne's use of learning time in reading activites were more difficult to isolate because of the extremely varied nature of those activities. A sample of 11 segment profiles, out of the possible 14, are presented below. They range from dictated spelling, written skills, oral and silent reading and creative writing, and are contained in Figures 7 through 17.

Dictated spelling activity, as indicated in Figures 7 through 10, show Wayne as being attentive during the verbal dictation aspect, and his giving the outward appearances of meaningful engagement. His written artifacts, however, reveal Wayne's engagement to have been with material which was largely incomprehensible to him. His lack of application during the assigned remediation phases of spelling activities is reflected in repeatedly incorrect attempts at many of the same words on successive days. Wayne's observed use of remediation time, when assigned, was observed to range from zero to 38 per cent.

By way of illustration, during the 7 day observation, a repertoire of 49 spelling words were delivered on four separate occasions. In various repetitive combinations, a total of 75 words were presented. Eighteen of these words were presented on at least two occasions, and four words were presented on three occasions. Wayne's performance indicated that, out of the 75 words, he correctly answered ten. Of the 18 words presented twice, Wayne answered one correctly on two occasions, four correctly on either one of the two possible occasions, and the remaining 13 incorrectly on both occasions. For the four words presented on three separate occasions, Wayne obtained none of these correct in any of the separate presentations.

The above analysis, when considered alongside Wayne's absence of attempted remediation, suggests that lack of application may have been at least a partial contributant to repeated performance failure.

Throughout a variety of other reading and reading-related activities, a similar perspective becomes apparent in respect of Wayne's work habits.

Figure 11 indicates a low capacity by Wayne to apply himself in listening to instructions and in carrying out a written activity and free reading. Although Wayne was able to carry out the simple assigned written task, he displayed a low ability to organize the remainder of his time in discretionary activity of a productive nature. In the written word usage exercise shown in Figure 12, Wayne demonstrated an incapacity to complete a substantial portion of the assigned work in the given time, due in part to his repeated disengaged activity. The combined oral and written activity depicted in Figure 13, indicates relatively large segments of time where clear indications were evident of non-attending behavior. Almost no attempt was made at all to follow the on-going language arts activity shown in Figure 14. Although Wayne's application to the silent reading task assigned by the teacher, and shown in Figure 15, was satisfactory during the early part of the lesson, it was punctuated later by frequent and periodic off-task wanderings.

As a consequence, Wayne did not finish the assigned reading, and did not attempt either of the two written activities set by the teacher in respect of the silent reading. The 2~~2~~7 minute free reading period set by the teacher, and shown in Figure 16, resulted in Wayne accumulating zero engaged time. A final demonstration of Wayne's inability to organize himself to complete tasks during self-paced seatwork, is provided in Figure 17. His engagement rate during the activity was less than one third, and his completed output amounts to nothing.

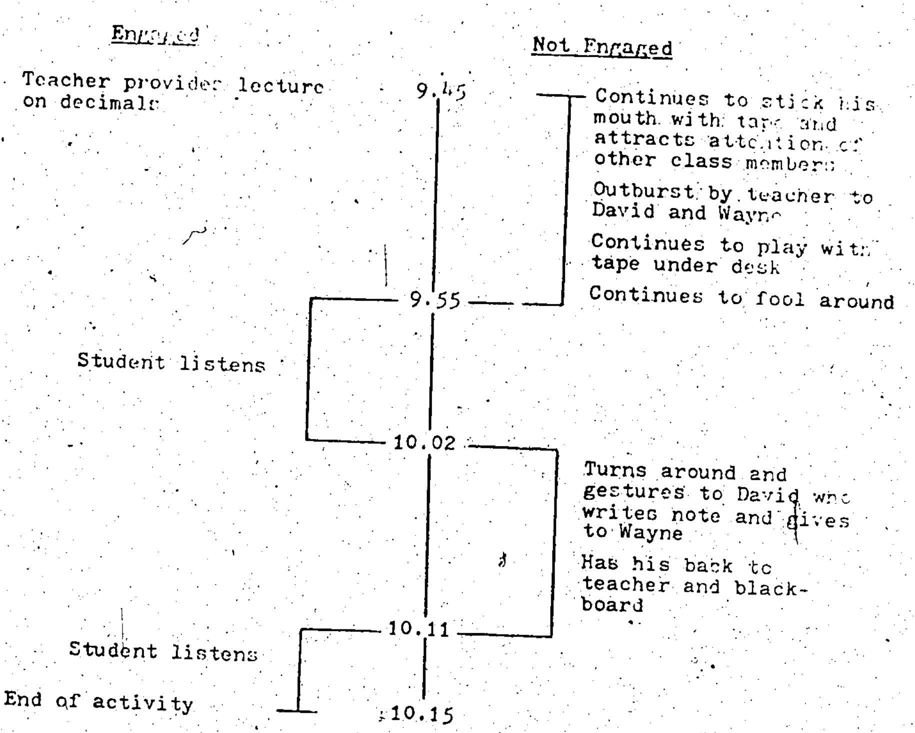
Summary

The final impressions of Wayne are of a pupil who encountered large amounts of learning material that were totally incomprehensible to him in terms of the level of difficulty. Continual repetition of errors of a similar type went unattended, despite adequate opportunities for remediation. Regardless of task difficulty, Wayne spent substantial amount of reading and mathematics time in not engaged activity. He frequently resorted to the disruptive activity of interfering with those in close proximity to him. When he was engaged on-task this invariably occurred during highly structured activities that required written responses. Totally lacking was even a minimal capacity by Wayne to organize himself to engage in any type of meaningful learning experience during free reading.

Figure 6

Whole-of-Class Lecture in Mathematics

23.10.78 Time: 9.45 - 10.15 Wayne



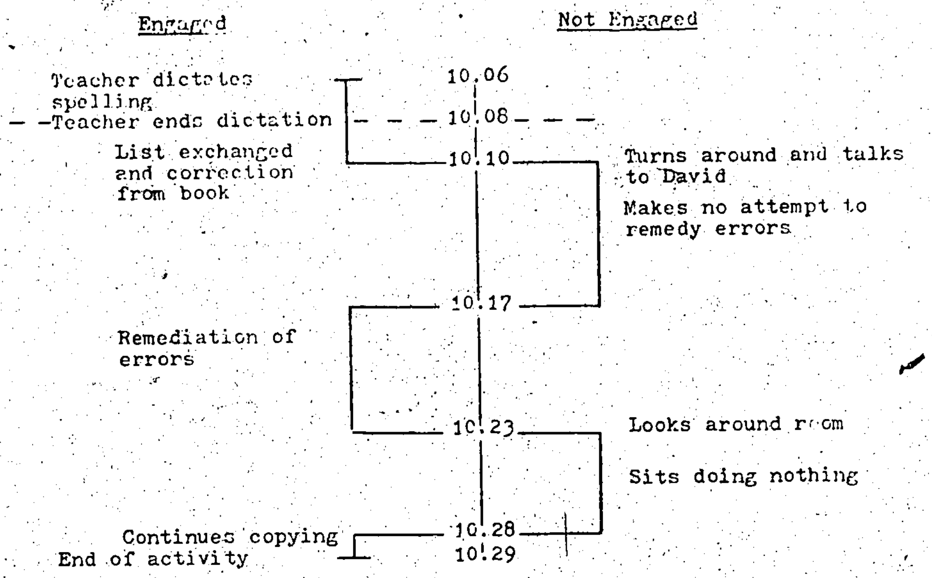
Engagement rate during lecture = 34.4%

Figure 7

Dictated Spelling Activity

16.10.78 Time: 10.06 - 10.29 Wayne

CORRECTION & REMEDIATION · DICTATION



Engagement rate during dictation = 100%

Engagement rate during correction and remediation = 38%

Maximum number of dictated words = 16

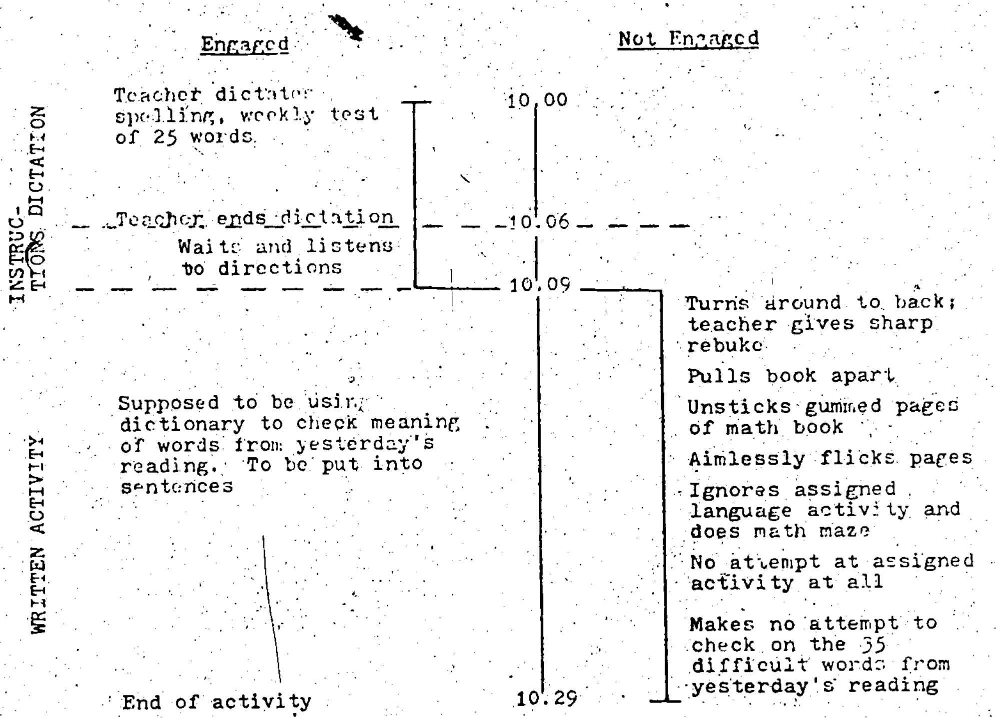
Words attempted = 16

Words answered correctly = 0

Figure 8

Dictated Spelling and Written Language Arts Activity

20.10.78 Time: 10.00 - 10.29 Wayne



Teacher dictates spelling, weekly test of 25 words.

Teacher ends dictation

Waits and listens to directions

Supposed to be using dictionary to check meaning of words from yesterday's reading. To be put into sentences

End of activity

Turns around to back; teacher gives sharp rebuke

Pulls book apart

Unsticks gummed pages of math book

Aimlessly flicks pages

Ignores assigned language activity and does math maze

No attempt at assigned activity at all

Makes no attempt to check on the 35 difficult words from yesterday's reading

Engagement rate during dictation = 100%

Engagement rate during instruction to task = 100%

Engagement rate during written language activity = 0%

Maximum number of dictated words = 25

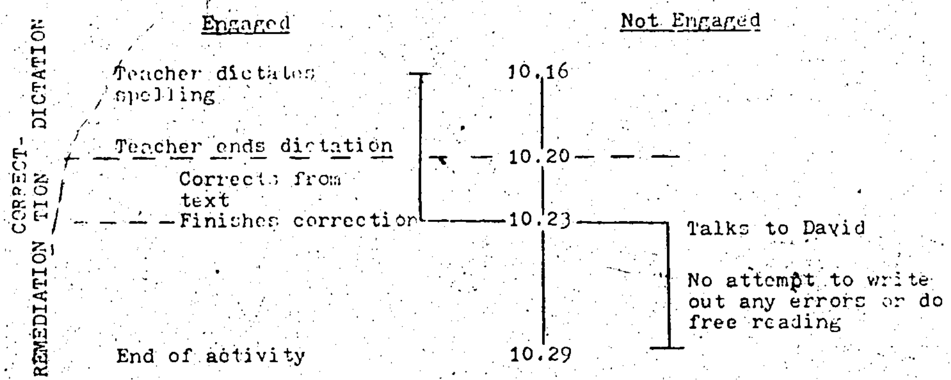
Words attempted = 25

Words answered correctly = 8

Figure 9

Dictated Spelling Activity

23.10.78 Time: 10.16 - 10.29 Wayne



Engagement rate during dictation = 100%

Engagement rate during correction = 100%

Engagement rate during remediation = 0%

Maximum number of dictated words = 15

Words attempted = 15

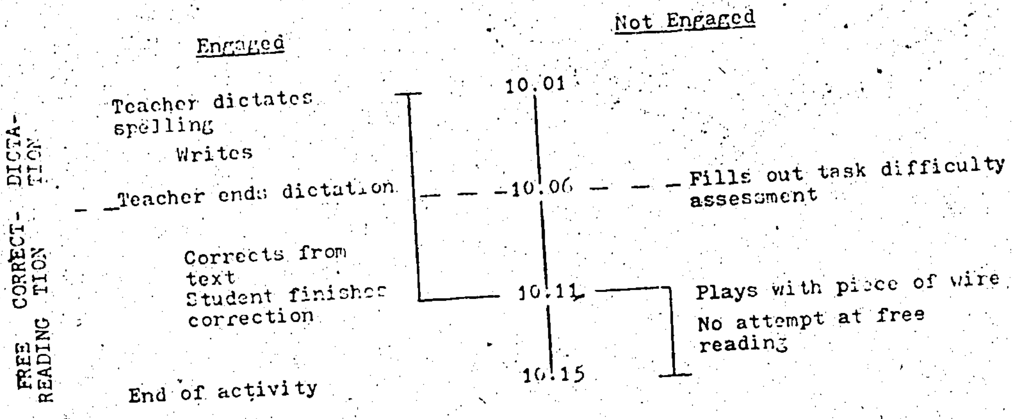
Words answered correctly = Nil

Figure 10

Dictated Spelling Activity

24.10.7 Time: 10.01 - 10.15

Wayne



Engagement rate during dication = 100%

Engagement rate during correction = 100%

Engagement rate during free reading = 0%

Maximum number of dictated words = 21

Words attempted = 21

Words answered correctly = 3

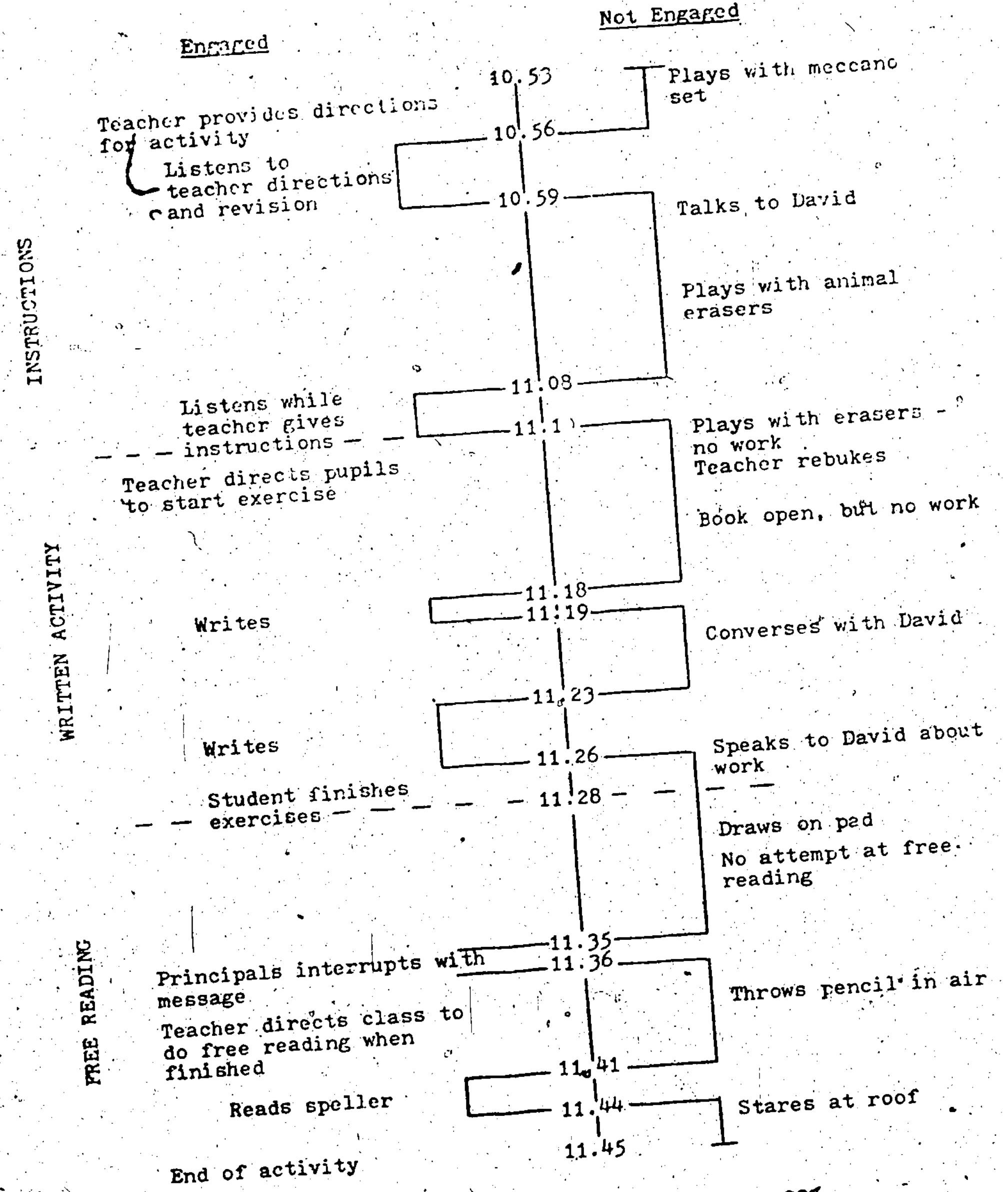
Errors in correction = 2

Figure 11

Written Language Skill Exercise

Wayne

17.10.78 Time: 10.53 - 11.45



Engagement rate during instructions to task = 29%

Engagement rate during language skill exercise = 25%

Engagement rate during free reading = 30%

Maximum number of exercises = 16

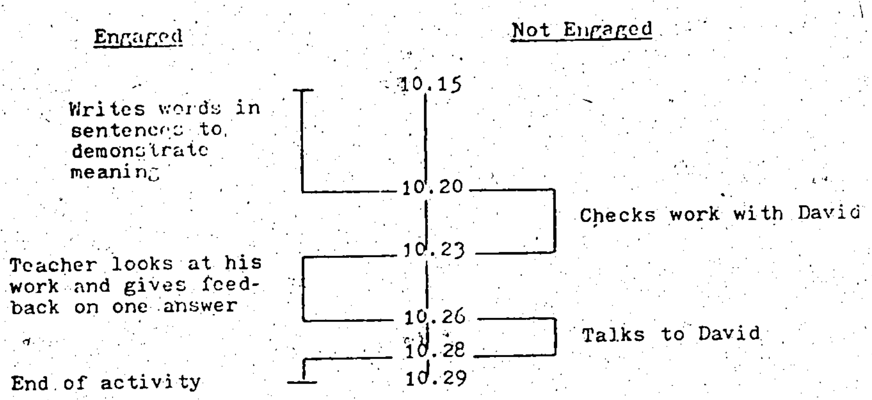
Exercises attempted = 16

Exercises correctly answered = 16

Figure 12

Written Language Skill Exercise

18.10.78 Time: 10.15 - 10.29 Wayne



Engagement rate during written exercise = 64%

Maximum number of items in exercise = 16

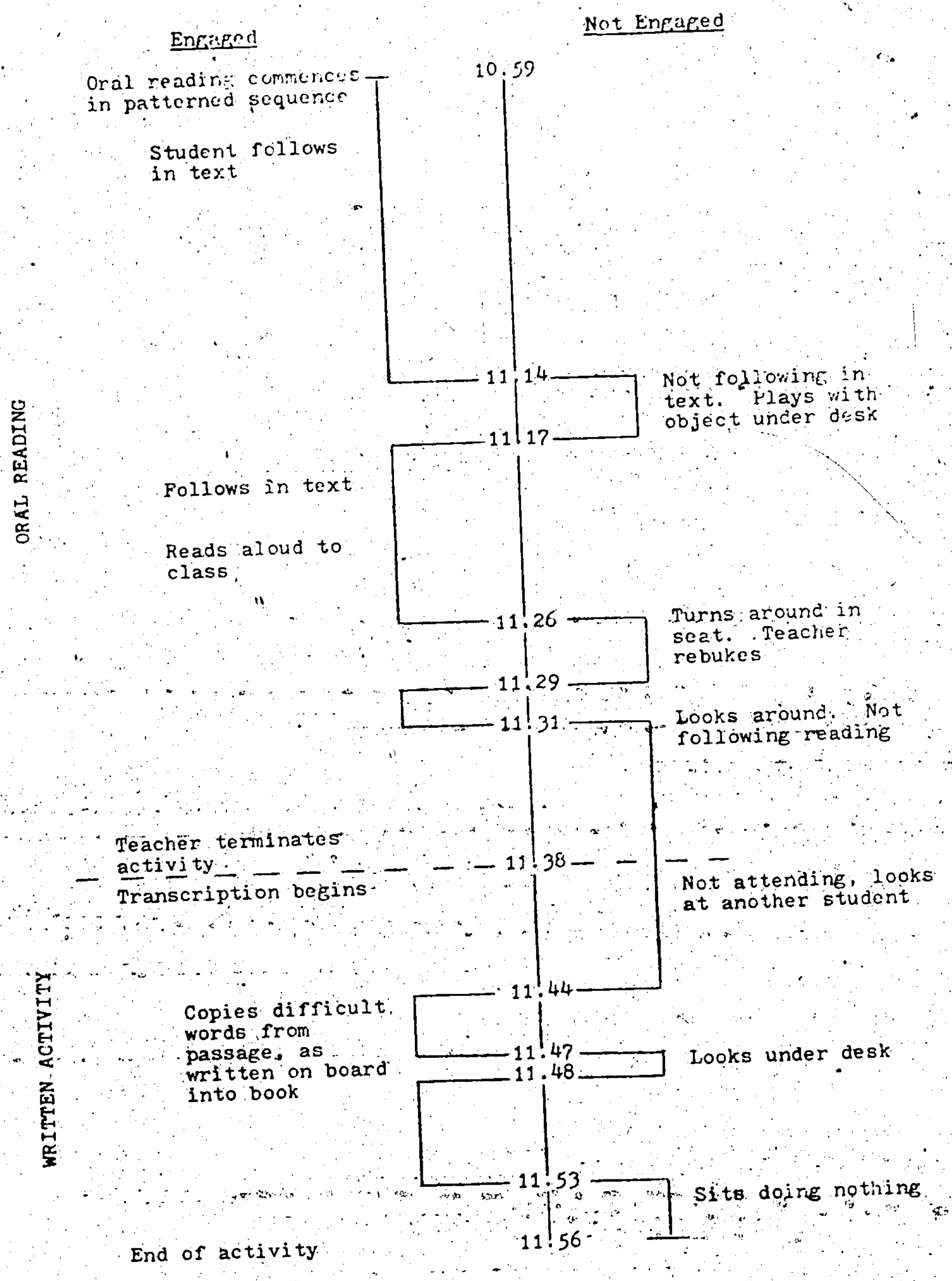
Items attempted = 4

Items correctly answered = 2

Figure 13

Oral and Written Language Arts Activity

19.10.78 Time: 10.59 - 11.56 Wayne



Engagement rate during oral reading activity = 65%

Engagement rate during written activity = 47%

Pages of assigned reading = 16

Figure 14

Oral Language Arts Activity

19.10.78 Time: 9.53 - 10.16 Wayne

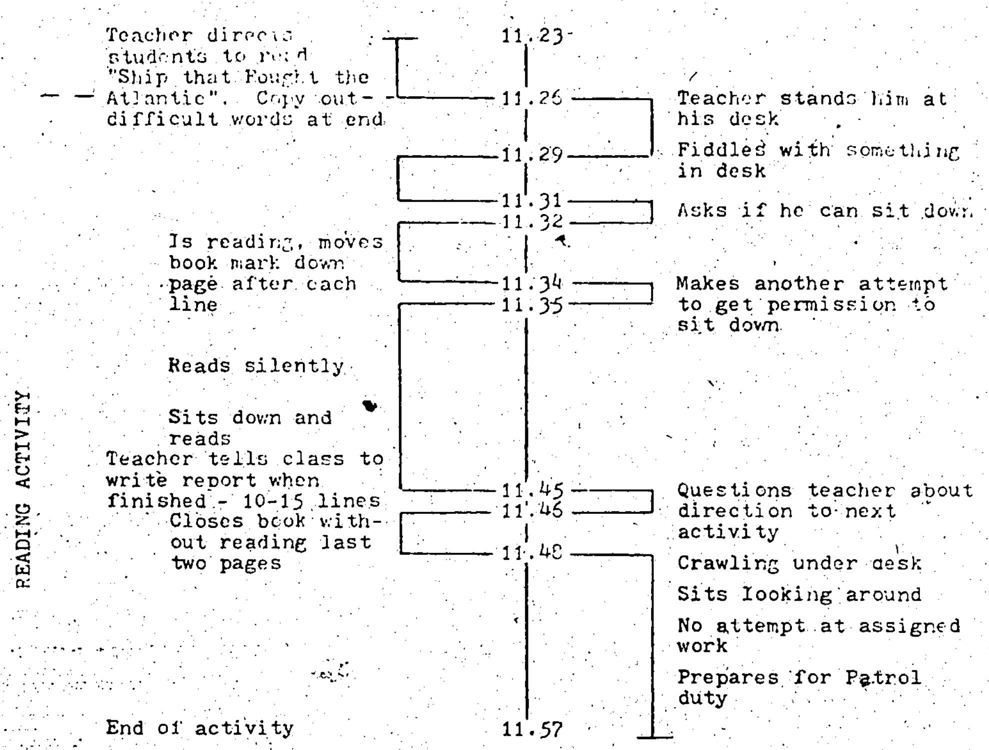
Engaged		Not Engaged
Teacher directs pupils to underline words written in sentences yesterday	9.52	Student makes no attempt to follow instructions
Selected pupils read answers to class. Teacher discusses each		Plays 'paddocks' Turns to back of room Looking in desk for an object
	10.04	
Listens	10.05	
		Playing 'paddocks'
Principal interrupts with message	10.08	
	10.10	Pays no attention to correction of work
End of activity	10.16	

Engagement rate during oral language arts activity = 4%

Figure 15

Silent Assigned Reading and Written Language Activity

20.10.78 Time: 11.23 - 11.57 Wayne



Engaged		Not Engaged
Teacher directs students to read "Ship that Fought the Atlantic". Copy out difficult words at end	11.23	
	11.26	Teacher stands him at his desk Fiddles with something in desk
	11.29	
	11.31	Asks if he can sit down
Is reading, moves book mark down page after each line	11.32	
	11.34	Makes another attempt to get permission to sit down
Reads silently Sits down and reads Teacher tells class to write report when finished - 10-15 lines	11.35	
	11.45	Questions teacher about direction to next activity
Closes book without reading last two pages	11.46	
	11.48	Crawling under desk Sits looking around No attempt at assigned work Prepares for Patrol duty
End of activity	11.57	

Engagement rate during reading and writing activity = 50%

Maximum number of pages of set reading = 10

Pages completed = 8

Number of "difficult" words recorded = nil

Lines of written report completed = nil

Figure 16

Free Reading Period

23.10.78 Time: 11.37 - 11.59 Wayne

Engaged		Not Engaged
On return from library teacher directs class to do free reading	11.37	Looks at pictures in magazine
		Closes magazine and looks under desk
		Turns around and looks out back window
		Takes out paper and draws
		Continues to draw
		Looks at David
End of activity	11.59	

Engagement rate during free reading = 0%

Figure 17

Creative Writing and Assigned Reading Activities

24.10.78 Time: 10.52 - 11.55 Wayne

Engaged		Not Engaged
Teacher gives directions to finish report from Friday, then read next story in reader	10.52	
	10.54	Plays with top of pen Whispers to Ronnie Book open; no attempt to start reading or writing
Reads story he was supposed to have written report on last Friday	11.00	
	11.02	Talks to David
Reads, sitting side on in desk, half faces back of class	11.04	
	11.10	Leaves desk and walks to bookcase Returns to desk gets book and goes and waits for teacher. Asks question Returns to desk
Reads	11.16	
	11.23	Leaves desk and goes to teacher. Waits Speaks to teacher, then leaves room Returns to room and talks to David
Reads	11.30	
	11.31	Stops reading Closes book. Leaves desk and is talking to other students at bookcase
Copies title of story to which he is to write report, on a small pad. He writes	11.36	
	11.39	Looks at book of riddles Quizzes Ronnie on some riddles
Writes	11.41	
	11.44	Stops writing. Stares blankly, then turns around and looks out of window Plays with note pad Talks to David Teacher asks him if finished. No. Flicks pages of note pad Plays with key ring
End of activity	11.55	

Figure 17 (Continued)

Wayne 24.10.78

Engagement rate during creative writing = 34%

Length of submitted written report = nil (not started)

Maximum pages of assigned reading = 10

Pages of assigned reading completed = nil (not started)

Kathy

Biographical Description

Kathy is the youngest of four children. She comes from a single parent family, her father having died when Kathy was young. Kathy's mother is a school teacher. Kathy was described by her grade 5 teacher as "a neat, tidy and conscientious kid." He ranked Kathy in the top three pupils in the class in language arts, and placed her in the top half of the class in mathematics. Kathy was aged 11 years and 6 months at the time of the research.

School records indicated Kathy as achieving between the seventy-fifth and ninety-seventh percentiles in "word meaning," "paragraph meaning" and "word study skills," based on Edmonton normed achievement tests administered over the six years of Kathy's schooling In mathematics, Kathy was recorded as achieving at between the fifty-fifth and sixtieth percentiles for Edmonton normed data. Her cumulative school record file reflected Kathy's grades as being well above satisfactory in reading and mathematics, indicating Kathy to be a high achieving student.

Allocation and Distribution of Academic Learning Time

Kathy was available for classroom instruction for 2139 minutes during the 7 day observation. Table 23 shows a fifth of Kathy's class time as being concerned with matters of a general classroom nature, involving commencing and terminating activities, as well as monitorial and organizational tasks. A further third of Kathy's available class time was spent between instruction of a non-academic nature, and academic activities with a non-reading, non-mathematics emphasis. The remainder of Kathy's class time, accounting for 47 per cent of the time available was divided between reading and mathematics, the amounts being 669 and 333 minutes respectively.

While Kathy's average daily exposure to reading was 95 minutes and to mathematics was 48 minutes, the actual daily range varied from a low in reading of 48 minutes to a high of 111 minutes, and in mathematics from a low of 33 to a high of 69 minutes. Extrapolated to a 180 day school year, other factors remaining constant, Kathy could expect to receive 285 hours of instruction in reading and 144 hours in mathematics.

Use of Academic Learning Time

Written, Oral and Covert Activity. The most noticeable aspect of Kathy's engagement in reading, as shown in Table 24, was the relatively high proportion both of engaged and available time spent by Kathy in covert activity. The two thirds of her engaged time spent by Kathy in reading or thinking silently, and in listening to the teacher or another pupil during the

Table 23

Distribution of Learning Time as a Percentage of Available Class Time - Kathy

Activity	%
Wait	3.2
Transition	13.7
Management	2.6
Non-Academic Instruction	19.1
Other Academic Instruction	14.4
Reading	31.3
Mathematics	15.6
	99.9

Table 24

Written, Oral and Covert Activity in Minutes and as a Percentage of Engaged and Available Time in Reading and Mathematics - Kathy

	Reading		Mathematics	
	Minutes	%	Minutes	%
Engaged Time				
Engaged Written	150	28.6	114	39.2
Engaged Oral	9	1.7	-	-
Engaged Covert	339	64.6	111	38.1
Engaged Direct	27	5.1	66	22.7
	525	100.0	291	99.9
Available Time				
Engaged Written		22.4		34.2
Engaged Oral		1.3		-
Engaged Covert		50.7		33.3
Engaged Direct		4.0		19.8
		78.4		87.3

explanation of reading material, resulted in Kathy accumulating in excess of 300 engaged minutes, or an average of 50 engaged minutes per day. Written responses involved Kathy for less than one third of her engaged reading time, while oral reading constituted only a small part of her total reading program. When required to, Kathy listened to and carried out teacher directives in reading, with efficiency.

Kathy's engaged time during mathematics instruction, was evenly distributed between written and covert activities, as shown in Table 24. The inflated figure for engagement in directions to task reflected the mode of instruction employed. Practice and review problems for computation were dictated by the teacher and copied by pupils into their notebooks prior to the start of computation. This activity was not considered, for coding purposes, to be a legitimate engaged written activity but rather a preliminary directive to the task undertaken before the onset of computation.

Tables 25 and 26 acknowledge the considerable daily fluctuation in Kathy's accumulation of engaged minutes in reading and mathematics. The range of zero minutes of engaged oral activity to 78 minutes of engaged covert activity in reading, shown in Table 25, is more a reflection of the diversity in the daily allocation of reading time, than any indication of Kathy's application to task. The percentage terms in

Table 25

Written, Oral and Covert Activity in Reading in Engaged Minutes and as a Percentage of Daily Engaged Reading Time - Kathy

Activity	16.10.78		17.10.78		18.10.78		19.10.78		20.10.78		23.10.78		24.10.78	
	mins.	%	mins.	%	mins.	%	mins.	%	mins.	%	mins.	%	mins.	%
Engaged Written	30	52.6	3	3.3	6	10.0	21	20.2	15	22.7	15	35.7	15	29.4
Engaged Oral	-		-		-		6	5.8	3	4.5	-		-	
Engaged Covert	27	47.4	78	86.7	54	90.0	71	68.3	39	59.1	27	64.3	33	64.7
Engaged Direct	-		9	10.0	-		6	5.8	9	13.6	-		3	5.8
	57	100.0	90	100.0	60	100.0	104	100.0	66	99.9	42	100.0	51	99.9

Table 26

Written, Oral and Covert Activity in Mathematics in Engaged Minutes and as a Percentage of Daily Engaged Mathematics Time - Kathy

	16.10.78		17.10.78		18.10.78		19.10.78		20.10.78		23.10.78		24.10.78	
Activity	mins.	%	mins.	%	mins.	%	mins.	%	mins.	%	mins.	%	mins.	%
Engaged Written	18	37.5	18	30.0	15	38.5	15	41.7	18	50.0	18	33.3	12	66.6
Engaged Oral	-		-		-		-		-		-		-	
Engaged Covert	21	43.7	30	50.0	9	23.0	15	41.7	9	25.0	24	44.4	3	16.7
Engaged Direct	9	18.8	12	20.0	15	38.5	6	16.6	9	25.0	12	22.2	3	16.7
	48	100.0	60	100.0	39	100.0	36	100.0	36	100.0	54	99.9	18	100.0

Table 25, with the exception of one day, reflect Kathy's uniformly high percentage level of engagement in covert reading activity throughout the observation period. Although Kathy's daily range in covert mathematics activity was between 3 and 30 engaged minutes, as shown in Table 26, the day-to-day pattern was more stable than for reading. Uniformly high rates were noticeable, as well, for engaged written activities for mathematics from day-to-day.

Academic Content Covered. As already indicated, Kathy's exposure to reading activity amounted to 669 minutes during the time she was observed. With two thirds of Kathy's reading time allocated to covert activity of some type, it was possible during the remaining one third to measure directly the extent of academic content actually covered by Kathy. Table 27 lists these activities according to type, amount of content assigned by the teacher, amount of content attempted, proportion of content correctly completed, and the elapsed time.

The most noticeable features of the data presented in Table 27 are the uniformly high levels of work attempted, as well as the high levels of success experienced by Kathy in measured reading-related activities. Both aspects are reflected in the Unadjusted Index of Effort and the Unadjusted Index of

Table 27

Content Covered, Effort and Success in Reading Activities - Kathy

Activity	Content Assigned	Content Attempted	Unadjusted Index of Effort	Content Correctly Completed	Unadjusted Index of Success	Elapsed Time (minutes)
Dictated Spelling	77 words	77 words	1.0	65 words	.84	17
Spelling Remediation	7 words	7 words	1.0	7 words	1.0	10
Word Transcription	35 words	35 words	1.0	35 words	1.0	17
Silent Reading	36 pages	27 pages	.75	*	*	91
Creative Writing	10 lines	6 lines	.60	*	*	20
Word Recognition	46 words	46 words	1.0	45 words	.98	48
Word Usage	16 words	16 words	1.0	15 words	.94	14

*Impossible to assess

Success, which approached unity in most categories for Kathy. Each of these indices will be weighted in a later section to take account of task difficulty. Nevertheless, the impression is left of a student who was most conscientious and who was capable, across a range of teacher and self-directed reading activities, of attaining high levels of engagement, with considerable success.

Further evidence in this regard is presented in Table 28.

Kathy was exposed to mathematics instruction for a total of 333 minutes, 255 minutes of which were accumulated in written form. Her daily performance in interacting with assigned materials is shown in Table 28. The most prominent statistics emerging from an analysis of Table 28, are shown in summary form in Table 29. Of particular note is Kathy's consistently high level of effort, as reflected in an overall index of 1.0, and her record of success in computations as shown by an index of .74.

Kathy, in fact, completed all assigned mathematics tasks during the observation period, and at a 75 per cent level of success. Kathy was not, however, as diligent as she might have been in her transcription of problems and in her subsequent attention to corrective feedback.

Table 28

Daily Content Covered in Mathematics Computation - Kathy

Date	Maximum Number of Problems	Problems Attempted	Problems not Transcribed	Problems Incorrectly Transcribed	Problems Correctly Answered	Errors in Correction	Elapsed Transcription Time (min)	Elapsed Computation Time (min	Elapsed Correction Time (min)
16.10.78	11	11	-	-	9	-	8	17	21
17.10.78	11	11	-	1	7	-	9	18	9
18.10.78	11	11	-	-	7	-	13	20	11
19.10.78	11	11	-	-	11	-	8	9	9
20.10.78	11	11	-	-	10	-	9	18	8
23.10.78	11	11	-	1	5	4	8	21	5
24.10.78	11	11	-	-	8	1	10	20	4
	77	77	-	2	57	5	65	123	67

Table 29

Summary of Content Covered in Mathematics Computation - Kathy

Category	Statistic
Problems Attempted	100.0%
Problems Not Transcribed	-
Problems Incorrectly Transcribed	2.6%
Problems Correctly Answered	74.0%
Errors in Correction	6.5%
Average Transcription Time per Problem	.8 min.
Average Computation Time per Problem	1.6 min.
Average Correction Time per Problem	.8 min.
Unadjusted Index of Effort in Mathematics Computation	1.0
Unadjusted Index of Success in Mathematics Computation	.74

Engagement, Difficulty and Academic Content. Kathy's total exposure to reading and mathematics instruction amounted to a 7 day total of 1002 minutes. She was observed to be engaged in reading and mathematics content for 816 of these minutes, or for 81.4 per cent of the available time. Separated according to content, Kathy was actively involved for 525 minutes in reading and 291 minutes in mathematics. Her engagement rate for reading was 78.4 per cent of the available reading time, and for mathematics was 87.3 per cent of allocated mathematics time. Converted to an average daily basis, Kathy was engaged for 75 minutes in reading and 42 minutes in mathematics.

Table 30 shows Kathy spent in excess of three quarters of her engaged time in reading and mathematics, interacting with materials that were considered by the observer to have been easy for her. Less than one quarter of the encountered material was considered to be of medium difficulty for Kathy, and the amount classified as hard, was inconsequential.

Table 31 reveals the percentage distribution of Kathy's engaged time across reading and mathematics activities, according to degree of task difficulty. In reading, all of her time was spent in easy and medium difficulty activities, with the predominance upon the former. In mathematics, over half of Kathy's engaged time was at the easy level of difficulty, the

Table 30

Percentage of Allocated Time in Reading and Mathematics According to Level of Task Difficulty - Kathy

Observer Assessment of Difficulty	Minutes	%
Easy	791	78.9
Medium	207	20.7
Hard	3	.3
	1001	99.9

Table 31

Minutes of Engaged Time and Percentage of Engaged Time in Reading and Mathematics According to Level of Task Difficulty - Kathy

Observer Assessment of Difficulty	Reading		Mathematics	
	Minutes	%	Minutes	%
Easy	468	89.1	159	54.6
Medium	57	10.8	129	44.3
Hard	-	-	3	1.0
	525	99.9	291	99.9

bulk of the remainder being at the medium level. The distribution of Kathy's engaged time according to the difficulty of work-related material, was suggestive of a high level of meaningful and productive learning.

Measurable indicators of Kathy's performance were available for activities associated with 32 per cent of her reading time, and during 79 per cent of her mathematics time. Table 32 provides evidence of the validity of observer assessment of Kathy's task difficulty. With the exception of a social studies test in which there was a reading component, the only other occasion on which the observer erred in his assessment of task difficulty, was for mathematics computation on 23.10.78. There was no apparent explanation for the observer's rating of easy, and Kathy's subsequent performance which revealed the task to have been hard.

Overall agreement between observer assessment of task difficulty, and actual success rate for Kathy, was shown by a 0.6 Coefficient of Agreement between Observer Assessment of Task Difficulty and Success Rate. For those of Kathy's learning activities where measurable output was available, the observer, therefore, was a more accurate judge of task difficulty than was Kathy herself. Comparative results are shown in Table 33.

Tables 34 and 35, with Kathy's daily percentage engagement for mathematics computation exercises and

Table 32

Results of Comparative Methods of Assessing Pupil Task Difficulty in Reading and Mathematics - Kathy

Task Description	Data	Student Assessment of Difficulty (1)	Observer Assessment of Difficulty (2)	Actual % Success on Written Pursuits (3)	Difficulty as Reflected by Success Rate (4)
Math Computation	16.10.78	M	E	82	E
Dictated Spelling	"	M	E	56	M
Library Skill Exercises	"	M	E	*	*
Math Computation	17.10.78	M	M	63	M
Word Recognition	"	E	E	0	E
Silent Reading (Test)	"	M	M	45	H
Silent Reading (Test)	"	M	M	77	M
Silent Reading (Test)	"	M	M	42	H
Math Computation	18.10.78	M	M	63	M
Word Usage	"	M	M	94	E
Silent Reading (Test)	"	M	M	50	M
Silent Reading (Test)	"	M	M	57	M
Silent Reading (Test)	"	M	M	75	M
Math Computation	19.10.78	E	M	0	E
Silent Reading	"	M	E	*	*
Math Computation	20.10.78	M	M	91	E
Dictated Spelling	"	M	E	0	E
Silent Reading	"	M	E	*	*
Creative Writing	"	M	E	90	E
Math Computation	23.10.78	M	E	45	H
Dictated Spelling	"	M	E	87	E
Math Computation	24.10.78	M	E	73	M
Dictated Spelling	"	E	E	86	E
Silent Reading	"	M	E	*	*

E = Easy M = Medium H = Hard * = No Assessment Possible

Table 33

Agreement Among Alternative Modes of Assessing Pupil Task Difficulty in Reading and Mathematics - Kathy

Modes	Number of Assessment Decisions	Number of Assessments in Agreement	Percentage Agreement
Observer v Student Assessment	24	12	50.0
Student Assessment v Success Rate	20	11	52.3
Observer Assessment v Success Rate	20	12	60.0

Table 34

Percentage Engagement by Activity in Selected Reading Tasks - Kathy

Date	16.10.78	17.10.78	18.10.78	19.1[illegible].78	20.10.78	23.10.78	24.10.78
Spelling Dictation	100				100	100	100
Spelling Correction and Remediation	100					100, 50	100
Free Reading	33, 90	100			0, 100	50, 100	0, 13
Library Skills	100						
Instructions to Task		100			100		100, 100
Word Recognition		100			100		100, 100
Word Usage			100		85		
Silent Reading				50			
Word Transcription				94			
Creative Writing					0		100

Table 35

Percentage Engagement by Activity in Mathematics Tasks - Kathy

Date	16.10.78	17.10.78	18.10.78	19.10.78	20.10.78	23.10.78	24.10.78	Mean
Introduction to Task				100				100
Transcription	100	100	100	100	100	100	87	98
Computation	100	100	85	100	95	95	87	94
Correction	100	100	100	100	100	100	75	96
Whole-of-Class Lecture		87				93		90
Free Reading	100	100			84	50	36	61.6

for selected reading activities, indicate uniformly high rates of engagement across most activities. Where Kathy's engagement rate did fall, it was invariably in self-directed activity.

Task Involvement According to Setting

Table 36 shows Kathy spent approximately three quarters of her reading time in settings where she had control over the extent and rate of her work participation. The remaining quarter of Kathy's reading was in activities where the pace of learning was determined either by the teacher or by the group of which Kathy was a member. During mathematics, Kathy's time distribution between the two types of setttings was more evenly distributed [illegible]h almost half being spent in each kind of setting.

The lower segment of Table 36 indicates 75 per cent of Kathy's self-paced reading time, to have been in engaged activity. During mathematics seatwork, Kathy was observed to have been engaged for 84 per cent of the time. These relatively high levels of engagement in settings where Kathy had considerable discretion as to the level of her academic involvement, were indicative of her well developed capacity too undertake learning with minimal outside supervision.

The upper segment of Table 36 provides data indicating Kathy's sustained ability to keep pace with

Table 36

Learner Behavior by Setting as a Percentage of Available Reading and Mathematics Time - Kathy

Learner Behavior	Reading	Mathematics
Other-Paced Settings (Group and Whole-of-Class)		
	%	%
Engaged Written	4.5	1.8
Engaged Oral	.5	-
Engaged Covert	11.2	28.8
Engaged Direct	4.0	18.9
Not Engaged Interim	.5	1.8
Not Engaged Waiting	1.3	.9
Not Engaged Off-Task	.5	2.7
	22.5	54.9
Self-Paced Settings (Seatwork)		
Engaged Written	17.9	32.4
Engaged Oral	.9	-
Engaged Covert	39.0	4.5
Engaged Direct	-	-
Not Engaged Interim	2.2	1.8
Not Engaged Waiting	1.8	1.8
Not Engaged Off-Task	15.2	3.6
	77.0	44.1

externally paced activity. Her engagement rate during the 147 minutes of other-paced reading was 88 per cent, and during the 183 minutes of mathematics was 90 per cent.

Comparing Kathy's performance across settings, it became clear that she achieved high levels of engagement when participation and control were vested in her, as well as when determined by some external source. In self-paced reading and mathematics, Kathy was off-task substantially more of the time than was the circumstance in other-paced settings.

Teaching Behavior

Table 37 describes the nature and extent of the teaching behavior, from various sources, directed to Kathy while she was in group and individual settings in reading and mathematics. The basis for reported percentages was the available instructional time in each content area.

The top portion of Table 37 indicates that when Kathy was a member of a reading group, the group was the target of substantive teaching behavior for 15.7 per cent of Kathy's total available reading time, or for 105 minutes. Explanations consumed 40 per cent or 42 minutes of the substantive teaching time during Kathy's other-paced reading, with academic monitoring either as observation, question or feedback, accounting

Table 37

Teaching Behavior by Setting as a Percentage of Available Reading and Mathematics Time - Kathy

Teaching Behavior	Reading	Mathematics
Other-Paced Settings (Group and Whole-of-Class)		
	%	%
Explanation Needed	3.6	4.5
Explanation Planned	2.7	8.1
Academic Observation	-	.9
Academic Question	3.1	20.7
Academic Feedback	6.3	15.3
Substantive Teaching	15.7	49.5
Structure Direct	4.5	3.6
Task Engagement Feedback	-	-
Total Interaction	20.2	53.1
No Teaching	2.3	1.8
	22.5	54.9
Self-Paced (Seatwork)		
Explanation Needed	-	1.8
Explanation Planned	.5	-
Academic Observation	-	-
Academic Question	-	.9
Academic Feedback	1.8	.9
Substantive Teaching	2.3	3.6
Structure Direct	.5	-
Task Engagement Feedback	.5	-
Total Interaction	3.3	3.6
No Teaching	74.7	40.5
	77.0	44.1

for 60 per cent or 63 minutes of the remaining substantive teaching behavior in her other-paced reading.

Content-oriented teaching behavior occurred during 165 minutes of the time Kathy spent in other-paced mathematics settings. As shown in Table 37, this amounted to 49.5 per cent of Kathy's total available mathematics time. Substantive teaching behavior in other-paced mathematics was divided between one quarter to explanations, for a total of 41 minutes, and three quarters to some form of academic monitoring, for 124 minutes of Kathy's time.

Kathy was not observed to have been the focus of praise or admonitions concerning her behavior in either reading or mathematics of the other-paced variety.

Content-related teaching behavior did not occur at all during the predominant portion of Kathy's time in either self-paced reading or mathematics. The 2.3 per cent of the time she received substantive teaching behavior in self-paced reading amounted to 15 minutes during the 7 day observation. In mathematics, the 3.6 per cent, amounted to 12 minutes.

Worthy of comment is the 74 per cent and 40 per cent of Kathy's time in self-paced reading and mathematics, spent by her in the absence of any form of interactive teaching behavior.

Table 38 highlights the disproportionately low amount of her total time Kathy spent receiving instructional teaching behavior individually, in contrast to collectively as a member of a larger group. The amount of individually tailored attention she received in reading and mathematics, was approximately one minute a day in each.

Table 39 provides an indication of the proportion of instructional behavior emanating from three sources for Kathy. While the teacher was the predominant source in reading and mathematics, a relatively high proportion of instruction in mathematics emanated from other students. This is explainable by reference to the public nature of academic feedback in mathematics, where students provided oral answers to completed computation exercises. The class corrected their individual work from this feedback. Curriculum materials were not used as an instructional source in this class.

Pupil Profile and Work Habits During Academic Content

The 14 reading and 7 mathematics segments analysed for Kathy produced a very different picture to that portrayed for Wayne. The overall impression is one of consistent and diligent application across a range of activities, as well as from day-to-day. Not only was Kathy's engaged time high, so too was her

Table 38

Group and Individual Focus of Teaching Behavior in Minutes and as a Percentage of Available Reading and Mathematics Time - Kathy

Direction of Teaching Focus	Reading		Mathematics	
	Minutes	%	Minutes	%
Individual Focus	9	1.3	6	1.8
Group Focus	141	21.1	186	55.9

Table 39

Source of Teaching Behavior in Minutes and as a Percentage of Available Reading and Mathematics Time - Kathy

Source of Teaching Behavior	Reading		Mathematics	
	Minutes	%	Minutes	%
Teacher	111	16.6	156	46.8
Other Students	33	4.9	36	10.8
Curriculum	9	1.3	-	-

output of attempted work and her level of success in those activities.

For the six mathematics computation activities shown for Kathy in Figures 18 through 23, the pattern was one of engagement on-task until completion, followed by a brief period of off-task social behavior prior to commencement of a free reading activity. Kathy's periods of application were generally long and relatively uninterrupted. The one exception to the pattern is shown in Figure 23. On this occasion, the principal acted as substitute teacher during the temporary absence of the teacher from the room. The sequencing of material and the general organization of the mathematics computation departed from the established pattern generally employed by the teacher.

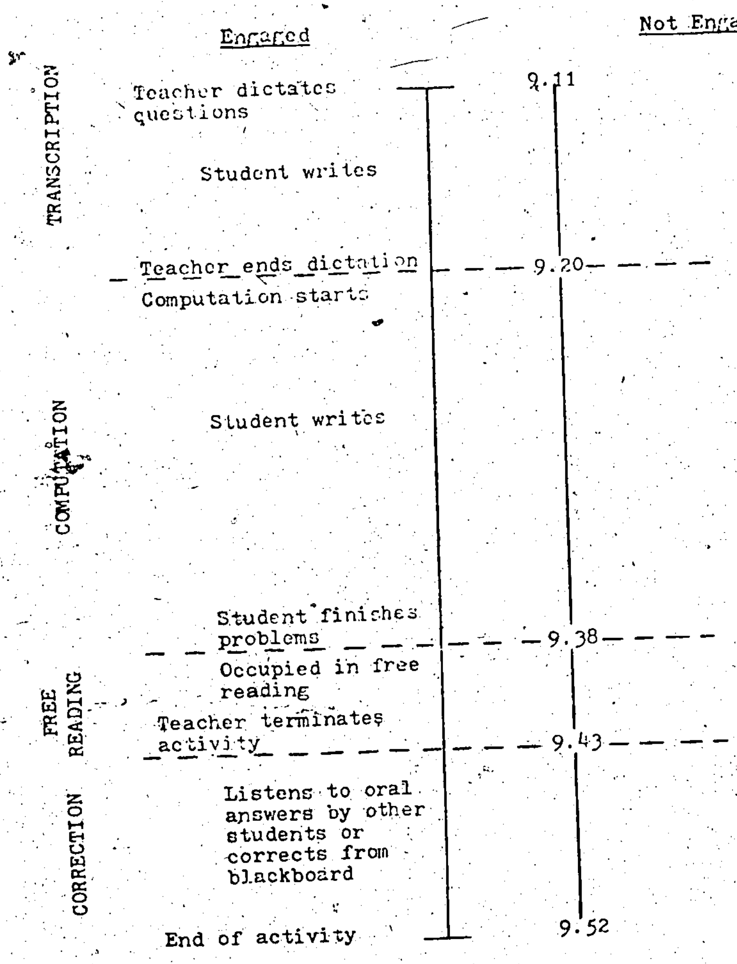
Kathy's performance in mathematics computation as depicted in Figure 22, gives the outward appearance of being consistent with her earlier performances in this type of activity. Her levels of engagement were high, all the assigned work was completed, but Kathy recorded an error rate of 63 per cent. In addition, one problem was incorrectly transcribed and four errors were made in attending to corrective feedback. There was no apparent explanation for this series of events.

Engagement during the whole-of-class lecture on decimals, as shown in Figure 24, was recorded as high for Kathy.

Figure 18

Mathematics Computation Activity

17.10.78 Time: 9.11 - 9.52 Kathy



Engagement rate during transcription = 100%

Engagement rate during computation = 100%

Engagement rate during correction = 100%

Maximum number of problems = 11

Problems attempted = 11

Problems correctly answered = 7

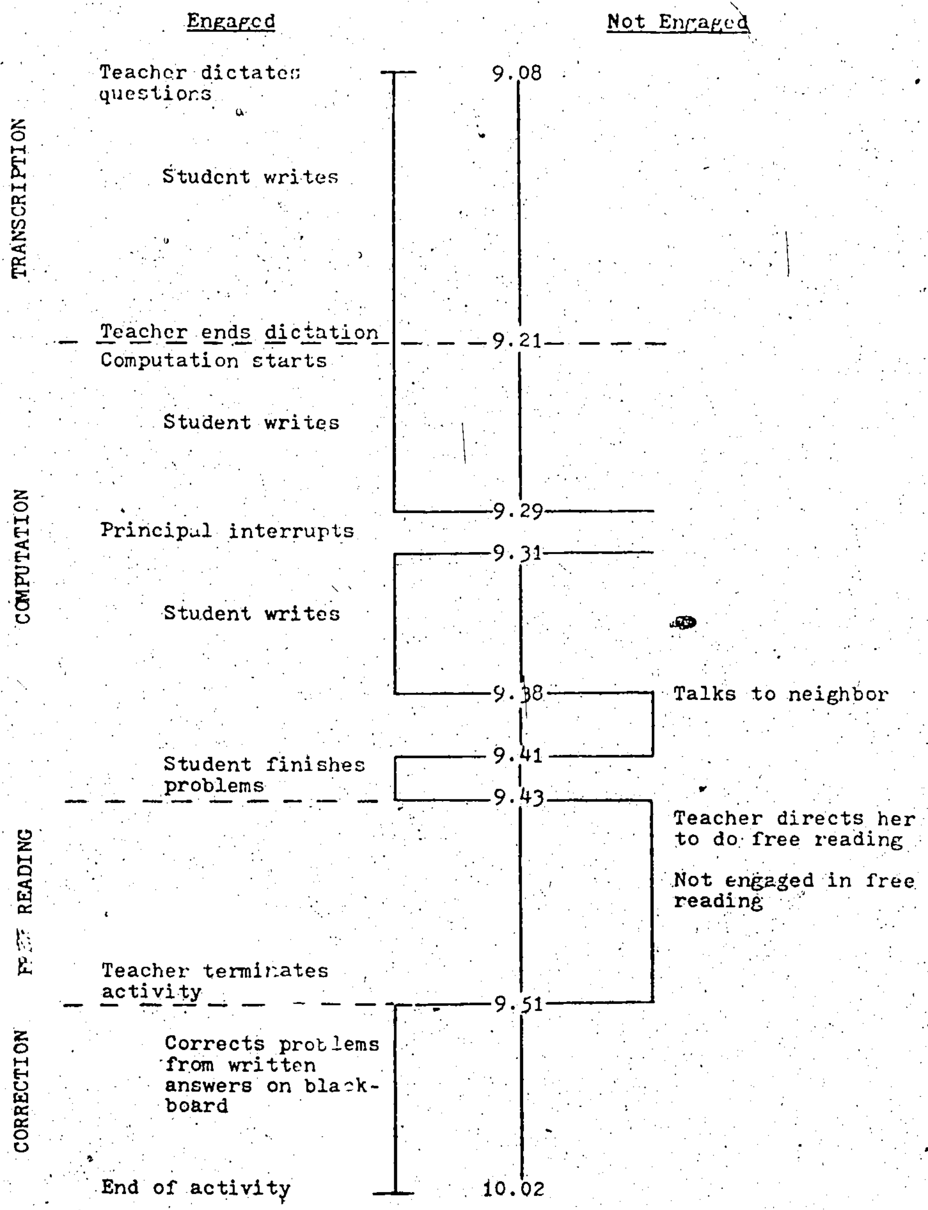
Problems incorrectly transcribed = 1

Engagement rate during free reading = 100%

Figure 19

Mathematics Computation Activity

18.10.76 Time: 9.08 - 10.02 Kathy



Engagement rate during transcription = 100%

Engagement rate during computation = 85%

Engagement rate during correction = 100%

Maximum number of problems = 11

Problems attempted = 11

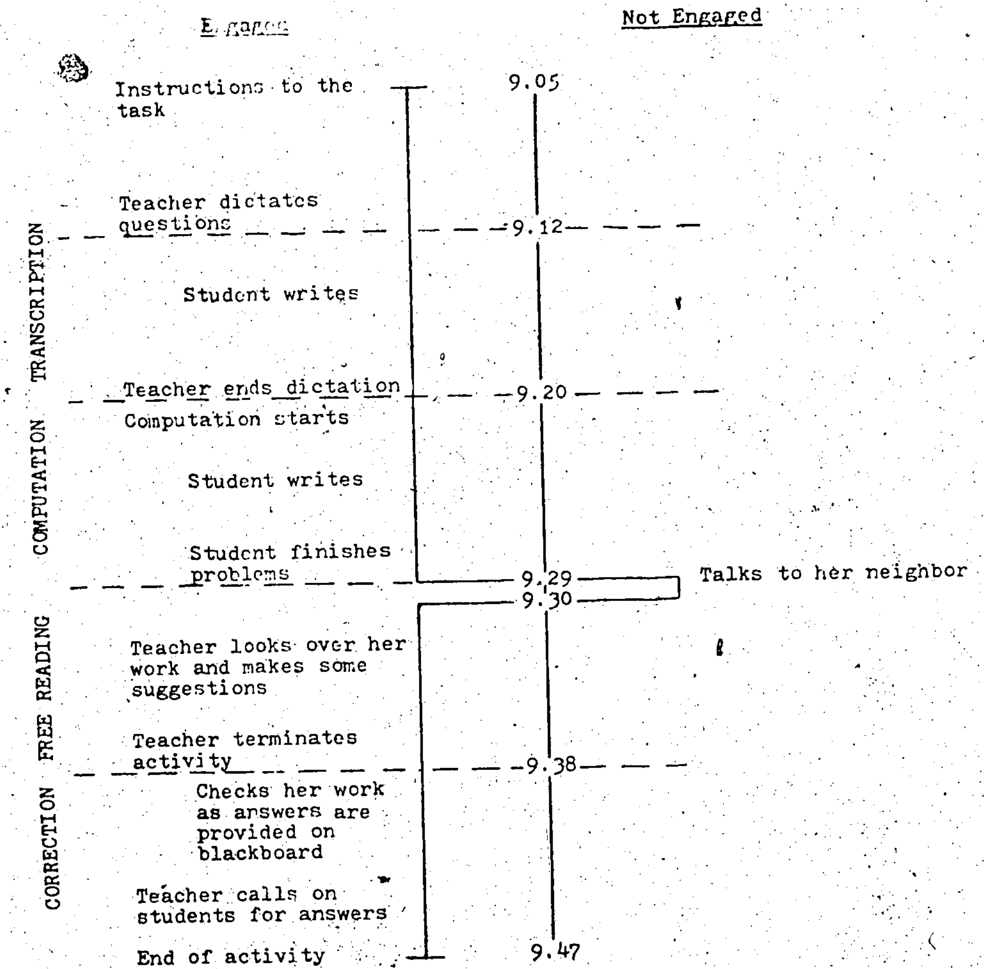
Problems correctly answered = 7

Engagement rate during free reading = 0%

Figure 20

Mathematics Computation Activity

19.10.78 Time: 9.05 - 9.47 Kathy ♀



Engagement rate during transcription = 100%

Engagement rate during computation = 100%

Engagement rate during correction = 100%

Maximum number of problems = 11

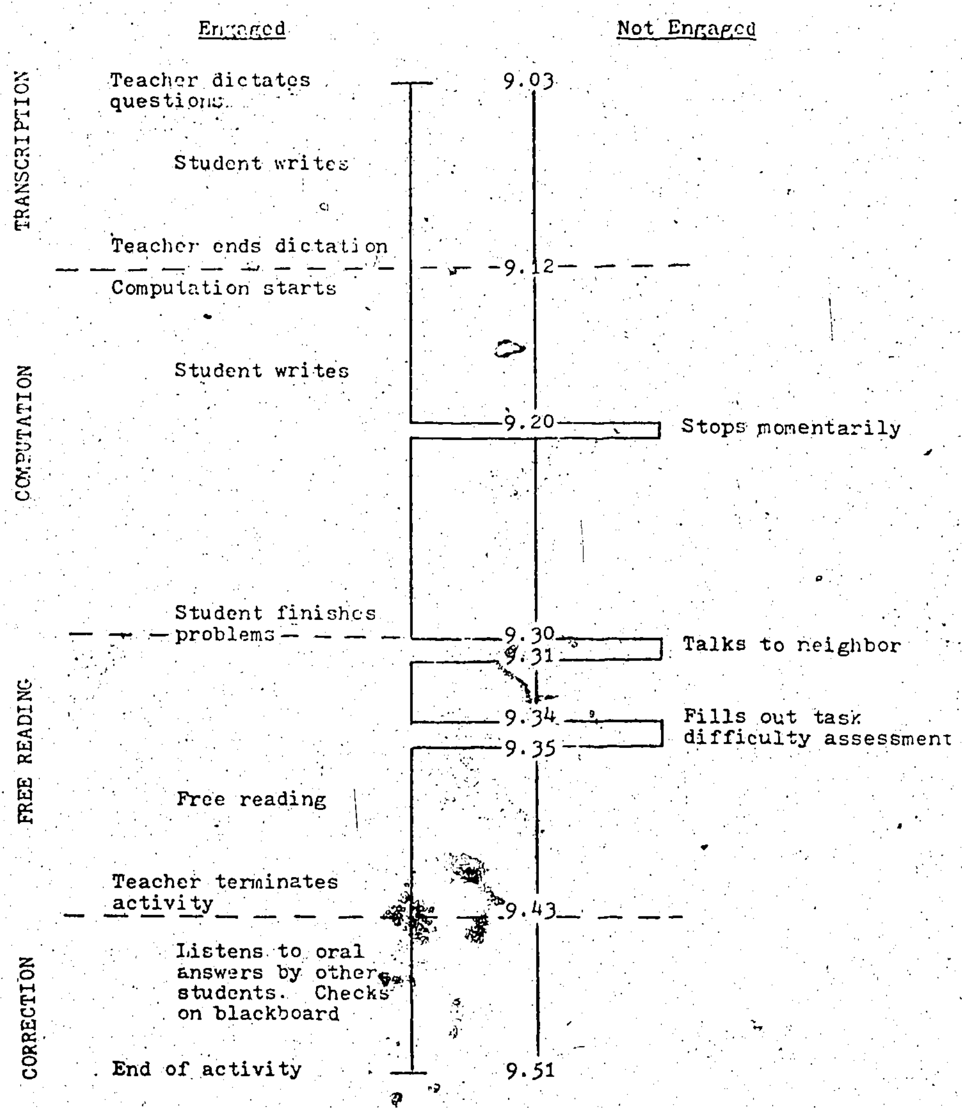
Problems attempted = 11

Problems correctly answered = 11

Figure 21

Mathematics Computation Activity

20.10.78 Time: 9.03 - 9.51 Kathy



Engagement rate during transcription = 100%

Engagement rate during computation = 95%

Engagement rate during correction = 100%

Maximum number of problems = 11

Problems attempted = 11

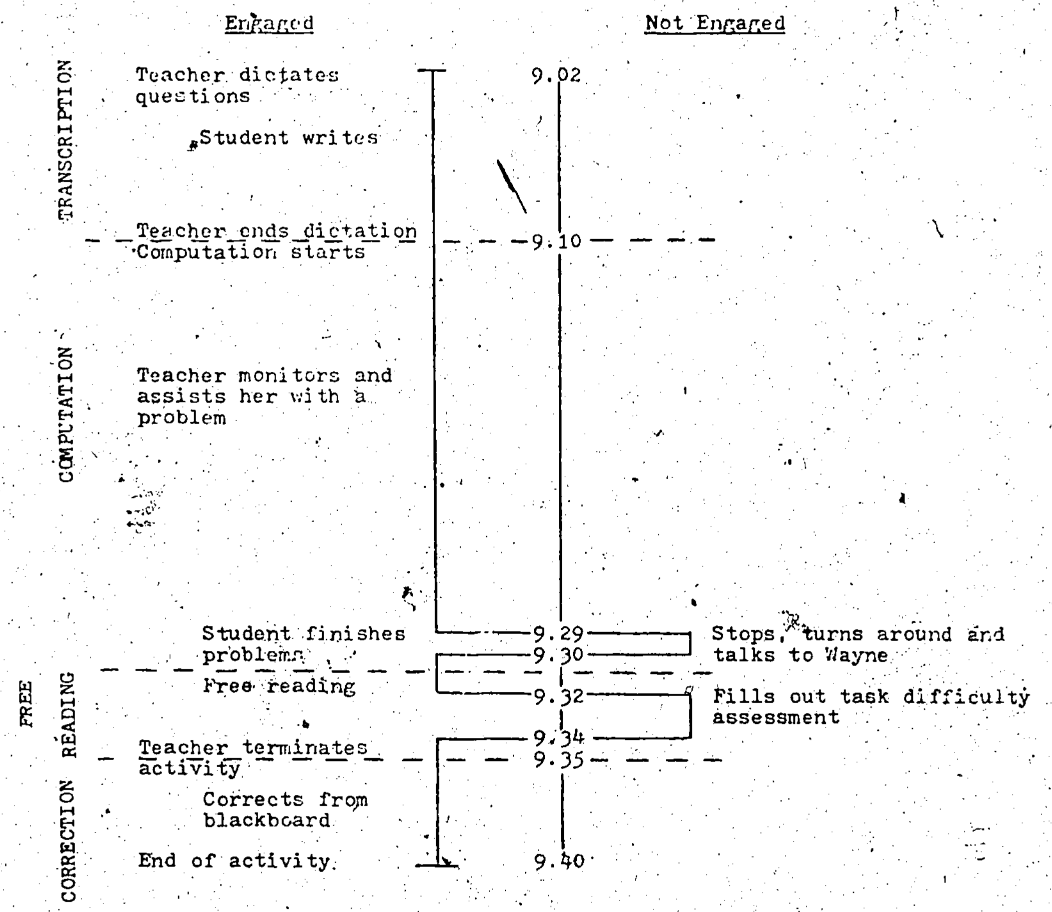
Problems correctly answered = 10

Engagement rate during free reading = 84%

Figure 22

Mathematics Computation Activity

23.10.78 Time: 9.02 - 9.40 Kathy



Engagement rate during transcription = 100%

Engagement rate during computation = 95%

Engagement rate during correction = 100%

Maximum number of problems = 11

Problems attempted = 11

Problems correctly answered = 5

Problems incorrectly transcribed = 1

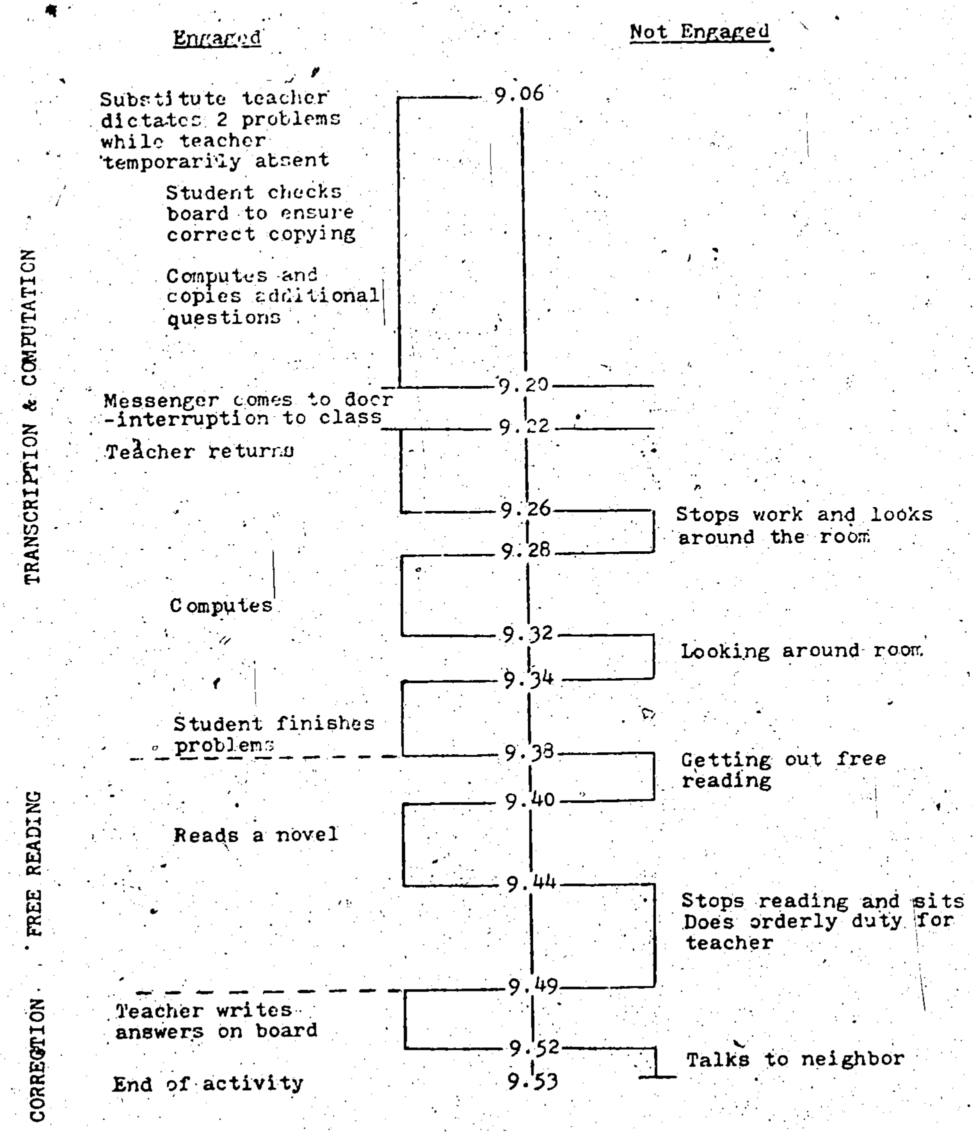
Errors in correction = 4

Engagement rate during free reading = 50%

Figure 23

Mathematics Computation Activity

24.10.78 Time: 9.06 - 9.53 Kathy



Engagement rate during transcription and computation = 87%

Engagement rate during correction = 75%

Maximum number of problems = 11

Problems attempted = 11

Problems correctly answered = 8

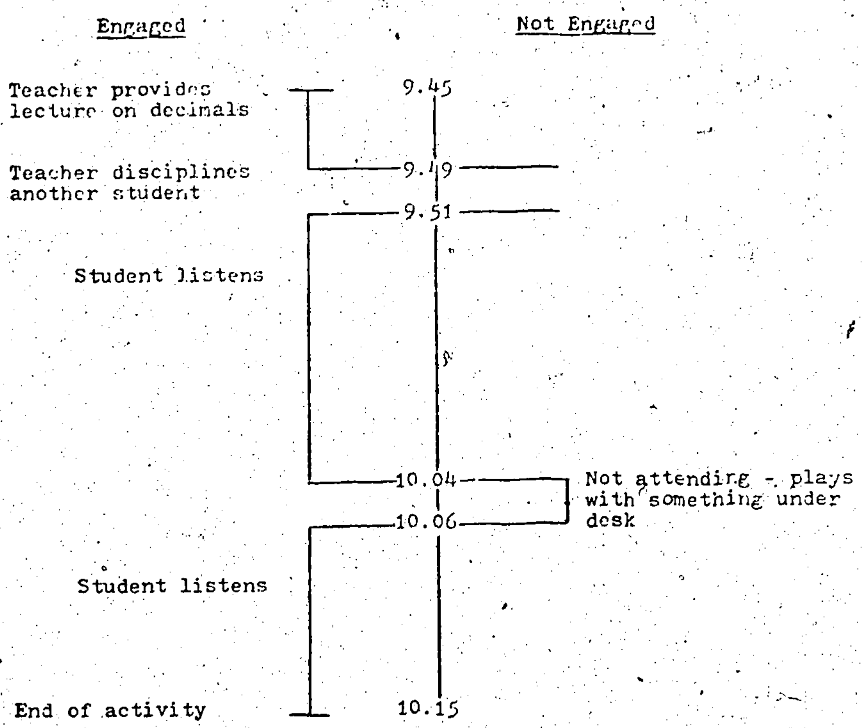
Engagement rate during free reading = 35%

Errors in correction = 1

Figure 24

Whole-of-Class Lecture in Mathematics

23.10.78 Time: 9.45 - 10.15 Kathy



Engagement rate during lecture = 93%

Kathy's segment profiles during dictated spelling, as shown in Figures 25 through 28, indicate high levels of engagement during both dictation and correction. Owing perhaps to the timing of the activity, just before morning recess, she sometimes used the brief remaining time as an opportunity to "rest."

For the most part, Kathy's written activities in reading were associated with particularly high levels of engagement, as shown in Figures 29 and 30. This applied also during the whole of class oral activity, portrayed in Figure 31. Although engaged in reading during the oral activity in Figure 32, this was reading of her own choosing, rather than the assigned on-going activity. In other respects, her activity was exemplary. This was further demonstrated in Figure 33.

In the free reading activities shown in Figures 34 and 35, Kathy displayed two opposed behavior patterns. Her activity in Figure 34 was uncharacteristic of Kathy's generally demonstrated behavior of a high ability to organize her free time. Although the assigned written task in Figure 36 was completed by Kathy, she displayed a negative attitude to the assigned reading activity that she was supposed to be engaged in following the written task.

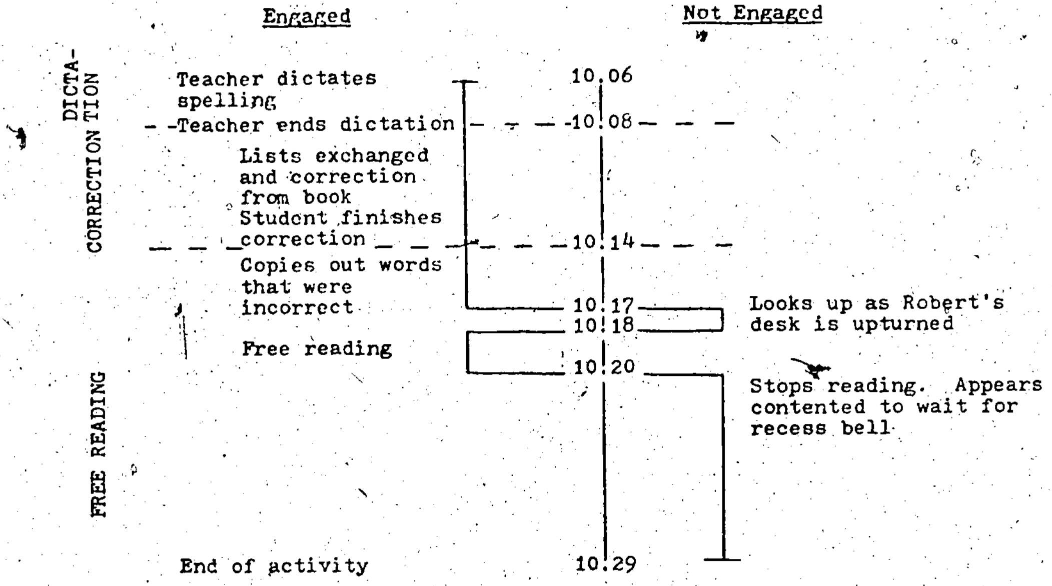
<u>Summary</u>

If it is possible to generalize about Kathy,

Figure 25

Dictated Spelling Activity

16.10.78 Time: 10.06 - 10.29 Kathy



Engagement rate during dictation = 100%

Engagement rate during correction and remediation = 100%

Engagement rate during free reading = 33%

Maximum number of dictated words = 16

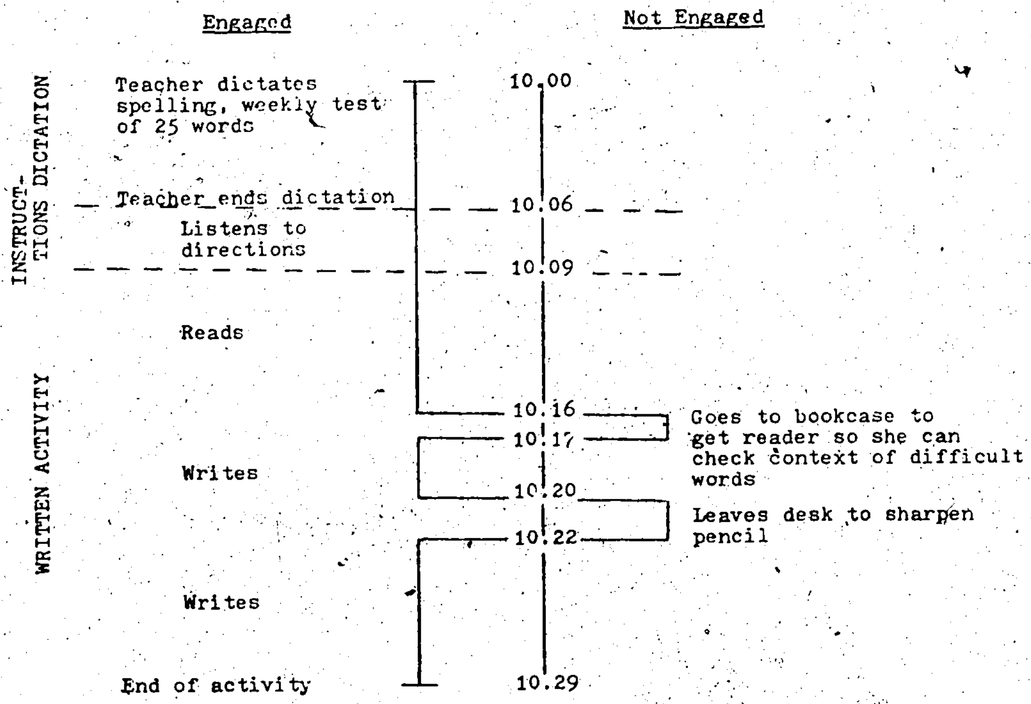
Words attempted = 16

Words answered correctly = 9

Figure 26

Dictated Spelling and Written Language Arts Activity

20.10.78 Time: 10.00 - 10.29 Kathy



Engagement rate during dictation = 100%

Engagement rate during instructions to task = 100%

Engagement rate during written language activity = 85%

Maximum number of dictated words = 25

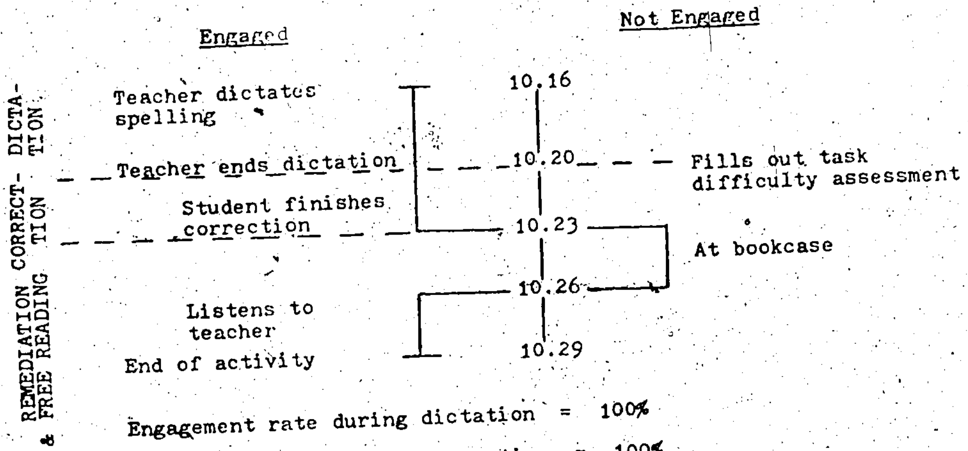
Words attempted = 25

Words answered correctly = 25

Figure 27

Dictated Spelling Activity

23.10.78 Time: 10.16 - 10.29 Kathy



Engagement rate during dictation = 100%

Engagement rate during correction = 100%

Engagement rate during remediation and free reading = 50%

Maximum number of dictated words = 15

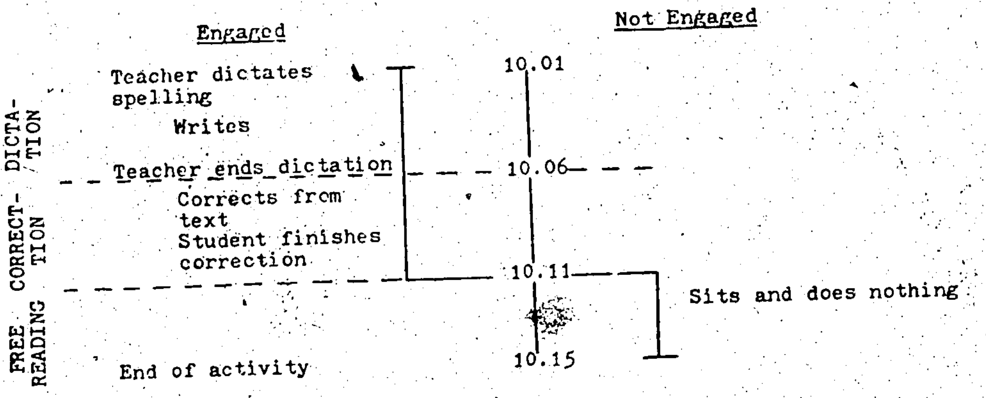
Words attempted = 15

Words answered correctly = 13

Figure 28

Dictated Spelling Activity

24.10.78 Time: 10.01 - 10.15 Kathy



Engagement rate during dictation = 100%

Engagement rate during correction = 100%

Engagement rate during free reading = 0%

Maximum number of dictated words = 21

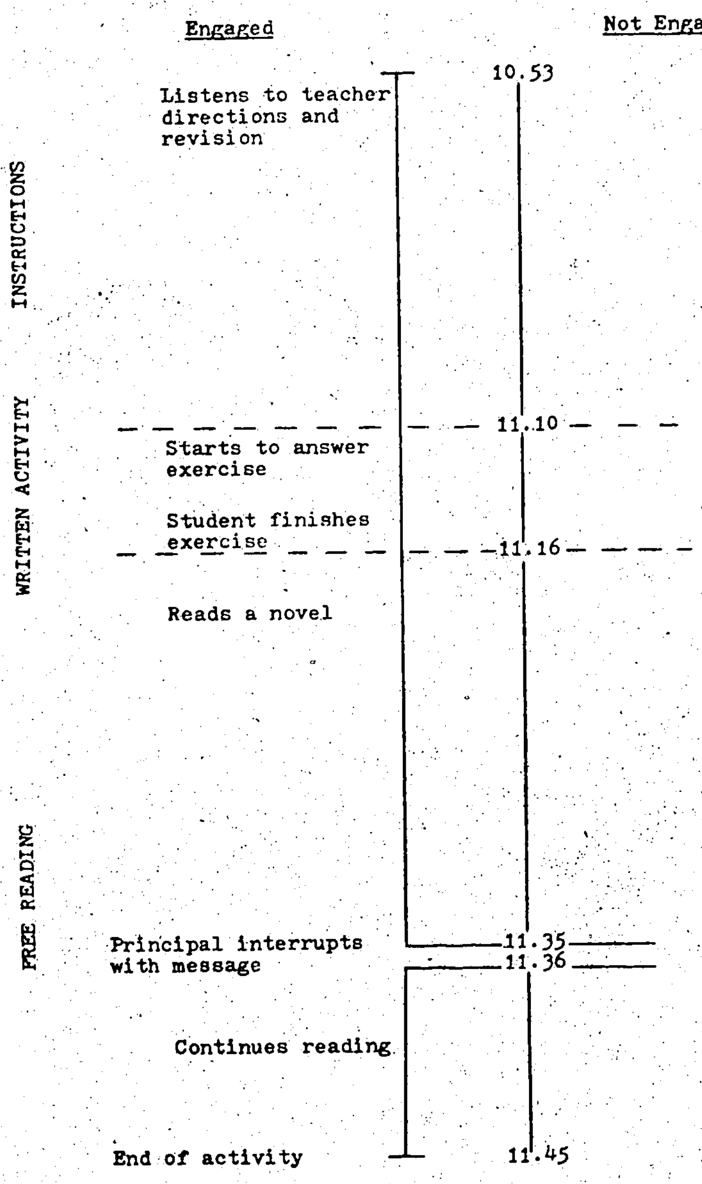
Words attempted = 21

Words answered correctly = 18

Figure 29

Written Language Skill Exercise

17.10.78 Time: 10.53 - 11.45 Kathy



Engagement rate during instructions to task = 100%

Engagement rate during language skill exercise = 100%

Engagement rate during free reading = 100%

Maximum number of exercises = 16

Exercises attempted = 16

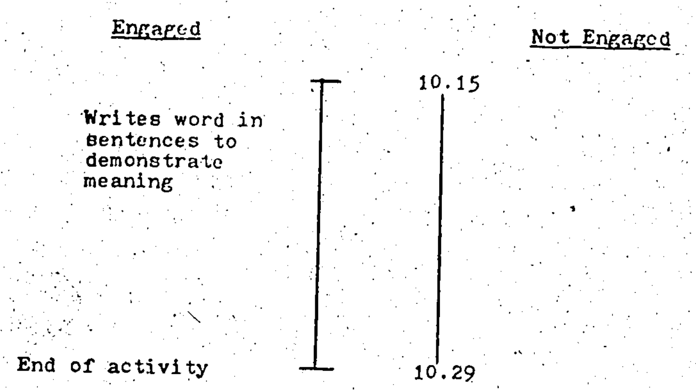
Exercises correctly answered = 16

Spelling mistakes = 1

Figure 30

Written Language Skill Exercise

18.10.78 Time: 10.15 - 10.29 Kathy



Engagement rate during written exercise = 100%

Maximum number of items in exercise = 16

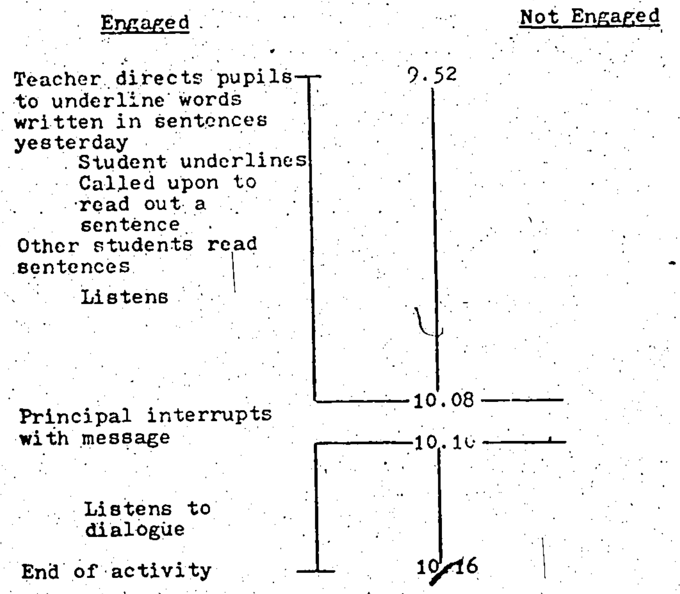
Items attempted = 16

Items correctly answered = 15

Figure 31

Oral Language Arts Activity

19.10.78 Time: 9.53 - 10.16 Kathy



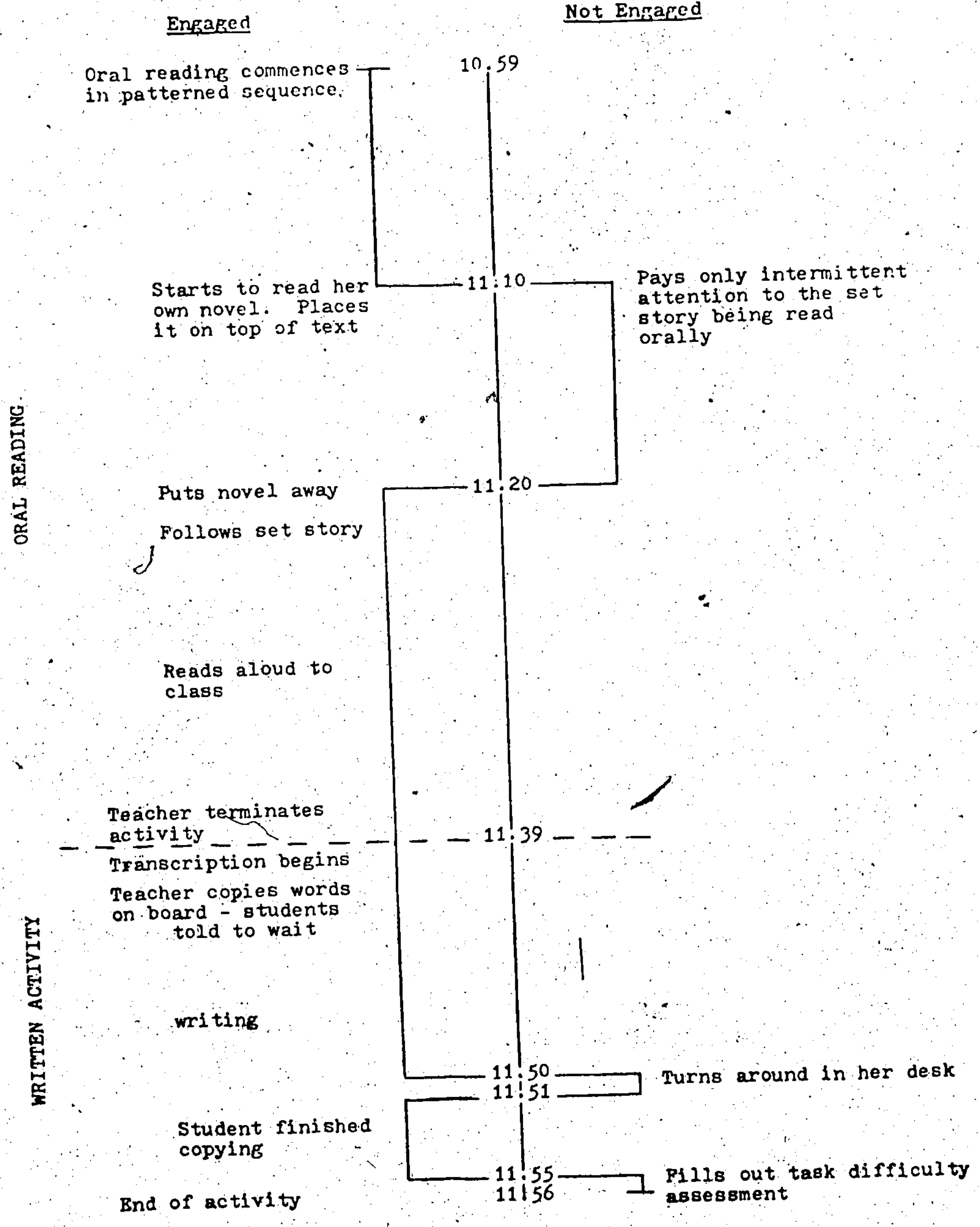
Engagement rate during oral language arts activity = 100%

Figure 32

Oral and Written Language Arts Activity

19.10.78 Time: 10.59 - 11.56

Kathy



Engagement rate during assigned oral reading activity = 50%

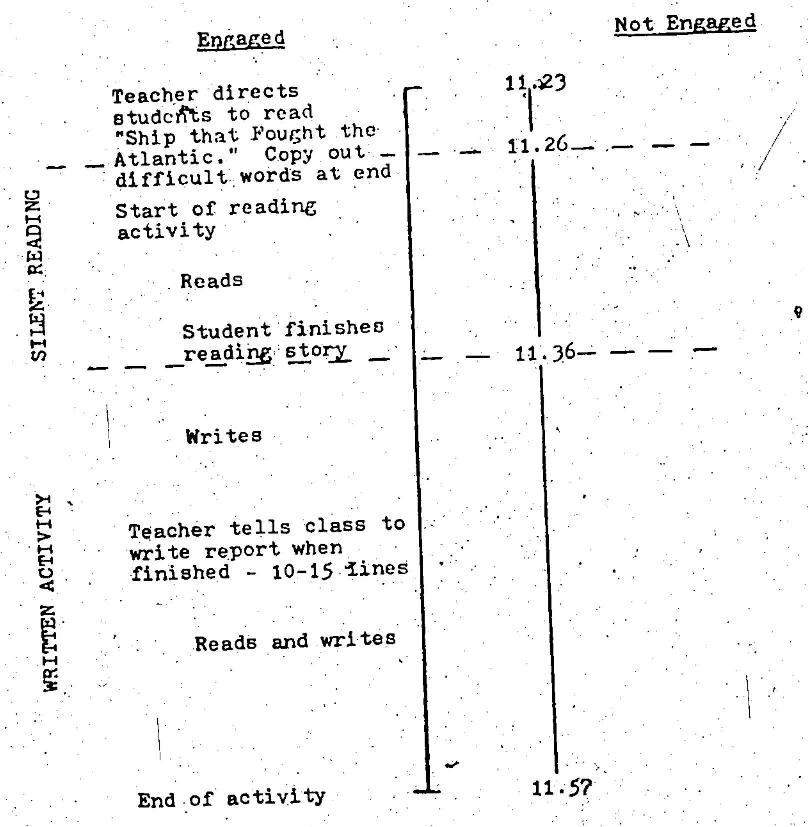
Engagement rate during assigned written activity = 94%

Figure 33

Silent Assigned Reading and Written Language Activity.

Kathy

20.10.78 Time: 11.23 - 11.57



Engagement rate during reading and writing activity = 100%

Maximum number of pages of set reading = 10

Pages completed = 10

Number of "difficult" words recorded = 14

Lines of written report completed = 1 (unfinished)

Figure 34

Language Arts and Free Reading Activity

20.10.78 Time: 10.50 - 11.17 Kathy

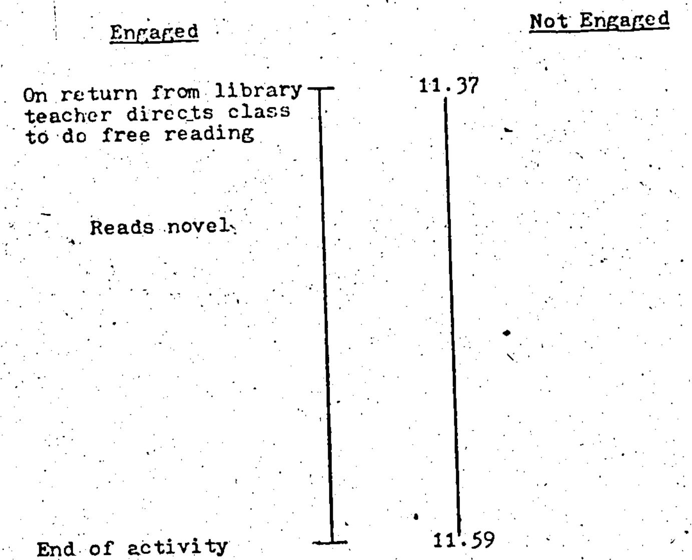
Engaged		Not Engaged
Teacher directs students to copy out incorrect spelling and then do free reading	10.50	Sits doing nothing Goes to bookcase to get book Goes to coat in cloak area Collects spelling test from teacher Draws Speaks to Wayne Notes on pad Draws cartoon Leaves desk - shows cartoon to another student
End of activity	11.17	

Engagement rate during free reading = 0%

Figure 35

Free Reading Period

23.10.78 Time: 11.37 - 11.59 Kathy



Engagement rate during free reading = 100%

Figure 36

Creative Writing and Assigned Reading Activities

24.10.78 Time: 10.52 - 11.55 Kathy

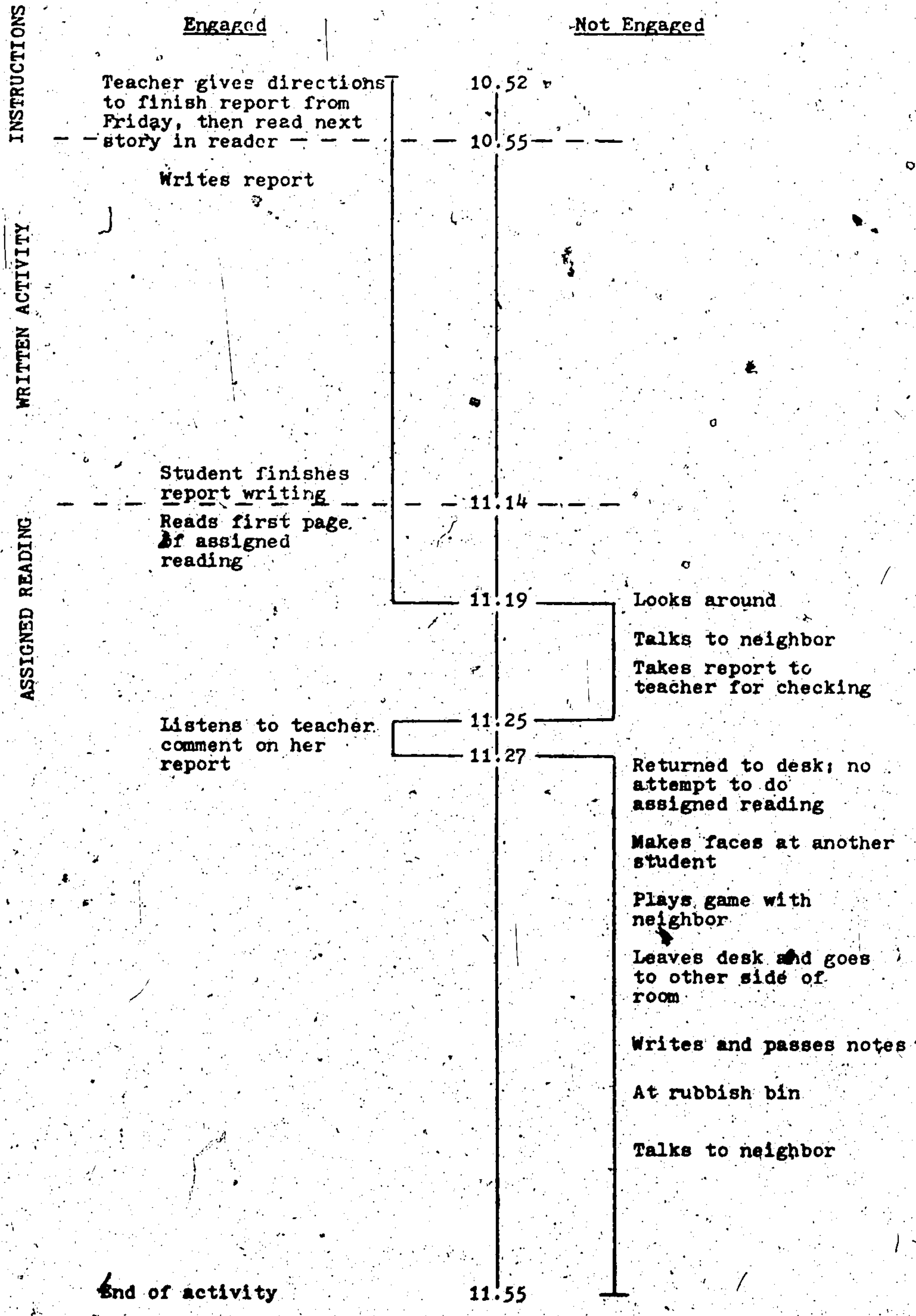


Figure 36 (Continued)

Kathy 24.10.78

Engagement rate during instructions = 100%

Engagement rate during report writing = 100%

Engagement rate during teacher consultation = 100%

Engagement rate during assigned reading = 13%

Length of submitted written report = 6 lines

Maximum pages of assigned reading = 10

Pages of assigned reading completed = 1

it could be said she achieved generally high levels of engagement on structured assigned tasks, particularly in circumstances where she could exercise some control herself. While Kathy did, on occasions, become engrossed in the productive use of free time, she could also display a capability to use it non-productively. Generally, her non-engagement went unnoticed by the teacher and involved little in the way of interruption to other pupils or the remainder of the class.

Robert

Biographical Description

Robert is the middle child in a family of three. His father is a university professor and his mother performs home duties. Robert was aged 11 years and 1 month.

For the past two years, Robert has attended a Gifted Program for one half day a week in another school. His most recent report from the teacher-in-charge of the program, noted that:

> Robert has participated fairly well this year, but fluctuates considerably in levels of concentration and involvement. When motivated to do so, he exhibits persistence and responds well to problems and challenges. Written work, however, is often done with excessive speed thus resulting in careless errors.

Robert's grade 5 teacher described him as "a bright child, but a messy worker." This teacher indicated Robert fitted in well with other students, and did not appear to allow his giftedness to interfere with his social relationships.

School records indicated Robert to be high achieving in the areas of reading and mathematics. Stanford Achievement Test end of year Edmonton data, revealed Robert as achieving between the eightieth and ninety-eighth percentiles in "word reading," "paragraph meaning" and "word study skills," in tests ranging over his school career. Likewise, in mathematics, Robert achieved between the ninetieth and ninety-seventh percentiles. His class grades in both reading and mathematics, provided further indications of superior ability and achievement.

Allocation and Distribution of Academic Learning Time

Robert was observed for six and one half school days amounting to a total possible instructional time of 1950 minutes. Table 40 shows 22 per cent of Robert's time allotted to the combined non-instructional activities of waiting, moving to and from activities, and involvement in general management activities initiated by the teacher. As in the case of other target pupils, one third of Robert's time was allotted to instruction of a non-academic nature and academic instruction lacking a reading or mathematics component. Instruction in reading and mathematics accounted for the remaining

Table 40

Distribution of Learning Time as a Percentage of Available Class Time - Robert

Activity	%
Wait	3.7
Transition	13.2
Management	[illegible].8
Non-Academic Instruction	18.1
Other Academic Instruction	15.0
Reading	31.2
Mathematics	13.9
	99.9

45 per cent of Robert's in-class time, which respectively amounted to 609 and 207 minutes.

Daily reading and mathematics times for Robert varied from a low of 33 minutes on the day of his partial absence to a maximum of 111 minutes in reading, to zero and 66 minutes in mathematics. Average daily available time for Robert, based on his six and one half day attendance, was 94 minutes of reading and 49 minutes of mathematics. Over a full year this would amount to 282 hours of reading and 147 hours of mathematics instruction.

Use of Academic Learning Time

Written, Oral and Covert Activity. Two thirds of Robert's engaged reading time, as shown in Table 41, was spent in activities where no opportunity was provided for either written or oral responses. By way of contrast, in mathematics, covert activity of this kind amount to half of Robert's engaged time. Written activity occupied a larger proportion of engaged time in mathematics than in reading, reflecting the more active nature of mathematics instruction.

As a result of the relatively large proportions of Robert's time in written and covert activity in both academic areas, verbalization constituted a relatively minor element of Robert's instruction. On a number of occasions, Robert was noticeably

Table 41

Written, Oral and Covert Activity in Minutes and as a Percentage of Engaged and Available Time in Reading and Mathematics - Robert

	Reading		Mathematics	
	Minutes	%	Minutes	%
	Engaged Time			
Engaged Written	105	26.5	84	34.8
Engaged Oral	3	.8	3	1.3
Engaged Covert	255	64.4	115	47.7
Engaged Direct	33	8.3	39	16.2
	396	100.0	241	100.0
	Available Time			
Engaged Written		17.2		31.1
Engaged Oral		.5		1.1
Engaged Covert		41.9		42.6
Engaged Direct		5.4		14.4
		65.0		89.2

frustrated by the lack of opportunity to verbalize, a consequence of the teacher's persistent directive to Robert to concern himself with the assigned covert or written activity and not with a discussion of the philosophy behind the activity. The teacher's standard response to Robert's frequently raised hand, when acknowledged at all was, "Yes, Robert. The answer is no! Now, what was your question?"

Tables 42 and 43 indicate the difficulties inherent in endeavouring to isolate daily patterns of pupil engagement. The variables of allocated time and engaged time co-vary. In reading, Robert's daily variability in engaged minutes was particularly unstable. As a subsequent section of this chapter will show, even though Robert's level of engaged activity was high, the non-uniform day-to-day allocation of time to reading, accounted for a predominant portion of the variability in Table 42.

In mathematics, as shown in Table 43, Robert's distribution of engaged time between written and covert activity was somewhat more stable on a day-to-day basis, a factor reflected by the interacting effects of a uniform time allocation and constant pupil perseverance on-task.

Academic Content Covered. Academic content actually covered in a number of reading activities

Table 42

Written, Oral and Covert Activity in Reading in Engaged Minutes and as a Percentage of Daily Engaged Reading Time - Robert

Activity	16.10.78		17.10.78		18.10.78*		19.10.78		20.10.78		23.10.78		24.10.78	
	mins.	%	mins.	%	mins.	%	mins.	%	mins.	%	mins.	%	mins.	%
Engaged Written	24	61.5	3	4.0	-		21	18.4	15	25.0	18	85.7	24	44.4
Engaged Oral	-		-		-		3	2.6	-		-		-	
Engaged Covert	15	38.5	63	84.0	33	100.0	78	68.4	36	60.0	3	14.3	27	50.0
Engaged Direct	-		9	12.0	-		12	10.5	9	15.0	-		3	5.6
	39	100.0	75	100.0	33	100.0	114	99.9	60	100.0	21	100,0	54	100.0

*Absent in the morning

Table 43

Written, Oral and Covert Activity in Mathematics in Engaged Minutes and as a Percentage of Daily Engaged Mathematics Time - Robert

	16.10.78		17.10.78		18.10.78*		19.10.78		20.10.78		23.10.78		24.10.78	
Activity	mins.	%	mins.	%	mins.	%	mins.	%	mins.	%	mins.	%	mins.	%
Engaged Written	12	30.7	15	25.0	-		12	40.0	15	45.4	18	37.5	12	57.1
Engaged Oral	-		3	5.0	-		-		-		-		-	
Engaged Covert	21	53.9	30	50.0	-		12	40.0	9	27.3	27	56.3	6	28.6
Engaged Direct	6	15.4	12	20.0	-		6	20.0	9	27.3	3	6.2	3	14.3
	39	100.0	60	100.0	-		30	100.0	33	100.0	48	100.0	21	100.0

*Absent in the morning

was measured for approximately one quarter of Robert's 669 minutes of allotted reading time. A summary of the various aspects of content covered in reading is given in Table 44. Opportunity to assess Robert's level of success in these categories was limited due, in part, to his absence on one morning.

In four out of the six reading categories of Table 44, Robert attempted all of the assigned work, as evidenced by an Unadjusted Index of Effort of 1.0. His lack of effort in spelling remediation and his reduced effort on the single creative writing exercise, were more than likely reflections of Robert's lack of desire on those occasions, rather than an indication of content difficulty.

Although indications of success were available for Robert in only three of the reading categories of Table 44, the Unadjusted Index of Success on each recorded occasion was 1.0, or close thereto. Actual collected artifacts of Robert's work, to be included in a later section, indicated that most of his reading-related errors were of the careless variety, generated out of an eagerness to dispense with the assigned task as rapidly as possible.

Out of the 270 minutes of mathematics time available to Robert, content covered was measured for 183 minutes, or two thirds of the available time. The daily record of Robert's measurable mathematics pursuits

Table 44

Content Covered, Effort and Success in Reading Activities - Robert

Activity	Content Assigned	Content Attempted	Unadjusted Index of Effort	Content Correctly Completed	Unadjusted Index of Success	Elapsed Time (minutes)
Dictated Spelling	77 words	77 words	1.00	64 words	.83	17
Spelling Remediation	6 words	nil	.0	nil	.0	6
Word Transcription	35 words	35 words	1.00	32 words	.91	17
Silent Reading	36 pages	36 pages	1.00	*	*	74
Creative Writing	15 lines	8 lines	.53	*	*	12
Word Recognition	19 words	19 words	1.00	19 words	1.00	9

*Impossible to assess

are shown in Table 45.

Indicative of the ease with which Robert was able to undertake assigned mathematics computations, was his Unadjusted Index of Effort of 1.0, his corresponding Unadjusted Index of Success of .85, and his average computation time per problem of 1.12 minutes, shown in Table 46. However the careless manner in which Robert often approached tasks was revealed in his 4.5 per cent error rate in transcribing problems. This was the major factor contributing to Robert's failure to answer correctly all assigned problems.

Engagement, Difficulty and Academic Content. Robert was present in class for 609 minutes of reading and 270 minutes of mathematics instruction. Using observational means, Robert was assessed as being engaged in reading for 65 per cent of the available reading time, or 396 minutes, and engaged in mathematics pursuits for 89 per cent of available mathematics time, amounting to 241 minutes. Given the six and one half days of Robert's attendance, these rates produced daily averages of 61 minutes of reading and 37 minutes of mathematics. When the 637 minutes of Robert's engaged time were expressed as a percentage of the total available reading and mathematics time, his overall engagement rate across the

Table 45

Daily Content Covered in Mathematics Computation - Robert

Date	Maximum Number of Problems	Problems Attempted	Problems not Transcribed	Problems Incorrectly Transcribed	Problems Correctly Answered	Errors in Correction	Elapsed Transcription Time (min)	Elapsed Computation Time (min)	Elapsed Correction Time (min)
16.10.78	11	11	-	[illegible]	10	-	10	18	21
17.10.78	11	11	-	[illegible]	9	-	9	15	9
18.10.78					ABSENT				
19.10.78	11	11	-	-	11	-	8	8	9
20.10.78	11	11	-	-	11	-	9	15	8
23.10.78	11	11	-	1	9	-	8	18	5
24.10.78	11	11	-	2	6	-	9	20	4
	66	66	-	3	56	-	53	74	56

Table 46

Summary of Content Covered in Mathematics Computation - Robert

Category	Statistic
Problems Attempted	100.0%
Problems Not Transcribed	-
Problems Incorrectly Transcribed	4.5%
Problems Correctly Answered	84.8%
Errors in Correction	-
Average Transcription Time per Problem	.8 min.
Average Computation Time per Problem	1.12 min.
Average Correction Time per Problem	.8 min.
Unadjusted Index of Effort in Mathematics Computation	1.00
Unadjusted Index of Success in Mathematics Computation	.85

two content areas was 71 per cent.

Table 47 reveals that Robert was considered by the observer to have spent in excess of 80 per cent of his available time in reading and mathematics, working with content that could be described as easy for Robert. For the balance of his time, Robert was involved in activities of medium difficulty. The frequency of his encounters with hard material, were insignificant.

The breakdown according to subject matter is shown for Robert in Table 48. The percentage distribution according to difficulty level between reading and mathematics is identical and differs little from the combined portrayal in Table 47. For the predominant portion of his time, Robert was clearly interacting with learning material of easy difficulty, with challenge provided on occasions by some material of medium difficulty.

Observer assessment of task difficulty and student self-assessment of task difficulty for 13 reading and 6 mathematics activities are shown in Table 49. Robert's actual success rate in 15 written pursuits are also shown. Measurable output was available for activities undertaken by Robert during 22 per cent of his available reading time and 76 per cent of his available mathematics time. All three methods rated Robert's various encounters in reading

Table 47

Percentage of Allocated Time in Reading and Mathematics According to Level of Task Difficulty - Robert

Observer Assessment of Difficulty	Minutes	%
Easy	719	81.8
Medium	156	17.8
Hard	3	.4
	878	100.0

Table 48

Minutes of Engaged Time and Percentage of Engaged Time in Reading and Mathematics According to Level of Task Difficulty - Robert

Observer Assessment of Difficulty	Reading		Mathematics	
	Minutes	%	Minutes	%
Easy	312	78.7	187	77.7
Medium	84	21.3	51	21.0
Hard	-	-	3	1.3
	396	100.0	241	100.0

Table 49

Results of Comparative Methods of Assessing Pupil Task Difficulty in Reading and Mathematics - Robert

Task Description	Data	Student Assessment of Difficulty (1)	Observer Assessment of Difficulty (2)	Actual % Success on Written Pursuits (3)	Difficulty as Reflected by Success Rate (4)
Math Computation	16.10.78	E	E	91	E
Dictated Spelling	"	M	E	63	M
Library Skill Exercises	"	E	E	*	*
Math Computation	17.10.78	E	E	82	E
Word Recognition	"	E	E	100	E
Silent Reading (Test)	"	M	M	64	M
Silent Reading (Test)	"	M	M	77	M
Silent Reading (Test)	"	M	M	67	M
Math Computation	19.10.78	E	M	100	E
Silent Reading	"	E	E	*	*
Math Computation	20.10.78	E	E	100	E
Dictated Spelling	"	M	E	100	E
Silent Reading	"	E	E	*	*
Creative Writing	"	E	E	75	M
Math Computation	23.10.78	M	E	82	E
Dictated Spelling	"	E	E	80	E
Math Computation	24.10.78	E	E	55	M
Dictated Spelling	"	E	E	81	E
Silent Reading	"	M	E	*	*

E = Easy M = Medium H = Hard * = No Assessment Possible

and mathematics as being of either easy or medium difficulty.

The extent of agreement among the three methods of measuring Robert's task difficulty is summarized in Table 50. The level of agreement between observer and pupil assessment was high. The identical coefficients of agreement between student assessment and success rate and observer assessment and success rate indicated that both observer and pupil were capable of accurately assessing the difficulty of written reading and mathematics activities in the on-going class situation.

When considered on a daily basis, as in Tables 51 and 52, Robert's engagement according to category of activity appeared highest in those activities which possessed a high degree of structure imposed by the teacher. When left to his own devices in free reading, as at the conclusion of assigned reading and mathematics activity, Robert showed himself to be inept at organizing that segment of his time productively.

Task Involvement According to Setting

Table 53 shows that when other-paced and self-paced settings were used as a basis for classification, Robert's reading time was distributed three quarters to self-paced settings and one quarter to other-paced.

Table 50

Agreement Among Alternative Modes of Assessing Pupil Task Difficulty in Reading and Mathematics - Robert

Modes	Number of Assessment Decisions	Number of Assessments in Agreement	Percentage Agreement
Observer v Student Assessment	19	15	78.9
Student Assessment v Success Rate	15	11	73.3
Observer Assessment v Success Rate	15	11	73.3

Table 51

Percentage Engagement by Activity in Selected Reading Tasks - Robert

Date	16.10.78	17.10.78	18.10.78	19.10.78	20.10.78	23.10.78	24.10.78
Spelling Dictation	100				100	100	100
Spelling Correction and Remediation	100					100	100
Free Reading	0, 91	55			0	17, 0	0, 27
Library Skills	100						
Instructions to Task		100			100		100
Word Recognition		100		88			
Word Usage					55		
Silent Reading				85	88		96
Word Transcription					100	88	
Creative Writing							

Table 52

Percentage Engagement by Activity in Mathematics Tasks - Robert

Date	16.10.78	17.10.78	18.10.78	19.10.78	20.10.78	23.10.78	24.10.78	Mean
Introduction to Task				100				100
Transcription	77	100		100	100	100	72	92
Computation	100	100		100	100	100	72	95
Correction	100	100		100	100	100	75	96
Whole-of-Class Lectures		100				100		100
Free Reading	77	100		100	63	0	41	63

Table 53

Learner Behavior by Setting as a Percentage of Available Reading and Mathematics Time - Robert

Learner Behavior	Reading	Mathematics
Other-Paced Settings (Group and Whole-of-Class)		
	%	%
Engaged Written	3.9	1.1
Engaged Oral	.5	1.1
Engaged Covert	9.9	35.6
Engaged Direct	5.4	13.3
Not Engaged Interim	.5	2.2
Not Engaged Waiting	1.0	1.1
Not Engaged Off-Task	.3	2.2
	21.5	56.6
Self-Paced Settings (Seatwork)		
Engaged Written	13.3	30.7
Engaged Oral	-	-
Engaged Covert	32.0	3.3
Engaged Direct	-	-
Not Engaged Interim	1.9	3.3
Not Engaged Waiting	-	2.2
Not Engaged Off-Task	30.5	3.3
	77.7	42.7

In mathematics, the distribution was in roughly equal proportions between the two types of settings.

Focusing upon the aspect of engagement in a global sense, Table 53 shows Robert as having been engaged in other-paced settings for 90 per cent of the time spent in that setting for both reading and mathematics. In self-paced situations, Robert was engaged for 58 per cent of the time actually spent in that setting in reading, and for 79 per cent in mathematics.

The most revealing aspect of these statistics is Robert's uniformly high engagement rate across subject areas in other-paced settings, and the correspondingly lower and more variable rates in self-paced situations, where control was in Robert's hands. This was most evident in reading where Robert showed a marked tendency toward off-task activity. Rather than being disruptive in nature, these non-productive periods were spent by Robert in the private activity of drawing. Almost all of his off-task time was used in this manner.

Teaching Behavior

Using the two types of classroom settings as the distinguishing variable, Table 54 indicates the composition of teaching behaviors directed towards Robert in the two subject areas.

Table 54

Teaching Behavior by Setting as a Percentage of Available Reading and Mathematics Time -- Robert

Teaching Behavior	Reading	Mathematics
Other-Paced Settings (Group and Whole-of-Class)		
	%	%
Explanation Needed	2.0	5.6
Explanation Planned	3.0	7.8
Academic Observation	-	1.1
Academic Question	3.5	18.9
Academic Feedback	6.4	15.6
Substantive Teaching	14.9	49.0
Structure Direct	5.4	4.4
Task Engagement Feedback	-	-
Total Interaction	20.3	53.4
No Teaching	1.2	3.2
	21.5	56.6
Self-Paced Settings (Seatwork)		
Explanation Needed	-	-
Explanation Planned	.5	-
Academic Observation	-	-
Academic Question	-	1.1
Academic Feedback	4.4	1.1
Substantive Teaching	4.9	2.2
Structure Direct	1.0	-
Task Engagement Feedback	.5	-
Total Interaction	6.4	2.2
No Teaching	71.3	40.5
	77.7	42.7

Substantive teaching behavior was present for 90 minutes of Robert's other-paced reading. For one third of that time, or 30 minutes, Robert was presented with explanations, and for the remaining 60 minutes, or two thirds of the substantive teaching in reading in that setting, he was the object of academic monitoring in the form of questions, observations or feedback, directed to the group as a whole.

In other-paced mathematics, Robert was present during 132 minutes of substantive teaching. The distribution of teaching behavior during that time was approximately one quarter, or 35 minutes to explanations, and three quarters, or 97 minutes, to some form of monitoring.

The variety of interactive teaching behavior was noticeably more varied when Robert was in a group setting. The significance, however, may well have been counter-balanced by the small proportion of total reading time in other-paced settings, and the reduced level of total minutes of mathematics time available.

Teaching behaviors directed toward Robert were what might have been expected of a behaviorally normal pupil in a structured self-contained classroom.

Table 55 provides further data on the absolute and relative proportion of Robert's time spent receiving individually-focused and group-focused teaching behavior. As a portion of available time in

Table 55

Group and Individual Focus of Teaching Behavior in Minutes and as a Percentage of Available Reading and Mathematics Time - Robert

Direction of Teaching Focus	Reading		Mathematics	
	Minutes	%	Minutes	%
Individual Focus	18	2.9	3	1.1
Group Focus	144	23.7	150	55.6

both content areas, individual focus featured low. Significant, however, was the larger proportion of available time in mathematics, in contrast to reading, devoted to teaching behavior with a group focus.

The teacher-centred nature of Robert's classroom was reflected in the statistics in Table 56. Of the 180 minutes of teaching behavior recorded as having occurred in reading, two thirds emanated from the teacher. In mathematics, the corresponding statistic was one fifth. Curriculum resources were conspicuous by their non-use, at least for Robert, in mathematics.

Pupil Profile and Work Habits During Academic Content

Segment profiles were prepared for 8 mathematics and 12 reading activities for Robert, samples of which are contained later in this section.

Figures 37 through 41, which portray self-paced mathematics computation for Robert, indicate high consistency from day-to-day in his engagement pattern. Generally, Robert worked without interruption until the assigned activity had been completed, and depending upon his disposition at the time either moved into free reading or indulged in off-task drawing. His off-task activity was rarely disruptive to other students, focusing mainly on self-generated drawing activity.

Figure 42 indicates a pattern of behavior which

Table 56

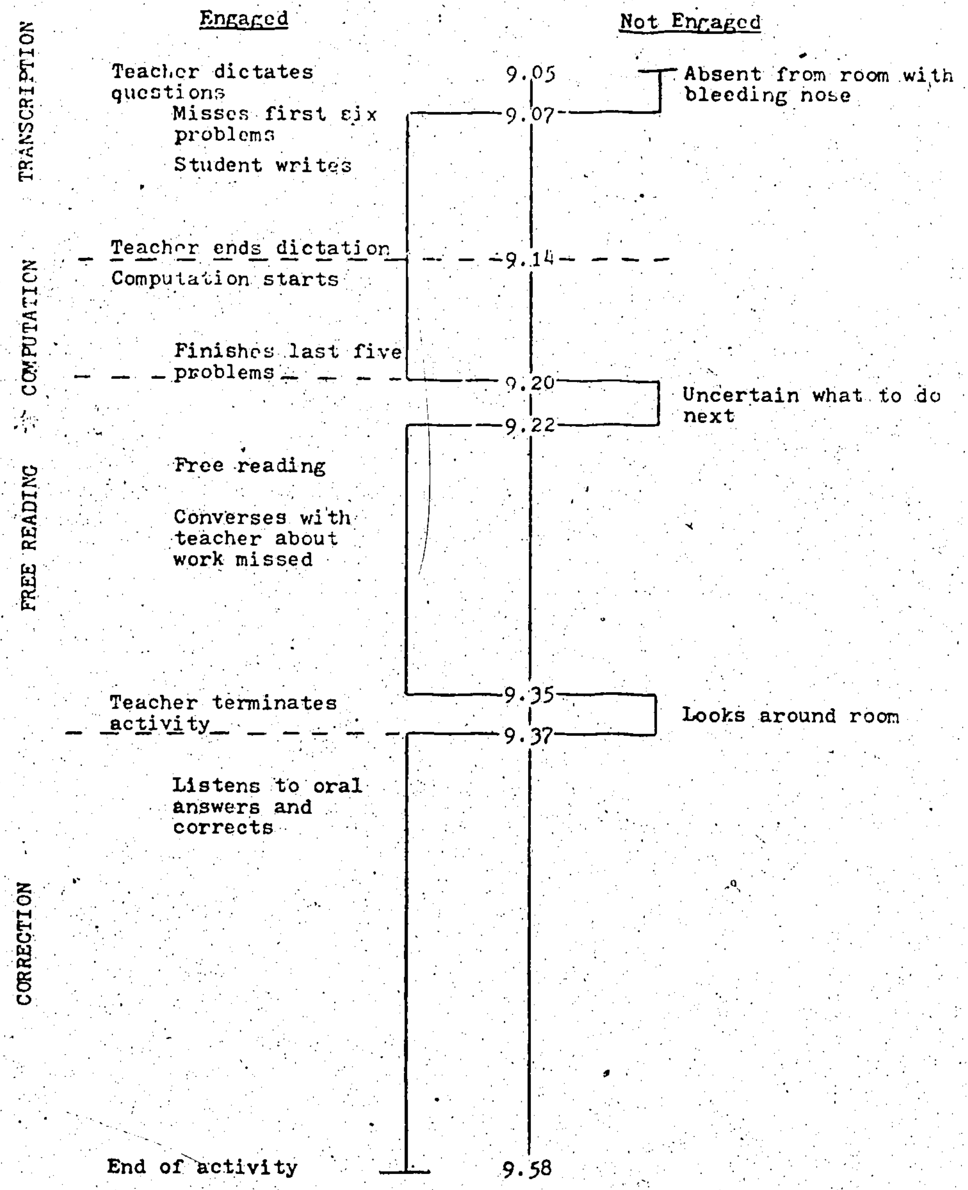
Source of Teaching Behavior in Minutes and as a Percentage of Available Reading and Mathematics Time - Robert

Source of Teaching Behavior	Reading		Mathematics	
	Minutes	%	Minutes	%
Teacher	108	17.7	120	44.4
Other Students	42	6.9	33	12.2
Curriculum	12	1.9	-	-

Figure 37

Mathematics Computation Activity

16.10.78 Time: 9.05 - 9.58 Robert



Engagement rate during transcription (of last 5 problems) = 77%

Engagement rate during computation (of last 5 problems) = 100%

Engagement rate during correction = 100%

Maximum number of problems = 5 (6 later)

Problems attempted = 5 (6 attempted later)

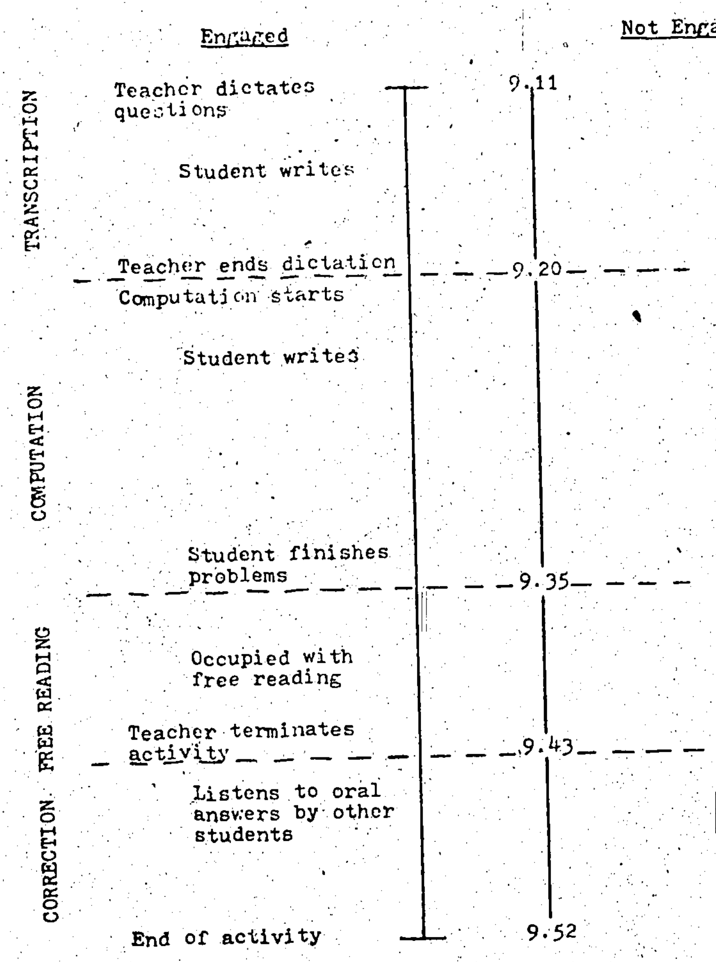
Problems correctly answered = 4 (6 correct later)

Engagement rate during free reading = 77%

Figure 38

Mathematics Computation Activity

17.10.78 Time: 9.11 - 9.52 Robert



Engagement rate during transcription = 100%

Engagement rate during computation = 100%

Engagement rate during correction = 100%

Maximum number of problems = 11

Problems attempted = 11

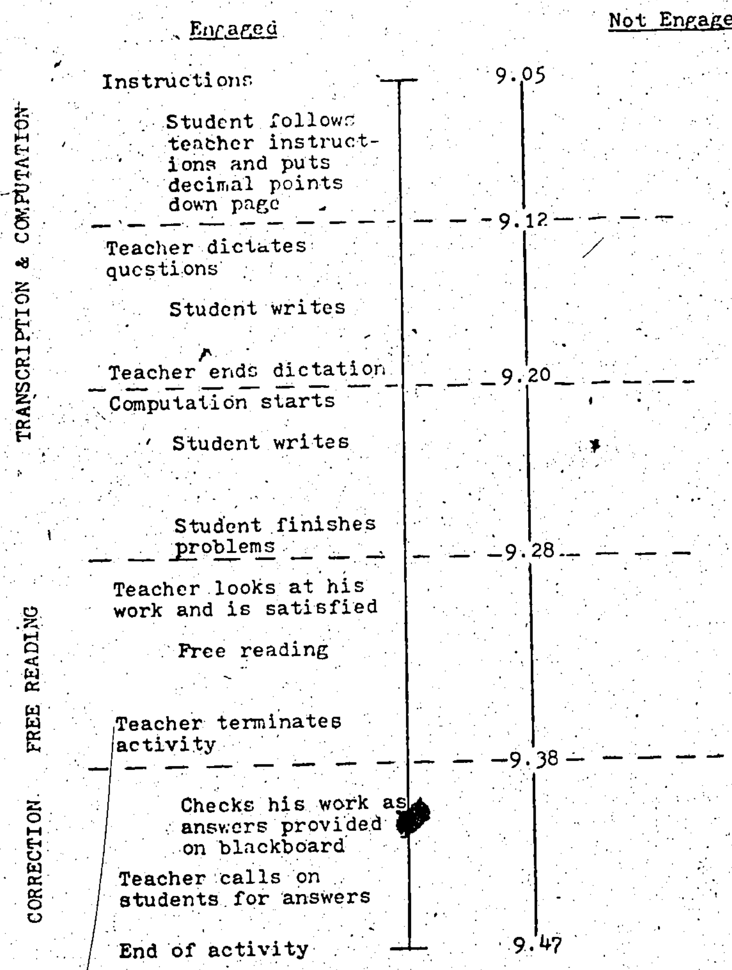
Problems correctly answered = 9

Engagement rate during free reading = 100%

Figure 39

Mathematics Computation Activity

19.10.78 Time: 9.05 - 9.47 Robert



Engagement rate during transcription = 100%

Engagement rate during computation = 100%

Engagement rate during correction = 100%

Maximum number of problems = 11

Problems attempted = 11

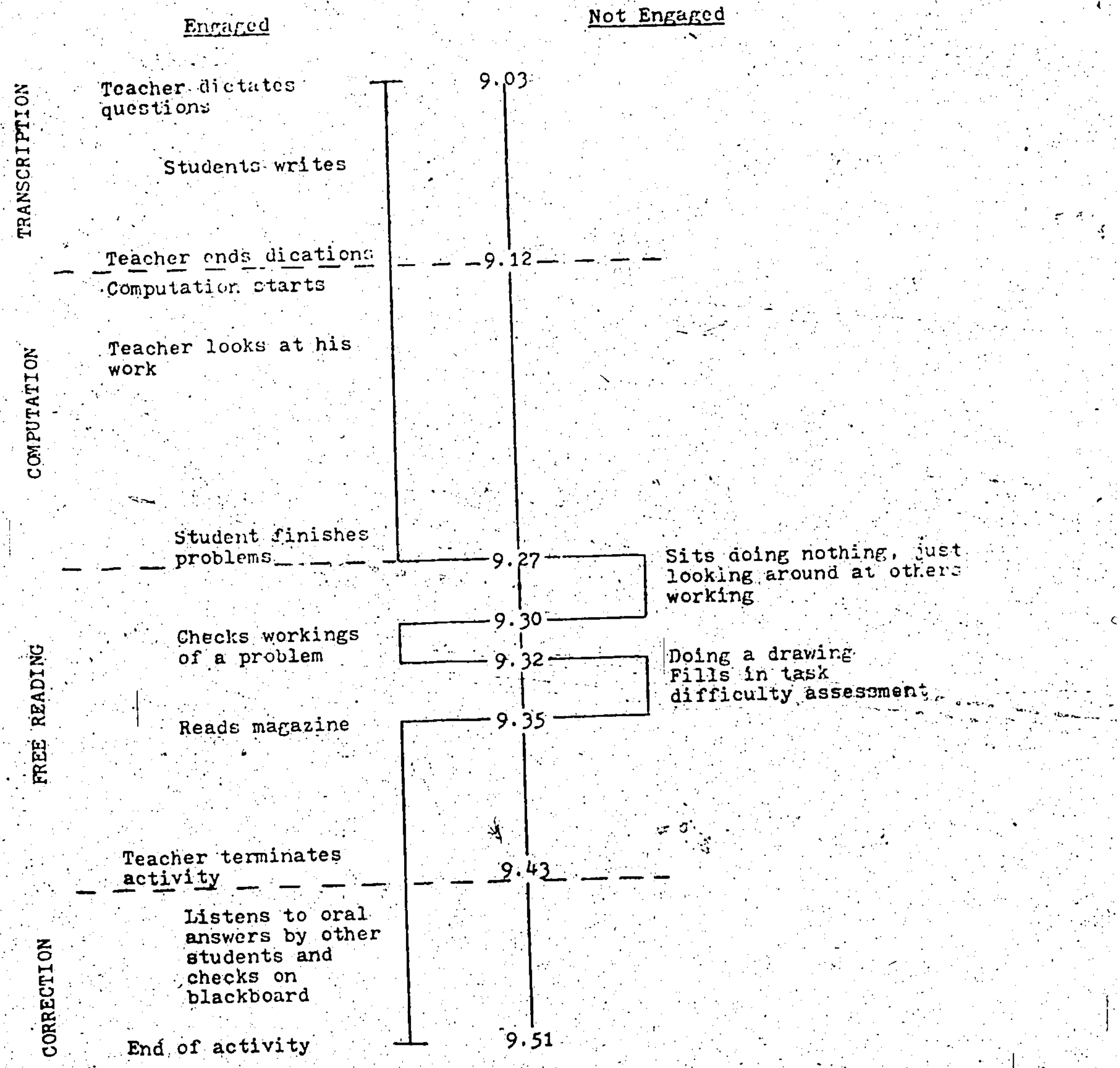
Problems correctly answered = 11

Engagement rate during free reading = 100%

Figure 40

Mathematics Computation Activity

20.10.78 Time: 9.03 - 9.51 Robert



Engagement rate during transcription = 100%

Engagement rate during computation = 100%

Engagement rate during correction = 100%

Maximum number of problems = 11

Problems attempted = 11

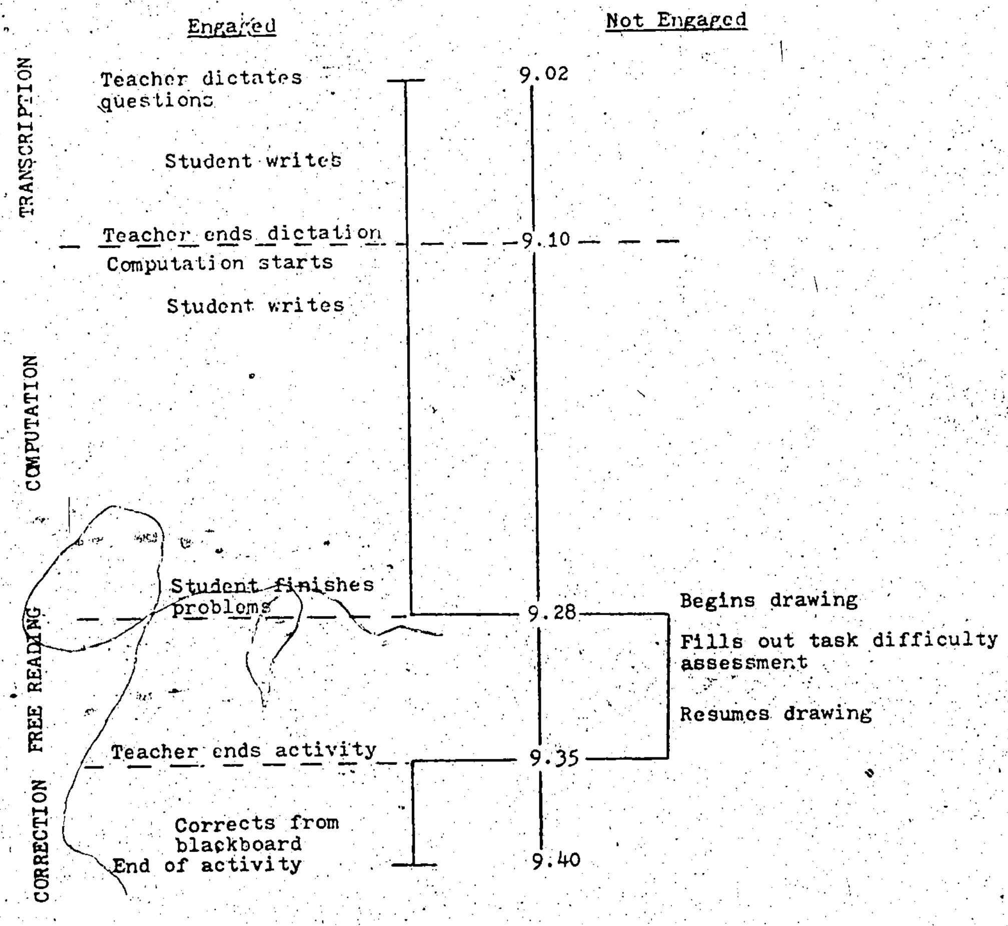
Problems correctly answered = 11

Engagement rate during free reading = 63%

Figure 41

Mathematics Computation Activity

23.10.78 Time: 9.02 - 9.40 Robert



Engagement rate during transcription = 100%

Engagement rate during computation = 100%

Engagement rate during correction = 100%

Maximum number of problems = 11

Problems attempted = 11

Problems correctly answered = 9

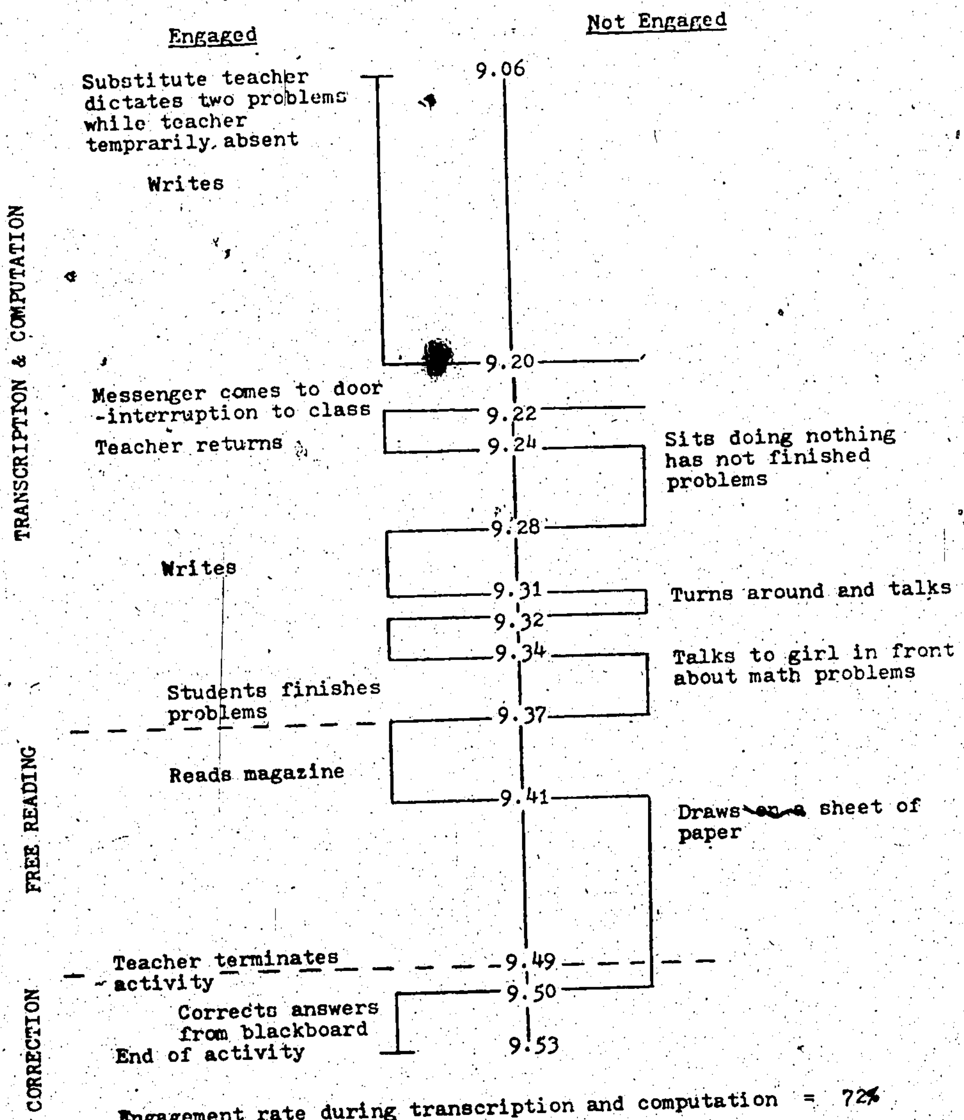
Problems incorrectly transcribed = 1

Engagement rate during free reading = 0%

Figure 42

Mathematics Computation Activity

24.10.78 Time: 9.06 - 9.53 Robert



Engagement rate during transcription and computation = 72%

Engagement rate during correction = 75%

Maximum number of problems = 11

Problems attempted = 11

Problems correctly answered = 6

Problems incorrectly transcribed = 2

Engagement rate during free reading = 41%

was at variance with Robert's earlier profiles. A likely explanation for the higher level of non-engaged behavior on this occasion, was the departure from the established routine consistently employed by the teacher. In his capacity as substitute teacher, the principal conducted the activity while the teacher was temporarily absent from the room. The entire class was noticeably upset by the changes made from the standard procedure.

Figure 43 provides evidence of Robert's high engagement during one of the two whole-of-class mathematics lectures.

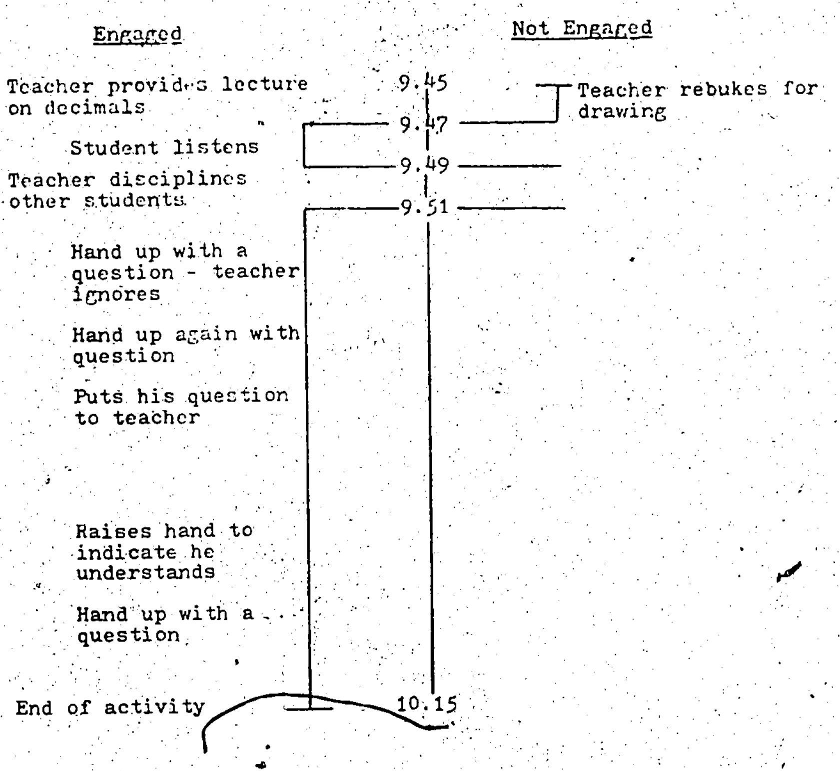
Figures 44 through 49 provide profiles of reading activities which commenced as other-paced and developed into self-paced free reading activities. A pattern emerged of Robert being engaged during the external control phase, followed by a marked decline in application when left to his own devices in free reading. Examples of Robert's use of free reading time are contained in accompaniments to Figures 47 and 50 in Appendix I. There was also evidence in Robert's written activity of his generally careless attitude in the performance of his work. This included spelling mistakes, transcription mistakes and errors in correction.

Figures 50 through 53 represent reading activities where work involvement was left substantially

Figure 43

Whole-of-Class Lecture on Mathematics

23.10.78 Time: 9.45 - 10.15 Robert

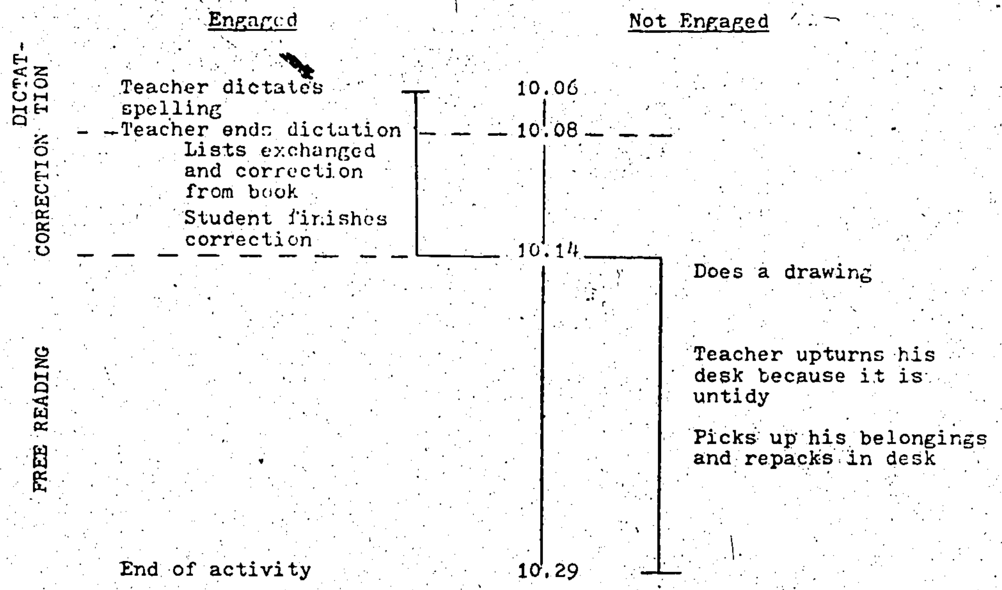


Engagement rate during lecture = 100%

Figure 44

Dictated Spelling Activity

16.10.78 Time: 10.06 - 10.29 Robert



Engagement rate during dictation = 100%

Engagement rate during correction and remediation = 100%

Engagement rate during free reading = 0%

Maximum number of dictated words = 16

Words attempted = 16

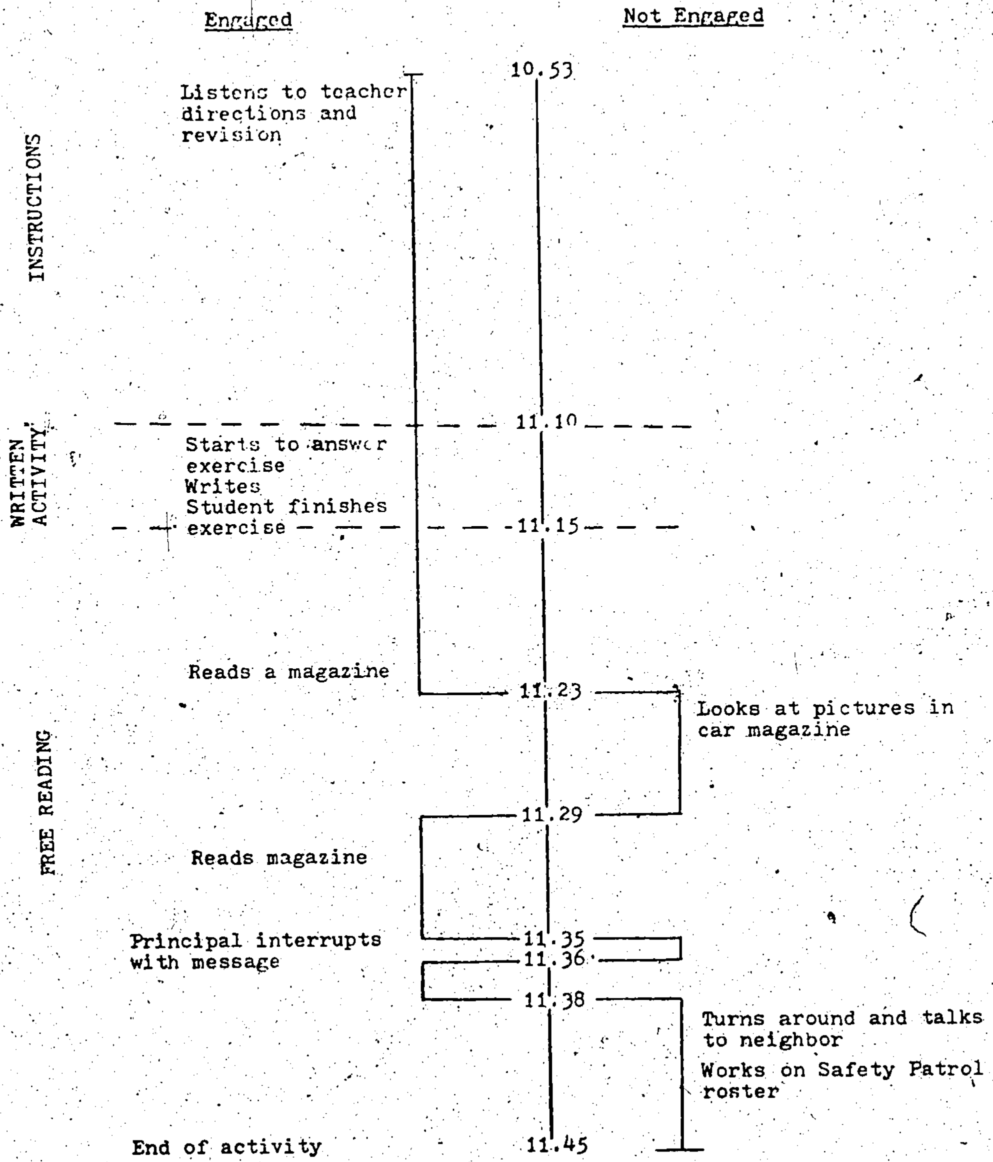
Words answered correctly = 10

Errors in correction = 2

Figure 45

Written Language Skill Exercise

17.10.78 Time 10.53 - 11.45 Robert



Engagement rate during instructions to task = 100%

Engagement rate during language skill exercise = 100%

Engagement rate during free reading = 55%

Maximum number of exercises = 16

Exercises completed = 16

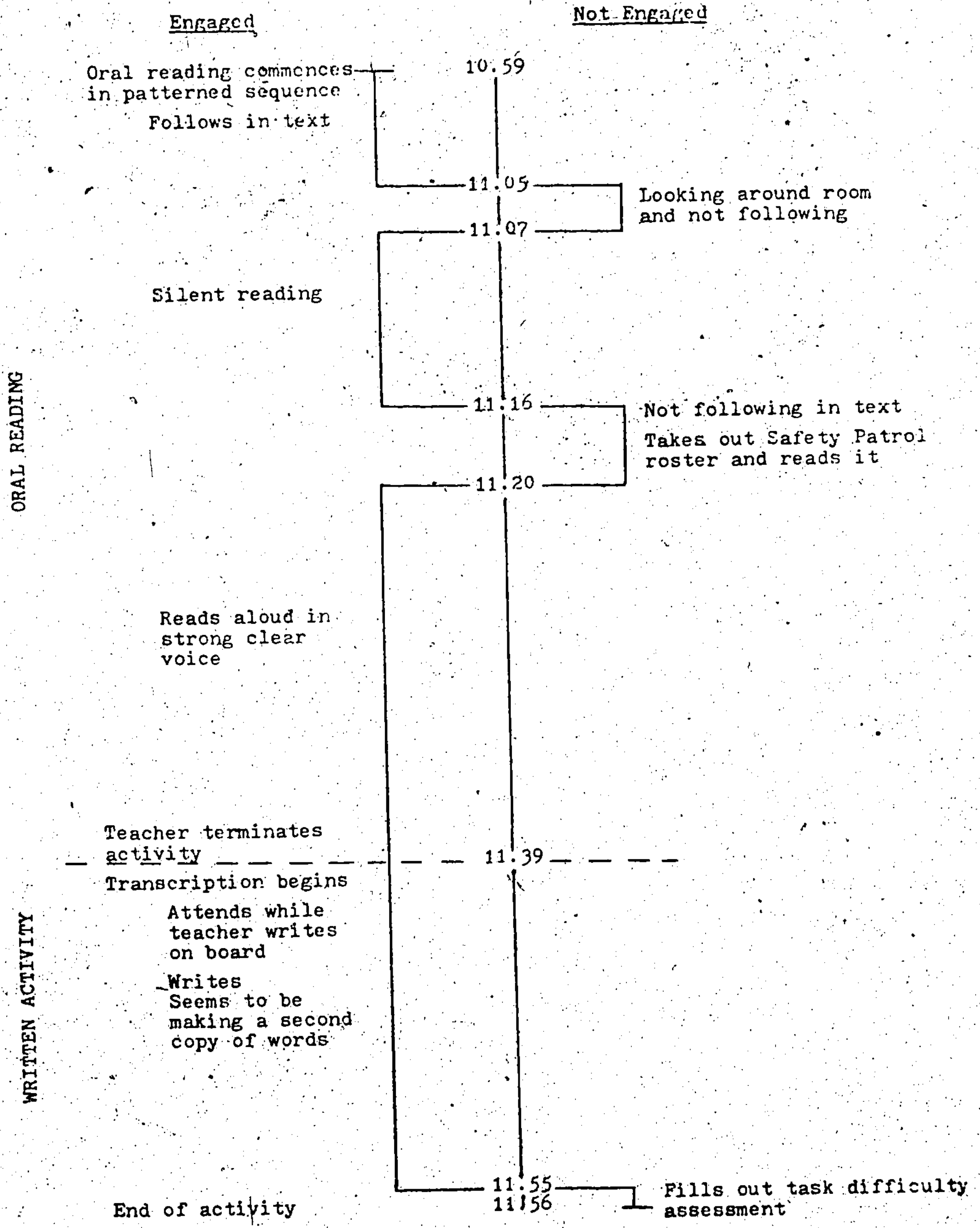
Exercises correctly answered = 16

Spelling mistakes = 2

Figure 46

Oral and Written Language Arts Activity

19.10.78 Time: 10.59 - 11.56 Robert



Engagement rate during oral reading activity = 85%

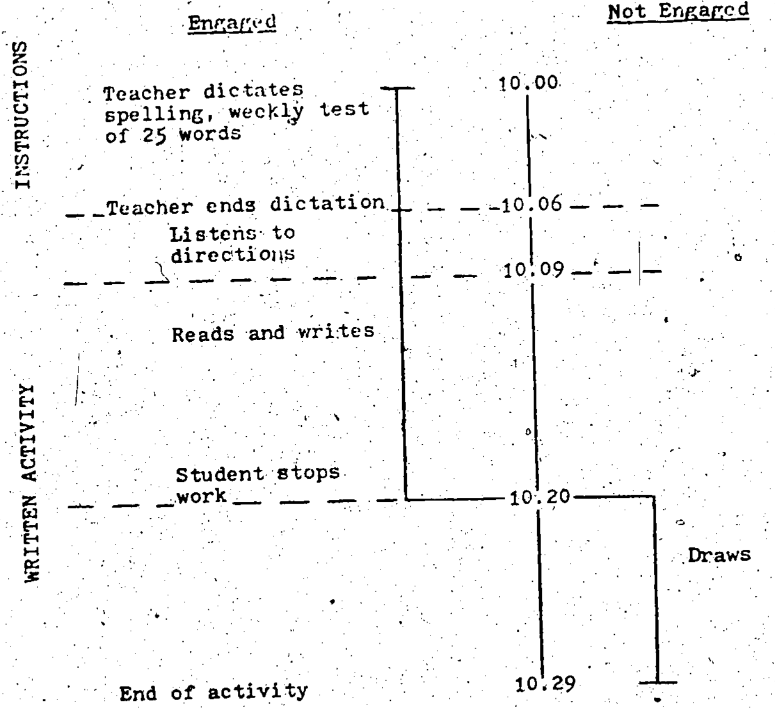
Engagement rate during written activity = 100%

Transcription mistakes = 3

Figure 47

Dictated Spelling and Written Language Arts Activity

20.10.78. Time: 10.00 - 10.29 Robert



Engagement rate during dictation = 100%

Engagement rate during instructions to task = 100%

Engagement rate during written language activity = 55%

Maximum number of dictated words = 25

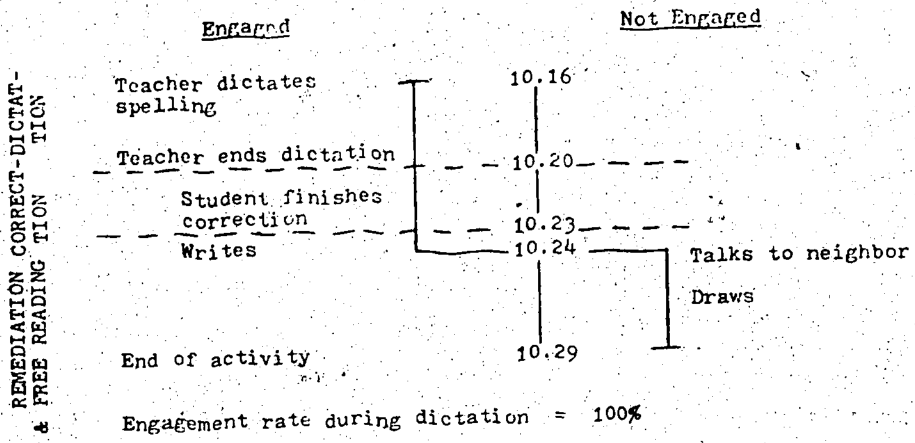
Words attempted = 25

Words answered correctly = 25

Figure 48

Dictated Spelling Activity

23.10.78 Time: 10.16 - 10.29 Robert



Engagement rate during dictation = 100%

Engagement rate during correction = 100%

Engagement rate during remediation and free reading = 17%

Maximum number of dictated words = 15

Words attempted = 15

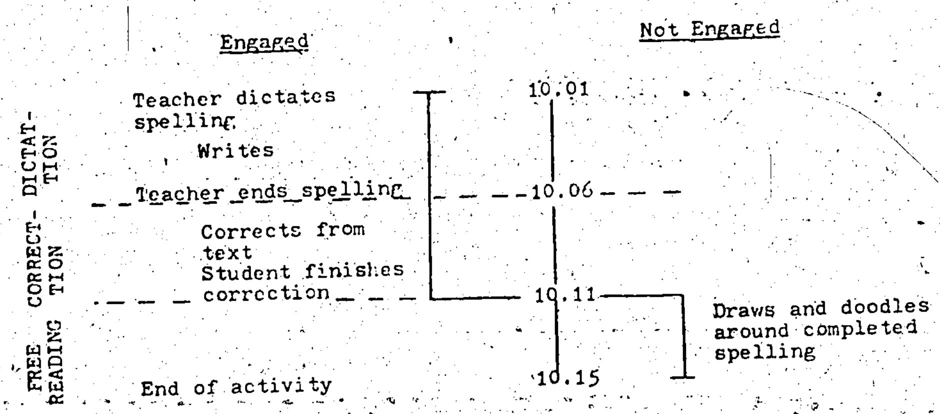
Words answered correctly = 12

Errors in correction = 2

Figure 49

Dictated Spelling Activity

24.10.78 Time: 10.01 - 10.15 Robert



Engagement rate during dictation = 100%

Engagement rate during correction = 100%

Engagement rate during free reading = 0%

Maximum number of dictated words = 21

Words attempted = 21

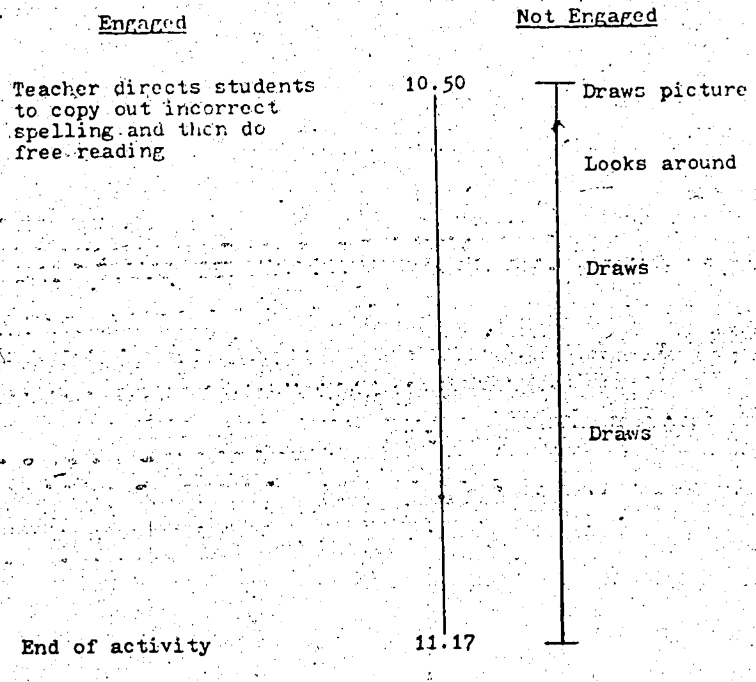
Words answered correctly = 17

Errors in correction = 2

Figure 50

Language Arts and Free Reading Activity

20.10.78 Time: 10.50 - 11.17 Robert

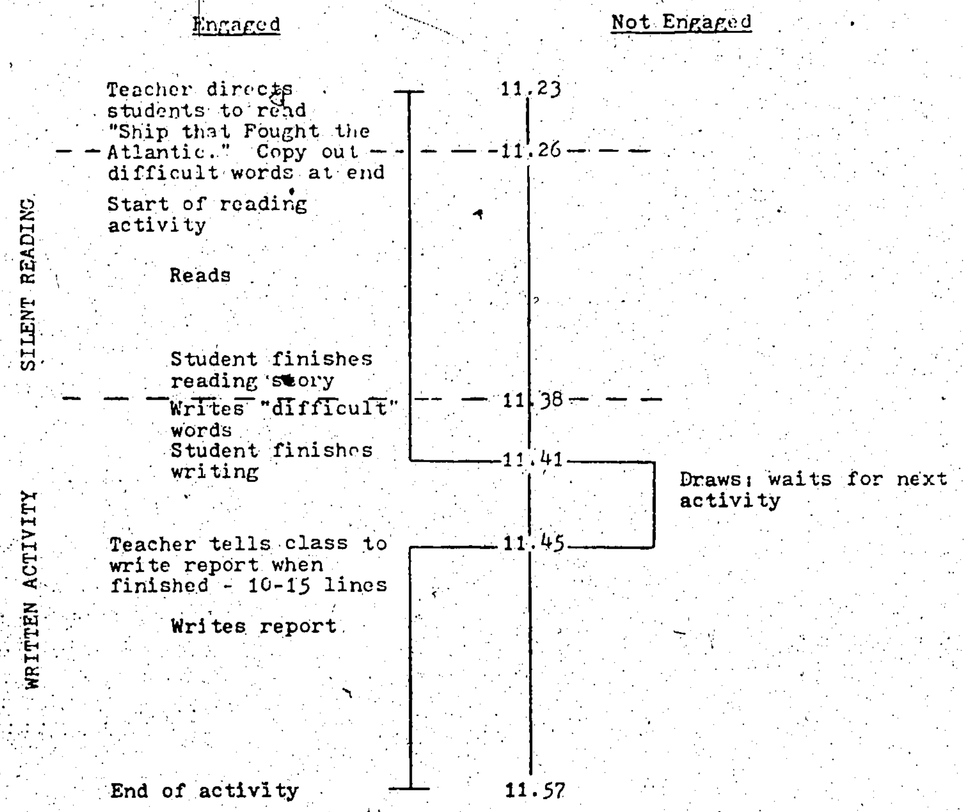


Engagement rate during free reading = 0%

Figure 51

Silent Assigned Reading and Written Language Activity

20.10.78 Time: 11.23 - 11.57 Robert



Engagement rate during reading and writing activity = 88%

Maximum number of pages of set reading = 10

Pages completed = 10

Number of "difficult" words recorded = 3

Lines of written report completed = 8 (finished)

Figure 52

Free Reading Period

23.10.78 Time: 11.37 - 11.59 Robert

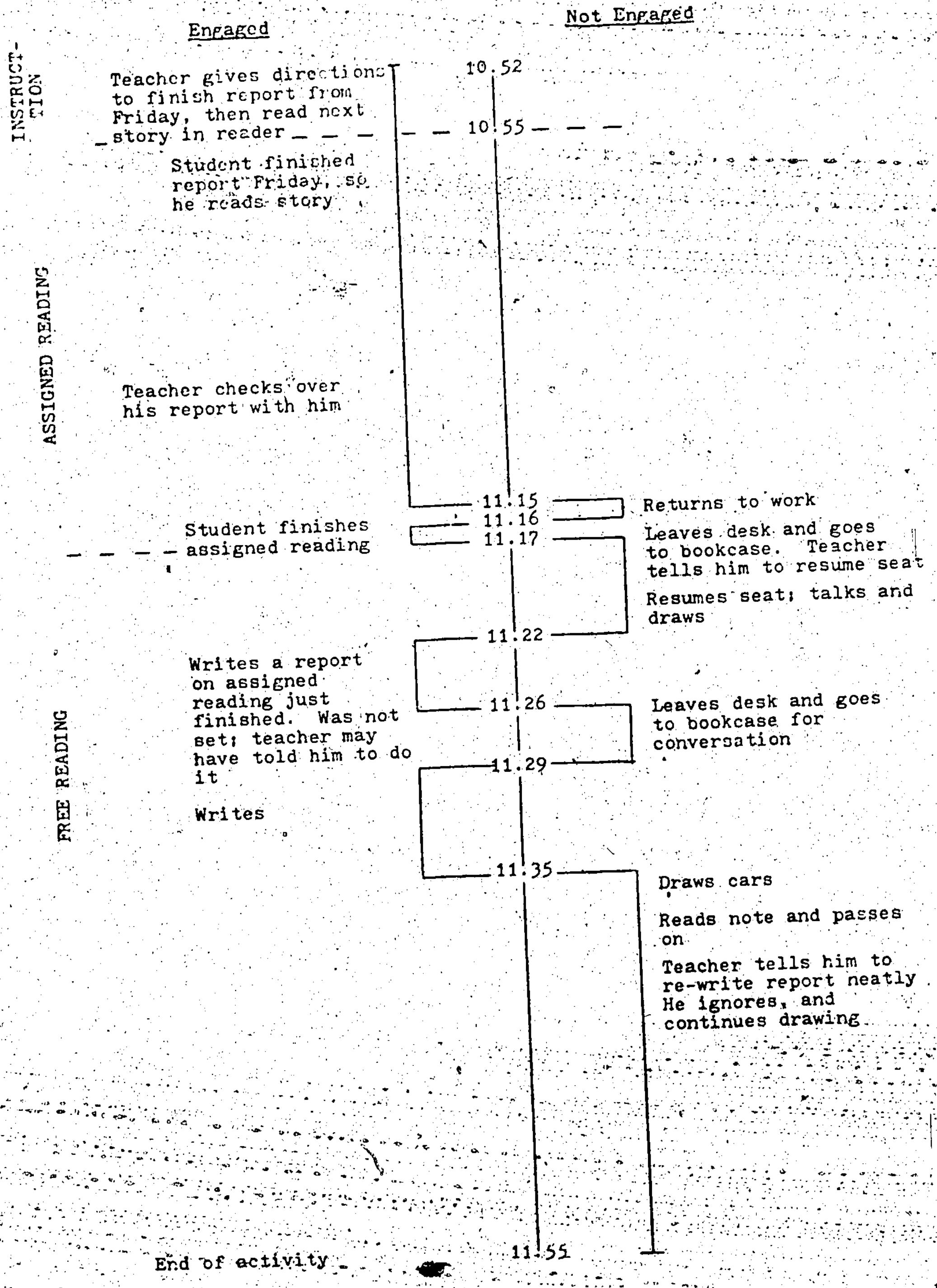
Engaged		Not Engaged
On return from library teacher directs class to do free reading	11.37	
		Looks at pictures in "Popular Mechanics" magazine
End of activity	11.59	

Engagement rate during free reading = 0%

Figure 53

Creative Writing and Assigned Reading Activities

24.10.78 Time: 10.52 - 11.55 Robert



Teacher gives directions to finish report from Friday, then read next story in reader

Student finished report Friday, so he reads story

Teacher checks over his report with him

Returns to work

Student finishes assigned reading

Leaves desk and goes to bookcase. Teacher tells him to resume seat

Resumes seat; talks and draws

Writes a report on assigned reading just finished. Was not set; teacher may have told him to do it

Leaves desk and goes to bookcase for conversation

Writes

Draws cars

Reads note and passes on

Teacher tells him to re-write report neatly. He ignores, and continues drawing

End of activity

Figure 53 (Continued)

Robert 24.10.78

Engagement rate during instructions = 100%

Engagement rate during assigned reading = 96%

Engagement rate during teacher consultation = 100%

Engagement rate during free reading = 27%

Maximum pages of assigned reading = 10

Pages of assigned reading completed = 10 to Robert's discretion. Although not true for all occasions, there is a noticeable tendency towards non-engagement, particularly during free reading periods.

Summary

Considerable diversity is apparent in Robert's pursuit of academic activities. On the one hand, he demonstrated high levels of effort, success and engagement when working in mathematics at his own pace, but when required to select and pursue self-directed reading, his performance was often unproductive. While able to complete work with rapidity, this was often at the expense of careless errors in transcription, spelling and attention to corrective feedback. Segmented profiles substantiate these aspects of Robert's activity. His optimal engagement occurred in self-paced mathematics, as well as in reading and mathematics activities that were associated with interactive teaching.

Although clearly a capable pupil, Robert displayed more diligent work habits when the learning task was unambiguously defined. While he was eager to express himself verbally, relatively little opportunity was provided in his normal setting for this type of activity. The demand of Robert's normal classroom may have been at variance, in this respect, with the approach hinted at by his teacher during the other half day Robert attended the gifted program. Without observing him in his alternative setting, it is difficult to be conclusive.

Kevin

Biographical Description

Kevin comes from a family of two children. His twin sister is in the same class. Kevin's father is a steel fitter and his mother performs home duties. Relatively little information was available about Kevin from his past teachers. His grade 5 teacher was no longer at the school. Kevin's present teacher described him as "a very timid child, slow, but a model student in class." Kevin was 11 years old at the time of the study.

School records indicated considerable variability over a number of years in Kevin's performance on standardized achievement tests. In "word meaning" his performance varied between the thirty-second and the seventy-fifth percentile, in "paragraph meaning" from the twentieth to the sixty-eighth percentile, and in "word study skills" from the fifth to the fourtieth percentiles, for Edmonton normed data. In mathematics, Kevin displayed a performance trend over the past four years, at around the twelfth percentile. Kevin's grades in reading and mathematics, as assigned by his various class teachers, also reflected a low level of performance indicating him to be a low achieving pupil by the criteria generally applied.

Allocation and Distribution of Academic Learning Time

Brief illness and a scheduled dental appointment reduced the span of observation of Kevin to six and one quarter school days. The total instructional time available to Kevin during this period was 1938 minutes. As indicated in Table 57, 20 per cent of this time was occupied with matters of general classroom routine, 35 per cent with instruction of a non-reading or mathematics nature, leaving 45 per cent for reading and mathematics. The total available time for reading was observed to be 537 minutes, and for mathematics was 330 minutes.

Kevin's day-to-day distribution of available reading time ranged from 33 to 105 minutes, and for mathematics from 30 to 69 minutes. Average daily exposure for Kevin during the period he was present was 86 minutes for reading and 53 minutes for mathematics. In a full school year, Kevin could expect to receive 258 hours of reading instruction and 159 hours of mathematics instruction, all other factors remaining unaltered. Indications were that absence from school was the exception rather than the norm for Kevin.

Table 57

Distribution of Learning Time as a Percentage of Available Class Time - Kevin

Activity	%
Wait	3.7
Transition	13.2
Management	2.9
Non-Academic Instruction	20.7
Other Academic Instruction	14.7
Reading	27.7
Mathematics	17.0
	99.9

Because of the timing of Kevin's absences on one afternoon and during the latter half of one morning, the impact on Kevin's exposure time in reading and mathematics was minimal. In mathematics he missed no instruction, as that segment had been completed prior to his departure for a dental appointment. He did, however, miss some reading activity during that absence. Neither reading nor mathematics was scheduled for afternoon sessions, so that no formally structured reading was missed as a consequence of Kevin's illness.

Use of Academic Learning Time

Written, Oral and Covert Activity. Table 58 shows the relatively non-active nature of Kevin's reading with two thirds of his occupied reading time being involved with silent covert activities. In terms of the total 537 minutes of available reading time, covert activity amounted to slightly more than half of that time. While written activity accounted for approximately one quarter of Kevin's engaged and available reading time, oral activity did not occur at all.

Observational data for mathematics indicated greater emphasis by Kevin in engaged written activity than in covert pursuits. An additional quarter of his engaged time was taken up by the written activity of transcribing problems verbally dictated

Table 58

Written, Oral and Covert Activity in Minutes and as a Percentage of Engaged and Available Time in Reading and Mathematics - Kevin

	Reading		Mathematics	
	Minutes	%	Minutes	%
	Engaged Time			
Engaged Written	120	27.6	123	41.4
Engaged Oral	-	-	6	2.0
Engaged Covert	285	65.5	102	34.3
Engaged Direct	30	6.9	66	22.2
	435	100.0	297	99.9
	Available Time			
Engaged Written		22.4		37.3
Engaged Oral		-		1.8
Engaged Covert		53.1		30.9
Engaged Direct		5.6		20.0
		81.1		90.0

by the teacher.

The shortcoming of sole reliance upon aggregated data, without consideration for day-to-day variations, is demonstrated in Tables 59 and 60. While it is impossible to determine a fixed daily pattern of engagement in reading, Table 59 illustrates clearly that Kevin experienced considerable day-to-day variability as between written and covert reading activity. On two days, the predominance favoured written activity, while on the remaining five, the emphasis was clearly upon covert activity.

As evidenced in Table 60, Kevin's predominant engagement in mathematics oscillated between written and covert activities. On four days written activity predominated, while on another two, covert activity prevailed, and on the remaining day the percentage distribution of Kevin's occupied time was evenly spread between the two type of activities.

Academic Content Covered. For approximately one quarter of Kevin's 537 minutes of reading and one third of his 330 minutes of mathematics instruction, it was feasible to conduct measurements of the extent of his coverage of academic content. [illegible] capturing artifacts of Kevin's completed work, it was also possible to assess the level of effort and success on assigned activities. The results of these measurements are

Table 59

Written, Oral and Covert Activity in Reading in Engaged Minutes and as a Percentage of Daily Engaged Reading Time - Kevin

	16.10.78		17.10.78		18.10.78		19.10.78*		20.10.78		23.10.78		24.10.78+	
Activity	mins.	%	mins.	%	mins.	%	mins.	%	mins.	%	mins.	%	mins.	%
Engaged Written	36	70.6	12	13.3	9	15.8	18	20.0	15	16.7	15	38.5	15	83.3
Engaged Oral	-		-		-		-		-		-		-	
Engaged Covert	15	29.4	66	73.3	48	84.2	63	70.0	66	73.3	24	61.5	3	16.7
Engaged Direct	-		12	13.3	-		9	10.0	9	10.0	-		-	
	51	100.0	90	99.9	57	100.0	90	100.0	90	100.0	39	100.0	18	100.0

*Absent in the afternoon

+Absent for half the morning

Table 60

Written, Oral and Covert Activity in Mathematics in Engaged Minutes and as a Percentage of Daily Engaged Mathematics Time - Kevin

Activity	16.10.78		17.10.78		18.10.78		19.10.78*		20.10.78		23.10.78		24.10.78+	
	mins.	%	mins.	%	mins.	%	mins.	%	mins.	%	mins.	%	mins.	%
Engaged Written	15	31.2	18	31.6	18	46.1	12	40.0	18	50.0	24	40.0	18	66.7
Engaged Oral	6	12.5	-		-		-		-		-		-	
Engaged Covert	18	37.5	27	47.4	6	15.4	12	40.0	9	25.0	24	40.0	6	22.2
Engaged Direct	9	18.8	12	21.0	15	38.5	6	20.0	9	25.0	12	20.0	3	11.1
	48	100.0	57	100.0	39	100.0	30	100.0	36	100.0	60	100.0	27	100.0

*Absent in the afternoon

+Absent for half the morning

presented in Tables 61, 62 and 63.

In all but one of the seven reading categories of Table 61, Kevin's effort was at the maximal level, as shown in his consistent Unadjusted Index of Effort of 1.0. When content correctly completed was taken into consideration, there was a small decrease in Kevin's Unadjusted Index of Success in two categories. His performance, nevertheless, in respect of both effort and success, was high. Indeed, on the criteria used here, Kevin out-performed all other target pupils.

Kevin's daily performance on retrievable academic content in mathematics is shown in Table 62. His continued high level of effort was reflected in the Unadjusted Index of Effort in Mathematics Computation of 1.0, shown in Table 63. Likewise, Kevin's success in mathematics computation, although not as high as in reading, was found to be at the respectable level of .79. There was evidence of some room for improvement in the area of attention to corrective feedback.

<u>Engagement, Difficulty and Academic Content</u>. Kevin was observed to be engaged in reading for 81 per cent of the available time, and in mathematics for 90 per cent. During the six and one quarter days he was observed, this represented a daily engaged time of 69 minutes in reading and 47 minutes in mathematics.

When differences between subject matter were

Table 61

Content Covered, Effort and Success in Reading Activities - Kevin

Activity	Content Assigned	Content Attempted	Unadjusted Index of Effort	Content Correctly Completed	Unadjusted Index of Success	Elapsed Time (minutes)
Dictated Spelling	77 words	74 words	.96	68 words	.88	17
Spelling Remediation	2 words	2 words	1.00	2 words	1.00	2
Word Transcription	35 words	35 words	1.00	35 words	1.00	16
Silent Reading	26 pages	26 pages	1.00	*	*	54
Creative Writing	5 lines	5 lines	1.00	*	*	13
Word Recognition	33 words	33 words	1.00	33 words	1.00	27
Word Usage	16 words	16 words	1.00	15 words	.94	10

*Impossible to assess

Table 62

Daily Content Covered in Mathematics Computation - Kevin

Date	Maximum Number of Problems	Problems Attempted	Problems not Transcribed	Problems Incorrectly Transcribed	Problems Correctly Answered	Errors in Correction	Elapsed Transcription Time (min)	Elapsed Computation Time (min)	Elapsed Correction Time (min)
16.10.78	11	11	-	-	8	-	9	17	21
17.10.78	11	11	-	-	8	1	9	21	9
18.10.78	11	11	-	-	9	-	13	16	11
19.10.78	11	11	-	-	9	-	8	9	9
20.10.78	11	11	-	1	9	-	9	18	8
23.10.78	11	11	-	-	9	1	8	24	5
24.10.78	11	11	-	-	9	-	10	20	3
	77	77	-	1	61	2	66	125	66

Table 63

Summary of Content Covered in Mathematics Computation - Kevin

Category	Statistic
Problems Attempted	100.0%
Problems Not Transcribed	-
Problems Incorrectly Transcribed	1.3%
Problems Correctly Answered	79.2%
Errors in Correction	2.6%
Average Transcription Time per Problem	.8 min.
Average Computation Time per Problem	1.6 min.
Average Correction Time per Problem	.8 min.
Unadjusted Index of Effort in Mathematics Computation	1.00
Unadjusted Index of Success in Mathematics Computation	.79

ignored, as in Table 64, Kevin was found to have spent almost 70 per cent of his engaged time in the combined areas of reading and mathematics in pursuits labelled by the observer as easy for him. All but a small fraction of the remaining 30 per cent of his engaged time was spent interacting with work of a medium level of difficulty. The proportion of time in the hard category was insignificant.

Separated according to subject matter content, as in Table 65, Kevin was found to have interacted for a higher proportion of his reading time with work rated as easy, than was the circumstance in mathematics. The reverse tendency was apparent with the distribution of activity described as being of medium difficulty. The dispersion of Kevin's engaged time in reading and mathematics according to level of perceived difficulty, indicated that Kevin interacted with sufficient material of an easy level to ensure a high level of success, but was confronted with enough material of medium difficulty to be challenged without experiencing excessive frustration.

Evidence of the accuracy of observer assessment of task difficulty for selected activities and the two methods used to substantiate the validity of that assessment are shown for Kevin in Table 66. Measurable output necessary to conduct the validation

Table 64

Percentage of Allocated Time in Reading and Mathematics According to Level of Task Difficulty - Kevin

Observer Assessment of Difficulty	Minutes	%
Easy	606	69.9
Medium	257	29.7
Hard	3	.4
	866	100.0

Table 65

Minutes of Engaged Time and Percentage of Engaged Time in Reading and Mathematics According to Level of Task Difficulty - Kevin

Observer Assessment of Difficulty	Reading		Mathematics	
	Minutes	%	Minutes	%
Easy	345	79.3	156	52.5
Medium	90	20.7	138	46.5
Hard	-	-	3	1.0
	435	100.0	297	100.0

Table 66

Results of Comparative Methods of Assessing Pupil Task Difficulty in Reading and Mathematics - Kevin

Task Description	Date	Student Assessment of Difficulty (1)	Observer Assessment of Difficulty (2)	Actual % Success on Written Pursuits (3)	Difficulty as Reflected by Success Rate (4)
Math Computation	16.10.78	E	E	73	M
Dictated Spelling	"	M	M	94	E
Library Skill Exercises	"	M	E	*	*
Math Computation	17.10.78	E	M	73	M
Word Recognition	"	M	E	100	E
Silent Reading (Test)	"	M	M	55	M
Silent Reading (Test	"	E	M	64	M
Silent Reading (Test)	"	M	M	25	H
Math Computation	18.10.78	M	M	82	E
Word U[illegible]ge	"	E	E	94	E
Silent Reading (Test)	"	E	M	64	M
Silent Reading (Test)	"	M	M	57	M
Silent Reading (Test)	"	M	M	63	M
Math Computation	19.10.78	E	M	82	E
Silent Reading	"	E	E	*	*
Math Computation	20.10.78	M	M	82	E
Dictated Spelling	"	E	E	96	E
Silent Reading	"	E	E	*	*
Creative Writing	"	M	E	75	M
Math Computation	23.10.78	E	E	82	E
Dictated Spelling	"	E	M	80	M
Math Computation	24.10.78	M	E	82	E
Dictated Spelling	"	M	E	81	E

E = Easy   M = Medium   H = Hard   * = No Assessment Possible

in Table 66 was obtainable for 26 per cent of Kevin's available time in reading and for 82 per cent of the available time in mathematics.

The extent of agreement among the various modes of assessing task difficulty for Kevin are presented in Table 67. Using completed student work and absolute standards, the observer emerged as a more accurate judge of the difficulty level of on-going task activity, than did Kevin.

Table 68 indicates Kevin's generally consistent day-to-day engagement rate in selected reading activities. During structured reading activity his record was almost faultless. However, when allowed to manage his own time, as in free reading, variability became evident in Kevin's engagement rate. For mathematics, a high level of day-to-day engagement is apparent from the statistics shown in Table 69. Kevin's free reading, undertaken at the conclusion of assigned mathematics, was also generally at a high level of engagement.

Task Involvement According to Setting

Table 70 shows that during the engaged time he spent in self-paced reading, Kevin's predominant occupation was with covert activity. Engaged covert also emerged as the single most important category in other-paced reading. When it occurred at all, off-task

Table 67

Agreement Among Alternative Modes of Assessing Pupil Task Difficulty in Reading and Mathematics - Kevin

Modes	Number of Assessment Decisions	Number of Assessments in Agreement	Percentage Agreement
Observer v Student Assessment	23	12	52.2
Student Assessment v Success Rate	20	8	40.0
Observer Assessment v Success Rate	20	13	65.0

Table 68

Percentage Engagement by Activity in Selected Reading Tasks - Kevin

Date	16.10.78	17.10.78	18.10.78	19.10.78	20.10.78	23.10.78	24.10.78
Spelling Dictation	100				100	100	100
Spelling Correction and Remediation	100					100	100
Free Reading	8, 79	100			100, 70	45, 100	0
Library Skills	100						
Instructions to Task		94			100		
Word Recognition		100		100	80		
Word Usage			100				
Silent Reading				100	100		
Word Transcription				100			
Creative Writing					100		

Table 69

Percentage Engagement by Activity in Mathematics Tasks - Kevin

Date	16.10.78	17.10.78	18[illegible].78	19.10.78	20.10.78	23.10.78	24.10.78	Mean
Introduction to Task				100				100
Transcription	100	100	100	100	100	100	100	100
Computation	100	100	91	100	94	100	100	98
Correction	95	100	91	100	100	100	100	98
Whole-of-Class Lectures		87				93		90
Free Reading	100	100	50	100	92	100	18	80

Table 70

Learner Behavior by Setting as a Percentage of Available Reading and Mathematics Time - Kevin

Learner Behavior	Reading	Mathematics
Other-Paced Settings (Group and Whole-of-Class)		
	%	%
Engaged Written	5.0	.9
Engaged Oral	-	.9
Engaged Covert	13.4	28.2
Engaged Direct	5.6	19.1
Not Engaged Interim	.6	1.8
Not Engaged Waiting	1.2	.9
Not Engaged Off-Task	.6	4.5
	26.4	56.3
Self-Paced Settings (Seatwork)		
Engaged Written	17.3	36.4
Engaged Oral	-	.9
Engaged Covert	39.6	2.7
Engaged Direct	-	-
Not Engaged Interim	2.2	.9
Not Engaged Waiting	2.2	.9
Not Engaged Off-Task	11.7	.9
	73.0	42.7

behavior was more likely to occur for Kevin, in self-paced reading.

In excess of half of Kevin's engaged time in other-paced mathematics was in covert activity. Carrying out directions to mathematics tasks consumed a substantial portion of the remainder of his engaged time in that setting. Written activity comprised the bulk of Kevin's engaged mathematics time in self-paced settings.

Table 70 shows Kevin to have been engaged for 90 per cent of the time spent in other-paced reading and for a similar percentage in mathematics. In self-paced settings total engagement accounted for 78 per cent of the time in reading and 93 per cent of the time during mathematics.

The picture that emerges of Kevin is one of a diligent student, capable across both content areas and in both types of settings of adjusting to the quite different demands of reading and mathematics content, as well as to the differing settings, to produce high levels of engaged time.

Teaching Behavior

Kevin was the object of 92 minutes of substantive teaching behavior while in other-paced reading settings. The upper part of Table 71 shows the percentage distribution of that time across various

Table 71

Teaching Behavior by Setting as a Percentage of Available Reading and Mathematics Time - Kevin

Teaching Behavior	Reading	Mathematics
Other-Paced Settings (Group and Whole-of-Class)		
	%	%
Explanation Needed	3.4	8.2
Explanation Planned	2.9	7.3
Academic Observation	-	.9
Academic Question	3.4	20.0
Academic Feedback	7.4	13.6
Substantive Teaching	17.1	50.0
Structure Direct	5.4	3.6
Task Engagement Feedback	-	-
Total Interaction	22.5	53.6
No Teaching	3.9	2.7
	26.4	56.3
Self-Paced Settings (Seatwork)		
Explanation Needed	-	-
Explanation Planned	.6	-
Academic Observation	.6	-
Academic Question	-	-
Academic Feedback	2.2	.9
Substantive Teaching	3.4	.9
Structure Direct	.6	-
Task Engagement Feedback	-	-
Total Interaction	4.0	.9
No Teaching	69.0	41.8
	73.0	42.7

types of teaching behavior. Explanations accounted for one third of the substantive teaching behavior directed to Kevin in other-paced reading. This amounted to a total of 34 minutes. The sequence described by Filby and Cahen (1977) as academic monitoring, and which consisted of all or part of the chain of question-observation-feedback to the pupil, accounted for the remaining two thirds of the substantive teaching behavior meant for Kevin in other-paced reading. The total time involved over the six and one quarter days, was 58 minutes.

A similar proportional distribution of one third explanation, two thirds academic monitoring, occurred, for Kevin, in other-paced mathematics. In that situation, he was the collective object of explanations for a total of 51 minutes and academic monitoring for 114 minutes.

Little comment of any consequence can be made concerning the composition of teaching behavior that was directed to Kevin in self-paced settings. As portrayed in the lower half of Table 71, the most obvious aspect was the absence of any interactive teaching behavior for 69 per cent of Kevin's total available reading time and for 41.8 per cent of his total available mathematics time. He was the recipient of substantive teaching behavior in self-paced reading for a total of 18 minutes in reading and for 3 minutes in mathematics, over the six and one quarter days he was observed.

In aggregate form, Table 72 provides a clearer indication of the minutes and percentage of Kevin's available time during which he was the object of teaching behavior as an individual, in comparison with situations when he was a member of a group. During only approximately one quarter of reading time was there any group focused interactive behavior from which Kevin might have benefited. The corresponding proportion for mathematics was about half of the available time. Individual teaching behavior was provided for Kevin for one per cent of the available time for reading and also for mathematics. Clearly, very little teacher attention was specifically designed to cater for Kevin's individual needs.

The relative proportions of his time according to the origin of the teaching behavior are shown for Kevin in Table 73. The teacher appeared as the predominant source in both content areas. The teacher's dominance was considerably greater in mathematics than in reading, when percentage of available time was considered. Other students appeared as being of equal significance as sources of instruction in both reading and mathematics. As a source of academic feedback, curriculum resources were nonexistent for mathematics, and inconsequential for

Table 72

Group and Individual Focus of Teaching Behavior in Minutes and as a Percentage of Available Reading and Mathematics Time - Kevin

Direction of Teaching Focus	Reading		Mathematics	
	Minutes	%	Minutes	%
Individual Focus	6	1.1	3	.9
Group Focus	153	28.5	180	54.5

Table 73

Source of Teaching Behavior in Minutes and as a Percentage of Available Reading and Mathematics Time - Kevin

Source of Teaching Behavior	Reading		Mathematics	
	Minutes	%	Minutes	%
Teacher	108	20.1	156	47.3
Other Students	45	8.9	27	8.2
Curriculum	6	1.1	-	-

reading.

Pupil Profile and Work Habits During Academic Content

Figures 54 through 60 provide visual representations of Kevin's disbursement of his time during self-paced mathematics computation. A pattern becomes apparent of high levels of attention to task, followed by a quick and efficient transition into some type of free reading upon completion of assigned work. Where non-engagement did occur it was invariably in a very passive form, namely looking around the room or staring blankly.

Figure 60 shows Kevin to have been less disturbed by the change in routine introduced by the substitute teacher, than was the case for any of the other target pupils.

Figure 61 indicates a continuing high level of attending behavior during the whole-of-class mathematics session.

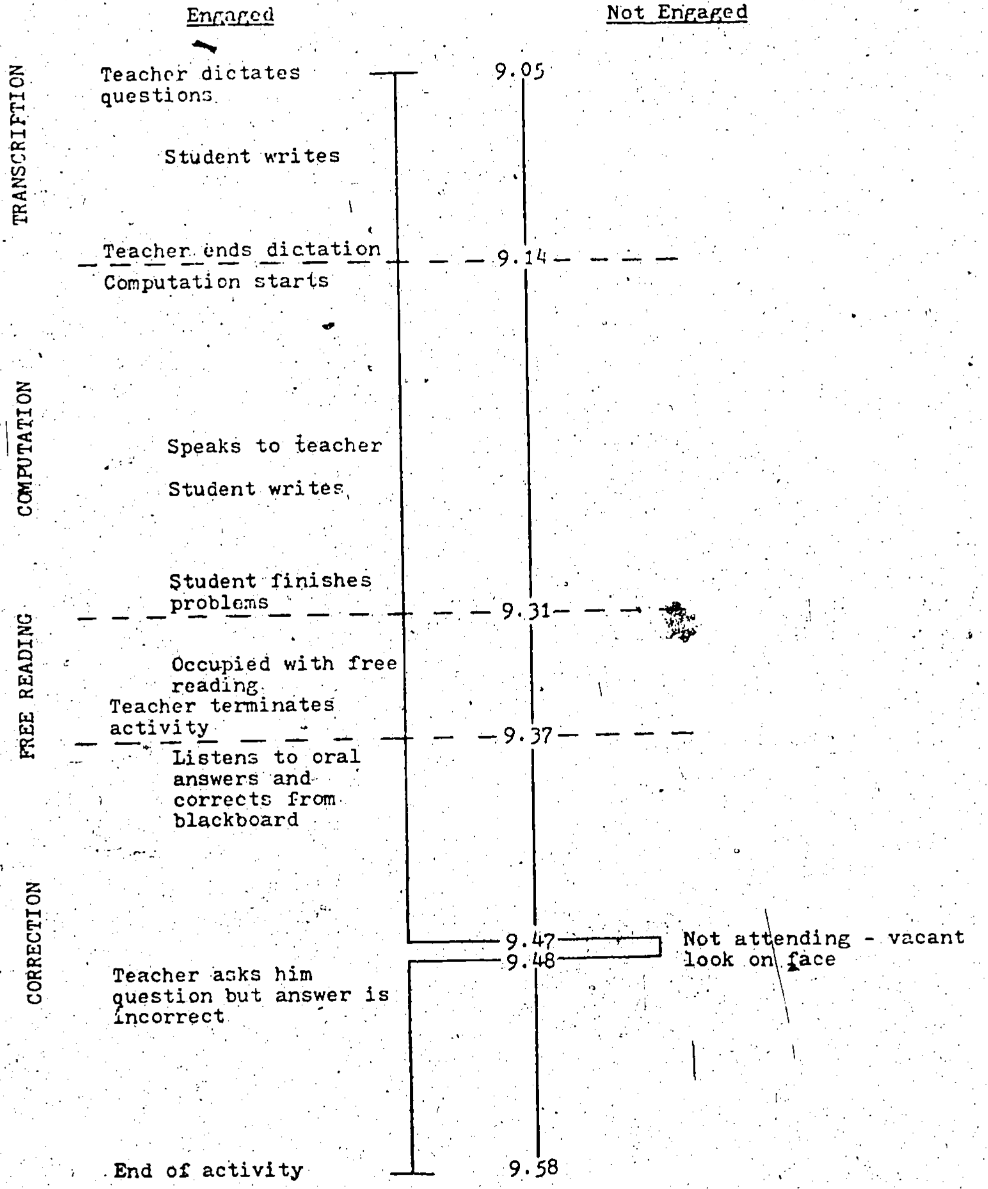
Figures 62 through 67, which describe Kevin's other-paced reading activity, indicate high levels of engagement during the teacher-directed activity, but variability from one occasion to another in application during follow-up free reading.

Figures 68 through 71, which indicate Kevin in self-paced reading, show engagement at a premium where tasks were structured and at a minimum where no

Figure 54

Mathematics Computation Activity

16.10.78 Time: 9.05 - 9.58 Kevin



Engagement rate during transcription = 100%

Engagement rate during computation = 100%

Engagement rate during correction = 95%

Maximum number of problems = 11

Problems attempted = 11

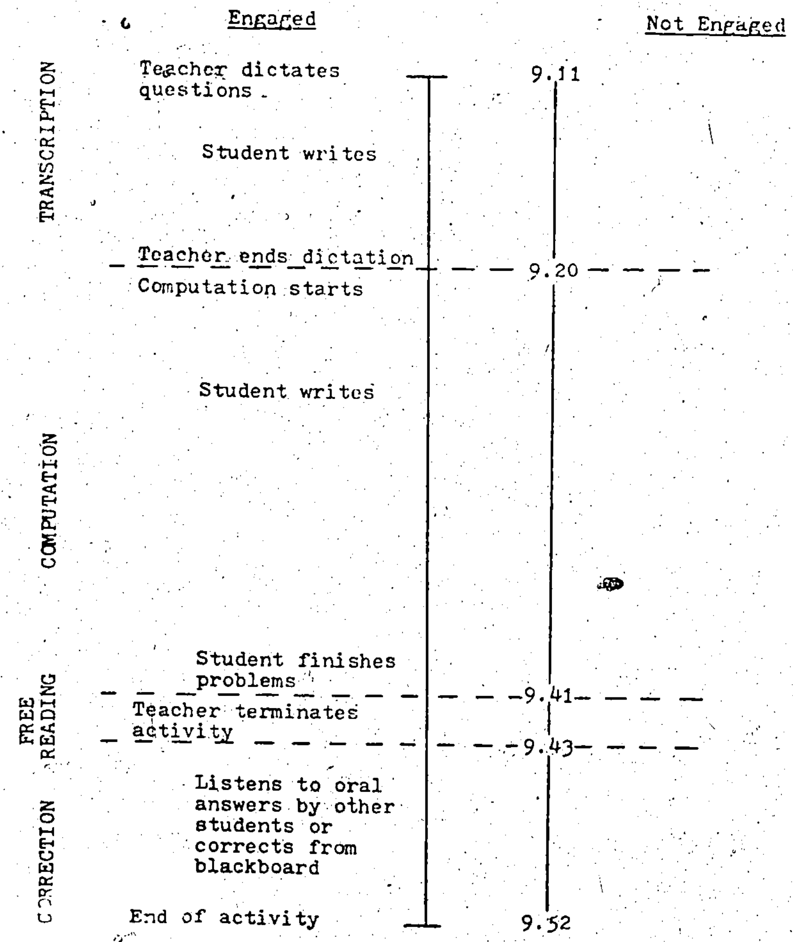
Problems correctly answered = 8

Engagement rate during free reading = 100%

Figure 55

Mathematics Computation Activity

17.10.78 Time: 9.11 - 9.52 Kevin



Engagement rate during transcription = 100%

Engagement rate during computation = 100%

Engagement rate during correction = 100%

Maximum number of problems = 11

Problems attempted = 11

Problems correctly answered = 8

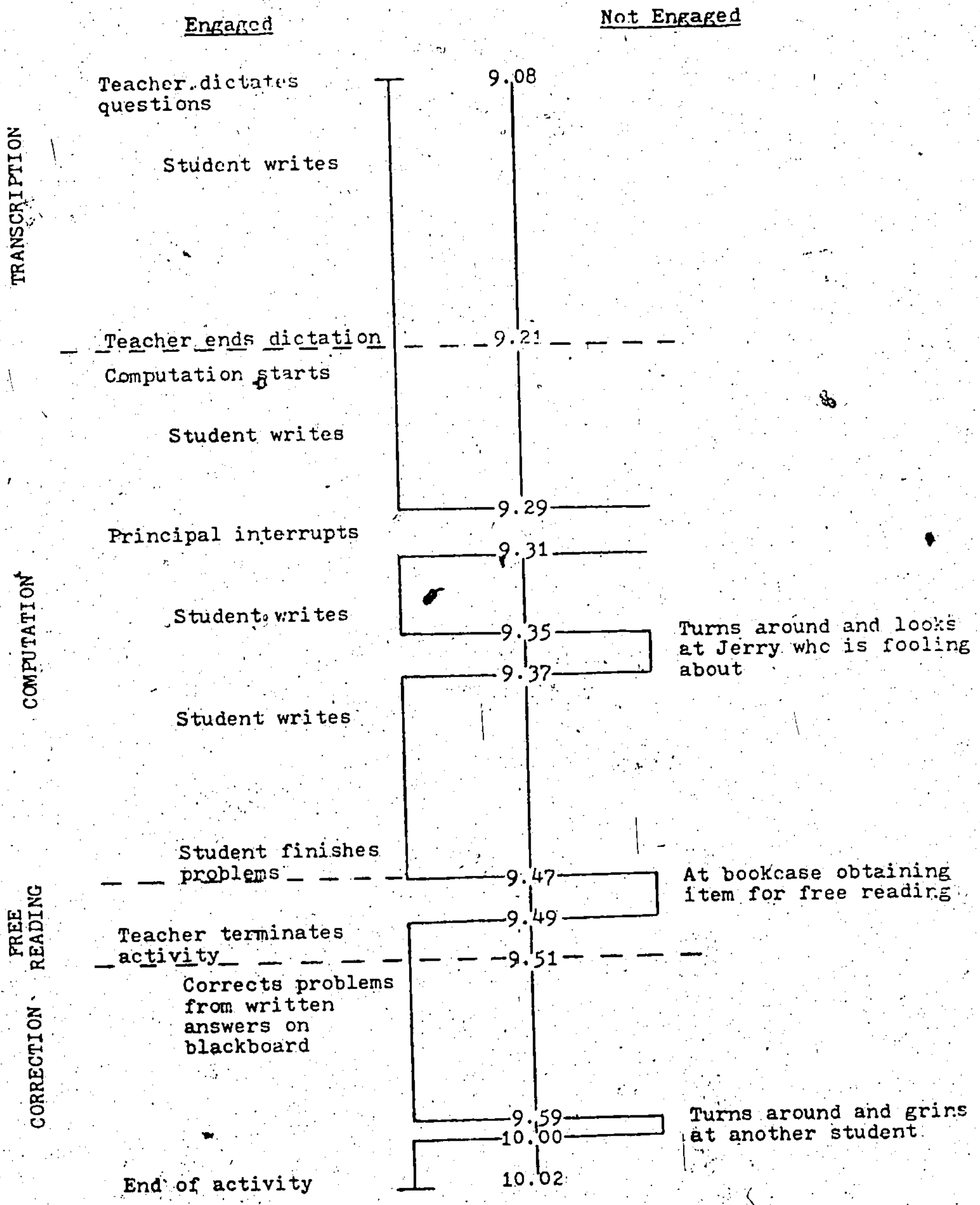
Errors in correction = 1

Engagement rate during free reading = 100%

Figure 56

Mathematics Computation Activity

18.10.78 Time: 9.08 - 10.02 Kevin



Engagement rate during transcription = 100%

Engagement rate during computation = 91%

Engagement rate during correction = 91%

Maximum number of problems = 11

Problems attempted = 11

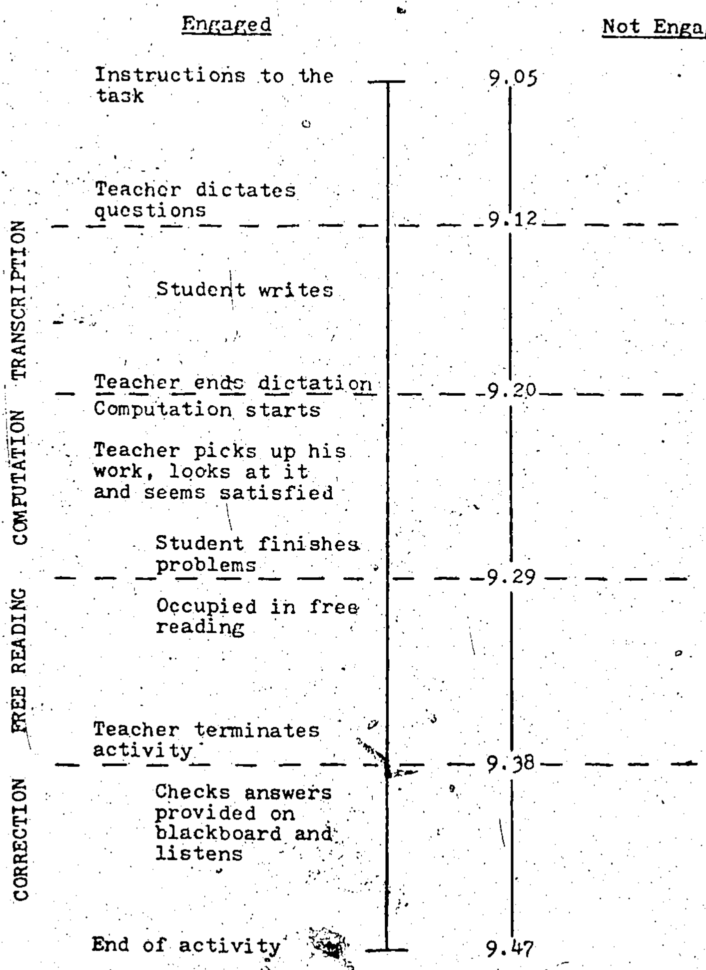
Problems correctly answered = 9

Engagement rate during free reading = 50%

Figure 57

Mathematics Computation Activity

19.10.78 Time: 9.05 - 9.47 Kevin



Engaged

Not Engaged

Instructions to the task — 9.05

Teacher dictates questions — 9.12

TRANSCRIPTION

Student writes

Teacher ends dictation — 9.20

Computation starts

COMPUTATION

Teacher picks up his work, looks at it and seems satisfied

Student finishes problems — 9.29

FREE READING

Occupied in free reading

Teacher terminates activity — 9.38

CORRECTION

Checks answers provided on blackboard and listens

End of activity — 9.47

Engagement rate during transcription = 100%

Engagement rate during computation = 100%

Engagement rate during correction = 100%

Maximum number of problems = 11

Problems attempted = 11

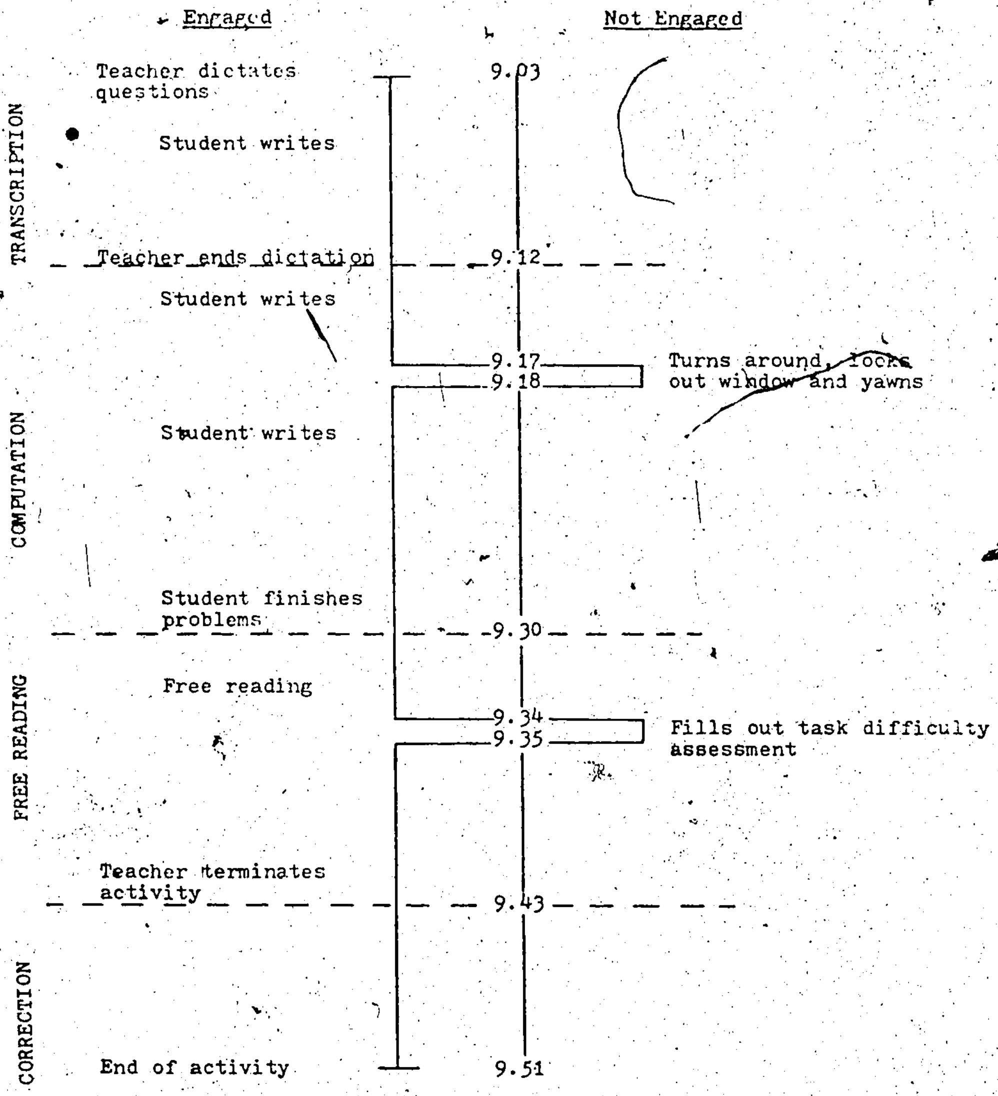
Problems correctly answered = 9

Engagement rate during free reading = 100%

Figure 58

Mathematics Computation Activity

20.10.78 Time: 9.03 - 9.51 Kevin



Engagement rate during transcription = 100%

Engagement rate during computation = 94%

Engagement rate during correction = 100%

Maximum number of problems = 11

Problems attempted = 11

Problems correctly answered = 9

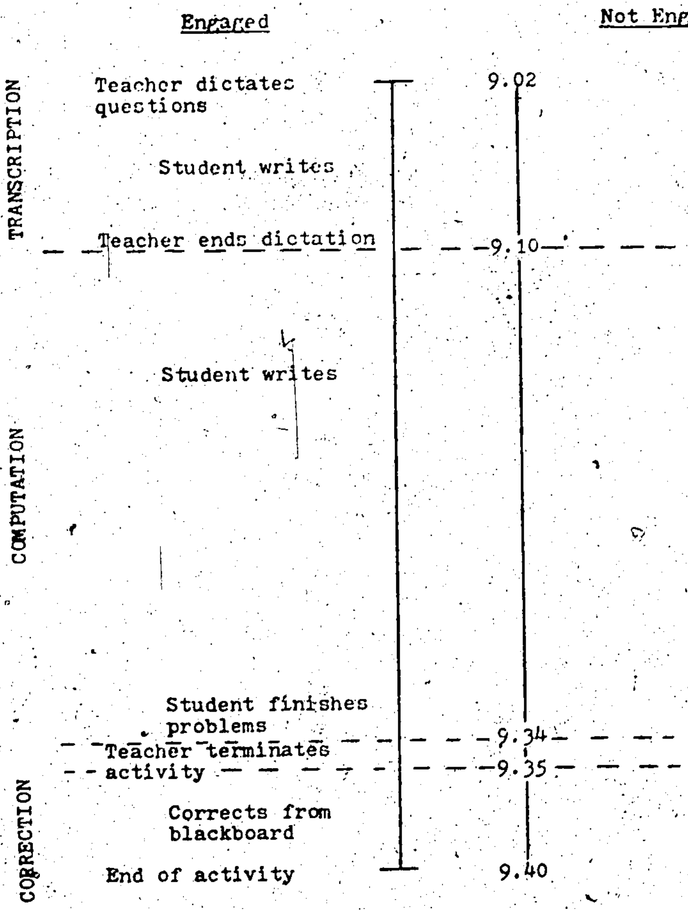
Problems incorrectly transcribed = 1

Engagement rate during free reading = 92%

Figure 59

Mathematics Computation Activity

23.10.78 Time: 9.02 - 9.40 Kevin



Engagement rate during transcription = 100%

Engagement rate during computation = 100%

Engagement rate during correction = 100%

Maximum number of problems = 11

Problems completed = 11

Problems correctly answered = 9

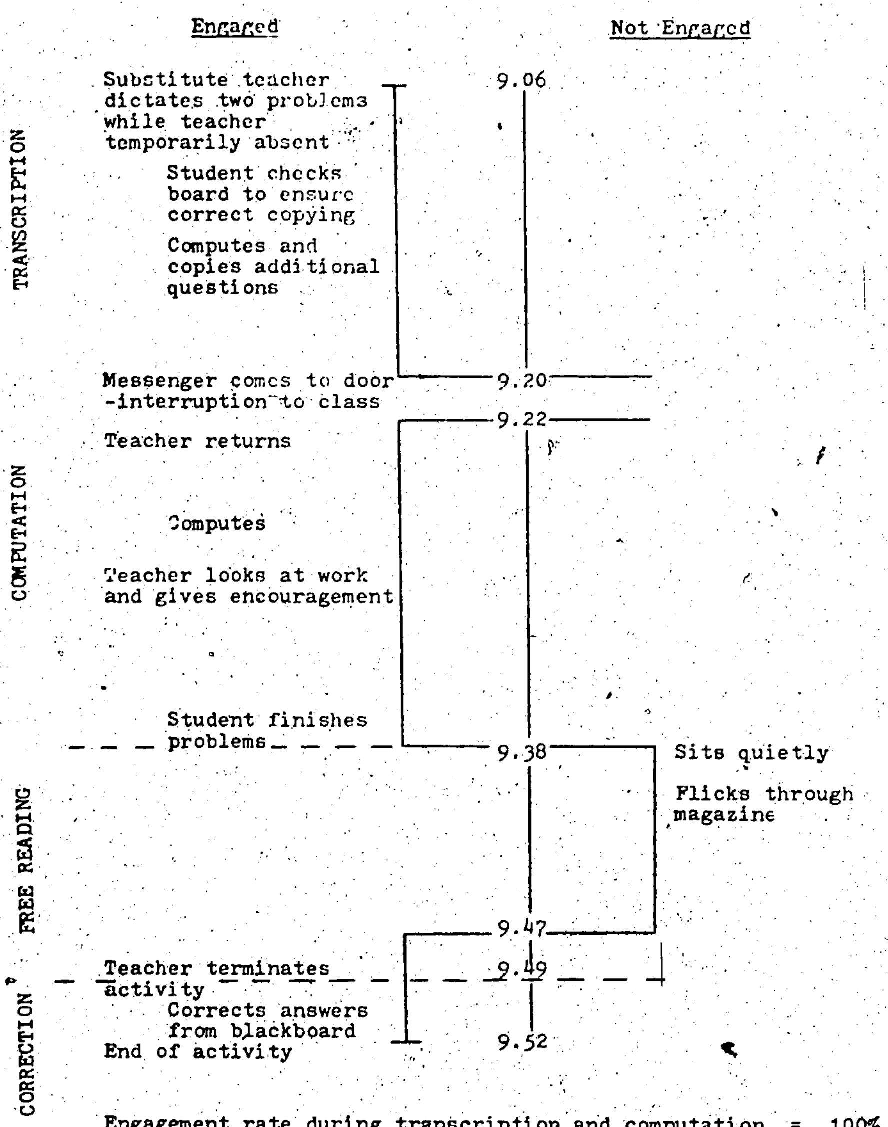
Errors in correction = 1

Engagement rate during free reading = 100%

Figure 60

Mathematics Computation Activity

24.10.78 Time: 9.06 - 9.53 Kevin



Engagement rate during transcription and computation = 100%

Engagement rate during correction = 100%

Maximum number of problems = 11

Problems attempted = 11

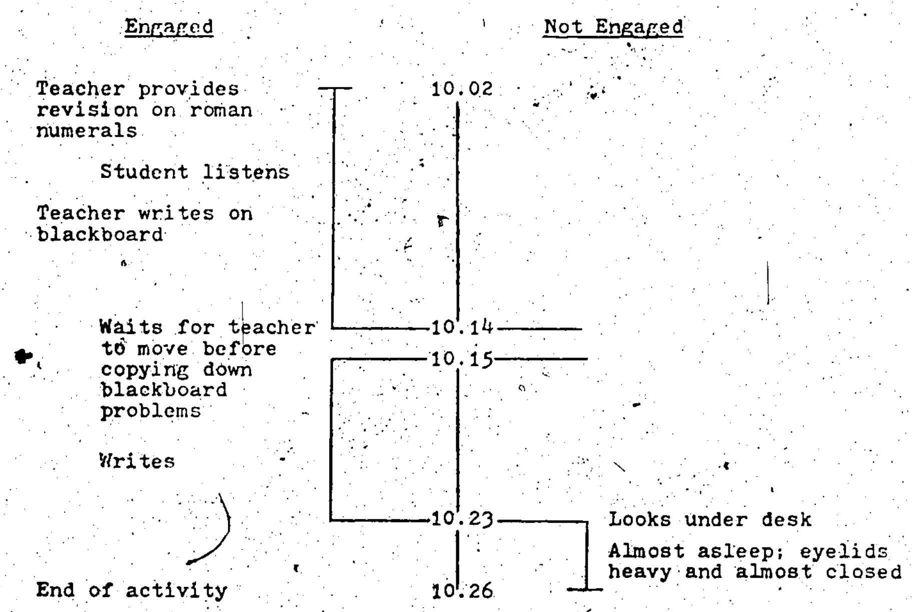
Problems correctly answered = 9

Engagement rate during free reading = 18%

Figure 61

Whole-of-Class Lecture in Mathematics

17.10.78 Time: 10.02 - 10.26 Kevin

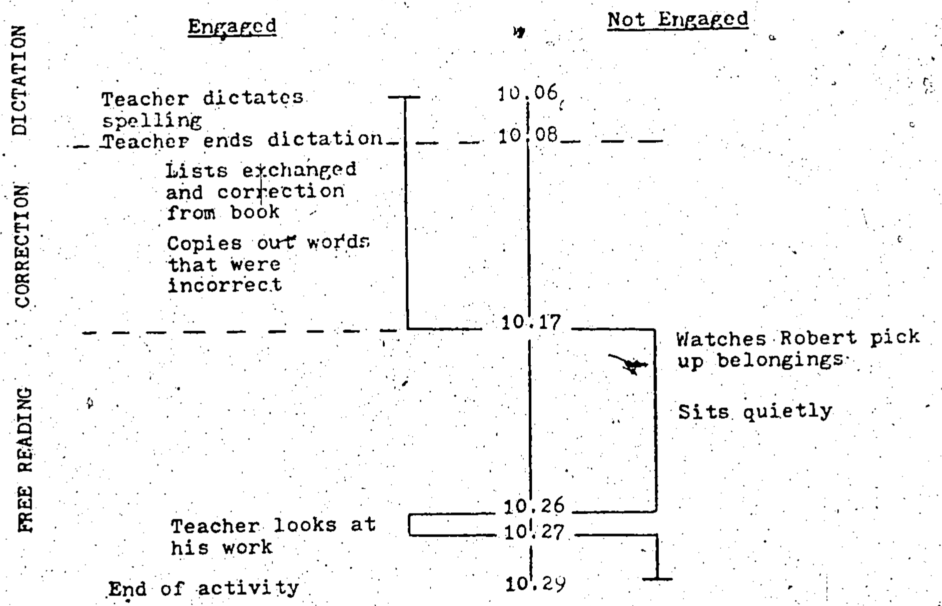


Engagement rate during mathematics lecture = 87%

Figure 62

Dictated Spelling Activity

16.10.78 Time: 10.06 - 10.29 Kevin



Engagement rate during dictation = 100%

Engagement rate during correction and remediation = 100%

Engagement rate during free reading = 8%

Maximum number of dictated words = 16

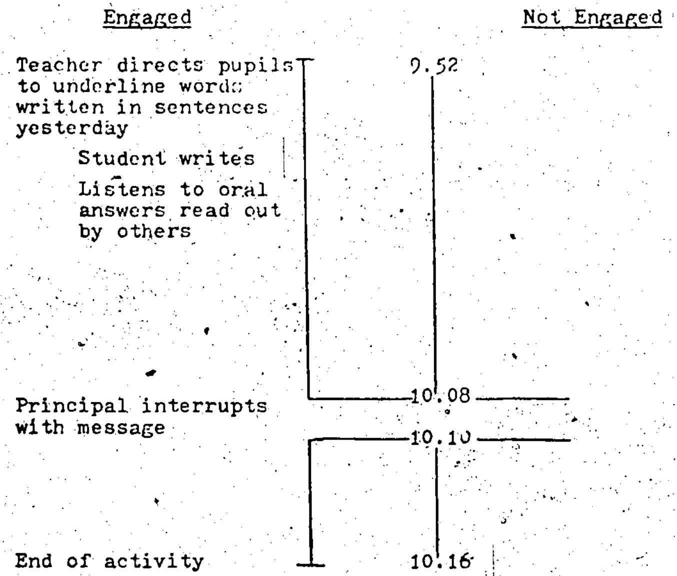
Words attempted = 16

Words answered correctly = 15

Figure 63

Oral Language Arts Activity

19.10.78 Time: 9.53 - 10.16 Kevin



Teacher directs pupils to underline words written in sentences yesterday

Student writes

Listens to oral answers read out by others

Principal interrupts with message

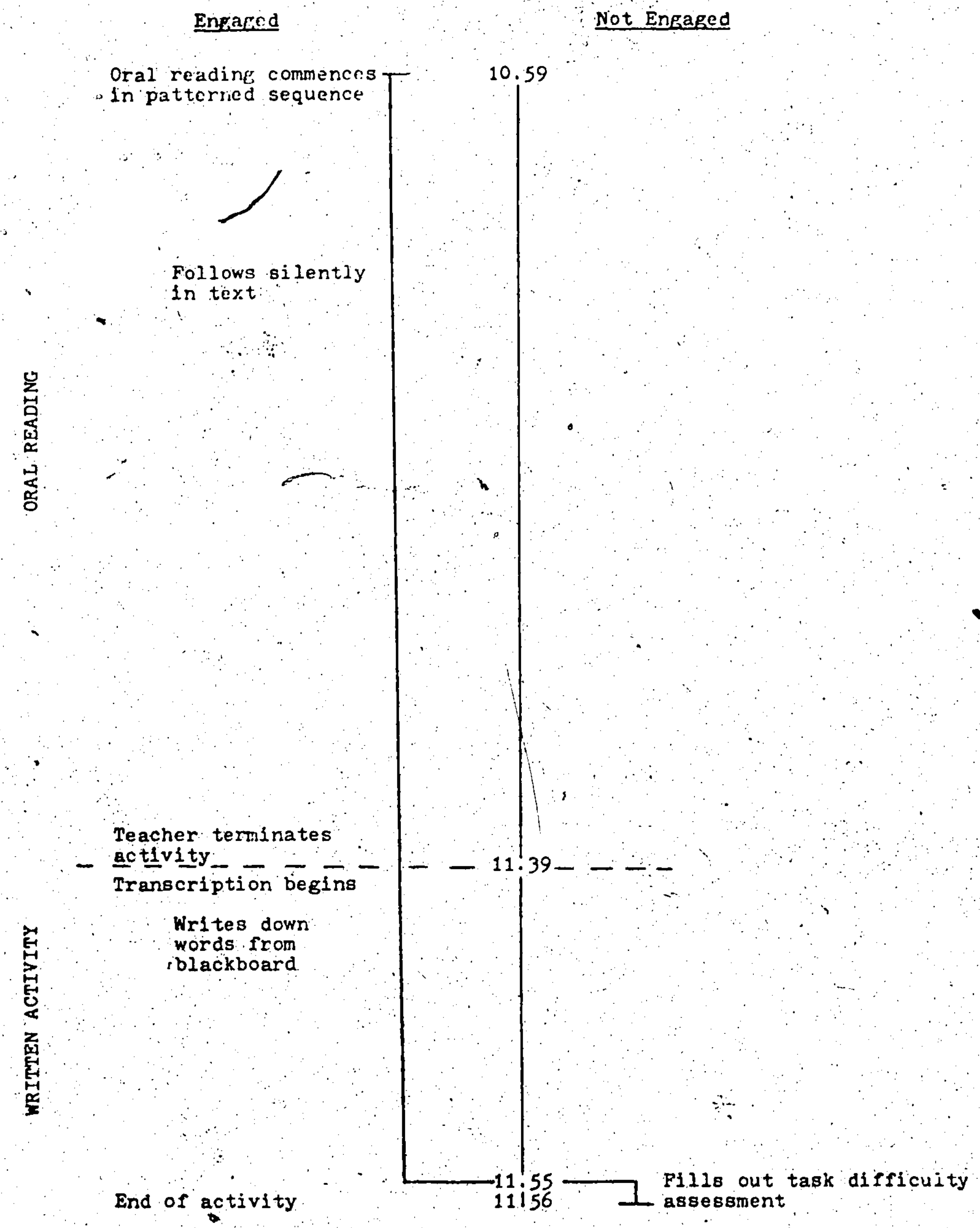
End of activity

Engagement rate during oral language arts activity = 100%

Figure 64

Oral and Written Language Arts Activity

19.10.78 Time: 10.59 - 11.56 Kevin



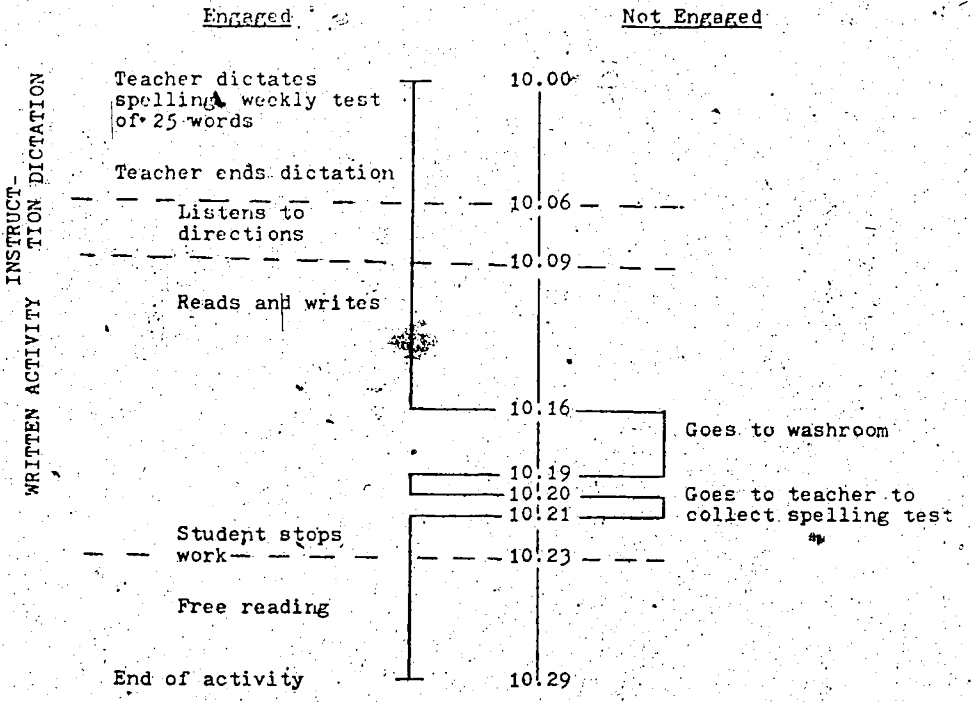
Engagement rate during oral reading activity = 100%

Engagement rate during written activity = 100%

Figure 65

Dictated Spelling and Written Language Arts Activity

20.10.78 Time: 10.00 - 10.29 Kevin



Engagement during dictation = 100%

Engagement during instructions to task = 100%

Engagement during written language activity = 80%

Maximum number of dictated words = 25

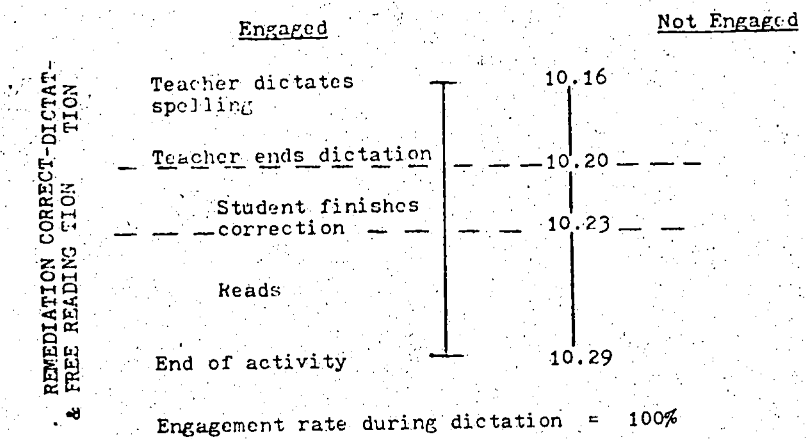
Words attempted = 25

Words answered correctly = 24

Figure 66

Dictated Spelling Activity

23.10.78 Time: 10.16 - 10.29 Kevin



Engagement rate during dictation = 100%

Engagement rate during correction = 100%

Engagement rate during remediation and free reading = 100%

Maximum number of dictated words = 15

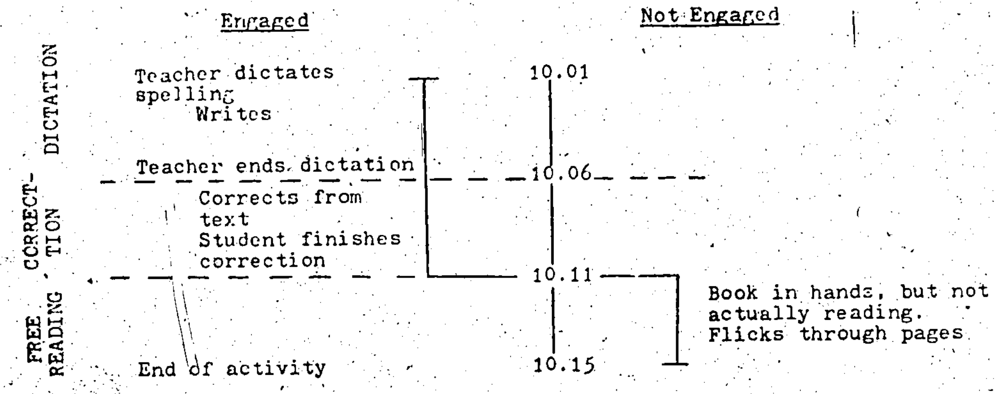
Words attempted = 12

Words answered correctly = 12

Figure 67

Dictated Spelling Activity

24.10.78 Time: 10.01 - 10.15 Kevin



Engagement rate during dictation = 100%

Engagement rate during correction = 100%

Engagement rate during free reading = 0%

Maximum number of dictated words = 21

Words attempted = 21

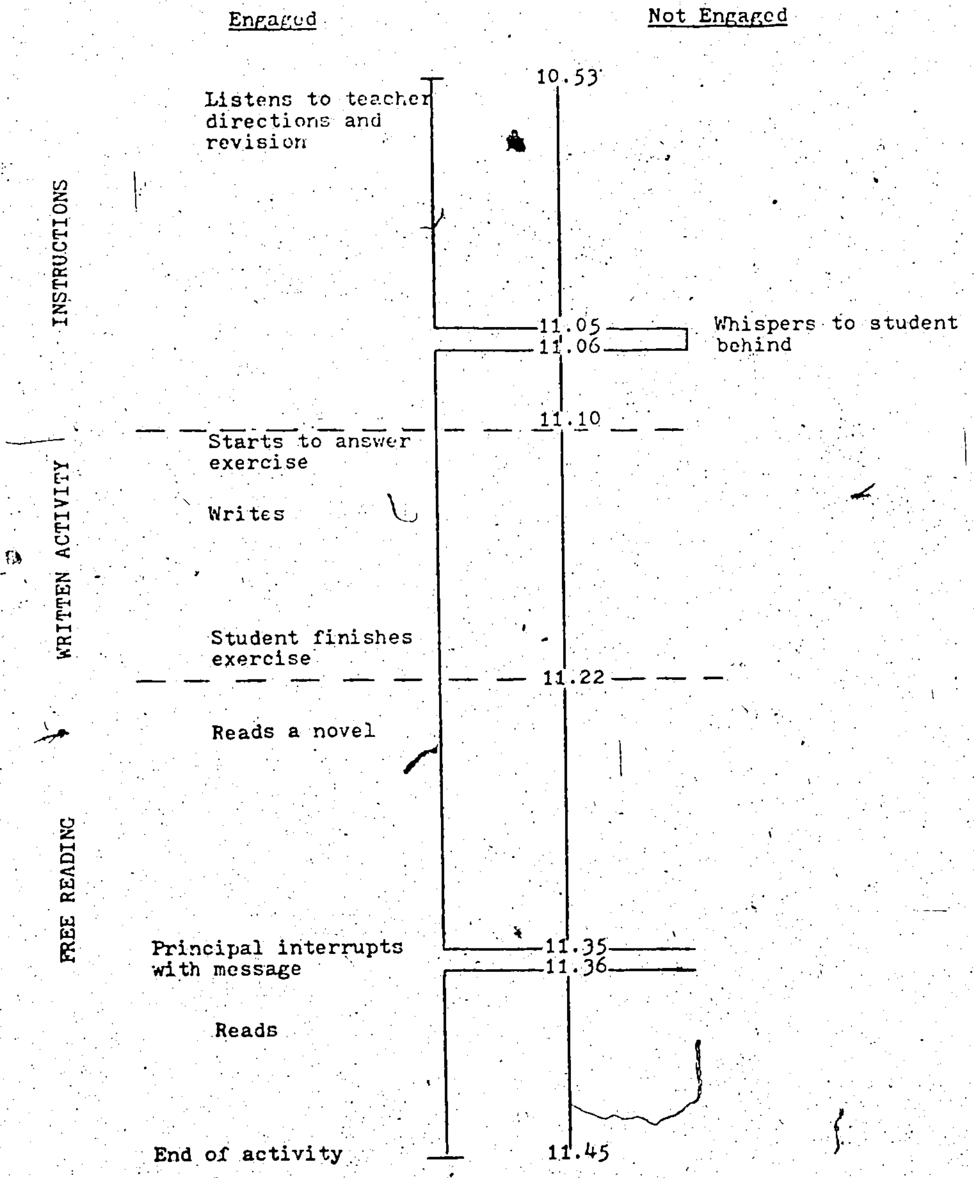
Words answered correctly = 17

Errors in correction = 3

Figure 68

Written Language Skill Exercise

17.10.78 Time: 10.53 - 11.45 Kevin



Engagement rate during instruction to task = 94%

Engagement rate during language skill exercise = 100%

Engagement rate during free reading = 100%

Maximum number of exercises = 16

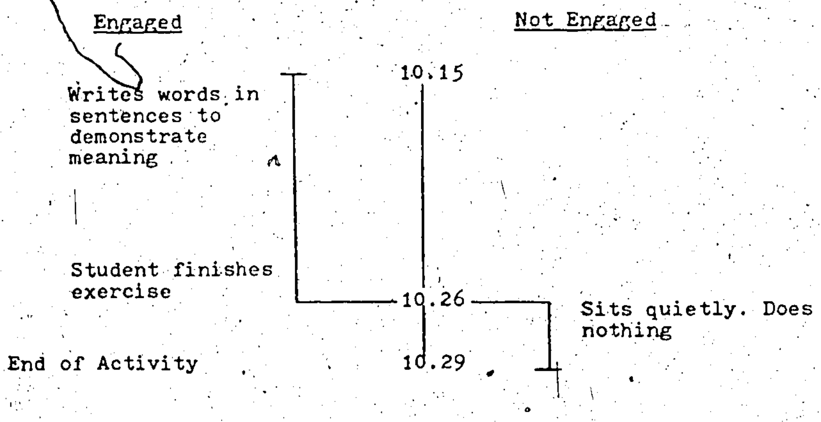
Exercises completed = 16

Exercises correctly answered = 16

Figure 69

Written Language Skill Exercise

18.10.78 Time: 10.15 - 10.29 Kevin



Engagement rate during written exercise = 100%

Maximum number of items in exercise = 16

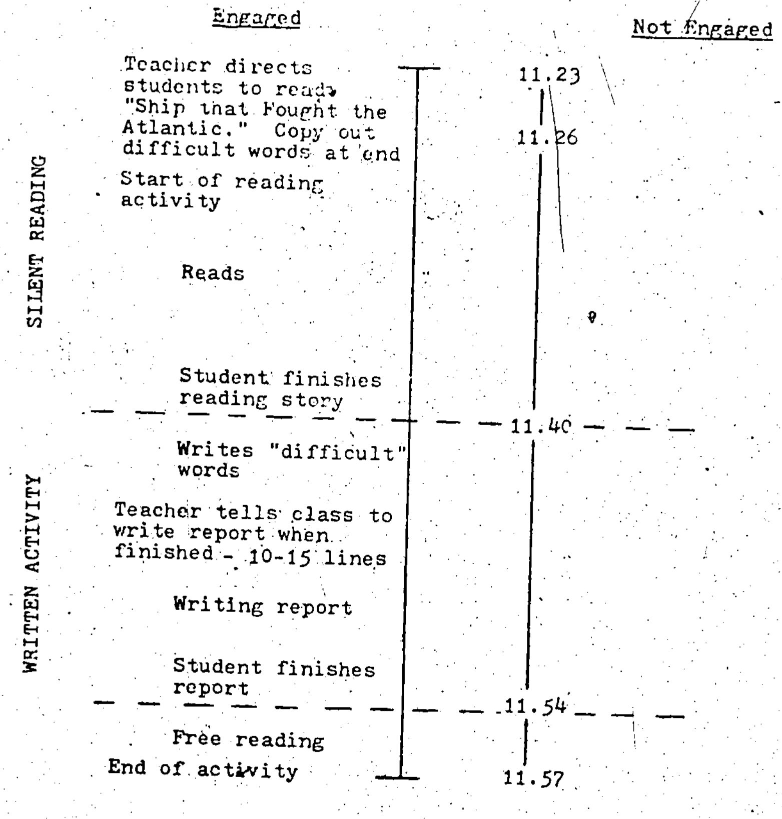
Items attempted = 16

Items correctly answered = 15

Figure 70

Silent Assigned Reading and Written Language Activity

20.10.78 Time: 11.23 - 11.57 Kevin



Engagement rate during reading and writing activity = 100%

Maximum number of pages of set reading = 10

Pages completed = 10

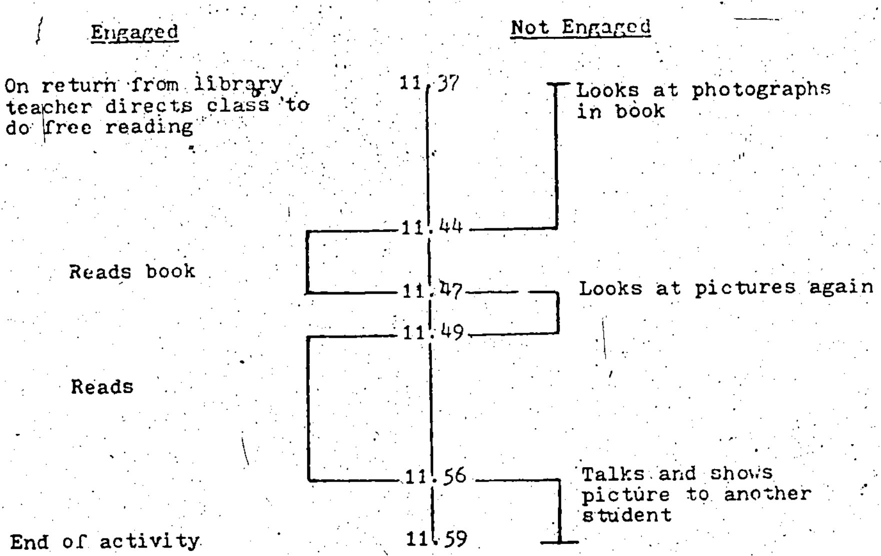
Number of difficult words recorded = 1

Lines of written report completed = 8 (finished)

Figure 71

Free Reading Period

23.10.78 Time: 11.37 - 11.59 Kevin



Engagement rate during free reading = 45%

external direction was provided.

Summary

Analysis of the quantitative data indicates Kevin to have been a pupil who invested considerable effort and enjoyed substantial success in assigned reading and mathematics tasks, considered to have been predominantly easy for him. High levels of engagement were apparent on a day-to-day basis, and throughout the period of observation. Kevin indicated a capacity to make efficient transitions from assigned seatwork to self-directed reading. While occasional variability was noted in respect of the latter, Kevin was seen to perform at his best, in terms of engagement, in settings that had a degree of external structure.

Like the other members of the class, Kevin worked for two thirds of his allotted reading time and one half of his allotted mathematics time in an absence of interactive teaching behavior. The proportion of time he spent receiving teaching behavior tailored to his specific needs was negligible. Profile data of discrete segments of learning activity reinforced the above description of Kevin.

The observable behavior of Kevin, his fellow pupils and the teacher occurred in an environmental context which itself requires description. The following section briefly addresses some of the prominent features peculiar to that setting.

Ecological Factors

Ecological factors are taken here to mean those environmental classroom aspects reflecting what Doyle (1977b) described as "the texture of the classroom." As Doyle (1977a) indicated elsewhere, research into classroom behavior has often proceeded in ignorance of the impact of settings upon the inhabitants. Barker (1963) expressed his view of the importance of context variables, when he said:

> Settings have plans for their inhabitants' behavior, and inputs are activated within the limits of the settings' control systems to produce the planned behavior (p. 37).

In the present research it became apparent, through observation, that certain classroom environment variables were sufficiently prominent to suggest that teacher and pupil behavior were circumscribed to an extent by the presence of these factors.

Observation during 3 days of familiarization and 7 days of coding, followed by an analysis of specimen records generated from field notes and informal comments made by the teacher, revealed two ecological factors worthy of comment: class size and the physical properties of the setting.

Class Size

The 33 pupils and the single teacher were restricted during observations to the one self-contained classroom for 2065 minutes of instructional time, with the exception of 120 minutes in the library and 50 minutes in the art room.

Questioned as to his feelings about the size of the class, the teacher indicated no particular concern and said that it was "a comfortable size group by comparison with some I have had."

The real constraints imposed upon the teaching strategy of the teacher as a result of the size of the class, became apparent during observation of the teacher as he attempted to comprehensively monitor and correct the written work of individual pupils. The teacher gave the impression, both through his actions and comments, of being particularly concerned about the need to provide feedback to pupils on an individual basis, in their on-going written activities. There was ample observable evidence of extensive, and often unrealistically long, time spans allocated by the teacher to assigned seatwork exercises. Although in excess of what was actually required by the majority of the pupils, these time spans were apparently considered necessary by the teacher to conduct a representative sampling of on-going pupil seatwork. The immediate outcome were lengthy periods at the conclusion of assigned reading and mathematics, in which pupils were supposed to be doing free reading.

For some students the opportunity to engage in free reading was approached enthusiastically and undertaken productively. Kathy, for example, between the conclusion of computational exercises and the onset of correctional feedback, was observed to have accumulated 37 minutes of engagement in free reading. At the conclusion of assigned language arts she amassed a further 53 minutes of engaged free reading. During these two situations alone, Kathy averaged 17 engaged minutes of free reading per day. Over a full school year, Kathy could therefore expect to accumulate 51 hours or 10 days of instructional time in free reading while the teacher checked on the seatwork of other pupils.

Other students, such as Wayne, made unwise use of the extended time allotted for the completion of assigned tasks, while the teacher monitored progress. The cost to these pupils, therefore, was the reading time of which they were unable to avail themselves.

Physical Setting

The true significance of Jackson's (1968) description of classrooms as "over-populated enclosures" became apparent in the present research.

Confinement of the class and the teacher to a room with dimensions of approximately 30 feet by 25 feet, provided little alternative to having desks physically arranged in parallel rows facing the teacher at the front of the room.

The structured seating arrangement which was necessitated by the large size of the class, was observed to have effectively eliminated the possibility of legitimate pupil interaction or movement. Apart from transitions into and out of class, pupil movement was prohibited by the teacher unless a pupil was conducting an assigned monitorial duty or leaving the room to attend the washroom. The only other occasions on which pupils were observed to have left their desks were to sharpen a pencil, place rubbish in the bin, or change a free reading book at the bookcase. Pupils who procrastinated in the performance of those activities received a teacher rebuke.

One manifestation of the need for control and order in this crowded setting, was the reduced scope for oral activity by target pupils during reading and mathematics. Oral reading was only observed on one occasion. The details were shown in Tables 7, 24, 41 and 58.

Another element of the physical setting of concern to the teacher was the noise level generated as a consequence of the combined effects of air-conditioning and lighting systems. This feature appeared as a low mechanical hum emanating from the front right-hand corner of the classroom. The observable impact was that during interactive teaching sequences, the general level of classroom noise tended to rise over the threshold level of the background noise. Private conversations, when simultaneously in progress, therefore, tended to occur at an increasingly elevated volume. The teacher's response to these conditions was a "pause and wait" technique accompanied by a severe look in the direction of the infraction.

Regardless of teacher disposition, therefore, pupils seemed destined to either individual seatwork or whole-of-class settings. The available learning settings in this particular classroom, were at least partially pre-determined by the size of the class, the physical limitations on the size of the room, and its peculiar acoustical properties.

Summary

A brief background sketch, based on information from school records and interviews with teachers, was presented for each pupil. An indication was provided, from observational data, of the allocation and distribution of available instructional time across a broad range of classroom activities. An analysis was made of the actual use of academic learning time for each pupil in reading and mathematics, according to type of engagement, the content covered during that engagement and the difficulty of the task. Pupil involvement in the context of various settings was considered, along with the nature of interactive teaching behaviors. Discussion of each pupil concluded with an analysis of discrete learning segments, and the compilation of an overall profile of work habits during academic content. The chapter terminated by looking at those ecological aspects of the particular classroom likely to have had a pervasive influence on time utilization.

Chapter VI

SUMMARY, INTERPRETATIONS, IMPLICATIONS AND RECOMMENDATIONS

Overview

This concluding chapter summarizes the study in terms of its purpose, the research techniques used, and the analytical procedures employed. The findings are interpreted through a re-assessment of the original research questions. Consideration is given to the implications for teaching and teacher education, some reflections made on the research design and methodology, and recommendations presented for future research.

Summary of the Study

Purpose

The purpose of the study was to describe the classroom learning pursuits of four grade 6 pupils in the academic areas of reading and mathematics. Answers were sought to questions regarding the distribution of time across broad categories of classroom activity, the levels and patterns of engaged activity, and the nature and extent of academic content covered. The determination of the amount of meaningful instructional time was an integral part of the study.

Research Techniques

The predominant technique involved classroom observation. The pupils were simultaneously observed in a natural classroom setting for seven complete continuous days. Observations were recorded using an established coding system, based on a rotational sequence and time sampling procedure. Extensive field notes of qualitative aspects were made, and the extent of content covered by pupils recorded on a specially designed transcript sheet. The meaningfulness to pupils of time actually spent, was gauged by observational means, as well as by pupil retrospective pencil and paper responses at the time of undertaking the task, and by artifact analysis of completed pupil written work, conducted at the conclusion of observation.

Analytical Procedures

Coded observational data were analysed using a prepared computer program to generate both daily and aggregated data for each pupil. Field notes were transcribed into detailed narrative/specimen records, to be used in the later compilation of comprehensive learning segment profiles on each pupil. Transcript sheets of content covered were analysed to obtain tallies of work assigned, work completed, times involved and success rates for selected activities for each pupil. An identifying number keyed each aspect of content covered, to pupil assessments of task difficulty.

Interpretation of Findings

The case study or quasi-clinical design in this research circumscribed the generalizability of the findings to the specific pupils involved in the study. Within the limitations of this design, it was possible to arrive at certain interpretations and conclusions based on the data. These interpretations and conclusions as to pupils' use of academic learning time, emerged from a consideration of the research questions, in the light of the collected data. A further conclusion was reached regarding the stereo-typing of one of the pupils.

An aspect that continually re-appeared in the data for each pupil, and noted in similar research by Berliner (1978c), was the absence of day-to-day stability in engagement rates. This observation applied more to some activities, than to others, in the present study.

While remaining cognizant of the dangers of combining daily data even for the same pupil, it was nevertheless considered prudent here to endeavour to obtain a profile of each pupil over segments of more than a few minutes. Learning is, after all, a cumulative experience. The fact that a particular pupil was recorded as demonstrating a fluctuating level of engagement from day-to-day should not be the sole grounds for dismissing aggregated data. Aggregation serves a useful purpose, provided adequate attention is also given to highlighting aspects of instability where they occur.

In this study sufficient data pertaining to pupil pursuits of a similar type across constant settings were collected permitting both micro and macro analyses to be performed.

1. <u>How was pupil time allocated among various academic, organizational and non-academic classroom pursuits</u>?

The pervasive influence of the teacher in the organizational learning pattern of the selected pupils was evident in the almost identical proportions of target pupil time allocated to various categories of classroom activities. Pupil time was apportioned 20 per cent to matters of a general classroom nature, 33 per cent to instruction without a reading or mathematics component, and 47 per cent to reading and mathematics.

Value judgements as to the efficiency, or otherwise, of time allocations for these pupils in this classroom are clearly impossible in the absence of either absolute or comparative standards. In these circumstances, it shall suffice to note that more than half of the available instructional time was apportioned for these pupils to activities without a reading or mathematics component.

The conclusion reached was that there was considerable uniformity among pupils in the allocation of time to broad categories of classroom instructional and non-instructional activities.

2. How did pupils use available learning time in reading and mathematics?

a. What was the pattern of engagement as among written, oral and covert activity?

For all pupils, written and covert activities were the predominant modes of engagement in reading and mathematics.

The structured teaching mode employed in mathematics computation, with a high occurrence of class directed questioning requiring written responses, was reflected in the one third of the available time for which each pupil was engaged in written activity. A further 15-20 per cent of available time was used by each pupil in the transcription aspect. Covert activity consumed one third of Kathy and Kevin's available mathematics time. Robert recorded slightly more, and Wayne less than one quarter of his available time in listening, following and thinking about mathematics.

The comparatively less active nature of reading activity was indicated by each target pupil spending only one fifth of the available reading time in written pursuits. The diversity between pupils in their covert reading activity was reflected in Kevin and Kathy using 50 per cent of their available reading time in silent passive pursuits, Robert spending 42 per cent and Wayne 15 per cent.

Considered according to the proportion of engaged reading time in written and covert activity, the following emerged. Kevin, Robert and Kathy all spent the largest portion, or two thirds, of their engagement in reading in some kind of covert activity. Wayne, in contrast, spent the predominant part of his engagement in reading in some form of written pursuit. He was twice as likely to be on-task in a reading-related activity, when there was a written aspect associated.

For all four pupils, therefore, it may be concluded that written activity was the predominant form of engagement in mathematics, and for three of the pupils, covert activity was the most prominent engaged pursuit across a range of reading activities.

b. What was the nature and extent of academic content covered in reading and mathematics by pupils during their engagement?

Considerable variation was found in the amount of content covered, and in the success on that coverage by individual pupils, both within and between reading and mathematics.

Kevin demonstrated the most consistent

performance in reading, in terms of content completed, over the seven measured categories of teacher and self-directed activities. Kathy covered all assigned content in five of the seven categories, while Robert completed the prescribed work in half the reading categories for which he was present. Wayne, however, attempted all the assigned content in only two of the seven reading categories. One of these was teacher directed spelling, and the other was a word transcription activity of low level difficulty.

With the exception of Kevin, instances of less than maximal content coverage in reading were associated with pursuits in which there was minimal teacher control and considerable potential for pupil discretion as to participation.

In mathematics computation, Robert, Kevin and Kathy attempted all the assigned content. Wayne attempted only half the allotted content, his further participation being seriously impeded by the one quarter of the prescribed content which he either failed to transcribe or did so inaccurately.

When content covered was used as a proxy for effort invested, leaving aside the issue of task difficulty, Kevin appeared as the most consistent pupil in reading and mathematics. Both Kathy and Robert were more consistent in their efforts in mathematics than in reading. Wayne's invested effort in reading and mathematics was consistently low.

In terms of success rate and time required to complete mathematics learning tasks, Robert emerged as superior on both. Robert's average computation time was 1.12 minutes per problem, compared with 1.6 minutes for Kevin and Kathy, and 2.3 minutes for Wayne. Robert achieved a success rate in mathematics of 84.4 per cent, while Kevin's was 79.2 per cent, Kathy's 74 per cent and Wayne's 20.1 per cent.

It may therefore be concluded, that although variability existed for content covered by these pupils, both effort and success during task engagement were higher and more consistent in mathematics computation, than in a range of sampled reading activities.

c. How did levels of pupil task engagement vary [illegible]riculum content and task difficulty?

[illegible] reading and mathematics were considered together, Robert was found to have spent the largest proportion of his allotted time, or 81.8 per cent, interacting with content considered to be easy for him, and Wayne the lowest proportion, or 23.5 per cent, interacting with content rated as easy for him. For 78.9 per cent and 69.9 per cent of Kathy and Kevin's respective allotted time, each was confronted with content considered easy. Learning incorporating known material and some new or challenging aspects, occurred during 17.8 per cent of reading and mathematics time for Robert, 20 per cent of the time for Kathy and 29 per cent of the time for Kevin. Wayne spent in excess of a third of his combined available reading and mathematics time in activity of medium difficulty. With an occurrence of less than one per cent of the time, the hard category was rare for Kathy, Robert and Kevin. Wayne experienced learning activity rated as hard, for 36.9 per cent of his reading and mathematics time.

When disaggregated according to content, it was found that engaged reading time at the easy level of difficulty consumed the largest percentage of either reading or mathematics engaged time, for all pupils except Wayne. Wayne was recorded as being engaged for the largest proportion of his engaged time in reading of medium level difficulty. Neither Robert, Kathy nor Kevin was judged as having been engaged in any reading that was considered hard. For Wayne, however, this category accounted for one quarter of his engaged reading time.

In mathematics a lower percentage of engaged time was assessed as having been spent by all pupils in content at the easy level, than was the circumstance in reading. Although Robert and Wayne differed substantially from each other, they displayed a consistency within themselves in the percentage of engaged time interacting with easy content in reading, as compared with mathematics. For Kathy and Kevin, on the other hand, the proportion of engaged time at the easy level was considerably less for each in mathematics than was the case in reading. Almost half of Kevin and Kathy's occupied mathematics time was spent interacting with material of a challenging level of difficulty. For Wayne the proportion was one third.

It may, therefore, be concluded that considerable diversity existed between pupils and across subject boundaries as to engagement rates and difficulty levels. As a generalization, for three of the four pupils, the predominance of the productive time in reading and mathematics was spent interacting with content upon which they experienced high levels of success. This was most noticeable in reading. For two pupils, in mathematics, almost as much time was spent with challenging material as with easy material. One pupil emerged as having spent one quarter of his engaged reading and one half of his involved mathematics time, in content that was clearly incomprehensible to him.

d. <u>What are the possible longer term implications of continual task engagement with learning material of demonstrated difficulty levels</u>?

The comparatively high concentrations of engaged time for Robert, Kathy and Kevin at the easy and medium levels of difficulty, is suggestive of substantial levels of meaningfulness in learning for these pupils.

The meaningfulness of instruction for Wayne, however, warrants further analysis. Observational data in Table 14, when expressed as daily averages over the 7 days, reveals Wayne to have accumulated, on average, 33 minutes a day in engaged reading and 39 minutes a day in engaged mathematics. On their own these statistics reveal little about the intrinsic educational value of that time spent by Wayne. When statistics on the difficulty level of specific tasks encountered are considered at the same time, a more valid indicator of meaningfulness emerges.

Recent research by Marliave, Fisher and Dishaw (1977) of 139 second grade and 122 fifth grade pupils, found that the proportion of time spent on content of medium difficulty was negatively related to pupil achievement, while the proportion of time spent on content of an easy type, was positively related to student achievement.

While acknowledging the need for some learning material of medium difficulty to provide challenge and avoid boredom and frustration, but accepting for the moment the Marliave, Fisher and Dishaw (1977) estimate as a conservative indicator of meaningful pupil learning, the following scenarios can be constructed for Wayne.

With the 23 per cent of his engagement in reading and the 22.6 per cent of his engagement in mathematics, at the easy difficulty level, as shown in Table 14, Wayne's daily average accumulation of meaningful learning during the period of observation was 7.75 minutes in reading and 9.16 minutes in mathematics. If the 7 days of observation were representative of Wayne's performance, he could therefore expect in a full school year to assimilate meaningful learning for a total of 23 hours in reading and 24 hours in mathematics.

A more optimistic, but less realistic, scenario might involve disregarding the research of Marliave, Fisher and Dishaw, and including all engaged learning time at both easy and medium difficulty levels. Under these conditions Wayne's average daily accumulation of meaningful learning in reading increases to 21 minutes a day, and in mathematics to 25 minutes. Yearly totals generated on this basis could be expected to be 63 hours for reading and 75 hours for mathematics.

By way of comparison, Kathy's meaningful engaged learning based on the easy difficulty proposition, amounted to a daily average of 66.8 minutes in reading and 22.7 minutes in mathematics. Projected over a year, these figures could be expected to accrue to 200 hours of meaningful learning in reading and 68 hours of meaningful learning in mathematics. For Robert, the statistics are 48 minutes in reading and 28.7 minutes in mathematics, generating possible annual totals of 144 and 86 hours respectively. Kevin, with daily averages of 55.2 meaningful minutes in reading and 24.9 minutes in mathematics, could expect annual totals of 165 and 75 hours respectively.

Regardless of whether the conservative or optimistic stance is accepted with respect to the content that might justifiably be included as a component of meaningful learning, the above scenarios demonstrate the considerable diversity that existed among pupils in this study, and the substantial impact which these differences could be expected to have over time.

e. Were there variations in engagement according to previously measured levels of pupil achievement?

Mixed results emerged when previous pupil achievement levels were considered.

Robert and Kathy were rated according to school records and teacher opinions as high achieving pupils. Their demonstrated levels of engagement in on-going reading and mathematics situations, as well as their effort and success on content covered and their work habits generally, supported the view of these pupils as being high achieving. While Kathy demonstrated her highest engagement, success and effort in reading activity, Robert's superior performance was in mathematics.

School record data retrieved on Wayne at the conclusion of observation, indicated him to be a low achieving pupil both in terms of standardized tests, as well as on teacher criterion-referenced grades. Given this information, it was not surprising to find observations revealing low levels of engagement and an absence of any sustained capacity to initiate and follow through academic tasks.

Kevin emerged as an enigma. School records indicated low levels of previous performance in reading and mathematics. Observation, however, of work habits and attempted and completed content, portrayed Kevin as being little different from his high achieving counterparts. On all aspects, during the six and one quarter days he was observed, Kevin displayed no indications that might have enabled an observer to conclude he was a low achieving pupil. On the contrary, his on-going performance was at a high level of competence.

The conclusion reached from this aspect was that, for one pupil, standardized achievement test score data and previous teacher grades, were not reflective of that particular pupil's on-going classroom performance in reading and mathematics at the time of observation. For the other three pupils there was a closer match between recorded test data, subjective teacher opinions, and observational data.

f. Were there characteristic patterns of pupil work habits?

Both quantitative data and sample segment profiles, indicated variability between pupils, within and between days, and over subject boundaries, in the manner in which they approached the learning process.

Wayne, for example, varied from an intermittent style of brief engagement followed by not so brief periods of disengagement in written mathematics seatwork, to protracted periods of non-engagement in less structured covert activities, such as free reading. His off-task behavior was frequently disruptive, although generally localized to pupils in close proximity to him.

Kathy, on the other hand, indicated generally high levels of committment to assigned academic tasks, as evidenced by her continuous engagement until task completion. This was usually followed by a brief period of social activity, prior to entering upon self-directed reading which she pursued with diligence and apparent enjoyment. Kathy's infrequent off-task behavior was never disruptive and seemed to be more of a "break" before moving into the next task.

Robert's work pattern on assigned tasks was generally one of pursuit without interruption, until completion. Once finished, however, it was unusual for Robert to organize his remaining time in valuable free reading. Instead, he resorted to the drawing of "Star Wars" pictures which he accumulated in an abundance. During interactive sequences, he was an attentive listener and a willing contributor.

Kevin was more like Kathy in his work habits, than he was to either of the other pupils, despite his being classified as a low achieving pupil. Kevin was capable of initiating and following through a learning sequence without pause. He was, however, able to move more efficiently than Kathy from a completed assigned written task to covert free reading, without the intervening social break.

The conclusion in respect of the research question bearing upon work habits, is that for three pupils there were similarities of uninterrupted pursuit on written activity and attentiveness during interactive teaching segments. In other respects, each pupil was idiosyncratic. The fourth pupil was quite unlike the others.

g. Was there evidence of varying intensities of pupil involvement in learning pursuits?

This question proved impossible to answer adequately, given the nature of the research design.

Indirectly, however, the question of intensity of involvement on academic tasks was addressed in discussing pupil work habits. For one pupil in particular, the pattern of engagement was observed to be so irregular and intermittent, as to suggest, that at best that pupil's involvement with academic content could only have been at a superficial level, even in those instances when he was on-task.

The conclusion reached in this aspect of the study was that, while it was possible to determine the presence or otherwise of involvement with academic content for these pupils for a large portion of their time, it was almost impossible by observational means alone, to ascertain the intensity of that involvement in academic tasks.

3. What was the nature and duration of pupil classroom task settings?

Relatively little variability was noted between pupils in the proportions of available time spent by each in whole-of-class and seatwork settings. For all pupils in reading, the distribution was approximately three quarters of the time in self-paced settings, with the remaining quarter to other-paced. In mathematics, the distribution was closer to half in self-paced and half in other-paced settings. The uniformity between pupils in this respect was indicative of the tight control exercised by the teacher in apportioning time to various settings.

a. How did pupil engagement vary with settings and across content?

All pupils demonstrated their lowest percentage of off-task behavior in mathematics seatwork and other-paced reading. The extent of minimum off-task activity, however, varied considerably between pupils. Robert, for example, was off-task for .3 per cent of his available time in other-paced reading. Wayne's lowest recorded level of off-task behavior was in self-paced mathematics, and for him it constituted 16.9 per cent of his available mathematics time.

For all pupils [illegible] setting and content combination most conducive of high levels of off-task behavior, was self-paced reading. Again, there was considerable variation between pupils. Whereas Kevin was off-task for a maximum of 11.7 per cent of his reading time, Kathy for 15.2 per cent and Robert for 30.5 per cent, the maximum for Wayne was 46.5 per cent of his available reading time. A substantial portion of the variability among pupils, can be accounted for in individual pupil ability to effectively organize free reading time.

An indication of the relative proportion of off-task time by each pupil in the two subject areas is summarized in Table 74. It is apparent that a substantially lower percentage of time was wasted by all pupils in mathematics, than was the circumstance in reading. For each pupil the percentage wasted in reading was twice as large as in mathematics. This may be partially accounted for by the more structured

Table 74

Percentage of Available Reading and Mathematics Time in Not Engaged Off-Task Behavior

	Reading	Mathematics
	%	%
Wayne	54.9	30.1
Kathy	15.7	6.3
Robert	30.8	5.5
Kevin	12.3	5.4

teaching technique used and the more applied nature of the content in mathematics, in contrast to reading. The level of pupil discretionary participation was also lower in mathematics.

The forms of engagement that occupied the most prominent portion of time in each setting, for each subject, for these pupils, were as follows.

In self-paced mathematics, written activity occupied the largest portion of engaged time for each of the pupils. For self-paced reading, covert activity was the predominant engaged pursuit for Kathy, Robert and Kevin. For Wayne, the largest portion of time when not off-task, was in written activities.

During whole-of-class mathematics instruction, the covert activity of listening or thinking, accounted for the largest portion of time for each pupil. Likewise, in whole-of-class reading, covert activity was the most predominant form of engaged pursuit for all pupils.

It can be concluded, therefore, that each of the pupils made more productive use of their learning time in mathematics, than in reading, at least as reflected by engagement levels. With the exception of one pupil, variability between pupils in the extent of off-task behavior, was greatest in reading and least in mathematics.

It can also be concluded, for these particular pupils, that the setting most conducive to apparent learning in mathematics, was written seatwork, and in reading, was externally paced non-written activity.

b. Were pupil pursuits influenced by ecological factors resident in the setting?

Although clearly impossible to locate precise cause and effects in a descriptive observational study of this kind, two classroom environmental factors were considered to have had an impact upon the behavior of the teacher and the pupils. The following tentative conclusions were reached.

Given the need to monitor individual on-going written pupil activity in a large class in more than a token way, the teacher appeared to have adapted to the setting constraints by extending the time available to pupils for various assigned activities. Whether rightly or wrongly, this time was left largely unstructured, except for the requirement that it be utilized in individual private reading. The observable consequence was that some pupils accumulated substantial amounts of engaged reading time through this means, while others acquired none.

The combination of a large class, a small room, poor acoustics, and the need for a modicum of control, combined to influence the classroom seating and layout pattern, the network of classroom interactions, and the predominant setting modes of whole-of-class recitation and individually paced seatwork, as employed in this particular classroom.

4. <u>What was the character and extent of teaching behaviors as they impinged upon individual pupils</u>?

   a. <u>Did some pupils spend more time receiving teacher monitoring, questions, explanations, directions and rebukes, and task feedback from various sources, than other pupils</u>?

In other-paced settings, where most interactive teaching behavior occurred, there was relatively little overall difference among pupils in the amount of substantive teaching behavior directed to them. All target pupils received substantive or content-related teaching for approximately 15 per cent of the time in reading and 50 per cent of the time in mathematics. Analysis of the statistical data did not reveal large discrepancies in the amount of any one category of teaching behavior received by any one particular pupil. In other-paced reading, explanations accounted for approximately one third of interactive teaching behavior, and monitoring for the remaining two thirds, for all pupils.

No target pupil appeared to have been the exclusive object of interactive teaching behavior in self-paced settings, with the possible exception of Wayne, who received individual teacher explanations for

3 per cent of his self-paced reading time. He was also the object of more teacher admonitions and rebukes than was the circumstance for other pupils.

The conclusion reached in this aspect of the research was that few differences of any substance existed among target pupils in the amount of substantive teaching behavior received. There was a high level of uniformity between pupils.

b. Did some pupils spend more time receiving instruction that originated from the teacher?

During reading and mathematics, Kathy, Robert and Kevin each spent less than 2 per cent of their instructional time receiving individually focused instruction from the teacher, specifically designed to meet their individual needs. The amount of individual teacher attention directed to Wayne was 6.9 per cent of available reading time and 4.4 per cent of available mathematics time. Most of this, however, was of the non-substantive teaching kind involving reprimands and exhortations to Wayne to remain on task. Teacher instruction with a group focus in reading and mathematics was also consistent among pupils, amounting to one quarter of the time in reading and one half the time in mathematics.

The research conclusion, therefore, was that all four pupils received uniformly low amounts of individually focused teacher attention, but with moderate amounts directed to them when members of the larger collectivity.

c. Did some pupils spend differing amounts of time receiving instruction from the teacher, other pupils and curriculum sources?

While there were noticeable differences in the proportion of instruction emanating from these three sources, differences among pupils were minimal.

The teacher constituted the source of teaching behavior for approximately 20 per cent of reading time, other pupils during 7 per cent of the time, and curriculum resources for 1 per cent of the time, for each pupil. As a source of mathematics instruction the teacher was more prominent, featuring for 45 per cent of the time, with other students occupying 10 per cent, and curriculum resources for none of the time.

The conclusion reached was that the small inter-pupil differences in the relative sources of instruction were not substantial.

Implications for Teaching

The pupils involved in the study represented a range of ability in reading and mathematics. The manner in which these pupils approached learning tasks, the settings in which learning occurred, the behavior of the teacher, and the subsequent outcomes have implications for pupils and teachers similar to those described here.

Given the demonstrated connection in the research literature between pupil task engagement and pupil achievement, findings from the present study indicate a number of school-based teacher-controllable variables that have potential for enhancing the engagement levels of high and low achieving pupils.

Rather than attempting a set of prescriptive "teacher should" statements based on the limited findings generated here, an indication will be provided instead of some tentative possibilities that warrant consideration and further research investigation.

Goal-directed and Structured Teaching Behavior

Observations in the present study suggest the possibility that both high and low achieving pupils may benefit, in terms of engagement, from structured teaching situations. Previous research by Soar (1977) and Stallings (1977) indicates that where teachers structure the learning situation by taking the initiative in deciding on class activities, using direct questioning and written pencil and paper activities, this was most conducive to high levels of learning for predominantly low achieving pupils. Soar (1977) found this activity to be dysfunctional for high achieving pupils.

Findings from the present research suggest that structured teaching situations may not be completely dysfunctional for high achieving pupils. The subject matter content may indeed be a confounding variable. It was observed here, that for both high and low achieving pupils, noticeably higher overall engagement rates were generated in mathematics, than in reading activities. While this may have been an artifact of the learning content in mathematics, it may also have been partially attributable to the considerably greater degree of teacher structuring employed in teaching mathematics in this class.

Further support for the above contention comes from the current findings related to reading activity. Although the overall percentage of pupil off-task behavior was higher in reading than in mathematics for these pupils, on those occasions where reading was undertaken in a context of high teacher structuring of the task, both high and low achieving pupils recorded consistently high levels of engagement.

The premium levels of engagement for high and low achieving pupils were observed to be in individual seatwork in mathematics, and with the exception of one low achieving pupil, in whole-of-class settings for reading. Despite the differences in subject matter and setting, the common factor was a high degree of teacher structuring and controlling behavior in both situations. While in reading, the structuring took the form of teacher orchestration of the entire performance, in mathematics the teacher's influence was less obtrusive, but no less pervasive. Sharply focused verbal computational questions provided the structuring framework in mathematics, with a similar method used in that part of other-paced reading comprising dictated spelling.

Teacher structuring behavior, if it consistently mediates both content and settings, for high and low achieving pupils, may well influence pupil engagement in a more complex way than we currently believe.

The implications of structured teaching behavior, and its impact upon different types of pupils, is clearly important to teachers. At the moment, however, we require further research on this issue.

Written Activity and the Low Achieving Pupil

For one low achieving pupil in the study, there was a persistent trend towards enhanced engagement in both reading and mathematics when written activity was involved. Although only tentative suggestions can be made on the basis of the observation of a single pupil, it is interesting to speculate on some possible explanations.

One theory which has intuitive explanatory appeal is Kounin's (1977) proposition that settings exercise "holding power." Accordingly, settings which maintain a "continuous source of signal emission" are more likely to produce high levels of engagement than settings with "multiple shifting signal sources." For low achieving pupils, it may well be that tightly structured written seatwork activity, falls into the former category, while group discussions and teacher-led whole-of-class explanations, particularly in a large class, fall into the latter category.

Although only empirically tested with kindergarten-aged children, Kounin and Doyle's (1974) above proposition, if thoroughly investigated and found applicable to upper elementary low achieving pupils, could provide one of the few mechanisms available to teachers for producing even a modicum of engagement, where little or none is possible in covert activity.

Content Covered as a Monitoring Device

Although used as a research device in this study, a simplified version of the content covered transcript sheet completed by pupils, could provide the teacher with valuable diagnostic data. This would not replace, but rather supplement, teacher monitoring of actual pupil on-going class activity. Sheets would be completed by the pupil at the beginning and end of assigned activities, showing starting and finishing times, content completed, success rate and difficulty.

Kept in a slot at the side of the pupil's desk, this could be checked periodically by the teacher as an easily interpreted summary of pupil progress. At the same time, it would divest some of the responsibility for monitoring progress, onto the pupils.

Classroom Ecology

A need exists for administrators and school authorities to look more carefully than they have in the past, to the nature of the classroom as a workplace. This would involve looking at the potential impact of physical classroom conditions upon learning, and the possibilities of re-arrangement or modification to increase pupil engaged time. Within prescribed limits, the teacher can make some setting adjustments as well.

Furthermore, if the image portrayed by Berliner (1978a) of the teacher as a "harried executive" trying to achieve the impossible, is an accurate description, and if administrators are concerned about the aspect of classroom productivity, then it behooves them to give careful consideration to the management and consultancy support services necessary to increase classroom productivity, as reflected through increased levels of pupil engaged time.

Significance for Teacher Education

The exploratory and small-scale nature of the basic research conducted here, militates against the production of a set of prescriptive "findings" which have immediate application in classrooms or teacher education programs. Indeed, without applied research as to how the descriptive protocols generated in this and similar studies, might be meaningfully translated into shaping and modifying teacher behavior, we can only guess at the likely specific applications.

The inability to specify definitive prescriptions for teacher educators, does not mean that the study is totally lacking in practical applications. In departing from the earlier research tradition of "teacher effectiveness" studies which sought the isolation of the universals of effective teaching, the emphasis here has been instead upon seeking to obtain a more comprehensive understanding of what Westbury (1979) described as the "technical properties of an effective teaching situation."

One practical implication that emerges as significant for the pre-service education of teachers focuses on the need for trainee teachers to be given adequate opportunity to observe for themselves using established observational procedures, the realities of classroom settings. By looking at the academic pursuits of pupils in the context of the activities and intentions of the classroom teacher and utilizing the type of vocabularly and descriptive profiles and protocols discussed in this study, prospective teachers will add to their understanding of the classroom as a workplace. In essence, the plea is for increased trainee observation of interactive classroom teaching, with adequate prior attention having been given to suitable observational techniques and procedures for data collection. The suggestion is that rather than look at "model" teachers or "demonstration" lessons, to be emulated or not at some future time, that instead a careful analysis be made of on-going naturalistic classroom processes and procedures. While observational aspects are already a component of many pre-service teacher education programs, what is being advocated is the provision of additional structure to that component so that comprehensive data, rather than subjective opinions, are available for later analysis and discussion by trainees. While it would be unrealistic to expect this procedure to yield highly competent observers, this method would be a useful complement for gaining realistically-based insights into the complexitities of teaching and classroom processes.

In the in-service realm, practicing classroom teachers could similarly benefit from a closer analysis of the classroom as a worksite. Utilizing the classrooms of colleagues, they might look at the pursuits of pupils, the settings, and teacher behaviors, productive of high levels of pupil engagement and content covered. By this means experienced teachers may extend their understanding of facets of classroom productivity and enhance their feeling for what Westbury (1979) described as "the sociotechnology of teaching" or the management of learning environments.

With suitable modifications to the observation instrument employed here to incorporate larger numbers of pupils, the technique might usefully be employed by administrators and personnel involved in supervision and formative teacher evaluation. By focusing upon the activities of pupils, rather than on the exclusive actions of the teacher, both teacher and supervisor will have access to less emotive data in their joint analysis of teaching episodes.

Reflections Upon the Research Design and Methodology

The methodological implications associated with exploratory research of the type undertaken here, are as important as the actual research findings. Brief comments will therefore be made concerning the efficacy of two major design and methodological aspects of the study.

The Case Study Method

The decision to conduct four individual case studies was not made because of any strong belief in the soundness of researching four individual subjects. Rather, the decision was undertaken for two reasons. Firstly on practical grounds, the nature of the observation instrument, the need to obtain accurate and reliable data using a short time sampling interval, the requirement of fully describing situational context by means of anecdotal records, and the desire for records of on-going content covered, imposed restraints upon what could be undertaken by a single observer. Secondly, four pupils were selected in preference to a smaller number because of the design feature requiring the generation of limited comparisions among discrete clusters of pupils in the same classroom setting. The research findings in fact, revealed similarities and differences between pupils in the process measures of engagement and content covered, that were not consistent with some traditionally used product measures.

Thus, an extended single subject research design, as used in the current study, had three distinct advantages:

1. In-depth situational descriptions of events and occurrences which represented reality for those inhabitants involved in that particular setting;
2. Flexibility was possible in the analysis of day-to-day subject variance;
3. The findings generated, at least for the pupils, teacher and classroom concerned, were more conclusive than results obtainable using a group research paradigm. Individual

differences were not disguised or counterbalanced as a consequence of the research design.

Future researchers contemplating variations of the extended single subject research design, may indeed be prepared to "trade-off" some of the in-depth descriptive data sought here, in return for breadth by opting to simultaneously investigate as many as 10 or 12 pupils in the one classroom. Other researchers may elect to develop more sophisticated investigatory techniques than the ones used here, in developing more complete descriptive protocols. Whatever decisions investigators of classroom processes adopt, in the final analysis they will be guided in the number of research subjects they select, by the desired research outcomes they have in mind.

In a similar fashion, the delimitation of this particular study to a single classroom in one school, was appropriate to the particular research requirements. Later studies intent upon pursuing the influence of varying classroom contexts on pupil use of academic learning time, would clearly need to entertain the possibility of describing multiple classrooms in a number of schools.

While arbitrary decisions were taken here as to the grade level and the curriculum content areas to be sampled, for the reasons outlined in Chapter III, future studies seeking to explore variations in engagement between grade levels and across different subject areas, would need to adjust their design requirements accordingly. As indicated earlier, reading and mathematics were chosen in this study because:

1. the presumed differences in structural content and the associated teaching strategy were considered likely influences upon pupil levels of engagement;
2. the central importance of these two content areas in the total elementary school curriculum;
3. because of the "richness" of data collected in this manner, restriction to two discrete subject areas imposed manageable controls upon the amount of data collected for analysis.

One concluding observation concerning the case study as a research method is that it need not be confined to studies labelled as "descriptive." This study has demonstrated both the feasibility and desirability for completness of description, in collecting both quantitative and anecdotal data in case study research.

Observation Systems versus Specimen Records

Naturalistic classroom research in the past has tended to opt for the exclusive use of a coded observational system, or has relied entirely on field notes and specimen records. Rarely has research on classroom processes utilized both techniques in a complementary fashion. The position adopted here is that substantial advantages accrue from the simultaneous use of both techniques.

While the coded observation system used in this instance provided a formal structure for the task of data collection, it suffered from the inevitable defect of all such instruments in that it omitted important aspects of classroom activity and imposed a degree of "closure." Variables incompatible with the observation system therefore are likely to be consistently ignored in research endeavours which use only coded observation systems. Premature closure resulting from excessive reliance on observational systems may seriously truncate the research effort particularly in an exploratory area. On the other hand, these same observation systems have the merit of providing the essential structure necessary for replication and hence the validation of research efforts.

The use of specimen records embraces a different set of merits and defects. The open-ended nature of this research technique whereby the researcher is able to record in an unfettered way his observations of a particular setting, can be just as limiting. The absence of a defined structure in this technique can be as bewildering, as the excessive structure is frustrating, in the alternative discussed above.

Clearly, a compromise situation lies in the middle ground whereby the researcher takes advantage of the structure provided by the observation system, while avoiding premature closure of his research effort by incorporating substantial provision for reporting unorthodox occurrences through the use of narrative specimen records. The recommendation, therefore, is that closer attention be paid by classroom researchers to possible ways of accommodating both strategies in their research designs.

The collection of artifacts of pupil content covered, to be analysed and used to substantiate observational data, is a further indication of the multiple procedures necessary to establish ecological validity in research of this type. Likewise, there is a need for complementary approaches to complex questions such as learner/task difficulty.

Recommendations for Continued Research

Despite an extensive past tradition of research, and recent intensified research interest, the possibilities for further research in aspects of pupil engagement still remain prolific. Suggestions here will focus upon further descriptive research, a possible area for combined observation-introspective study, the need for work on clinical interventions, and some aspects of methodological enquiry.

Descriptive

There is a need to continue with the descriptive research of the type pursued in the current study to provide more comprehensive answers to such questions as:

1. What characteristics of pupils, teachers and classroom contexts, are most conducive of high levels of engagement in meaningful learning?
2. What types of pupil grouping patterns, pupil pacing and degree of individualization, are most generative of high levels of academic learning time?
3. What engagement levels might be considered optimal for pupils with certain characteristics, at various grade levels, interacting with different types of academic content?

Observation - Introspection

Acquiring an understanding of the considerable day-to-day fluctuations in pupil engagement evident in this study is a potentially fruitful avenue for research. This would necessitate a continuation of intensive analysis of small numbers of pupils in clinical classroom settings. A comprehensive understanding of the complex issues surrounding the question of engagement variability is unlikely to be forthcoming from sole reliance upon a behavioristic research paradigm. Rather, on-site observations will need to be combined with introspective techniques to obtain a more incisive understanding than we currently possess as to the reasons for daily variations in individual pupil engagement with academic content.

Clinical Intervention

Once a comprehensive base-line of descriptive data has been accumulated by observational methods, there is a need to extend the type of clinical intervention research commenced by Berliner (1978a). This would involve a determination of the appropriate methods for modifying teacher classroom behavior so that optimal levels of engaged time could be attained by pupils in classrooms.

As a first tentative step in the direction of applied research, consideration need be given to a range of possible mechanisms for modifying teacher classroom behavior in classrooms considered to have excessively high levels of pupil wait and transition time. Improving the efficiency of classroom operations will increase the available instructional time from which increases in academic learning time may emerge. Subsequent research could address the issues of how best to modify teaching behavior to incorporate desired levels of structuring and monitoring considered necessary to enhance pupil engagement.

Methodological

Considering the paucity of research in the twin areas of content covered and task meaningfulness, and how to most effectively measure these concepts, there is considerable scope for devising alternatives to those used in the study.

Conclusion

This study of pupil use of academic learning time by four grade 6 pupils, confirmed the view expressed by Jackson (1968) that before we can hope to understand what happens in elementary school classrooms, we first must carefully investigate the myriad of events that constitute daily routines. These humdrum occurrences gain added significance when subjected to intense scrutiny.

We should not be deluded, however, into believing that the routine and mundane are necessarily simple, or that they can be dispensed with perfunctorily in a prescriptive fashion. Berliner and Rosenshine (1977) captured the true essence of the paradox when they concluded:

> The factors related to knowledge acquisition in the classroom may be viewed as both disarmingly simple, and frightfully complex at the same time (p. 394).

BIBLIOGRAPHY

BIBLIOGRAPHY

Arlin, M., & Roth, G. Pupils' use of time while reading comics and books. American Educational Research Journal, 1978, 15(2), 201-16.

Anderson, L. W. An empirical investigation of individual differences in time to learn. Journal of Educational Psychology, 1976, 68(2), 226-233.

Anderson, R. C. Control of student mediating processes during verbal learning and instruction. Review of Educational Research, 1970, 40, 349-369.

Armento, B. A. Teacher verbal cognitive behaviors related to student achievement on a social science concept test. Unpublished doctoral dissertation, Indiana University, 1977. Cited by B. V. Rosenshine & D. C. Berliner, Academic Engaged Time, British Journal of Teacher Education, 1978, 4(1), p. 5

Barker, R. G. On the nature of the environment. Journal of Social Issues, 1963, 19(4), 17-38.

Barker, R. G., & Wright, H. F. Midwest and its children. Evanston, Ill: Row & Peterson, 1955.

Barr, A. S. Characteristic differences in the teaching performance of good and poor teachers of the social studies. Bloomington, Ill: Public School Publishing, 1926.

Beez, W. V. Influence of biased psychological reports on teacher behavior and pupil performance. In M. W. Miles & W. W. Charters (Eds.) Learning in social settings. Boston: Allyn & Bacon, 1970.

Bennett, S. N. Recent research on teaching: a dream, a belief, and a model. British Journal of Educational Psychology, 1978, 48(2), 127-147.

Berliner, D. C. Impediments to the study of teacher effectiveness. Journal of Teacher Education, 1976, 27(1), 5-13.

Berliner, D. C. Instructional time in research on teaching. Paper presented to the A.E.R.A., New York, April 1977.

Berliner, D. C. Changing academic learning time: clinical interventions in four classrooms. Paper presented to the A.E.R.A., Toronto, March 1978 (a)

Berliner, D. C. Tempus educare. In P. L. Peterson & H. J. Walberg (Eds.), *Conceptions of Teaching*. Chicago, Ill: National Society for the Study of Education, 1978. (b)

Berliner, D. C. *Clinical studies of classroom teaching and learning*. Paper presented to the A.E.R.A., Toronto, March 1978. (c)

Berliner, D. C., Fisher, C. W., Filby, N. N., & Marliave, R. S. *Proposal for phase IIIB of the beginning teacher evaluation study*. San Francisco: Far West Laboratory for Educational Research and Development, 1976.

Berliner, D. C., & Rosenshine, B. V. The acquisition of knowledge in the classroom. In R. C. Anderson, R. J. Spiro & W. E. Montague (Eds.), *Schooling and the acquisition of knowledge*. Hillsdale, N. J: Lawrence Erlbaum, 1977.

Bjarnason, L. Relation of class size to control of attention. *Elementary School Journal*, September 1925, *26*, 36-41.

Block, J. H., & Burns, R. B. Mastery learning. In L. Shulman (Ed.), *Review of Research in Education*, (No. 4). Itasca, Ill: F. E. Peacock, 1977.

Bloom, B. S. Thought processes in lectures and discussions. *Journal of General Education*, April 1953, *7*(3), 160-169.

Bloom, B. S. Time and learning. *American Psychologist*, September 1974, *29*, 682-688.

Bloom, B. S. *Human characteristics and school learning*. New York: McGraw-Hill, 1976.

Blume, C. E. Techniques in the measuring of pupil attention. In J. F. Hosie (Ed.), *The national conference of supervisors and directors of instruction, second yearbook*. New York: Bureau of publications, Teachers College, Columbia University, 1929.

Bond, G. L., & Dykstra, R. The co-operative research programme in first grade reading instruction. *Reading Research Quarterly*, 1967, *2*, 1-142.

Borich, G. D., & Madden, S. K. Evaluating classroom instruction: a sourcebook of instruments. Reading, Mass: Addison-Wesley, 1977.

Bossert, S. Tasks, group management, and teacher control behavior: a study of classroom organization and teacher style. School Review, August 1977, 85, 552-565.

Brooks, D. M. The contextual application of observation schedules with naturalistic classrooms. Paper presented to the A.E.R.A., New York, April 1977.

Brophy, J. E., & Evertson, C. M. Process-product correlations in the Texas teacher effectiveness study: final report. Austin, Tex: Research and Development Centre for Teacher Education, 1974.

Brophy, J. E., & Evertson, G. M. Learning from teaching: a developmental perspective. Boston: Allyn & Bacon, 1976.

Broudy, H. S. Didactics, heuristics, and philetics. Educational Theory, Summer 1972, 251-261.

Brueckner, L. J., & Landenberg, A. Frequency of checking attention and the reliability of the attention quotient. School Review, May 1933, 40, 370-374.

Calfee, R. C. Personal communication, March 1978.

Calfee, R. C., & Calfee, K. H. Reading and mathematics observation system: description and measurement of time usage in the classroom. Paper presented to the A.E.R.A., San Francisco, April 1976.

Carroll, J. B. A model of school learning. Teachers College Record, 1963, 64(8), 723-733.

Chassan, J. Stochastic models of the single case as the basis of clinical research design. Behavioral Science, 1961, 6, 42-50.

Charlesworth, W. C., & Bart, W. M. Some contributions of ethology for education. Educational Studies, 1976, 7, 258-272.

Charlesworth, W. C., & Spiker, D. An ethnological approach to observation in learning settings. Minnesota: University of Minnesota, Institute for Child Development, 1974.

Cobb, J. A. Relationship of discrete classroom behaviors to fourth grade academic achievement. Journal of Educational Psychology, 1972, 63(1), 74-80.

Conant, E. H. Amount of time spent teaching. Phi Delta Kappan, September 1974, 56(1).

Crawford, J., & Gage, N. L. Development of a research-based teacher training program. California Journal of Teacher Education, 1977, 4(2), 105-123.

Cruickshank, D. P. Synthesis of selected recent research on teacher effects. Journal of Teacher Education, Spring 1976, 27(1), 57-60.

Denham, C. Utilizing research: can we agree on the findings? Paper presented to the A.E.R.A., Toronto, March 1978.

DeVault, M. L., Harnischfeger, A., & Wiley, D. E. Schooling and learning opportunity. (U.S. Department H.E.W., N.I.E., Interim Report, Project No. 6-0646) Chicago: ML-Group for Policy Studies in Education, CEMREL Inc., October 1977.

Douglas, J. W., & Ross, J. M. The effects of absence on primary school performance. The British Journal of Educational Psychology, 1965, 35, 28-40.

Doyle, W. Uses of non-verbal behaviors: toward an ecological model of classrooms. Merrill-Palmer Quarterly, 1977, 23(3), 179-192.

Doyle, W. Learning the classroom environment: an ecological analysis. Journal of Teacher Education, 1977, 28(6).

Dunkin, M. J., & Biddle, B. J. The study of teaching. New York: Holt, Rinehart & Winston, 1974.

Edminston, R. W., & Rhoades, B. J. Predicting achievement. Journal of Educational Research, 1959, 52, 177-180.

Far West Laboratory for Educational Research and Development. BTES Report, December 1977, 5, 1-6.

Felsenthal, H., & Kirsch, I. Variations in teachers' management of and time spent on reading instruction: effects on student learning. Paper presented to the A.E.R.A., Toronto, March 1978.

Filby, N. N. How teachers produce academic learning time: instructional variables related to student engagement and task difficulty. Paper presented to the A.E.R.A., Toronto, March 1978.

Filby, N. N., & Cahen, L. S. Teaching behavior and academic learning time in the A-B period. San Francisco: Technical Note V-1b, Beginning Teacher Evaluation Study, Far West Laboratory for Educational Research and Development, 1977.

Filby, N. N., Marliave, R. S., & Fisher, C. W. Allocated and engaged time in different content areas of second and fifth grade reading and mathematics curriculum. Paper presented to the A.E.R.A., New York, April 1977.

Fisher, C. W. Teaching behaviors, academic learning time, and student achievement: an overview. Paper presented to the A.E.R.A., Toronto, March 1978.

Fisher, C. W., & Berliner, D. C. Quasi-clinical inquiry in research on classroom teaching and learning. San Francisco: Technical Report VI-2, Beginning Teacher Evaluation Study, Far West Laboratory for Educational Research and Development, 1977.

Fisher, C. W., Filby, N. N., & Marliave, R. S. Instructional time and student achievement in second grade reading and mathematics. Paper presented to the A.E.R.A., New York, April 1977.

Flanders, N. Knowledge about teacher effectiveness. British Journal of Teacher Education, 1977, 3(1), 3-26.

Floden, M. B., Schmidt, W., & Roehler, L. Partial draft of a conceptual paper. Unpublished manuscript. Institute for Research on Teaching, Michigan State University. Febrary 1978.

Fogelman, K. School attendance, attainment and behavior. British Journal of Educational Psychology, 1978, in press.

Forness, S. R., & Guthrie, D. Stability of pupil behavior in short-term classroom observations. Psychology in the Schools, 1977, 14(1), 116-120.

Frederick, W. C. Use of classroom time in high schools above or below the median reading score. Urban Education, 1977, 11(4), 459-464.

French, W. C. The correlation between teaching ability and thirteen measurable classroom activities. Unpublished masters thesis, University of Chicago, 1924. Cited by P. W. Jackson, Life in Classrooms. New York: Holt, Rinehart & Winston, 1968.

Frick, T., & Semmel, M. I. Observer agreement and reliabilities of classroom observational measures. Review of Educational Research, 1978, 48(1), 157-184.

Gaier, E. L. The relationship between selected personality variables and the thinking of students in discussion classes. School Review, October 1952, 60, 404-411.

Gall, M. D., Ward, B. A., Berliner, D. C., Cahen, L. S., Elashoff, J. D., Stanton, G. C., & Winnie, P. H. The effects of teacher use of questioning techniques on student achievement and attitude. San Francisco: Far West Laboratory for Educational Research and Development, 1975.

Garner, W. Time in learning and schooling. APSS Know How. December 1976 - January 1977, 28, (4 & 5), 1-4.

Garner, W. Resource equalizing effects of student time allocation. Paper presented to the A.E.R.A., Toronto, March 1978.

Glaser, B. G., & Strauss, A. C. The discovery of grounded theory: strategies for qualitative research. New York: Weidenfield, 1967.

Good, T. L., & Beckerman, T. M. Time on task: a naturalistic study in sixth grade classrooms. Elementary School Journal, 1978, 78(3), 193-201.

Good, T. L., & Grouws, D. A. Process-product relationships in fourth grade mathematics classes. Columbia, Miss: University of Missouri, 1975.

Good, T. L. Grouws, D. A., & Beckerman, T. M. Curriculum pacing: some empirical data in mathematics. Journal of Curriculum Studies, 1978, 10(1), 1-7.

Good, T. L., & Power, C. N. Designing successful classroom environments for different types of students. Journal of Curriculum Studies, 1976, 8(1), 45-60.

Grady, M. Selection criteria for choosing classroom observation instruments. Contemporary Education, 1975, 46(3), 173-176.

Grannis, J. C. Task engagement and the consistency of pedagogical controls: an ecological study of differently structured classroom settings. Curriculum Enquiry, 1978, 8(1), 3-30.

Gump, P. V. Intra-setting analysis: the third grade classroom as a special but instructive case. In E. P. Willems & H. C. Raush, (Eds.), Naturalistic viewpoints in psychological research. New York: Holt, Rinehart & Winston, 1969.

Harnischfeger, A., & Wiley, D. E. Schooling cutbacks and achievement declines: can we afford them? Administrator's Notebook, 1975, 24(1), 1-4.

Harnischfeger, A., & Wiley, D. E. The teaching-learning process in elementary schools: a synoptic view. Curriculum Enquiry, 1976, 6(1), 5-43.

Harnischfeger, A., & Wiley, D. E. Time allocations in fifth grade reading. Paper presented to the A.E.R.A., New York, April 1977.

Harnischfeger, A., & Wiley, D. E. A perspective for research policy. Educational Technology, May 1978, 46-50.

Harris, A. J., Morrison, C., Serwer, B. L., & Gold, L. A continuation of the CRAFT project: comparing reading approaches with disadvantaged urban negro children in primary grades. U.S. Office of Education Project, New York: Division of Teacher Education, City University of New York, 1968.

Harris, A. J., & Serwer, B. L. Comparison of reading approaches in first grade teaching with disadvantaged children. New York: City University of New York, 1966.

Harris, T., & Yinger, R. Time: current directions in research on teaching. Meeting of the Invisible College of Researchers on Teaching, Michigan State University, November 1976.

Hess, R. D., & Takanishi, R. Teacher strategies and student engagement in low income area schools. Research and Development Memorandum No. 105. Stanford: Stanford Centre for Research and Development in Teaching. (ERIC Document Reproduction No. ED 087 768).

Heyns, B. Exposure and the effects of schooling. Unpublished manuscript. The Johns Hopkins University, 1976.

Heyns, R., & Lippitt, R. Systematic observational techniques. In G. Lindzey, (Ed.), Handbook of Social Psychology, Cambridge, Mass: Addison-Wesley, 1954.

Holsti, O. R. Content analysis for the social sciences and humanities. Reading, Mass: Addison-Wesley, 1969.

Hudgins, B. R. Attending and thinking in the classroom. Psychology in the Schools, 1967, 4(3), 211-216.

Husén, T. International study of achievement in mathematics: a comparison of twelve countries. Volume 2. New York: Wiley, 1967.

Husén, T. Does more time in school make a difference? Saturday Review, April 1972, 29, 32-35.

Jackson, P. W. Life in classrooms. New York: Holt, Rinehart & Winston, 1968.

Jackson, P. W. Looking into education's crystal ball. Instructor, August 1977, 87, 38.

Jorgensen, G. W. Relationship of classroom behavior to the accuracy of the match between material difficulty and student ability. Journal of Educational Psychology, 1977, 69(1), 24-32.

Joyce, B. Variables, designs and instruments in the search for teacher effectiveness. San Francisco: Technical Report 75-10-4, Beginning Teacher Evaluation Study, Far West Laboratory for Educational Research and Development, 1975.

Judd, C. H. Introduction to the scientific study of education. Boston. Ginn & Co., 1918.

Karweit, N. The organization of time in schools: time scales and learning. Paper presented to the National Invitational Conference on School Organization and Effects, San Diego, January 1978.

Kazdin, A. E. Artifact bias and complexity of assessment: the ABC's of reliability. Journal of Applied Behavior Analysis, 1977, 10(1), 141-150.

Kiesling, H. The productivity of instructional time by mode of instruction for students at varying levels of reading skill. Reading Research Quarterly, 1978, in press.

Knudsen, C. W. A program of high school supervision. Peabody Journal of Education, May 1930, 7, 326-327.

Kounin, J. S. Discipline and group management in classrooms. New York: Holt, Rinehart & Winston, 1970.

Kounin, J. S. Some ecological dimensions of school settings. Paper presented to the A.E.R.A., New York, April 1977.

Kounin, J. S., & Doyle, P. H. Degree of continuity of a lesson's signal system and the task involvement of children. Journal of Educational Psychology, 1975, 67(2), 159-164.

Lahaderne, H. M. Attitudinal and intellectual correlates of attention: a study of four sixth grade classrooms. Journal of Educational Psychology, 1968, 59(5), 320-324.

Lambert, N., & Hartsough, C. APPLE observation variables and their relationship to reading and mathematics achievement. Princeton, N. J: Final Report, Volume III, Phase II 1973-4, Beginning Teacher Evaluation Study, Educational Testing Service, 1976. (ERIC Document Reproduction No. ED 127 366).

Levanto, J. The identification and analysis of factors related to secondary school absenteeism. Doctoral dissertation, University of Conneticut, 1973 . Dissertation Abstracts International, 1974, 34, 1537A.

Magoon, A. J. Constructivist approaches in educational research. Review of Educational Research, Fall 1977, 47(4), 651-693.

Mann, C. H. How schools use their time. New York: Teachers College, Columbia University, 1928.

Marliave, R. S. Observable classroom variables. San Francisco: Technical Report 1-2, Beginning Teacher Evaluation Study, Far West Laboratory for Educational Research and Development, 1976. (a)

Marliave, R. S. Findings of clinical field observations. San Francisco: Technical Note 1-4, Beginning Teacher Evaluation Study, Far West Laboratory for Educational Research and Development, 1976. (b)

Marliave, R. S. Academic learning time and achievement: the validation of a measure of on-going student engagement and task difficulty. Paper presented to A.E.R.A., Toronto, March 1978.

Marliave, R. S., Cahen, L. S., & Berliner, D. C. Prolegomenon on the concept of the appropriateness of instruction. San Francisco: Technical Report IV-1, Beginning Teacher Evaluation Study, Far West Laboratory for Educational Research and Development, 1977.

Marliave, R. S., Fisher, C. W., & Dishaw, M. M. Academic learning time and student achievement in A-B period. San Francisco: Technical Note V-1a, Beginning Teacher Evaluation Study, Far West Laboratory for Educational Research and Development, 1977.

Marliave, R. S., Fisher, C. W., & Filby, N. N. Alternative procedures for collecting instructional time data: when can you ask the teacher and when must you observe yourself? Paper presented to the A.E.R.A., New York, April 1977. (ERIC Document Reproduction No. ED 137 380).

Marliave, R. S., Fisher, C. W., Filby, N. N. & Dishaw, M. M. The development of instrumentation for a field study of teaching. San Francisco: Technical Report 1-5, Beginning Teacher Evaluation Study, Far West Laboratory for Educational Research and Development, 1977.

May, F. To help children read. Columbus, Ohio: Charles E. Merrill. 1973.

McDonald, B., & Walker, R. Case study and the social philosophy of educational research. Cambridge Journal of Education, 1975, 5(1), 2-11.

McDonald, F. J. Research on teaching and its implications for policy making: report on phase II of the beginning teacher evaluation study. Paper presented to the Conference on Research on Teacher Effects, University of Texas, Austin, November 1975.

McDonald, F. J. Teachers do make a difference. Princeton, N.J: Educational Testing Service, 1976. (a)

McDonald, F. J. Beginning teacher evaluation study, phase II 1973-4, summary report. Princeton, N. J: Educational Testing Service, 1976. (b) (ERIC Document Reporoduction No. ED 127 375).

McDonald, F. J. Research on teaching: report on phase II of the beginning teacher evaluation study. In G. Borich, (Ed.), The appraisal of teaching: concepts and process. Reading, Mass: Addison-Wesley, 1977.

McDonald, F. J. & Elias, P. The effects of teaching performance on pupil learning. Final report, Vol. 1, phase II, Beginning Teacher Evaluation Study. Princeton, N.J: Educational Testing Service, 1976.

McGaw, B., Wardrop, J. C., & Bunda, M. A. Classroom observation schemes: where are the errors? American Educational Research Journal, 1972, 9(11), 13-27.

McKinney, J. D., Mason, J., Perkerson, K., & Clifford, M. Relationship between behaviors and academic achievement. Journal of Educational Psychology, 1975, 67(2), 198-203.

Medley, D. M., & Mitzel, H. E. Measuring classroom behavior by systematic observation. In N. L. Gage, (Ed.), Handbook of research on teaching. Chicago: Rand McNally, 1963.

Medley, D. M., & Norton, D. P. The concept of reliability as it applies to behavior records. Paper presented at the meeting of the American Psychological Association, Washington, D. C., 1971.

Menzel, E. W. Naturalistic and experimental approaches to primate behavior. In E. P. Willems & H. L. Raush, (Eds.), Naturalistic viewpoints in psychological research, New York: Holt, Rinehart & Winston, 1969.

Mercatoris, M., & Craighead, W. E. Effect of non-participant observation on teacher and pupil classroom behavior. Journal of Educational Psychology, 1974, 66(4), 512-519.

Morch, J. E. Systematic observation of instructor behavior. Developmental report AF PTRC-TN-56-52. San Antonio, Texas: Air Force Personnel and Training Research Centre, Lackland A.F.B., 1956.

Morrison, H. C. The practice of teaching in the secondary school. Chicago: University of Chicago Press, 1927.

Mosher, R. L. Clinical supervision: the analysis of teaching. Teacher Education, Spring 1972, 22-41.

Odell, C. W. The effect of attendance upon school achievement. Journal of Educational Research, December 1923, 8, 425-432.

Olson, W. C. A study of classroom behavior. Journal of Educational Psychology, 1931, 22, 449-454.

Özcelik, D. A. Student involvement in the learning process. Unpublished doctoral dissertation, University of Chicago, 1973. Cited by B. S. Bloom, Time and learning, American Psychologist, September 1974, 29, p. 687.

Pidgeon, D. A. Expectation and pupil performance. Slough: National Foundation for Educational Research in England and Wales, 1970.

Porter, A. C., Schmidt, W. H., Floden, R. E., & Freeman, D. J. Impact on what? The importance of content covered. Research report No. 2. East Lansing, Mi: Institute for Research on Teaching, Michigan State University, February 1978.

Powell, J., Martindale, A., & Kulp, S. Evaluation of time sampling measures of behavior. Journal of Applied Behavior Analysis, 1975, 8(4), 463-469.

Powell, M., & Cahen, L. S. Policy issues related to research on instructional time. Paper presented to the A.E.R.A., New York, April 1977.

Repp, A. C., Roberts, D. M., Slack, D. J., Repp, C. F., Berkler, M. S. Comparison of frequency, interval and time sampling methods of data collection. Journal of Applied Behavior Analysis, 1976, 9(4), 501-508.

Roehler, L., Schmidt, W., Floden, M., Yinger, R., & Hill, R. Studies of teacher decision making regarding time, integration, and meaningfulness in language arts. East Lansing, Mi: Institute for Research on Teaching, Michigan State University, December 1977.

Romanczyk, R. G., Kent, R. N., Diament, C., & O'Leary, K. D. Measuring the reliability of observational data: a relative process. Journal of Applied Behavior Analysis, 1973, 6(1), 175-184.

Rosenshine, B. V. Teacher behaviors and student achievement. Windsor: National Foundation for Educational Research in England and Wales, 1971.

Rosenshine, B. V. Classroom instruction. In N. L. Gage, (Ed.), The psychology of teaching methods. Seventy fifth yearbook of the national society for the study of education. Chicago: University of Chicago Press, 1976.

Rosenshine, B. V. Primary grades instruction and student achievement. Unpublished manuscript, 1977. (a) (ERIC Document Reproduction No. ED 142 308).

Rosenshine, B. V. Review of teaching variables and student achievement. In G. Borich, (Ed.) The appraisal of teaching: concepts and process. Reading, Mass: Addison-Wesley, 1977. (b)

Rosenshine, B. V., & Berliner, D. C. Academic engaged time. British Journal of Teacher Education, 1978, 4(1), 3-16.

Rothkopf, E. Z. The concept of mathmagenic activities. Review of Educational Research, 1970, 40, 325-336.

Rowley, G. L. The reliability of observational measures. American Educational Research Journal, 1976, 13(1), 51-60.

Ryan, K., & Cooper, J. M. Those who can teach. Boston: Houghton-Mifflin, (2nd. ed.), 1975.

Samuels, S. J., & Turnure, J. E. Attention and reading achievement in first grade boys and girls. Journal of Educational Psychology, 1974, 66(1), 29-32.

Schultz, R. E. A comparison of negro pupils ranking high with those ranking low in educational achievement. Journal of Educational Sociology, March 1958, 31, 265-270.

Schultz, S. B. A study of relationships between overt verbal behavior in the classroom and conscious mental processes of the students. Unpublished doctoral dissertation, University of Chicago, 1951. Cited by P. W. Jackson, Life in Classrooms, New York: Holt, Rinehart & Winston, 1968, p. 98.

Scott, M. Some parameters of teacher effectiveness as assessed by an ecological approach. Journal of Educational Psychology, 1977, 69(3), 217-226.

Shannon, J. R. A comparison of three means of measuring efficiency in teaching. Journal of Educational Research, March 1936, 29, 501-508.

Shannon, J. R. Homogeneous grouping and pupil attention in junior high schools. Teachers College Journal, January 1941, 12, 49-52.

Shannon, J. R. Measure of the validity of attention scores. Journal of Educational Research, April 1942, 35, 623-631.

Shavelson, R., & Dempsey, N. Generalizability of measures of teacher effectiveness and teaching process. San Francisco: Technical Report 75-4-2, Beginning Teacher Evaluation Study, Far West Laboraties for Educational Research and Development, 1975.

Shulman, L. S. Reconstruction of educational research. Review of Educational Research, 1970, 40(3), 371-395.

Shutes, R. E. Verbal behaviors and instructional effectiveness. Unpublished doctoral dissertation, Stanford University, 1969. Cited by B. V. Rosenshine & D. C. Berliner, Academic engaged time, British Journal of Teacher Education, 1978, 4(1), p. 5.

Silberman, H. F. A symposium on current research on classroom behavior of teachers and its implications for teacher education. Journal of Teacher Education, 1963, 14(3), 235-237.

Simon, A., & Boyer, E. G. (Eds.) Mirrors for behavior II: an anthology of observation instruments. Philadelphia: Research for Better Schools, 1970.

Smith, M. Attribution, achievement motivation and task difficulty in physical education. Paper presented at the Third Annual British Columbia Conference on the Teaching of Physical Education, University of Victoria, B.C., 1977.

Smith, N. The relationship between time allotted to social studies instruction and student achievement in fifth grade classes of the tri-county area of Southern Maryland. Unpublished doctoral dissertation, University of Maryland, 1976. Dissertation Abstracts International, 1977, 3274A. (University Microfilms No. 77-26-539).

Soar, R. S. Follow-through classroom process measurement and pupil growth (1970-71). Gainesville, Fla: College of Education, University of Florida, 1973.

Soar, R. S. An investigation of findings from four studies of teacher effectiveness. In G. Borich, (Ed.), The appraisal of teaching: concepts and process. Reading, Mass: Addison-Wesley, 1977.

Stallings, J. A. How instructional processes relate to child outcomes. In G. Borich, (Ed.), The appraisal of teaching: concepts and process. Reading, Mass: Addison-Wesley, 1977.

Stallings, J. A. Teaching basic reading skills in secondary schools. Paper presented to the A.E.R.A., Toronto, March 1978.

Stallings, J. A., & Kaskowitz, D. Follow-through classroom observation evaluation, 1972-3. Menlo Park, Calif: Stanford Research Institute, 1974.

Stanford Program on Teacher Effectiveness. A factorially designed experiment on teacher structuring, soliciting and reading. Stanford, Calif: Stanford Centre for Research and Development in Teaching, 1976.

Symonds, P. M. Study habits of high school pupils shown by close observation of controlled groups. Teachers College Record, April 1926, 27, 713-724.

Taylor, M. Intercorrelations among three methods of estimating students' attention. Report Series 39. Stanford, Calif: Stanford Centre for Research on Teaching, 1968.

Thomas, J. A. The productive school: a systems analysis approach to educational administration. New York: Wiley, 1971.

Tikunoff, W. J., Berliner, D. C. & Rist, R. C. An ethnographic study of the forty classrooms of the Beginning Teacher Evaluation known sample. San Francisco: Technical Report 75-10-5, Beginning Teacher Evaluation Study, Far West Laboratory for Educational Research and Development, 1975.

Tikunoff, W. J. & Ward, B. A. Some selected findings from three studies. Effective teacher education program. San Francisco: Far West Laboratory for Educational Research and Development, 1976.

Tikunoff, W. J. & Ward B. A. Conducting naturalistic research on teaching: some procedural considerations. Paper presented to the A.E.R.A., Toronto, March 1978.

Tunnell, G. B. Three dimensions of naturalness: an expanded definition of field research. Psychological Bulletin, 1977, 84(3), 426-437.

Washburne, C., Vogel, M. & Gray, W. S. Results of practical experiments in fitting schools to individuals. Journal of Educational Research, 1926, Supplementary Issue, 106-107.

Webb, E. J., Campbell, D. T., Schwartz, R. Z. & Sechrest, L. Unobtrusive measures: non-reactive research in social sciences. Chicago: Rand McNally, 1966.

Weber, M. B. The effects of environmental congruence on time on-task, lower mental process achievement and higher mental process achievement. Unpublished doctoral dissertation, University of Chicago, 1976. Dissertation Abstracts International, 1977, 713A.

Weick, K. E. Systematic observational methods. In G. Lindzey & E. Aronson, (Eds.), The handbook of social psychology, Vol.II, (2nd.ed.), Massachusetts: Addison-Wesley, 1968.

Weiner, B. Achievement motivation and attribution theory. Morristown, N. J: General Learning Press, 1974.

Welch, W. W. & Bridgham, R. G. Physics achievement gains as a function of teaching duration. School Science and Mathematics, May 1968, 449-454.

Westbury, I. Research into classroom processes: a review of ten years' work. Journal of Curriculum Studies, 1979, 10(4), forthcoming.

Wiley, D. E. Another hour, another day: quantity of schooling, a potent path for policy. In W. H. Sewell, R. M. Hauser, & D. L. Featherman, (Eds.), Schooling and achievement in America, New York: Academic Press, 1976.

Wiley, D. E. & Harnischfeger, A. Explosion of a myth: quantity of schooling and exposure to instruction, major educational vehicles. Educational Researcher, 1974, 3(4), 7-12.

Winkler, D. R. Time and learning: an economic analysis. Unpublished manuscript. Santa Barbara: University of California, 1975.

Ziegler, C. W. School attendance as a factor in school progress: a study of the relations existing between school attendance of pupils and their scholastic achievements and progress and their home environments together with other causal factors. Contributions to Education, 297. New York: Teachers College, Columbia University, 1928.

APPENDICES

APPENDIX A

CRITERIA FOR THE SELECTION OF POTENTIAL TARGET PUPILS

Criteria for Selecting Target Pupils

A main requirement of the research project is to obtain classrooms in which teachers feel able and comfortable in isolating the kind of students required for observation.

You should be able to select two distinct groups of students from within your class. One group of six students (3 boys and 3 girls) would be described as consisting of high achieving students. The other group, also of six students (3 boys and 3 girls), would be described as low achieving students.

To assist you in isolating these two groups of students for observation, the following guidelines are provided.

1. It is not necessary that the two groups represent the very best or the very poorest students in the class. It is sufficient if the two groups are representative of students at either end of the continuum.
2. The point of reference for selecting "highs" and "lows," should be the remaining pupils in the class you teach.
3. The type of students being sought are ones in which there appears to be a reasonable match between ability and achievement. That is to say, you would avoid the selection of under

achievers, or students who perform at a level below what might be expected given their ability. At the same time you would be required to avoid the selection of *over-achievers*, or students who perform at a level higher than their ability would indicate.

4. It would be helpful if you had particular regard to student performance in reading and mathematics and selected students who were "high" in both and "low" in both.

In view of the early stage of the school year, you may feel that you do not know your students sufficiently well to be able to make the kind of decisions required. Should the task appear more feasible by consulting with the teacher (or teachers) who taught your class last year, feel free to do so.

An important part of the research is concerned with students' per[illegible]ed *ease* or *difficulty* with tasks they encounter in learning. What I would like to do is have the children fill out a short "tick the box" slip, at the end of each *language arts* and *mathematics activity* (sample attached). If I could briefly explain to the children at the beginning what was required, you might indicate to them (after a cue from me), when to tick the box. Once accustomed to the idea, there should be little interruption to the normal lesson. The information would, I feel sure, be useful to you.

APPENDIX B

STUDENT ASSESSMENT OF TASK DIFFICULTY

The work I have just finished was, for me:

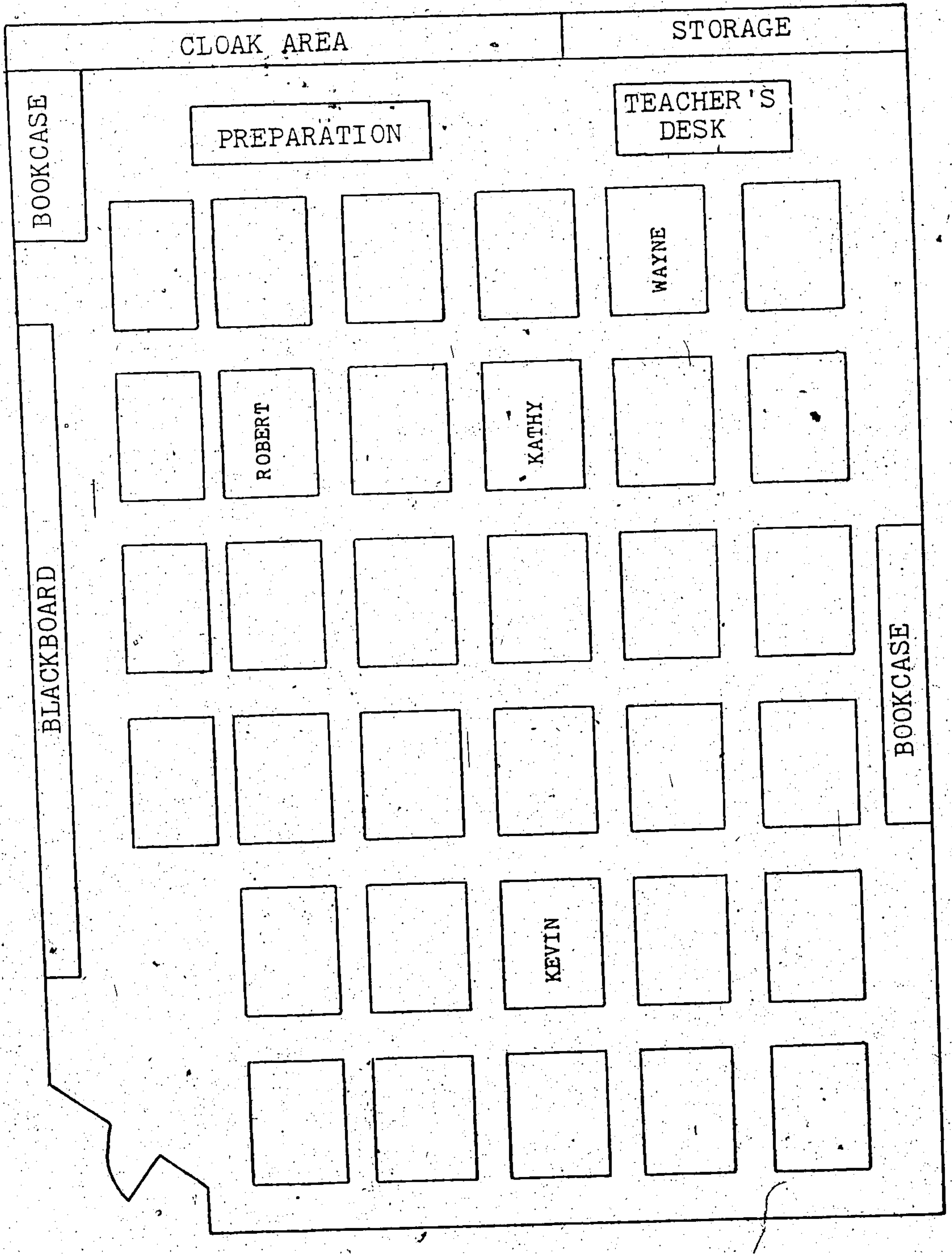
HARD	I feel I made lots of mistakes and I didn't really understand it.
MEDIUM	I feel I understood most of this although I know there are some mistakes.
EASY	I feel I understood this work and made no mistakes.

(Tick one below)

Learning Task Number	HARD	MEDIUM	EASY
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

APPENDIX C

CLASSROOM SEATING PLAN


CLOAK AREA
STORAGE
BOOKCASE
PREPARATION
TEACHER'S DESK
WAYNE
ROBERT
KATHY
BLACKBOARD
BOOKCASE
KEVIN

APPENDIX D

OBSERVATIONAL CATEGORIES AND SAMPLE CODING SHEET

Source: Marliave, Fisher, Filby & Dishaw, 1977

Outline of Observation Categories

The following is a list of the observation categories to be used with very brief descriptions of each. This outline is to be used only for an initial overview and for quick reference. Complete explanations of these categories appear in the manual.

General Content Categories

General content includes periods other than reading or mathematics instruction. Any event that is coded in a general content category is not coded for any other categories, such as student and teacher behaviors.

W = Wait

Wait refers to periods of no activity and no movement between activities. This would often occur when a student finishes his/her work early and no other activity is initiated.

T = Transition

Transition refers to periods of change from one activity to another. This might include lining up, taking seats, or quieting down before the next activity.

M = Management

Management refers to the conduct of class business that is unrelated to any instructional activity. This includes such things as the collection or distribution of milk money and making arrangements for a field trip.

B = Break

Break includes any recreational or free period, such as recess, unstructured P.E., lunch, milk breaks, and leaving class to use the restroom.

N = Non-academic instruction

Non-academic instruction refers to a wide range of organized classroom activities that do not fall within a fairly narrow domain of academic instruction. Non-academic instruction includes flag salutes, sharing, storytime, music, art, and structured P.E.

O = Other academic instruction

Other academic instruction refers to academic instruction other than reading and mathematics. This includes social studies and science (where there is no reading or mathematics content).

Blank circle (between "O" and "R" in the eleventh column) = Absent.

Academic Content Categories

R = Reading

M = Mathematics

Setting Categories

S = Self-paced

Self-paced includes activities where the student works at his own pace (such as seatwork).

O = Other-paced

Other-paced includes activities where the student must work at the pace of other students (such as group activities).

Difficulty Level Categories

E = Easy

Easy includes review and practice. Few errors are made and little effort is required of the student.

M = Medium

Medium difficulty includes any activities between "easy" and "hard."

H = Hard

Hard includes those activities that the student cannot carry out. Many errors and few correct responses (about what you would expect by chance) occur.

Learner Moves

Learner moves coded must be those of the target student being sampled.

EW = Engaged, Written response

EO = Engaged, Oral Response (statement or question)

EC = Engaged, Covert response

Engaged, covert responses includes any student response that is generally not observable. This includes most activities where the student is simply thinking, such as listening to the teacher or reading silently.

ED = Engaged, Directions

The above categories for engaged learner moves must involve the substantive content of the reading or mathematics coded. Engaged, directions includes any written, oral, or covert student response that involves only the directions to the reading or mathematics activity.

NI = Not engaged, Interim activity

Not engaged, interim activity refers to the non-academic interim tasks that are part of a reading or mathematics task. This includes sharpening pencils, turning in and passing out papers, and getting books.

NW = Not engaged, Waiting for help

Not engaged, waiting for help refers to periods where the student has stopped working on a reading or mathematics task because he is waiting for help.

NO = Not engaged, Off-task

Not engaged, off-task refers to periods where the student is inappropriately disengaged from a reading or mathematics task. This would include socializing, daydreaming, and misbehavior during a reading or mathematics task.

Instructor Moves

An instructor move is coded only if it is received by the target student and is therefore relevant to the behavior coded for the target student at that moment. For example, if the student continues to work on a reading assignment while the teacher gives instructions to get out the mathematics text, then the student engagement in reading is coded, with no instructor move for that student.

AO = Academic Observational monitoring

Academic observational monitoring consists of the instructor looking at or listening to a student response during a reading or mathematics task.

AF = Academic Feedback

Academic feedback refers to the teacher informing the student that a written or oral response was correct or incorrect. Any explanation is more than academic feedback.

AQ = Academic Question

An academic question consists of the teacher asking the student for a written or oral answer.

EN = Explanation, Need

Explanation, need refers to instructional explanation provided to the student to satisfy a clear and immediate student need for help.

EP = Explanation, Planned

Explanation, planned refers to instructional explanation provided according to previous plans of the instructor. This would include lectures. Explanation, planned may involve a general student need, but not an immediate student need.

SD = Structure or Direct

As with the other instructor moves, this move must be relevant to the reading or mathematics task coded at the same moment. Structure or direct refers to statements of goals or objectives and the provision of instructions or directions.

TE = Task Engagement Feedback

Task engagement feedback refers to the instructor's moves to control inappropriate student behavior, such as off-task behavior, or to praise appropriate behavior, such as good work habits. However, inappropriate and appropriate student behavior does not refer, here, to correct and incorrect responses to a reading or mathematics task. Teacher feedback for these responses would, as discussed above, be coded AF.

Source of Instructor Move

T = Teacher

Teacher refers, here, to the instructor in charge of the class unit in which the observation takes place. This might be a reading or mathematics specialist during the student's reading or mathematics laboratory period.

O = Other Adult

Other adult refers to an instructor who is not in charge of the class unit. This might be an aide or parent volunteer.

S = Student

Student is coded as the source of instruction when the target student is receiving instructional assistance (usually tutoring) from another student.

C = Curriculum

Curriculum is coded as the source of instruction when answers provided in the curriculum materials are used by the student to obtain academic feedback. Therefore, the source code, C, is used only with the instructor move code, AF.

Focus of Instructor Move

T = Target

The target student is the focus of the instructor move only when that move is directed specifically to that individual target student.

G = Group

A group is the focus of the instructor move when the target student of the moment is in a group (two or more) that receives an instructor move. The group is coded when the instructor move is directed to the group as a whole or to some student in the group other than the target student (so long as the move is relevant to the target student).

Start time ______

______

______

______

______

______

Stop time ______

BTES TIME CODING SHEET

School: ____________ Date: ____________

Teacher: ____________ Observer: ____________ Page: ________ of ________

I.D.				GENERAL CONTENT							ACADEMIC CONTENT		SETTING		DIFFICULTY			LEARNER MOVES							INSTRUCTOR MOVES							SOURCE OF INSTR. MOVES				FOCUS OF INST. MOVES		CONTENT COVERED
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	
				W	T	M	B	N	O		R	M	S	O	E	M	H	EW	EO	EC	ED	NI	NW	NO	AO	AF	AQ	EN	EP	SD	TE	T	O	S	C	T	G	
				W	T	M	B	N	O		R	M	S	O	E	M	H	EW	EO	EC	ED	NI	NW	NO	AO	AF	AQ	EN	EP	SD	TE	T	O	S	C	T	G	
				W	T	M	B	N	O		R	M	S	O	E	M	H	EW	EO	EC	ED	NI	NW	NO	AO	AF	AQ	EN	EP	SD	TE	T	O	S	C	T	G	
				W	T	M	B	N	O		R	M	S	O	E	M	H	EW	EO	EC	ED	NI	NW	NO	AO	AF	AQ	EN	EP	SD	TE	T	O	S	C	T	G	
				W	T	M	B	N	O		R	M	S	O	E	M	H	EW	EO	EC	ED	NI	NW	NO	AO	AF	AQ	EN	EP	SD	TE	T	O	S	C	T	G	
				W	T	M	B	N	O		R	M	S	O	E	M	H	EW	EO	EC	ED	NI	NW	NO	AO	AF	AQ	EN	EP	SD	TE	T	O	S	C	T	G	
				W	T	M	B	N	O		R	M	S	O	E	M	H	EW	EO	EC	ED	NI	NW	NO	AO	AF	AQ	EN	EP	SD	TE	T	O	S	C	T	G	
				W	T	M	B	N	O		R	M	S	O	E	M	H	EW	EO	EC	ED	NI	NW	NO	AO	AF	AQ	EN	EP	SD	TE	T	O	S	C	T	G	
				W	T	M	B	N	O		R	M	S	O	E	M	H	EW	EO	EC	ED	NI	NW	NO	AO	AF	AQ	EN	EP	SD	TE	T	O	S	C	T	G	
				W	T	M	B	N	O		R	M	S	O	E	M	H	EW	EO	EC	ED	NI	NW	NO	AO	AF	AQ	EN	EP	SD	TE	T	O	S	C	T	G	
				W	T	M	B	N	O		R	M	S	O	E	M	H	EW	EO	EC	ED	NI	NW	NO	AO	AF	AQ	EN	EP	SD	TE	T	O	S	C	T	G	
				W	T	M	B	N	O		R	M	S	O	E	M	H	EW	EO	EC	ED	NI	NW	NO	AO	AF	AQ	EN	EP	SD	TE	T	O	S	C	T	G	
				W	T	M	B	N	O		R	M	S	O	E	M	H	EW	EO	EC	ED	NI	NW	NO	AO	AF	AQ	EN	EP	SD	TE	T	O	S	C	T	G	
				W	T	M	B	N	O		R	M	S	O	E	M	H	EW	EO	EC	ED	NI	NW	NO	AO	AF	AQ	EN	EP	SD	TE	T	O	S	C	T	G	
				W	T	M	B	N	O		R	M	S	O	E	M	H	EW	EO	EC	ED	NI	NW	NO	AO	AF	AQ	EN	EP	SD	TE	T	O	S	C	T	G	
				W	T	M	B	N	O		R	M	S	O	E	M	H	EW	EO	EC	ED	NI	NW	NO	AO	AF	AQ	EN	EP	SD	TE	T	O	S	C	T	G	
				W	T	M	B	N	O		R	M	S	O	E	M	H	EW	EO	EC	ED	NI	NW	NO	AO	AF	AQ	EN	EP	SD	TE	T	O	S	C	T	G	
				W	T	M	B	N	O		R	M	S	O	E	M	H	EW	EO	EC	ED	NI	NW	NO	AO	AF	AQ	EN	EP	SD	TE	T	O	S	C	T	G	
				W	T	M	B	N	O		R	M	S	O	E	M	H	EW	EO	EC	ED	NI	NW	NO	AO	AF	AQ	EN	EP	SD	TE	T	O	S	C	T	G	
				W	T	M	B	N	O		R	M	S	O	E	M	H	EW	EO	EC	ED	NI	NW	NO	AO	AF	AQ	EN	EP	SD	TE	T	O	S	C	T	G	
				W	T	M	B	N	O		R	M	S	O	E	M	H	EW	EO	EC	ED	NI	NW	NO	AO	AF	AQ	EN	EP	SD	TE	T	O	S	C	T	G	
				W	T	M	B	N	O		R	M	S	O	E	M	H	EW	EO	EC	ED	NI	NW	NO	AO	AF	AQ	EN	EP	SD	TE	T	O	S	C	T	G	
				W	T	M	B	N	O		R	M	S	O	E	M	H	EW	EO	EC	ED	NI	NW	NO	AO	AF	AQ	EN	EP	SD	TE	T	O	S	C	T	G	
				W	T	M	B	N	O		R	M	S	O	E	M	H	EW	EO	EC	ED	NI	NW	NO	AO	AF	AQ	EN	EP	SD	TE	T	O	S	C	T	G	
				W	T	M	B	N	O		R	M	S	O	E	M	H	EW	EO	EC	ED	NI	NW	NO	AO	AF	AQ	EN	EP	SD	TE	T	O	S	C	T	G	
				W	T	M	B	N	O		R	M	S	O	E	M	H	EW	EO	EC	ED	NI	NW	NO	AO	AF	AQ	EN	EP	SD	TE	T	O	S	C	T	G	
				W	T	M	B	N	O		R	M	S	O	E	M	H	EW	EO	EC	ED	NI	NW	NO	AO	AF	AQ	EN	EP	SD	TE	T	O	S	C	T	G	
				W	T	M	B	N	O		R	M	S	O	E	M	H	EW	EO	EC	ED	NI	NW	NO	AO	AF	AQ	EN	EP	SD	TE	T	O	S	C	T	G	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	

APPENDIX E

SAMPLE CONTENT COVERED TRANSCRIPT SHEET

Content Covered

Page ....

Date ....

STD No.	Content Description		Time		Time		Time		Time
		Start		Start		Start		Start	
		Stop		Stop		Stop		Stop	
Max. set									
		Start		Start		Start		Start	
		Stop		Stop		Stop		Stop	
Max. set									
		Start		Start		Start		Start	
		Stop		Stop		Stop		Stop	
Max. set									
		Start		Start		Start		Start	
		Stop		Stop		Stop		Stop	
Max. set									

APPENDIX F

GUIDING CRITERIA IN THE COLLECTION OF TARGET PUPIL QUALITATIVE DATA

Possible Qualitative Data Sought on High and Low Achieving Students

1. How does this student spend instructional time? Mainly with the teacher in a total group or with materials in a seatwork setting?

2. What can be said about the pattern of work/disengagement? Does the student work for a short period, talk to neighbor and then work again? Or does the student demonstrate long periods of engagement interspersed with brief periods of disengagement?

3. What does this student appear to be doing during talk to neighbor? Checking answers, copying or social activity?

4. Does the teacher encourage students to help each other with work?

5. Does the teacher do much to control the behavior of this student?

6. When this student converses with a neighbor, what is the nature of that interaction? Does it occur in view of the teacher, or is it surreptitious?

7. Does this student appear to be deeply involved in work?

8. Are the periods of work, brief or protracted?

9. What does this student do during teacher drills and demonstrations?

10. Does this student participate actively in class as evidenced by such procedures as raising the hand to answer questions?

11. Does this student converse much with the teacher?

12. Is there any evidence to suggest that the teacher treats this student any differently to other students?

13. What is this student like so far as punctuality to class is concerned? How does the teacher react?

14. Does this student make much eye contact with the teacher?

APPENDIX G

SAMPLE SPECIMEN RECORDS

Specimen Record of Observations
for
Target Pupils

Thursday 19, October 1978

Specimen Record 19. 10 78

8:50 Line up and entry into class.

8:53 Teacher allocates points for orderly entry.

8:56 Wayne sits down with other students then realizes he has not taken off hat and coat. Leaves seat and walks to cloak area. Principal announces over public address system the names of the soccer referees for the day.

8:59 Teacher proceeds with weather recording details. Wayne is sitting in his seat so he is half turned to the front and half facing the student behind him. Kathy gets weather record sheet out of her desk. Robert complains about the likelihood of the weather turning cold soon. Suggests we should cover the city with a large dome.

9:02 Teacher discusses the implications of Robert's suggestion in terms of carbon monoxide build-up.

9:05 Teacher indicates to class that today's math shall involve decimals, but that it shouldn't cause trouble because they are familiar with decimals. He warns: "You will have to be careful and listen during the dictation, in order to get the decimal point in the correct place."

9:11 Teacher demonstrates to pupils using the blackboard, how to put all the decimal points down first, underneath each other.

9:12 Teacher reprimands Wayne for not putting decimal points down on the page before the dictation of questions commenced. Teacher then commences dictating math problems.

9:14 Dictation of problems continues.

9:17 Dictation of problems still in progress.

9:18 Student calls out that teacher is reading problems too fast. Teacher replies that part of the task is to listen carefully. A good deal of unrest amongst some of the other pupils about the pace of delivery.

9:19 Teacher looks to Wayne on resumption of dictation, and disciplines him for not copying down as told. Teacher repeats one problem and shows Wayne the step by step procedure in copying down. Wayne is pleased that he can now do the task.

9:20 Dictation of problems finishes and students begin working on solving the problems. Teacher moves around the pupils individually and monitors their progress.

9:23 Teacher continues to look at the work of individuals in a systematic fashion, gradually moves up and down the rows.

9:25 Teacher picks up Kevin's work and looks at it. Puts it down without comment. Obviously the work is O.K.

9:26 Observation of individual work by the teacher continues. Wayne is turning around talking to David. The talk is unrelated to the work.

9:28 Wayne is working on the problems. However he is sitting so that he is half facing the front and half facing David behind him. Seems that he finds this the most convenient position to rapidly move out of on-task behavior, to talk to David. Robert has finished his problems.

9:29 Teacher continues to move around looking at individual work. Teacher looks at Robert's work and seems satisfied. Robert has moved into free reading. Kathy talks with a neighbour briefly about one of the problems. Kevin has finished. He sits quietly.

9:30 Teacher looks at Kathy's work and points out some errors to her privately.

9:32 Wayne is turning around talking to David. Teacher looks up from helping Kathy with her work and says to Wayne: "Finish your work and stop wasting time." Robert is engaged in reading a car magazine. Kevin reads.

9:35 Wayne is off-task again, this time looking around the room. Kathy still receives an explanation from the teacher. Kevin reads on.

9:38 Teacher moves into providing answers to math problems on the blackboard. No workings, just answers. Pupils correct their work as each answer is provided.

9:39 Teacher stops providing answers and waits because there is too much arguing amongst the pupils about an aspect of the answers.

9:40 Teacher resumes writing answers on blackboard. Wayne turns around and plays a pencil and paper game with David involving the drawing of small squares between pre-arranged dots (called by students, "paddocks").

9:41 Teacher continues writing answers on blackboard.

9:42 Because of the arguing among students while he is writing on blackboard, the teacher abandons this method of providing answers and instead uses patterned turn system of calling upon students.

9:44 Wayne listens to answers. He raises hand to volunteer an answer but is ignored. Another student provides the answer.

9:45 Teacher provides an explantion to an incorrect student answer.

9:46 Wayne is off-task again, playing "paddocks" with David.

9:47 All the answers to problems have now been provided. Teacher allocates points to rows according to number of correct answers per row.

9:50 Teacher continues to find out verbally how students performed on problems. Awards points accordingly.

9:52 Transition into spelling activity. Teacher says: "Take out your spelling books." He allocates points to rows according to the smoothness of the transition.

9:53 Students are asked to underline spelling words written in sentences yesterday. Wayne takes no notice. Kathy carries out the task and Robert sits and does nothing. Kevin carries out the task.

9:56 Teacher asks selected students to read out their sentences using yesterday's spelling so he can check them for correct use of words. Wayne is playing "paddocks" with David. Kathy, Robert and Kevin listen to one student's use of the word "densely." The sentence is: "He was densely in the head." This provokes some laughter from some students. Teacher indicates that is a colloquial use of the word "densely" and not a correct usage.

9:58 Wayne is turning around to the back of the room. Teacher deducts 10 points from his row because of his behavior.

9:59 Wayne is looking in his desk for something. Kathy is called upon to read her sentence. Her sentence is: "The fog was very densely." Robert and Kevin attentive.

10:00 Teacher provides Kathy with a public explanation of why her use of "densely" is not correct.

10:01 Teacher asks Robert: "What is your problem?" His response is inaudible. Teacher responds: "I can't read from here, I'm not a brain surgeon."

10:02 Other students read answers. Wayne pays no attention. Kathy listens, as do Robert and Kevin.

10:04 Students have become noisy. Teacher calls for "quiet" and gives disapproving look.

10:05 Students resume reading sentences and at this time all target pupils are listening.

10:07 Wayne is playing "paddocks" with David and Ronnie.

10:08 Wayne is not paying attention. The principal enters the classroom and the teacher directs the class to rise and say: "Good morning, Mr. Browne." They do this, but not particularly well. Mr. Browne asks: "How many students want UNICEF boxes?". After obtaining a count, he departs.

10:10 Teacher rebukes class for poor greeting to Mr. Browne when he entered.

10:11 Activity of students reading out sentences resumes. All target students attentive except Wayne. Robert has hand up to ask a question but is ignored.

10:13 Students continue to read sentences with teacher indicating correctness or otherwise. Wayne takes no notice, but Kathy, Robert and Kevin appear attentive. Background noise is beginning to rise so teacher finds it necessary to repeat student answers to the class.

10:14 Teacher looks over Robert's shoulder and reads his answer to the class as an illustration of correct usage.

10:16 Teacher: "Put spelling workbooks away."

10:17 Teacher hands back spelling tests he corrected, from last week. Students are told to take them home for parental signatures. Each student comes forward to collect tests as names are called out.

10:19 Noise level has risen again. Teacher pauses in handing out of test papers and looks disapprovingly.

10:20 Resumption of distribution of tests. Class quietly looks on during this activity.

10:21 Distribution of papers with students collecting from teacher at front of room.

10:23 Handing back of papers while class waits. Kathy walks out and gets her paper.

10:25 Distribution of tests completed. Teacher says: "Those who got all last week's spelling correct may do free reading. The others are to write out mistakes five times in the back of your spelling book."

10:26 Wayne who received 32 out of 50 for his spelling begins to write out mistakes. Kathy gets out a book to do free reading, so that she apparently got all spelling correct. Robert takes out book for free reading, so presumably he had no mistakes either. Kevin is copying mistakes out. These will be checked later in the teacher's records. Robert doesn't open book, he just sits looking around.

10:27 Teacher stands out front and pupils come to him with problems and questions about last week's spelling test.

10:29 Kevin waits next to the teacher to show him that incorrect answers have been corrected. Wayne still writes, Kathy and Robert read.

10:30 Line up for recess.

10:32 Class dismissed. Except for Wayne, who teacher keeps behind for a talk.

10:33 Teacher: "Your behavior is deteriorating back there." Wayne: "Can you shift me away from David." Teacher: "I'd like to shift you into the cupboard."

10:50 Pupils line up outside of class for re-entry.

10:52 Teacher indicates to monitors to hand out "The People and Progress" reading books. The story is entitled "The Fabulous Ditch." Teacher also gives directions as to how the task is to be carried out.

10:55 In response to student roughness in handling books, the teacher delivers a brief talk on the need to respect communal property.

10:56 Teacher illustrates this by indicating the correct way to turn the page of a book.

10:59 Oral reading to the class begins with students reading in a patterned sequence up and down rows. The story is about Colonel By, an early figure in Canadian history. All target students silently following.

11:02 Oral reading with all targets seeming to follow in book.

11:05 Oral reading continues. Target students appear to be following. Eyes on text and turning page at appropriate point, except Robert.

11:08 Teacher interjects to briefly explain to the class an aspect of story.

11:10 Oral reading resumes. Kathy has taken out her free reading novel, placed it open over the reader and is reading it.

11:11 Oral reading continuing. Kathy still reads from her novel, although occasionally she slips the novel away to check on the place in the reader, and then goes b[illegible]he novel. Other targets show no signs of not being attentive.

11:14 Activity unchanged and targets proceed as above.

11:16 Robert is not following in the text. He looks around. Nothing in particular seems to distract him.

11:17 Wayne is looking down to something he plays with beneath desk. Kathy continues with private reading. Robert has taken out the Safety Patrol roster and is reading it. Kevin is still attending. Oral reading with students taking turns, continues.

11:20 Wayne follows now. He is looking at the text. Kathy has put her novel away and is following the oral reading. Likewise for Robert and Kevin.

11:22 Wayne's turn to read. Before he starts teacher tells him to hold book correctly by standing and holding in two hands. He is slouching against desk, with one hand on desk and book balancing on one hand. Wayne's reading is not fluent. He struggles over a number of words and has little regard for punctuation.

11:23 Wayne continues reading aloud. Teacher watches and corrects words that are mispronounced.

11:25 Wayne finishes reading. Teacher rebukes him for not following earlier readers more closely. A number of words he struggled over had been dealt with by others earlier in the activity.

11:26 Wayne off-task again, looking around behind him. Teacher rebuke has clearly had no effect. Kathy follows, as do Robert and Kevin, as another pupil reads.

11:28 Teacher tells Wayne: "Pay attention."

11:29 Wayne pays attention for a short while. Kathy reads. Her reading is smooth and she has little difficulty with pronounciation. Very quiet voice.

11:31 Robert reads aloud. A good reader.

11:32 Robert continues to read. Wayne is not attending. Both Kevin and Kathy are following.

11:33 A question from a student about the present day aspect of something in the story.

11:34 Teacher provides an answer to the question.

11:35 Teacher explanation continues although Wayne is not attending, he is looking at Ronnie. The other three targets are following the teacher.

11:37 Teacher explanation continues. He asks: "How many of you have been to Ottawa?" Three students raise hands.

11:38 Oral reading finishes. Teacher writes the difficult words from the story on the board. Students watch. Indicates that after he has copied all the words down he wants class to take out workbooks and copy the words down. "Get your books out and leave them on the desk."

11:41 Pupils follow the directive and get books out.

11:44 Despite the teacher's directive to watch the board, a number of pupils have already commenced writing the words down. Wayne, Robert and Kevin are in this category. Kathy sits and waits for the teacher to complete the list.

11:47 Wayne stops writing, but does not attend to blackboard. Instead he looks down to the floor. Kathy begins writing. Robert and Kevin continue writing down the words.

11:49 Teacher gives the directive to start writing down the words, even though a number of students are already well advanced with this activity.

11:50 Teacher breaks the words on the blackboard down into component syllables by underlining the segments. Indicates to pupils to do the same in their workbooks. Wayne is still copying down. Kathy is turning around off-task. Robert and Kevin are still writing and underlining.

11:52 Teacher continues the underlining process on the blackboard.

11:53 Teacher gives a brief explanation on the pronunciation of one of the words. Wayne is not attending. Kathy sits waiting as does Kevin, for the teacher to underline the words. Robert is writing.

11:56 Teacher reminds students to fill out their task difficulty sheets for Mr. Smyth on their reading of the story. "This is activity number 15."

11:59 Wayne and Robert prepare themselves to leave for Safety Patrol duty. Kathy and Kevin pack up ready for dismissal.

12:00 Class dismissed for lunch.

1:15 Lining up outside the classroom for commencement of afternoon class.

1:18 Pupils enter the classroom for afternoon classes. Kevin is absent this afternoon due to illness.

1:20 Teacher enters and says: "Stop talking."

1:21 Teacher discusses with class the problems being encountered with the School Safety Patrol. Teacher asks Wayne why he didn't do patrol duty at 1:00 pm. Wayne indicates a substitute was supposed to do duty for him. Teacher indicates substitutes only to be used in event of illness, not when officers have something better to do. The issue is resolved by Wayne indicating he wishes to continue with patrol duties.

1:24 Teacher speaks to class about the need to get a drink and go to the washroom before class begins. Teacher: "I'm fed up - you're worse than kindergarten in this respect."

1:25 Dean, acting as spokesman for the class, indicates that Mrs. Green will not allow them to get a drink at the corridor fountain at recess. According to him, the supervising teacher tells them to go outside and play. The class teacher indicates he will check this matter out with supervising teachers.

1:26 Teacher stands David up for misbehavior.

1:27 While the class continues to sit, the row monitors collect the readers used in the reading activity before lunch.

1:29 Teacher: "Get out your social studies workbooks."

1:30 Teacher gives directions for social studies activity. "Get out your outline maps of Canada and print the names of the provinces in the correct places."

1:32 Wayne indicates that he is not sure whether Edmonton or Alberta is the province. Teacher clears up the problem.

1:33 Wayne, Kevin and Robert are writing the names on the map.

1:36 Wayne who sits close to the teacher's desk, takes a book off the teacher's desk. Teacher says: "Wayne, that's my desk not yours." Wayne returns the book to the desk. Robert and Kathy continue working.

1:37 Teacher moves around the room monitoring individual work on the social studies activity.

1:38 David still stands and does his work with a book resting on his knee.

1:39 David seats himself without any direction from the teacher. Wayne appears to be aimlessly flicking through the pages of an atlas. Kathy has stopped working and is looking around. Robert has finished his map and has taken out a car magazine and is reading.

1:42 Wayne leaves his desk and walks to the teacher at the front of the room. Before getting there, the teacher directs him to return to his desk. Kathy has finished her map and is cleaning out her desk. Robert continues reading.

1:45 Wayne has resumed writing on his map. Kathy is still cleaning out her desk. Robert has put away his private reading and has his map out again, checking it. He receives a note passed to him from behind.

1:48 Wayne has completed his map, but makes no attempt to take out private reading. Kathy has completed the desk cleaning and sits quietly doing nothing. Robert makes adjustments to his map.

1:50 Kathy leaves her desk and goes to the bin to deposit rubbish. On the way back she goes to the bookcase to get another book for free reading. Teacher is still checking individual work.

1:51 Wayne plays "paddocks" with Ronnie who sits to his left. Kathy does free reading. Robert has taken out a sheet of paper and is drawing Star Wars rockets.

1:54 Wayne continues to play his game, while Kathy reads and Robert draws.

1:56 Teacher still checks the work of individual pupils.

1:57 Wayne leaves his seat and walks toward the teacher. He indicates he wishes to leave the room to go to the washroom. The teacher responds: "No, if I let you go, I have to let three others go also." Wayne returns to seat and resumes playing the game with Ronnie. Kathy continues with reading, and Robert is still drawing.

2:00 Wayne continues with the game. Kathy reads. Robert draws.

2:01 Ronnie and Wayne move their desks closer together so it is easier to play their game. This occurs behind the teacher's back. He continues to check work.

2:03 There are only 3 pupils in the class actually involved in a reading activity. Kathy is one of these. There are 4-5 other pupils working on their social studies activity. The remainder of the class are doodling on pieces of paper, or just sitting. Despite the number of unoccupied pupils, the class is remarkably quiet. The teacher continues with his checking of maps from an earlier social studies activity. He is about half way around the class. Wayne plays his game and Robert draws.

2:06 Wayne plays, Kathy reads and Robert draws.

2:07 Teacher disciplines Bryan for not working. The teacher was at the front of the room with his back to Bryan at the back. Teacher was, therefore, aware of what Bryan was doing even though involved in providing individual help to Michelle. Activity of target pupils is unchanged.

2:10 Wayne plays game. Kathy has stopped reading and is doing a drawing of a Halloween pumpkin on a note pad. Robert continues to draw rockets.

2:11 Wayne and Robert continue as before. Kathy closes her free reading book and continues to draw.

2:12 Teacher: "I can hear noise behind me." Targets continue unchanged.

2:14 Kathy leaves desk and sharpens her pencil at pencil sharpener on the wall.

2:15 Activities of targets remains the same.

2:16 Question from a class member about the point system.

2:17 Pupils line up in rows for recess. Teacher: "Don't forget to go to the washroom and get a drink, Wayne in particular."

2:18 Dismissed for recess.

2:33 Pupils re-enter class from recess.

2:36 Wayne indicates to teacher he had trouble spelling the names of Canadian provinces, but that he went to the text.

2:39 Discussion about who is on patrol duty after school. Teacher to Wayne: "What time will you be on duty tomorrow morning?" Teacher: "8:30 is the time." Remainder of class sits and waits.

2:40 Wayne begins to get together the necessary equipment for patrol duty.

2:41 Row monitors hand out sheets of paper for a forthcoming activity.

2:42 Students sit and wait while teacher pauses for quiet before proceeding with next activity.

2:44 Teacher explains that this is: "a formal writing activity which shall be conducted twice a week." He rules lines on the blackboard and writes the letter "a" between them.

2:45 A student calls out: "Do we use the full line?" Teacher responds to the class: "Yes."

2:48 Targets proceed with the assigned task. Teacher moves around.

2:51 Activity continues.

2:54 Activity continues.

2:57 Activity continues.

3:00 Teacher moves around and continues to look at individual written work. Wayne has finished. Instead of writing a line of "a's" across the page and filling the page, he has used half the line in each instance. Robert has finished the set task and is drawing rockets. Kathy has finished and is sitting waiting.

3:03 Wayne sits, Kathy sits and Robert draws.

3:05 Teacher continues with inspection of individual work. Most of the class is sitting doing nothing. There is a good deal of socializing and the noise level has risen.

3:06 Teacher to class: "If you have finished take out your free reading books." Teacher: "Only three people at the bookcase at a time." Little apparent notice taken by most of the class to the teacher's directive to read privately.

3:07 Kathy has gone to the bookcase and selected a book for free reading.

3:09 Wayne has decided to finish the writing activity and is completing each of the lines of "a's." Kathy sits with book on desk unopened. Robert draws.

3:10 Teacher still checking pupil writing exercises by moving around the room. Teacher to class: "Nick, have you got your reading book out?" No answer.

3:12 Wayne has finished the writing exercise but has made no attempt to find a book to read. Kathy turns around and shows David the six bookmarks she has from the bundle made available by the teacher. Robert continues with drawing.

3:14 Kathy has her book open but is not actually reading. Robert reads a magazine. Wayne just sits.

3:15 Wayne looks vacant. David is not behind him to talk to. Kathy talks to the girl on her right. Robert reads his magazine.

3:17 Kathy has turned her book face down on the desk and is climbing around in her desk talking to the boy in front of her about the bookmarks she has.

3:18 Wayne is out of his desk, looking out the window at the back of the room. Kathy looks in her desk. Robert reads his magazine.

3:19 Kathy closes her book.

3:20 Dean goes to the teacher who is still moving around the room checking work. He has a handkerchief over his nose. Teacher: "That's a good way to get to the washroom." Pupil leaves room.

3:21 Teacher stops checking work and tells the class to put their names on their handwriting sheets.

3:24 Teacher resumes checking. Target pupils sit and wait.

3:26 Teacher still checks work.

3:27 Only two pupils in class actually doing free reading. Rest, including targets, are sitting or talking.

3:29 Row monitors take up handwriting sheets. Teacher: "I am going to offer a prize of $10 for the best, and $10 for most improved writer, between now and May 1st." Some agitated discussion among the class as to the sincerity of the offer. Teacher indicates he is sincere.

3:30 Pupils pack up ready for dismissal.

3:32 Dismissed.

Specimen Record of Observations
for
Target Pupils

Monday 23, October 1978

Specimen Record 23. 10. 78

8:50 Pupils line-up outside classroom.

8:52 Pupils enter class. Entry reasonably quiet. All targets present. Kathy is orderly officer this week. Stands at front during entry and exit from class and reports to teacher on row with the most efficient transition.

8:53 Wayne walks to Jerry and gives him a toy car. Principal interrupts over public address system with announcements concerning soccer umpires, newsletter to go home to parents, and taking shoes off at the door in wet weather.

8:54 Teacher discusses weather details with pupils. Tells pupils to take out weather charts and make entries.

8:56 Robert fills out his chart. Wayne and Kevin have not taken charts out yet. Kathy gets her chart out.

8:57 Student indicates to teacher that the monitor roster for the week has not been changed. Teacher attends to this picking pupils for tasks.

8:58 Targets attend while re-allocation of monitors is in progress.

8:59 Teacher continues to look for monitors who have not had a turn yet this year. Targets watch.

9:00 Teacher finishes attending to monitorial duties.

Teacher to class: "Get your arithmetic out."

9:01 Pupils get workbooks out.

9:02 Teacher commences dictating math problems: "First multiplication."

9:03 Target pupils copying down dictated problems.

9:04 Student asks teacher: "How many lines do we leave for multiplication?" Teacher: "You work it out."

9:05 Dictation of problems continues with targets copying down.

9:06 Dictation continues.

9:07 Wayne missed some of the numbers dictated by the teacher. Reason was possibly the noise being made by student behind him. Wayne stops copying down.

9:08 Dictation continues and Wayne resumes copying.

9:09 Dictation continues with targets writing down problems.

9:10 David makes noises after each question. Wayne asks teacher to repeat a question. Teacher ignores request. Class begins working on math problems.

9:11 Teacher to David: "Shut up." Targets work at problems.

9:12 Wayne stares vacantly ahead.

9:13 All target pupils continue with written answers to problems. Teacher moves around monitoring individual progress.

9:14 Wayne, Kathy, Robert and Kevin all writing.

9:15 Wayne cleans his glasses. Teacher walks past and Wayne asks him a question. Brief one or two word reply.

9:16 Wayne stopped working. He looks out across the class.

9:17 Wayne has resumed writing again. He is working on problems. Kathy, Robert and Kevin continue working.

9:18 Wayne stopped again. Teacher to Wayne: "Get working."

9:19 All target students working on problems.

9:20 All targets continue working. Teacher moves around.

9:21 Class works quietly as teacher continues to move around helping individuals.

9:22 Teacher monitors Kathy's work and assists her with a problem.

9:23 Targets working.

9:24 Teacher: "Wayne, turn around please."

9:25 Targets are working.

9:26 David is out of his seat pulling down the blind. Teacher to David: "Sit down." Targets all working.

9:28 Robert finishes problems and works on "Susannah" drawing from Friday afternoon.

9:29 Wayne and Kathy have stopped working and talk to each other. Kevin continues writing. Robert draws.

9:30 Wayne has brief word to David and resumes working on math problems.

9:31 Kathy finishes problems.

9:32 Researcher interrupts with request to fill in Task Difficulty Assessment Activity No. 20. Kathy and Robert fill out sheets. Other pupils who are still working take no notice. Wayne turning around again.

9:34 Kevin finishes and gets out novel and begins free reading. Kathy gets out book and begins reading. Teacher to Wayne: "Turn around." Teacher resumes helping another pupil and Wayne takes no notice.

9:35 Teacher indicates to class that time has expired for the activity. He copies answers to questions onto blackboard. Wayne makes no attempt to start correcting. Kathy begins correction. Robert continues drawing. Kevin corrects his work.

9:36 Wayne has sealed his mouth with scotch tape. He looks around for attention. Robert, Kathy and Kevin look at blackboard while teacher continues to write answers to problems.

9:37 Class corrects work.

9:38 Teacher reads out answers off blackboard. Kathy, Robert and Kevin attend. Wayne works at sticking his mouth.

9:40 All answers now on blackboard. Teacher moves to the top of each row of desks and asks pupils to indicate how many problems correct.

9:41 Teacher continues checking procedure and allocates points to each row on the basis of individual performance on math task just completed.

9:42 Checking completed. Teacher to class: "Leave your arithmetic books out." "Turn around Wayne. I've been watching you sticking your mouth for the last 10 minutes. It's a great improvement."

9:43 Class is restless as consequence of turning around to observe Wayne. Some others begin to copy the idea. Teacher waits for silence.

9:44 Teacher: "Robert, put that drawing away. The rest of you listen." Wayne pays no attention. Kathy and Kevin wait for teacher to proceed.

9:45 Teacher begins a lecture designed to build on pupils' knowledge of decimals. He uses dollars and cents as the mechanism for effecting the transfer.

9:46 Teacher writes an example on blackboard. Indicates the aims and objectives of the discussion to follow shortly.

9:47 Introductory comments from teacher continue, indicating what he hopes they will be able to do at the end.

9:49 Teacher yells at David who has copied Wayne and is sticking his mouth with tape: "Put it in the bin." Da[illegible]umbles an inaudible comment and reluctan[illegible] goes to bin. Hushed atmosphere through the classroom as they observe. Teacher and class wait.

9:50 Teacher regains posture and continues lecturing on topic of decimals. Students are restless after the outburst directed at David.

9:52 Teacher continues with planned explanation of decimals using blackboard examples. Wayne plays with tape under his desk and shows no sign of attentiveness to teacher's explanation. Robert has his hand up with a question. Kathy and Kevin attend to the blackboard while teacher talks.

9:53 Wayne continues fooling around. Other targets listen.

9:55 A question from a student to the teacher about the substance of the planned explanation. Teacher gives an explanation.

9:56 Teacher explanation to student's question continues. All target pupils attend while the explanation is given.

9:59 Having answered the pupil question, the teacher has resumed his planned discussion where he left off. Robert has his hand up with a question. The teacher ignores. Wayne, Kathy and Kevin appear attentive.

10:00 Question from a student: "What is the meaning of '0' in the number .9001?" Teacher explains that zero in this context is not meaningless or without value. It does serve a purpose. Robert asks: "Is .9 larger in value than .9001?" Teacher answers in the negative and expands on the reason.

10:01 Teacher continues to explain the value of zero in decimal numbers.

10:02 All targets are attentive to the answer given by teacher.

10:04 Wayne is turning around and is gesturing to David. David writes something on the cover of his workbook and shows it to Wayne. Kathy is not attentive. She plays with something under the desk, while looking around the class. Kevin rests his head on his hand with a vacant look in his eyes.

10:05 Wayne has turned around with his back to the teacher and the blackboard instruction. Kathy looks around. Kevin has a glazed look in his eyes. Robert attends. Teacher answers a student question about an aspect of the work.

10:07 Teacher explanation has moved away from decimals and dollars and cents, to the connection between fractions and decimals. Teacher indicates class should know this work. They demonstrate by their questions and their inability to answer teacher questions, that they don't understand this aspect. Class has become quite restless. They are squirming in their seats as teacher answers questions from specific students.

10:08 Teacher asks: "How many understand." There is a sprinkling of hands raised. Robert is the only target who indicates in the affirmative.

10:10 Teacher places a fraction on board and asks class: "What is the bottom of a fraction called?" With difficulty he finds a student able to respond correctly. Robert had his hand up. All target pupils except Wayne were attending when the question was asked.

10:11 Situation unchanged.

10:12 Discussion of the functions of numerator and denominator in a fraction.

10:13 Teacher continues to explain the above.

10:14 All four targets attending to teacher's discussion.

10:15 Teacher to class: "Put your math away. Take out your spelling workbooks." "First word." Pause.

10:16 Teacher starts dictation of 15 words from page 16 MacMillan Spelling Series No. 6. Pupils write.

10:17 Teacher dictates words one at a time and pupils continue to copy down.

10:18 Teacher asks students: "Write the plural of the word 'practice'." Student asks: "What does the word 'plural' mean?" Teacher indicates.

10:20 Teacher finishes dictation of words. Pupils continue to write down. Researcher asks pupils to fill out Task Difficulty Assessment for activity number 21. Teacher tells pupils: "Correct the words from your texts."

10:21 Pupils correct from textbooks. Teacher moves around and monitors checking. Teacher: "When you have finished correcting, write out the wrong words in your books."

10:23 Targets have finished correction, but other class members continue.

10:24 Wayne fools with David. Robert talks to neighbor. Kathy is out of her desk at the bookcase.

Kevin reads.

10:25 Teacher to class: "When you have finished, go on with your free reading, or get ready for library." Teacher continues to check work.

10:26 Wayne makes no attempt to write out incorrect words. He talks to neighbor. Kathy talks. Robert draws. Kevin reads his book.

10:29 Teacher writes the words "racket" and "raquet" on blackboard and indicates different usages.

10:30 At teacher's direction, pupils line up for recess.

10:31 Dismissed for recess.

10:47 Pupils re-enter class. Hang-up coats and sit down.

10:48 Teacher waits for silence.

10:50 Teacher to class: "Get your library books out." "Too much talking."

10:51 An instruction before going to library. Teacher: "Don't sit with your friends in the library. You tend to get them into trouble."

10:52 Pupils stand to exit from classroom to the library. Group moves to library.

10:54 In the library. Teacher shifts individuals to reduce possibility of distractions. Wayne shifted.

10:55 Monitors hand back corrected library exercises from last week. Teacher to Kathy: "Kathy, take the names of people who misbehave and take 20 points off for that row."

10:56 Librarian revises work from last week on types of catalogue cards.

10:58 Wayne has a blank look. Kathy and Kevin attend. Robert has his hand up with a question.

10:59 Wayne has his back to the transparency being shown on the wall and is clearly not attentive.

11:00 While librarian speaks, Kevin reads the back cover of a book; Robert, Kathy and Wayne attend.

11:02 Librarian hands out worksheets she wants pupils to do today.

11:03 Wayne has been given the task of handing out sheets for the librarian.

11:05 Pupils commence work on the 18 questions on the sheet. All targets working.

11:08 Work continues on problem sheet. All targets are involved writing their answers.

11:11 Kathy, Robert and Kevin write while Wayne attends to individual assistance given by the librarian.

11:12 Kathy, Robert and Kevin have finished. Wayne writing.

11:13 Pupils who have finished either use the catalogue or browse through books.

11:32 Library activity terminates. Pupils line up.

11:35 Class moves back to classroom.

11:37 On arrival in classroom, teacher says: "Go on with free reading."

11:38 Wayne reads a magazine with pictures. Likewise for Robert who has a copy of "Popular Mechanics." Although Robert's magazine has writing, his pre-occupation is clearly with the coloured photographs. Kevin has a hard covered book on aircraft, but his current concern is with the photographs rather than the written words. Kathy reads a novel entitled "I Know What You Did Last Summer."

11:41 Kathy continues to read. Robert, and Wayne look at pictures in magazines. Kevin looks at aircraft pictures in his book.

11:44 Kathy reads, Wayne looks at pictures as does Robert. Kevin is now reading the written words in his book.

11:46 Wayne has closed his magazine. He looks underneath the desk at something.

11:47 Wayne is turned looking out the back window of the classroom. Kathy reads. Robert looks at pictures and flicks pages, and Kevin has reverted to perusing pictures. Teacher organizes Newsletter for distribution at end of class.

11:49 Wayne has taken out sheets of paper and draws. Kathy reads. Robert looks at pictures. Kevin reads.

11:50 Activity unchanged.

11:52 At the moment there are 7 students reading magazines, 3 students drawing, 1 student doing nothing and the remainder read books.

11:53 Activity of targets is unchanged.

11:56 Wayne looks at David. Kevin talks and shows a picture in his book to the student behind him. Kathy reads. Robert shuffles through magazine.

11:59 Teacher to class: "Clear your desks."

12:00 Teacher hands out Newsletter to be taken home.

12:01 Class dismissed.

1:15 Class lines up for entry to room.

1:18 Class enters.

1:20 Kathy, who is orderly officer, observes class entry and reports to teacher on the row ready first.

1:21 Order still being established.

1:22 Teacher: "Take out social studies notebooks, please." There is a good deal of background noise.

1:23 Teacher: "Tomorrow we shall have a test on social studies. I will give you a map to see if you know land features."

1:24 Teacher: "In preparation for that test we will review your maps of an imaginary island." Targets have books out watching the blackboard while the teacher revises geographic features of: wind direction, mountain range, rivers, lakes, seas and a divide.

1:25 Teacher: "What is the system to which these features all belong?" Student eventually answers: "Water cycle."

1:27 Targets attend to front while teacher draws diagrams on blackboard.

1:28 Wayne turns around and looks at David who shakes sand out of his hair.

1:31 Class as a whole is quiet and attentive.

1:32 Kathy slouches in her seat. The reason becomes obvious. She is tidying out the contents of her desk, yet still partially paying attention.

1:33 Kathy now attending to teacher and blackboard revision.

1:35 Although Wayne sits in a side-on position, he looks to the front and seems to be attending to the teacher.

1:36 Ronnie hands a sheet of paper to David in preparation for a game of "paddocks." David asks Wayne if he wants to play. Wayne shakes his head indicating, no. Teacher question to class: "Why is it important to know the height of the land when building a house?" Robert's answer is not acceptable.

1:37 Teacher re-phrases question: "Why would you not build a house in Canada on high ground exposed to a north wind?"

1:38 A variety of answers, none correct.

1:39 David, Ronnie and Wayne are asked to respond. They have no answers.

1:40 Robert attempts an answer that builds in many assumptions not in the question. Teacher: "That's enough." Student eventually gives correct answer.

1:41 Wayne plays with pen under desk.

1:44 Wayne tears up paper and stuffs into pen top and rams with a wire. Teacher demonstrates on map on blackboard.

1:46 Wayne continues working on his pen. Other targets attentive.

1:48 Wayne still off-task; plays with pen. Robert has hand up with question.

1:49 Robert still has hand up. Teacher ask him what is his problem. Robert proceeds to say where he thinks an airport should be located on the island on the blackboard. Before finishing he bursts out giggling. Doesn't finish answer.

1:50 Wayne looks at a note on a piece of paper that David and Ronnie are discussing. Teacher stops and tells Wayne: "Turn around Wayne. Yes, you."

1:52 Teacher tells David to face the front.

1:53 Teacher to class: "Does everyone understand those terms?"

1:59 Teacher draws an outline map on blackboard and students practice placing features on it, given the wind direction.

2:00 Teacher monitors activity while students work.

2:01 Kathy is asked by teacher to record names of people he calls out so points can be deducted for those people.

2:03 Wayne not working. Kathy started work, but she has a question. Teacher comes to her desk and provides answer. Conversation inaudible. Robert and Kevin work on maps.

2:05 Robert has his hand up with a question. Wayne talks to Ronnie about his pen top.

2:06 Robert still has his hand up. Teacher tells Kathy to deduct points for named students for talking.

2:07 Robert has hand up again. Kathy talks to Ronnie. Wayne plays with pen. Kevin works.

2:08 Kathy asks teacher what name goes at top of map. Teacher replies: "Arithmetic Island."

2:09 While counselling a student at his desk, teacher reprimands another student two desks back without turning to face the offending student.

2:10 Kevin finishes, takes out book and reads. Robert finishes and looks at "Popular Mechanics" magazine. Kathy interacts with Ronnie behind her. Her sheet with names on it changes hands, struggle ensues to get it back.

2:12 Kathy writes down more names at teacher's directions. Wayne plays with piece of wire.

2:14 Wayne still off-task. Has made no attempt at assigned exercises.

2:15 Bell rings for recess. Teacher: "Pack up."

2:18 Kathy tallies up points lost and reads out. Row monitors make note.

2:19 Dismissed.

2:33 Pupils begin entering class after recess.

2:35 Clear up desks ready for Art.

2:36 Waiting for Art teacher to arrive.

2:37 Art teacher arrived: "Get pumkin heads
and we'll go to art-room."

2:39 Pupils leave classroom for art-room.

2:40 Pupils return because of disorderly exit.

2:41 Try exit again. More orderly this time.

2:42 Art in art-room.

3:27 Clean up art activity.

3:30 Dismissed.

APPENDIX H

TARGET PUPIL PERSONAL DATA INTERVIEW SCHEDULE

Interview Schedule

Questions to be asked of the classroom teacher in respect of each target pupil during the post-observation de-briefing.

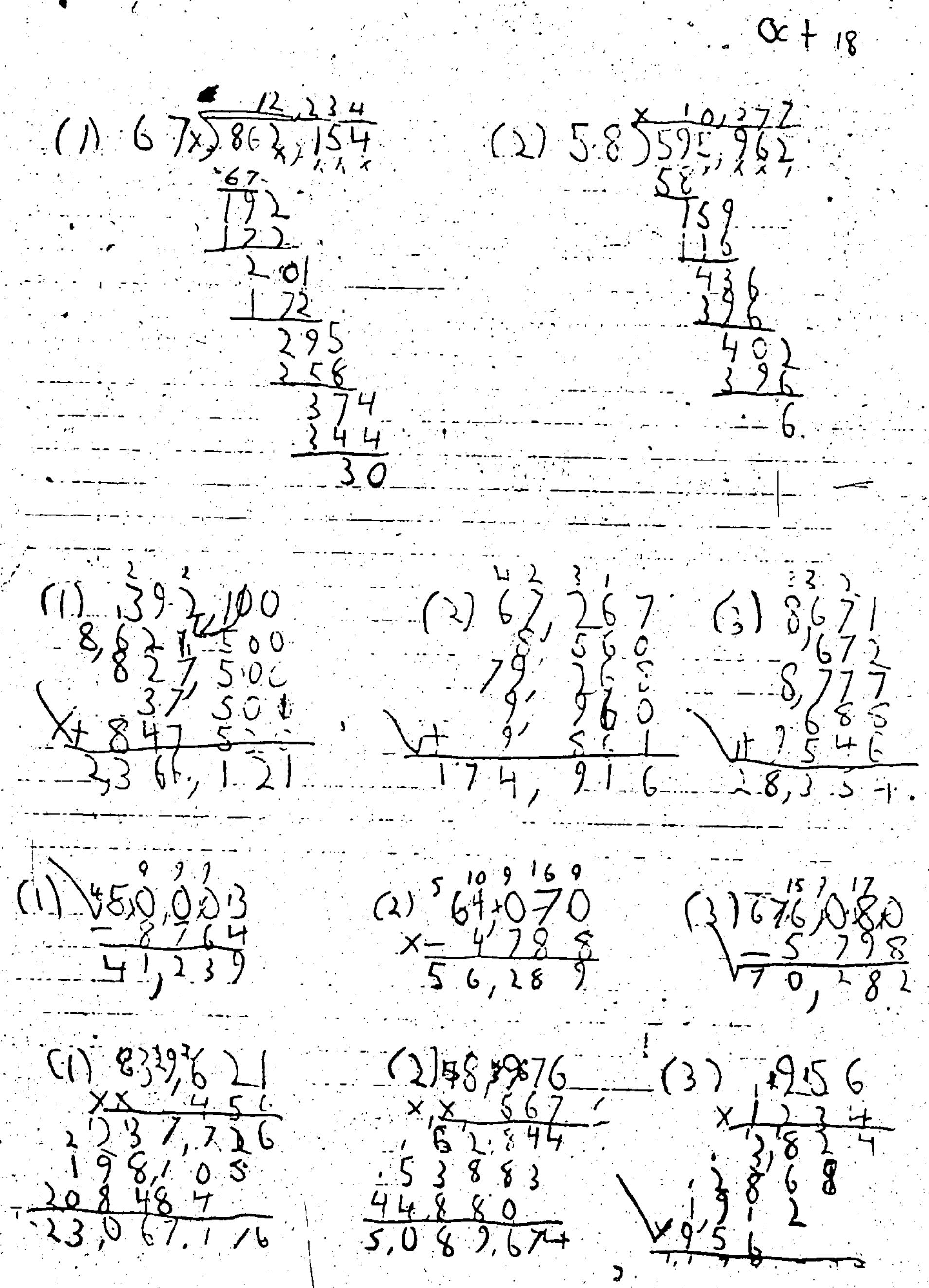
1. What do you know about the family background of (target pupil)? viz. number of siblings etc.
2. Can you indicate the socio-economic status of (target pupil)? viz. father's occupation, whether mother works, etc.
3. How does (target pupil) get along socially with his peers?
4. What information can you provide in respect of (target pupil) performance on reading and mathematics tests?
5. Are there any comments you can make about the classroom work habits of (target pupil) in reading and mathematics?

APPENDIX I

SAMPLED ARTIFACTS OF PUPIL CONTENT COVERED

CONTENT COVERED IN
MATHEMATICS COMPUTATION

Wayne 18.10.78



Oct 18

```
          12,234                      10,272
(1) 67 ) 862,154          (2) 58 ) 595,962
         67                        58
         192                        159
         122                        116
          201                        436
          172                        396
           295                        402
           258                        396
            374                         6
            344
             30

(1)   392,100        (2)  67,267      (3)  8,671
    8,827,500              8,560             672
      827,500             79,265           8,777
       37,501              9,960             685
   + 847,500             + 9,561         + 7,546
    2,366,121            174,916          28,354

(1)  50,003          (2)  64,070      (3)  76,080
    - 8,764            x-  4,788          - 5,798
     41,239               56,289           70,282

(1)  83,976 21       (2)  78,976      (3)    956
    xx    456           x,x  567           x 1234
      237,726             62,844            3,824
      198,105             53883            2,868
     208484              44880            1,912
   23,067,176          5,089,674           956
```

Accompanies Figure 1

Wayne

19.10.78

$53
$53.00
$5300.00

¢0.53
53¢

2

Oct 19

(1)
3.06
43.0
4.095
0.5
495.01
545.665

(2)

(3)

(1)
5 9 10 9
16,040
− 4,056
11,953

(2)
2 10 9
31,075
X − 2,100
28,875

(3)
5 11 9 9
62,000
− 3,987
58,013

(1)
2,953
X × 25
12,765
5,906
71,825

(2)
390
× 39
3510
1170
15,210

(3)
269,501
× 50
X 3,27,5050

(1)
X 16 303
36)562,736
36
202
192
109
108
136
108
28

(2)
87)26,598

Accompanies Figure 2

Wayne 20.10.78

Oct 20

(4) 62)1,045,671 = 1 6,8 65 r 41
62
425
372
536
496
407
372
351
210
41

(2) x 86)521,634 = 6 14 / 50
492
296
~~258~~
383
344
394
344
50

(1)

(2) 62,710
5,027
631,120
6,021
5,734
+ 6,781

(3) 68,915
57,804
46,713
35,622
24,531
+ 13,640

(1) 45,721
− 6,732

(2) 4,400,000
− 72,891

(3) 500,000
255,9[illegible]

(1) 45,621
× 56

(2) 5,276
× 555

(3) 3,672
× 32

Accompanies Figure 3

Wayne 23.10.78

Oct 23.

×(1) 49,621
× 86
297,726
3,977,68
4,277,406

(2) 4673
× 567
4711
4038
3365
381,592

(3) 232,871
× 234
459,584
89,613
791
× 8,969,914

(4) 49)654,721
13,361 32/49
49
164
147
177
147
302
294
81
49
32

(2) 38)69,578

(1) 17,251
27,653
\+ 843

(2)

(3) 4,567
890
12,304
\+ 9,012

(1) 70,800
\- 9,963

(2) 76,543
\- 26,078

(3) 56,216

Accompanies Figure 4

Wayne 24.10.78

Oct 24

```
             91,942
(1) 75)67,890,123
       670
        89
        25
        140
         75
         701
         670
          312
          290
           223
           150
```

```
               98,757
X (2) 90)8,888,850
         810
          788
          720
           688
           637
            515
            450
             650
             637
              13
```

```
(1)  67,001
    - 9,993
     62,008
```

```
3(2) 862,950
    - 73,967
     788,993
```

```
(2)  888,000
    - 99,990
      79,019
```

(1)

Accompanies Figure 5

<u>Kathy</u> 17.10.78

9:20 9 38

October 17

① 49621
× 86
299726
396968
4269406
(7)

② 39871
× 234
159484
119613
79742
9,329814

③ 673
× 567
4711
4038
3365
381,591 ✓

④ 1831 ✓
38) 69571
38
315
304
117
114
38
38
0

⑤ 13361 x
49) 654731
49
164
147
177
147
302
296
61
49
12
(32)

⑥ 4567
890
1234
8765
+ 9012
24468 ✓

⑦ 8901
5432
6789
350
+ 20150
41522 x
(23622)

⑧ 17251
6872
27652
9571
843
61090 x
(62190)

⑨ 56217
- 8978
47239 ✓

⑩ 76543
- 7678
68865 ✓

⑪ 70800
9962
60838 ✓

Accompanies Figure 18

Kathy 18.10.78

9:21 9:42

October 18

① 67)862,154 — 12,867

67
192
134
581
536
455
402
534
464
65 ✓

② 58)595 962 — 10,275

58
159
116
436
406
302
290
12 ✓

③
393 100
[illegible]
82750
37571
+847520
10,726,141 ✓

④
67867
8560
79268
9960
9861
174,916 ✓

⑤
8671
672
8777
688
+9546
28,254 x

⑥
50003
−8764
41,239 ✓

⑦
61070
−4788
55,7[illegible]2 x

⑧
76080
−5798
70,282 ✓

⑨
39621
x 456
234726
198[illegible]
15[illegible]4[illegible]1
18069,176 x

⑩
8976
x 567
62832
54046
448[illegible]0
5,091,292 x
,893

⑪
956
x 1234
3824
2868
1912
956
1,179,704 ✓

Accompanies Figure 19

Kathy

19.10.78

9:18
Octo[illegible] 19

① 3.[illegible]
43.[illegible]
4.[illegible]5
0.5
+495.01
545.[illegible]6[illegible] ✓

② 6.01
0.7[illegible]
[illegible]6.0
66.066
0.96
129.798 ✓

③ 5.62
65.015
8.1
5.825
955.05
1039.610

④ 16010
− 4056
11954 ✓

⑤ 31075
−2100
[illegible]975 ✓

⑥ 62000
−3987
58013 ✓

⑦ 2953
× 25
14765
5906
73[illegible]25 ✓

⑧ 390
× 39
3510
1170
15210 ✓

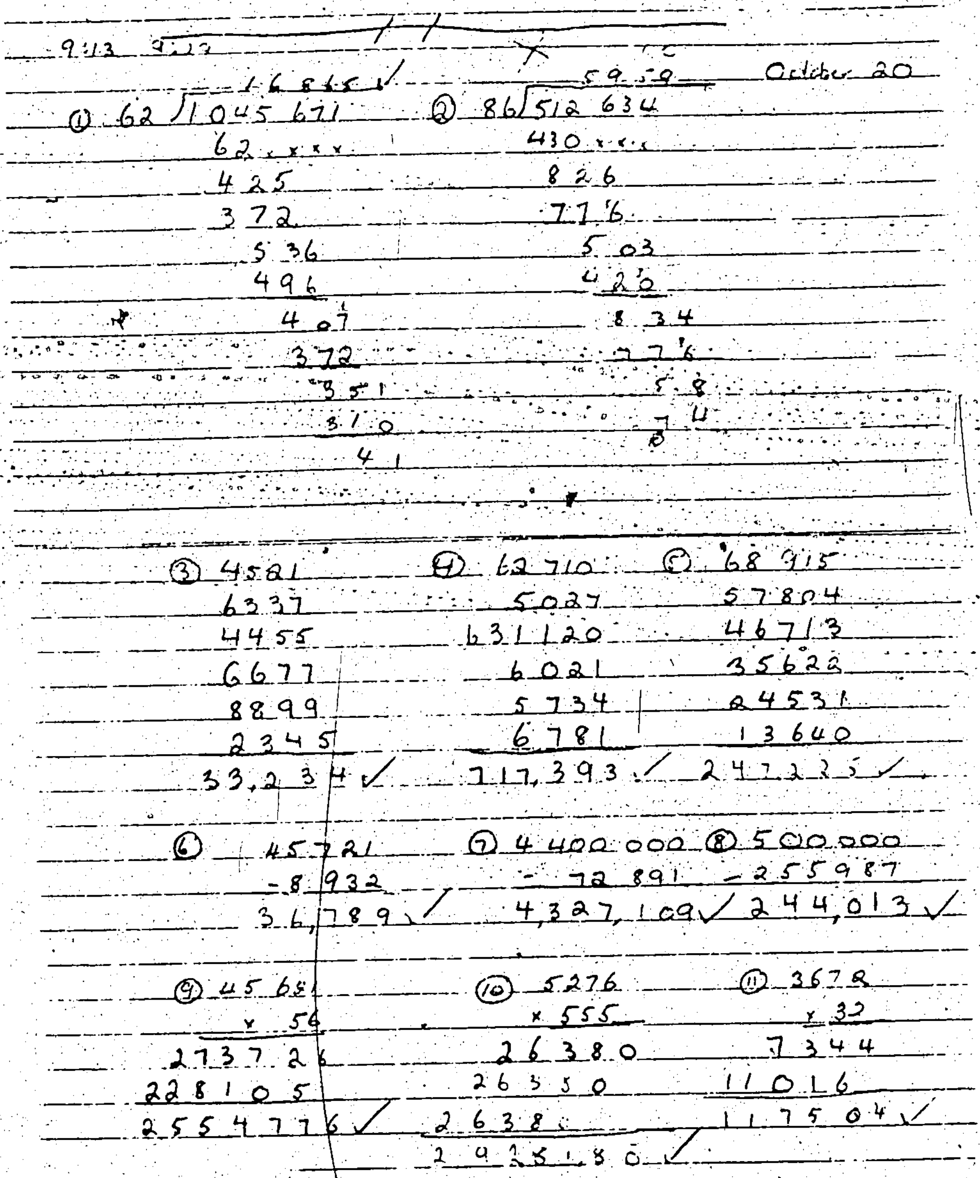
⑨ 69501
× 50
3475050 ✓

⑩ 36)562936
15[illegible]7 ✓
36×
202
180
229
216
133
108
256
252
4

⑪ 87)29598
340 ✓
261××
349
348
18

Accompanies Figure 20

Kathy 20.10.78



```
9:13  9:27
        16 865 ✓                  5959         October 20
① 62)1045 671           ② 86)512 634
      62 x x x                 430 x x x
      425                      826
      372                      776
       536                      503
       496                      430
        407                      834
        372                      776
         351                      58
         310                      74
          41                      

③  4521        ④  62 710       ⑤  68 915
   6337            5027            57 804
   4455          631120            46 713
   6677            6021            35 622
   8899            5734            24 531
   2345            6781            13 640
  33,234 ✓      717,393 ✓        247225 ✓

⑥    45 721    ⑦ 4 400 000      ⑧ 500 000
    - 8 932      -   72 891      - 255 987
     36,789 ✓    4,327,109 ✓      244,013 ✓

⑨   45 681       ⑩   5276         ⑪  3672
      x 56           x 555             x 32
   273726           26380              7344
  228105           26350             11016
  2554776 ✓        2638               117504 ✓
                   2928180 ✓
```

Accompanies Figure 21

Kathy 23.10.78

9.10 October 23

① 49621
× 86
297726
3969680
4267406 ✓

③ 673
×517
4351
4038
336
38120

③ 39871
234
159484
119613
79742
9329814 ✓

② 49)654721 13361 ✓
49
164
147
177
147
302
294
81
49
32 ✓

⑥ [illegible])6952
315
204
112
114
38
38
0

⑦ 17251
6872
27653
9571
843
62180 ×

⑧ 8901
5432
6789
350
+2150
24468 ✓

⑨ 4567
890
1234
8765
9018
[illegible] ✓

⑩ 70800
9962
60838

⑪ 76543
−76078 ×
465

⑫ 56217
−8978
47239 ✓

Accompanies Figure 22

Kathy

24.10.78

① 905 201 ✓
75 ⟌ 67 890 1[illegible]
675
390
375
151
150
123
75
48

② 98 762 ✗
90 ⟌ 8 888 8[illegible]
810
788
720
688
630
585
560
250
180
70

③ 72 001
− 9 293
62 00[illegible] ✓

④ 862 950
− 78 967
788,9[illegible]3 ✓

⑤ 890 009
− 99 990
79[illegible]019 ✓

⑥ 36,295
8,279
223
3,283
3,213
51,293 ✓

⑦ 569.01
87.05
689.75
39.15
51.39
1436.35 ✓

⑧ 69 513
7654
89,012
543
6789
173511 ✓

⑨ 39876
× 86
241266
319005
3,431,346 ✗

⑩ 567890
× 306
340734[illegible]
17037[illegible]
20444[illegible] ✓

⑪ 754320
× 40
30172800 ✓

9 C

Accompanies Figure 23

Robert 17.10.78

9:20:25
:15:00

9:35:25

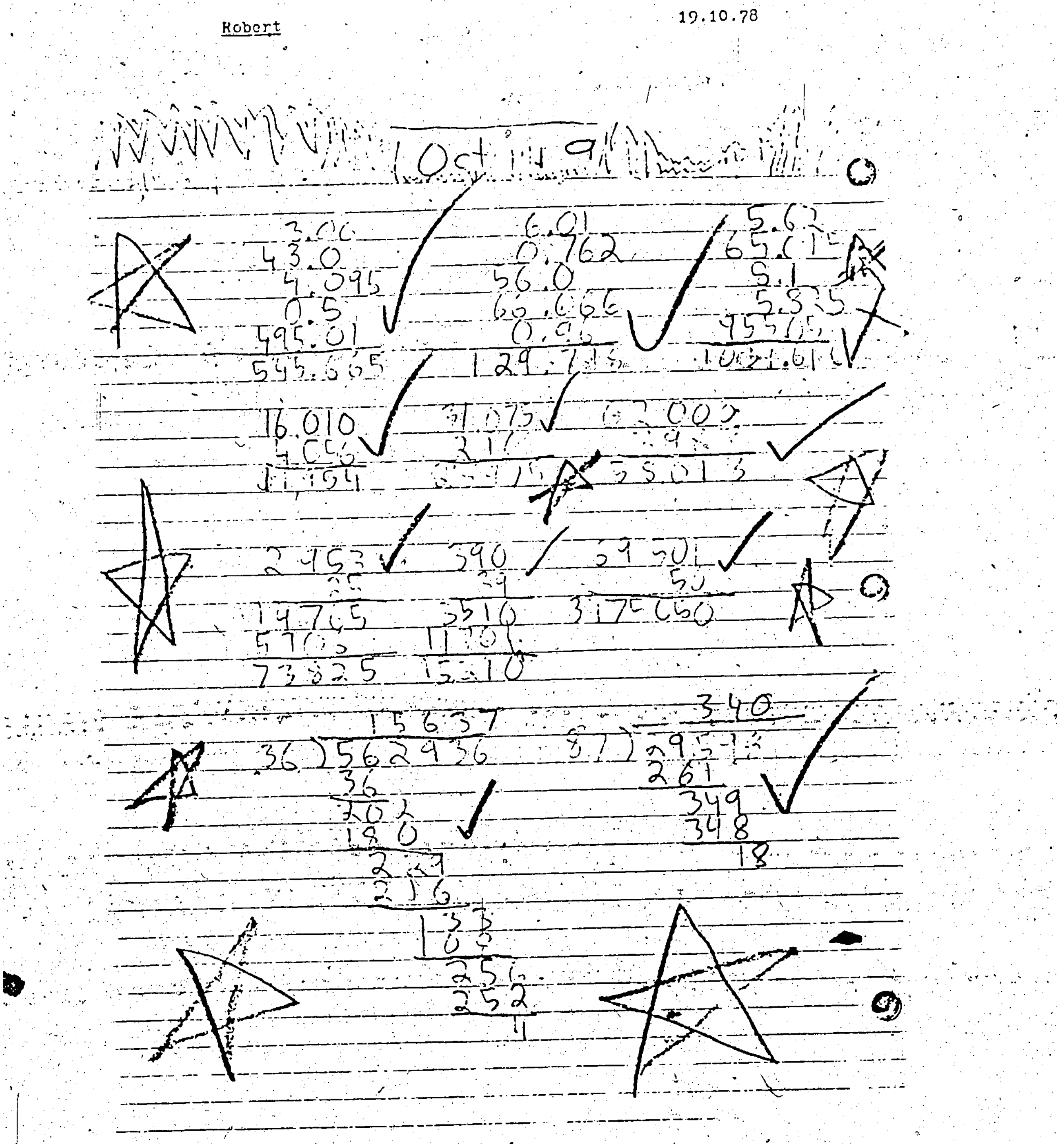
49621	39871	673
×86	1234	1567
297726 ✗	159484	4711
3996968	119613 ✓	4038 ✗
40267406	79742 ✓	3365
(4,267,406)	9,329,814	3410091
		(381,511)

1831	13361
38)69578 ✓	49)654721 ✓
38	49
315	164
304	147
117	177
114	147
38	302
38	206
0	[illegible]
	[illegible]
	32

4567 ✓	8901	17251
890	5432 ✓	6372 ✓
1234	6789	27653
8765	350	0571
+9012	2150	[illegible]
24458	23662 ✓	62190 ✓

~~[illegible]~~	56217 ✓	76543	70800 ✓
	−8978	7678	1962
	47239	68865	60538

Accompanies Figure 38



Robert 19.10.78

lost in 9

3.00
43.0
4.095
0.5
595.01
545.665 ✓

6.01
0.762
56.0
66.666
0.96
129.7[illegible] ✓

5.62
65.615
5.1
5.835
955.05
1021.610 ✓

16.010
4.856
11.154 ✓

41.075
3.17
[illegible] ✓

62.003
[illegible]
55.013 ✓

2953 ✓
25
14765
5906
73825

390 ✓
39
3510
1170
15210

5950 ✓
50
317560

15637
36)562936
36
202
180
229
216
133
108
256
252
4 ✓

340
87)29598
261
349
348
18 ✓

Accompanies Figure 39

Robert

20.10.78

9:27 30
9:12 50
0:14:50

if all correct
fill this square
with blue .... ■

16865
62) 1045671
62
425
372 ✓
536
496
407
372
351
310
41

5 960
86) 512 634
430
826
774
523
516
74 ✓

2345
4521
6337 ✓
4455
6677
8899
33234

62 710
5027 ✓
631120
6021
5734
6781
717393

68 975
57 804
46 713 ✓
35 622
24 531
13 640
247225

45 721 ✓
8 932
36 789

4,400 000
72 891 ✓
4,327,109

500 000 ✓
255 987
244 013

45621
56
273726 ✓
228105
2554776

5276
555
26350 ✓
26380
26380
2,928,180

3672 ✓
x32
7344
11016
117,504

Accompanies Figure 40

Robert

23.10.78

49621 ✓
×86
297726
396970
426[illegible]906

673
×567
4711 ✓
4038
3365
38,541

39871
234
159484 ✓
119613
79742
9,329,514

13361
49) 654721
49
164 ✓
147
177
147
302
294
81
49
32

1831
38) 69578
38
315 ✓
304
117
114
38
38
0

17,251
6872
27655
9571 ✓
842
62190

9901
5432
6739 ×
350
2150
23572

4567
220
1234
8765 ✓
9012
24468

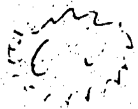
70800 ×
9962
61832

76543 ✓
7678
68865

56217
[illegible]
47254

Accompanies Figure 41

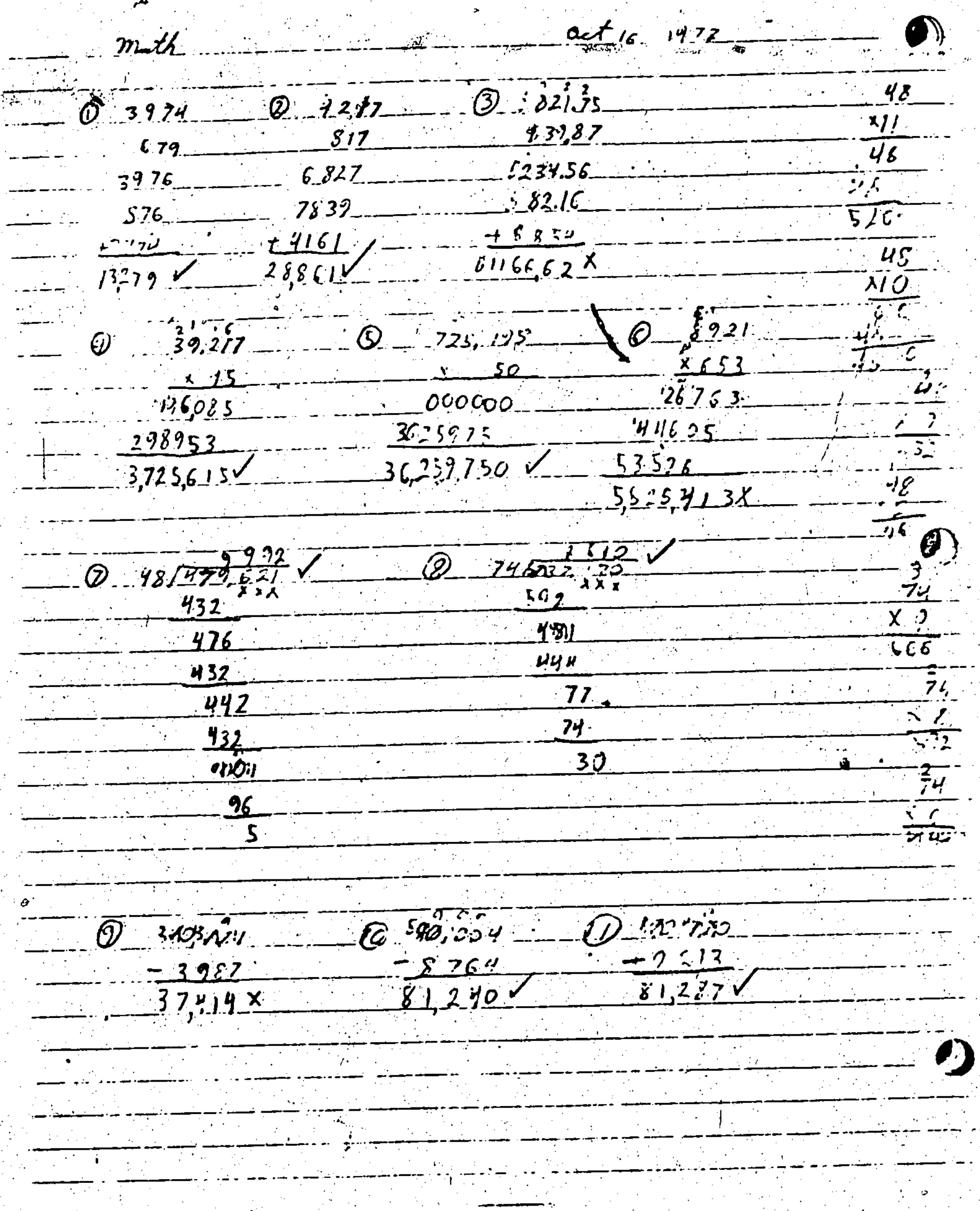
Robert 24.10.78



```
      905 334                 98 765
75)67,890,123          90)8,888,850
   675                    810
    390     X              788
    375                    720
     251                    688
     225                    630
      262                    585
      225                    540
       373                    450
       300                    450
        73                      0

  72001          862952           890002
   9993           73967            99990
  62008          788985           790011

 36295          569.01          6951.3
  8279           87.05           7654
   223          689.75          89012
  3283           39.15            543
  3213           51.39           6789
 51293         1436.35          1735[illegible]1

  39876 X        767890 X        754320
    286           X306             X 40
 239256         4587340         3017284
3199882        23036700
32227936       246240340
3 4 3 9 2 3 6  1 7 3 7 2 4 3 4 0
```

Accompanies Figure 42

Kevin 16.10.78



math oct 16 1478

① 3974
679
3976
576
+ [illegible]
13,279 ✓

② 7,287
817
6,827
7839
+ 4161
28,861 ✓

③ 821.35
439.87
5234.56
82.16
+ 6850
61166.62 X

48
×11
46
526

45
×10

④ 39,217
× 15
196,085
298953
3,725,615 ✓

⑤ 725,195
× 50
000000
3625975
36,259,750 ✓

⑥ 8921
× 653
26763
44605
53526
5,525,413 X

⑦ 48)479,621 9992 ✓
432
476
432
442
432
0101
96
5

⑧ 74)[illegible] 1512 ✓
502
481
444
77
74
30

3
74
× 9
666

⑨ [illegible]
− 3987
37,414 X

⑩ 590,004
− 8764
81,240 ✓

⑪ [illegible]
− [illegible]
81,277 ✓

Accompanies Figure 54

Kevin 17.10.78

9 ✓ 920

Math oct 17 1978

① 49,621
× 56
297726
39696
4264406 X
4,187,466 ✓

② 39,871
× 234
159484
120613
79742
9,329,814 ✓

③ 673
× 567
4711
4038
3365
381,591 ✓

④ 38)69,572 1831 ✓
38
315
304
117
114
38
38
0

⑤ 49)654,721 1334 X
49
164
147
177
147
302
196
106
13,361 32/49

38
× 2
76

38
× 9
342

38
× 4
342

38
× 5
304

38
× 3
114

49
× 2
196

49
× 3
147

49
× 4

⑥ 4567
890
1234
8765
+ 9012
24,466 ✓

⑦ 8901
5432
6739
350
+ 2150
23,622 ✓

⑧ 17,251
6872
27,653
9571
+ 843
62,190 ✓

⑨ 56,217
− 8978
47,239 ✓

76,643
− 7678
68,965 ✓

70,800
− 9962
60,838 ✓

Accompanies Figure 55.

Kevin

18.10.78

Math

Oct 18 1978

① 67) 862,154 = 12,867 ✓

67

192

134

581

536

455

402

534

469

65

② 56) 505,762 = 12 ~~76~~ X

56

159

116

436

406

2802

270

12

127.5

× 58

00

12

67 × 3 = 201

67 × 2 = 134

67 × 9 = 603

67 × 8 = 536

67 × 6 = 402

56 × 2 = 116

58 × 3 = 174

58 × 8 = 264

③ 392,100

8,621,500

827,500

32,571

+847,520

10,726,191 ✓

④ 67,367

8,560

79,268

9,960

+9561

174,916 ✓

⑤ 8671

672

8777

688

+9526

28,354 ✓

⑥ 50,003

−8,764

41,239 ✓

⑦ 61,011

−4,729

56,282 ✓

⑧ 76,080

−5798

70,282 ✓

⑨ 32,621

× 456

195,726

163,105

130,484

18,067,176 ✓

⑩ 8976

× 567

62832

53856

44880

5,089,392 ✓

⑪ 956

× 1234

3824

2868

1912

956

1,182,704 X

Accompanies Figure 56

Kevin 19.10.78

Math Oct 19 1978

① 3.06
42.0
4.095
0.5
+ 495.01
545.665 ✓

② 6.01
0.762
56.0
66.066
+ 0.96
129.748 ✓

③ 5.62
65.015
8.1
5.825
+ 955.[illegible]
1039.610 ✓

④ 16,010
- 4056
11,954 ✓

⑤ 31,075
- 2 100
28,975 ✓

⑥ [illegible]
- 3,3[illegible]
58,013 ✓

⑦ 2953
x 25
14765
5906
73,825 ✓

⑧ 390
x 39
000
1170
11,700 X

⑨ 69,501
x 50
00000
347505
3,475,050 ✓

⑩ 36)56[illegible] 15,641 X
36
202
180
229
216
13
144
89
36
53

⑪ 87)29,598 340 ✓
261
349
348
18

36 x 2 = 72
36 x 5 = 216
36 x 5 = 180
36 x 7 = 252
36 x 3 = 108
36 x 4 = 144
87 x 3 = 261
87 x 4 = 348

Accompanies Figure 57

Kevin 20.10.78

.9✓

Math oct 20 1978

① 62)1,450,676 23,397 X
124
1240
186
12416
186
56017
558
43911
460
22

② 86)312,534 52
340
172
172
0

③ 512,634 X 55
430
430
0

③ 4521
6337
4455
6677
8899
+2343
33234 ✓

④ 62,710
5027
631,120
6021
5734
+6781
717,393 ✓

⑤ 68,915
57,804
46,713
35,622
24,531
+13,6[illegible]
247,225 ✓

⑥ 3488721
− 8932
36,789 ✓

⑦ 4,3[illegible]
− 722[illegible]1
4,327,109 ✓

⑧ [illegible]
−255,[illegible]
2,44,01[illegible] ✓

⑨ 45,621
56
273726
228105
2554,776 ✓

⑩ 5276
× 555
26380
26380
26380
2927,180 ✓

⑪ 3672
× 32
7344
11016
117,504 ✓

62
× 2
124

62
× 3
186

62
× 4
248

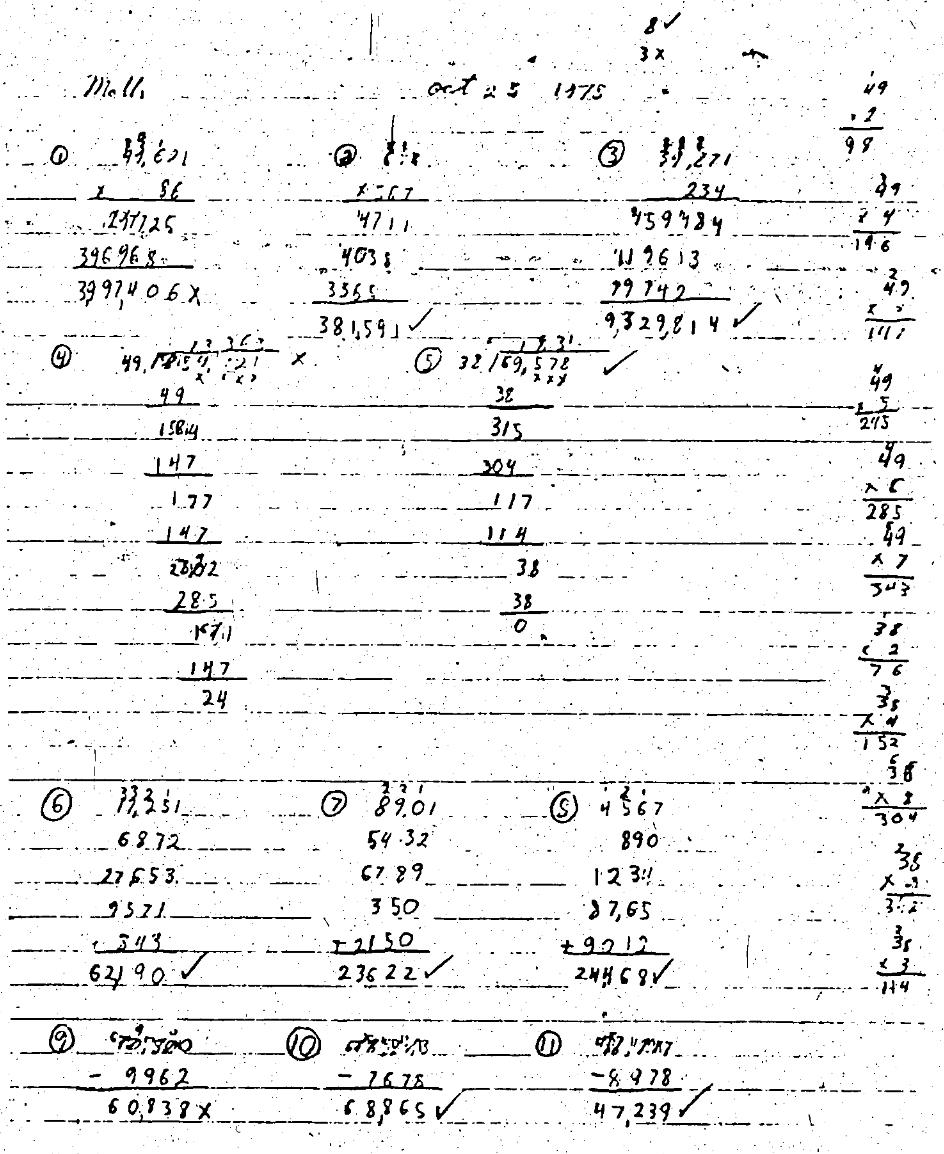
62
× 8
496

86
× 5
430

86
× 2
172

Accompanies Figure 58

Kevin 23.10.78



8 ✓
3 X

Math oct 25 1975

① 47,621
× 86
287125
396968
3997406 X

② [illegible]
× 567
4711
4038
3365
381,591 ✓

③ 39,271
234
459784
119613
79742
9,329,814 ✓

④ 49)158,421 X
49
158
147
177
147
282
285
171
147
24

⑤ 32)159,578 ✓
32
315
304
117
114
38
38
0

49 × 2 = 98
49 × 4 = 196
49 × 3 = 147
49 × 5 = 245
49 × 6 = 285
49 × 7 = 343
38 × 2 = 76
38 × 4 = 152
38 × 8 = 304
38 × 9 = 342
38 × 3 = 114

⑥ 11,251
6872
27653
9571
+ 543
62190 ✓

⑦ 8901
54.32
6789
350
+ 2150
23622 ✓

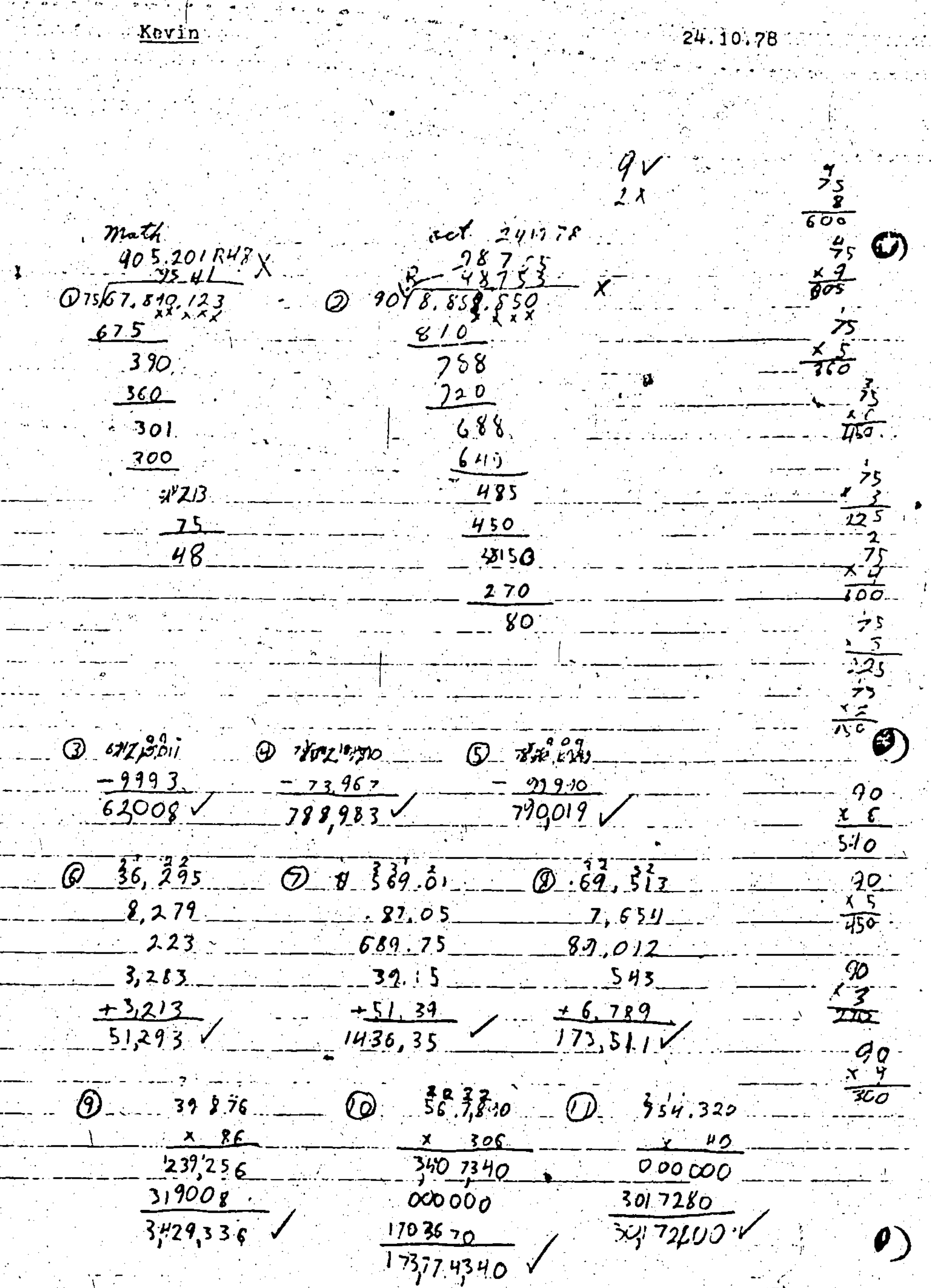
⑧ 4567
890
1234
8765
+ 9012
24468 ✓

⑨ [illegible]
− 9962
60,838 X

⑩ [illegible]
− 7678
68,865 ✓

⑪ [illegible]
− 8978
47,239 ✓

Accompanies Figure 59



Kevin

24.10.78

9 ✓
2 X

Math

act 24.10.78

① 75)67,810,123 = 405,201 R48 X

675
390
360
301
300
213
75
48

② 90)8,858,850 = 98,755 X

810
788
720
688
640
485
450
450
270
80

③ 72,001
− 9993
62008 ✓

④ 862,950
− 73,967
788,983 ✓

⑤ 800,029
− 9910
790,019 ✓

⑥ 36,295
8,279
223
3,283
+ 3,213
51,293 ✓

⑦ 569.01
87.05
689.75
39.15
+ 51.39
1436,35 ✓

⑧ 69,513
7,659
89,012
543
+ 6,789
173,511 ✓

⑨ 39 876
× 86
239,256
319008
3,429,336 ✓

⑩ 56,7840
× 306
340 7340
000000
1703670
17377,4340 ✓

⑪ 754.320
× 40
000000
3017280
30172800 ✓

75 × 8 = 600
75 × 9 = 805
75 × 5 = 360
75 × 6 = 450
75 × 3 = 225
75 × 4 = 300
75 × 3 = 225
75 × 2 = 150

90 × 6 = 540
90 × 5 = 450
90 × 3 = 270
90 × 4 = 360

Accompanies Figure 60

CONTENT COVERED IN READING AND READING RELATED ACTIVITIES

Wayne

Dictated Spelling

20.10.78

clever
jealous
immediately
usually
erect
excellent
kindly

finally
certainly
generally
aerial
truly
stumble
densely

double
luncheon
trial
dictionary
circle
settlement
archipelago

delta
strait
straight

Oct 2

clover
Jealis
omeditle
oshit
erelt
es
Kindly
finly
srettle
generile
aldle
truly ✓
stumble ✓
densely ✓
double
luncheon ✓
trial ✓
dictionary ✓

clever
jealous

circurot
saltlement
goerly
Aicty
deto
storit
stoirth

Accompanies Figure 8

Wayne Dictated Spelling 23.10.78

×	pictou	picture
×	champon	championship
×	signle	signal
×	leag	league
×	steale	steal
×	board	board
×	stral	strikes
×	stoed	stole
×	meager	major
×	pralic	practise
×	wrc	risk
×	racked	rocked
×	iponond	incident
×	lost	lose
×	pralkcess	practices

Accompanies Figure 9

24.10.78

Oct 24

×	isadeaded	incident
✓	racket ~~Kag~~	racket racquet
✓	risk	risk
×	meger	major
×	sodle	stole
✓	strickes	strikes
×	leagle	league
×	sengl	signal
×	inmle	immediately
×	ksreme	extremely
✓	fingly	finally
×	jealy	jealous
×	usully	usually
×	luchean	luncheon
×	georchy	grocery
×	arl	aerial
✓	dictionary	dictionary
×	inristing	interesting
×	sondwitch	sandwiches
×	pictor	pitcher

Accompanies Figure 10

Wayne **Written Language Exercise** 17.10.78

[illegible]

dense	densly
true	truly
main	mainly
generally	generially
extrem	extremly
sincere	sincerily
certain	certainly
final	finally
kind	kindly
usual	usually
immediate	immediatly
jealous	jealousy
excellent	excellently
faithful	faithfully
clever	cleverly
exact	exactly

Accompanies Figure 11

Wayne

Dictated Spelling

16.10.78

X bansler truly ~~truly~~ densely
X tolly generally
X only
X X stream extremely
X sui sincerely
X crutomly certainly
X finlyree
X cinylee
X usuly
X omly
X mon
X Julis
X X aly
X fafully
X cliver
X dictey erect

densely
truly
generally
extremely
sincerely
certainly
finally
kindly
usually

immediately
main
jealous
excellent
faithful
clever
erect

Accompanies Figure 7

Written Skill Exercise

18.10.78

1. The forest is dinsly.
2. He was a truly little boy.
3. He was mainly nice.
4. He is a generally sweet boy.
5. His extremely carefully.
6
7
8
9
10

Accompanies Figure 12

Wayne   Written Language Activity   19.10.78

the Fabulous Ditch

Clambered
bustling
Colonel By
Bytown
thriving
ark
Sappar
lock
magnificent
cascade
swirling
spume
choppey
scarcely
canal
Ridlau
floes
battering
indicated
relluctance
crumple
barrows
descende
strode
tremed
superstructure
half-crown
whittled
treacherous

Chaudiere
impulsively
epidemic
Harassed
truce - demolished
toque subsided

Accompanies Figure 13

Kathy **Written Language Skill Exercise** 18.10.78

You could barly see him for the [illegible] fog.
She did truly love him.
He generally went to the store every day.
She got extremely mad when he spilt his milk.
He was certianly not! moving to Texes.
Susie finally got the present she wanted.
The nurse told Meg "Kindly have a seat".
He usually didn't get home till 9:00.
Carole's mother told her to call immediatly to
call, when she got to her friends' house
Mainly she stayed home at night.
Her [illegible] led her to fighting.
She was excellent in math.
He faithfully practiced her piano every day.
She sat erectly in her desk.

Accompanies Figure 30

Creative Writing 24.10.78

~~The Ship that fought the Atlantic~~
~~deceased merits schooner preceded tamarack distinguished~~
~~merits~~

THE SHIP THAT FOUGHT THE ATLANTIC
deceased merits schooner preceded tamarack distinguished
berth [illegible] monarch unforseeable epidemic swelled
foremost [illegible]

The Ship That Fought the Atlantic

Captain McDougall and the owners of the Royal William
decided to try ~~to cross~~ the Atlantic. ~~with it.~~ They were
also only going to use cole. They ~~only~~ came across ONLY one
bad storm that caused some damage. ~~but~~ On September [illegible],
nineteen days after they left port, the arived safely at Isle
of Wight. They had made it!

arrived
coal
safely

Accompanies Figure 36

Kathy **Written Language Activity** 19.10.78

THE FABULOUS DITCH

clambered
bristling
~~Coral~~ Colonel By
By town
chopper
Rideau
indicated
furrows
tremor
whittled
epidemic
treacherous

thriving
arc
Sappers
lock
scarcely
flees
reluctance
crescendo
superstruction
Chaudiere
assured

magnificent
cascade
swirling
spume
canal
latter
crumple
strode
half crown
impulsively
twice - [illegible]
toque [illegible]

Accompanies Figure 32

Robert **Dictated Spelling** 16.10.78

densely ✓

truly ✓

generally ✓

extremly ×

Sincerly ✓

certenly ×

finbally ✓

kinbly ✓

usually ✓

immediatly

main

jealous ✓

ecilant ×

faithful ✓

lever ✓

erect ✓

C

Accompanies Figure 44

Robert **Written Language Exercise** 17.10.78

dense	densly
true	toruly
general	generally
extreem	extreemly
sincere	sinceerly
certain c	certainly
final	finally
kind	kindly
usual	usully
immediate	immediatly
main	mainly
~~be~~ jealous	jealously
excelent	excilently
faithful	faithfully
clever	cleverly
erect	erectly

Accompanies Figure 45

Robert Written Language Activity 19.10.78

THE FABULES DICH is a [illegible] lousy story

climbered thriving
[illegible] brattling arc ~~[illegible]~~
colonal By Sapper
Bytown magnifice ~~[illegible]~~
chopper scarcely

clambered
bristling
Colonal By
Bytown
thriving
arc
Sapper
lock
mggnificent
cascade
swirling
spume
chopper
canal
Rideua
floes
battering
indicated
reluctance
crumple

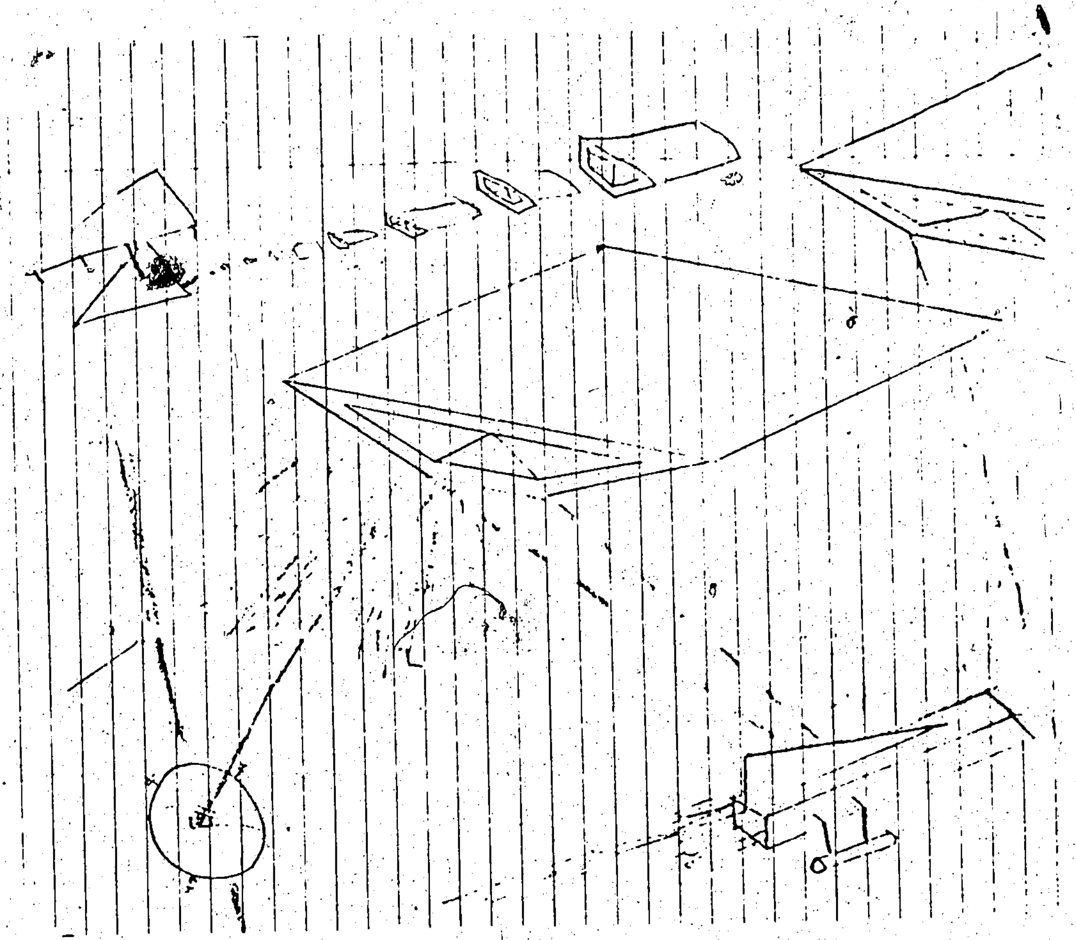
barrous
crescendo
strode
tremor
superstructure
haif crown
whittled
treacherous
Chaudiore
impulsively
epedemic
reassured
twice-demolished
toque
subsided

Accompanies Figure 46

Robert

Dictated Spelling and Written Exercise

20.10.78



Accompanies Figure 47

Robert **Dictated Spelling** 23.10.78

pitcher ✓
chapionship ✓
signal ✓
liauge ✓
steal ✓
board ?
strikes ✓
stole ✓
major ✓
practias ✗
risk ✓
Rackit ✓
Incident ✓
lose ✓
practicis ✓

practise
practise
practise
practise
practise
practise

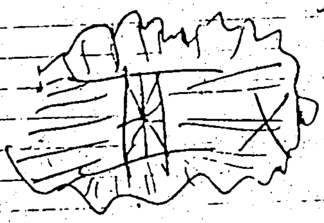
Accompanies Figure 48

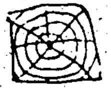
24.10.78

Robert

Dictated Spelling

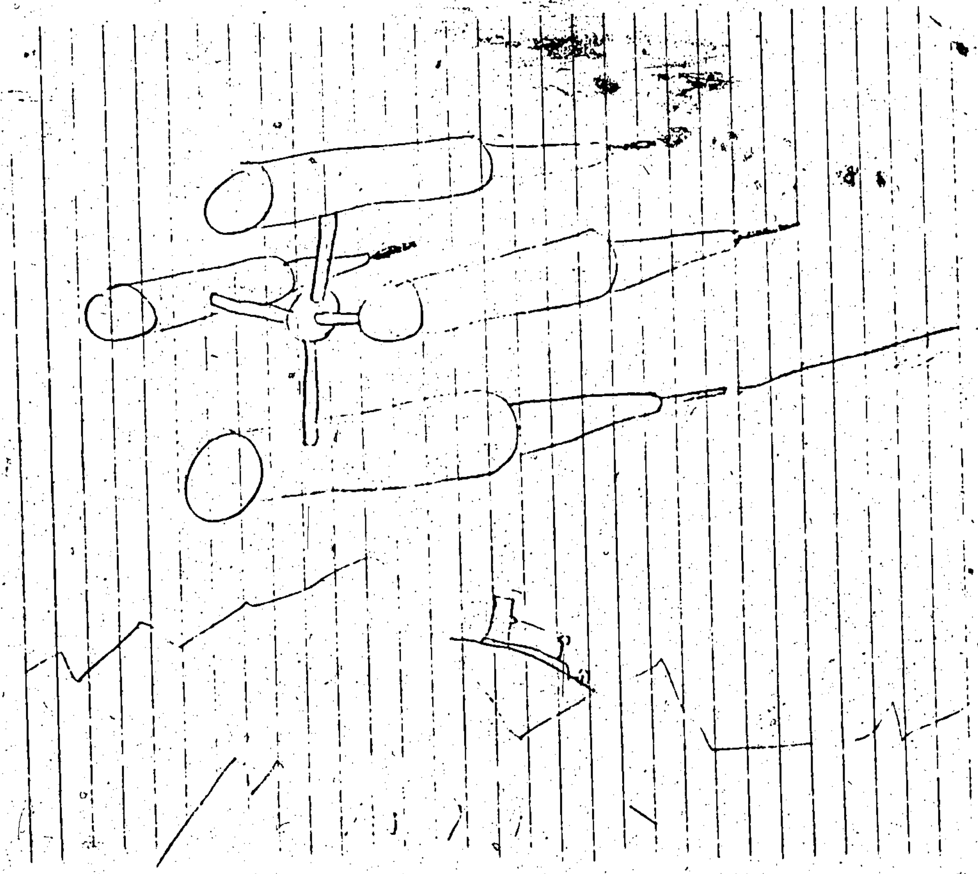
incident ✓✓✓✓✓✓✓✓✓✓✓✓✓✓✓
~~[illegible]~~ racket raquet ✓
ruiti ✓
major ✓
stoli ✓
strikes ✓
liaggi ✓
signal ✓
~~[illegible]~~ imidiatly ✓
extreamly ✓
finaly × finally
jealous ✓
visually ✓
luncheon ✓
grocery ✓
aerial ✓
dictionary ✓✓✓✓✓✓✓✓✓✓✓
sondirisling ✓✓✓✓✓✓✓✓✓✓✓✓
sandwitches ×
pitcher ✓✓✓✓✓✓✓✓





Accompanies Figure 49

Robert **Language Arts and Free Reading** 20.10.78



Accompanies Figure 50

Robert **Creative Writing Exercise** 20.10.78

~~THE SHIP THAT FOUGHT THE ATLANTIC~~

THE SHIP THAT FOUGHT THE ATLANTIC

Writing needs improvement

The Royal William ~~took off~~ sailing in 1833 with
GREAT
324 tonnes of coal from Quebec, heading for
Great Britain. But a disease struck that
killed and (injured) several people in Quebec and
Montreal. If the ship made it it would be a
miracle with such a heavy load and low-quility.
But the ship made it after 19 days and
sold the motor and the ship that used it
sunk.

not good sentence

THE LADY ON THE COW CATCHER

There was a lady ~~that~~ was
going to the pacific ocean by tra.
with her husbend the pirime minister
of Canada. She came from Montr.
When she got to the rocky
mountains, she insisted that she ride on
the cowcatcher. every body said
she was dumb.

Accompanies Figure 51

Kevin **Creative Writing Exercise** 20.10.78

① They will clean out the harbor with a dredge.

The Ship That Fought the Atlantic

Landmark's

The story was about the first seamship that crossed the atlantic Ocean the ship was called The Royal William. The engine was covered with sea salt from the water. On one voyage the crew got calera a deadly disease but the crew survined.

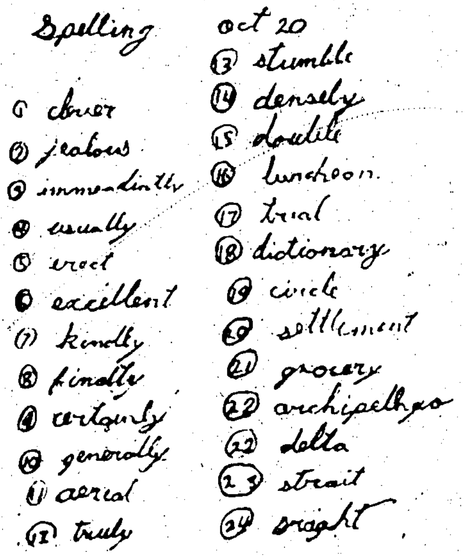
A few months later the ship sank in the Mediterranean sea.

Accompanies Figure 65

Kevin

Dictated Spelling

20.10.78

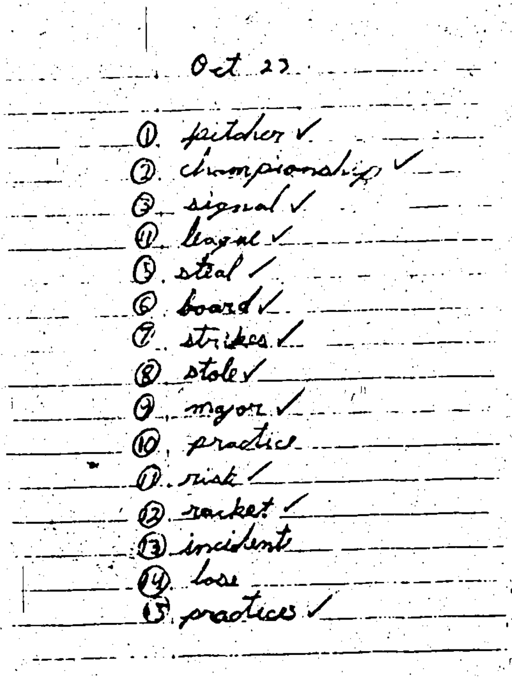


Spelling oct 20

① cluer
② jealous
③ immendintly
④ usually
⑤ erect
⑥ excillent
⑦ kindlly
⑧ finalle
⑨ certanly
⑩ generolly
⑪ aerial
⑫ truly
⑬ stumble
⑭ densely
⑮ double
⑯ luncheon.
⑰ trial
⑱ dictionsry
⑲ circle
⑳ settlement
㉑ grocery
㉒ archipelhgo
㉒ delta
㉓ strait
㉔ sraght

Accompanies Figure 65

23.10.78



Oct 23

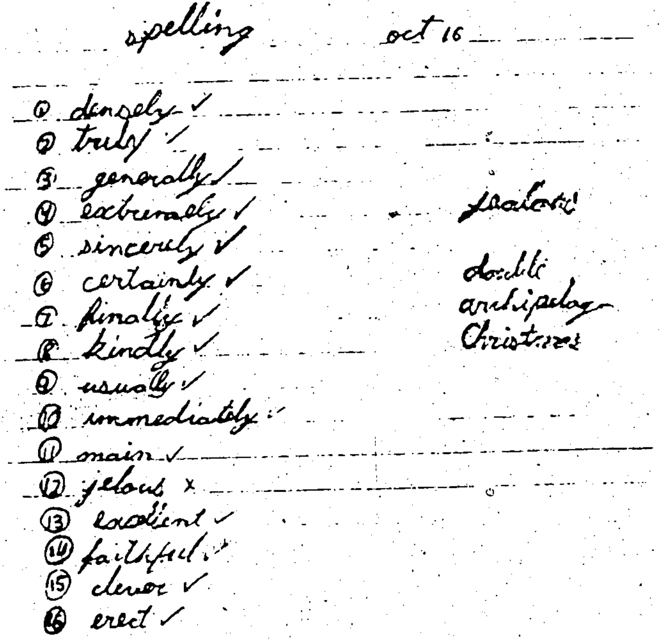
①. pitcher ✓
②. championship ✓
③. signal ✓
④. league ✓
⑤. steal ✓
⑥. board ✓
⑦. strikes ✓
⑧. stole ✓
⑨. mgor ✓
⑩. practice
⑪. risk ✓
⑫. racket ✓
⑬. incidente
⑭. lose
⑮. practices ✓

Accompanies Figure 66

Kevin

Dictated Spelling

16.10.78



spelling oct 16

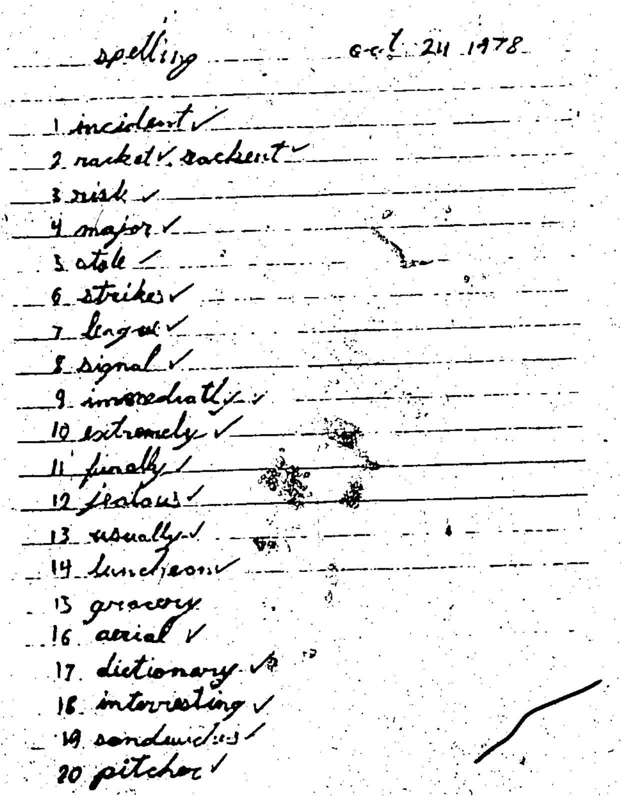
① densely ✓
② truly ✓
③ generally ✓
④ extremely ✓
⑤ sincerely ✓
⑥ certainly ✓
⑦ finally ✓
⑧ kindly ✓
⑨ usually ✓
⑩ immediately ✓
⑪ main ✓
⑫ jelous ×
⑬ excellent ✓
⑭ faithful ✓
⑮ clever ✓
⑯ erect ✓

jealous

double
archipelago
Christmas

Accompanies Figure 62

24.10.78

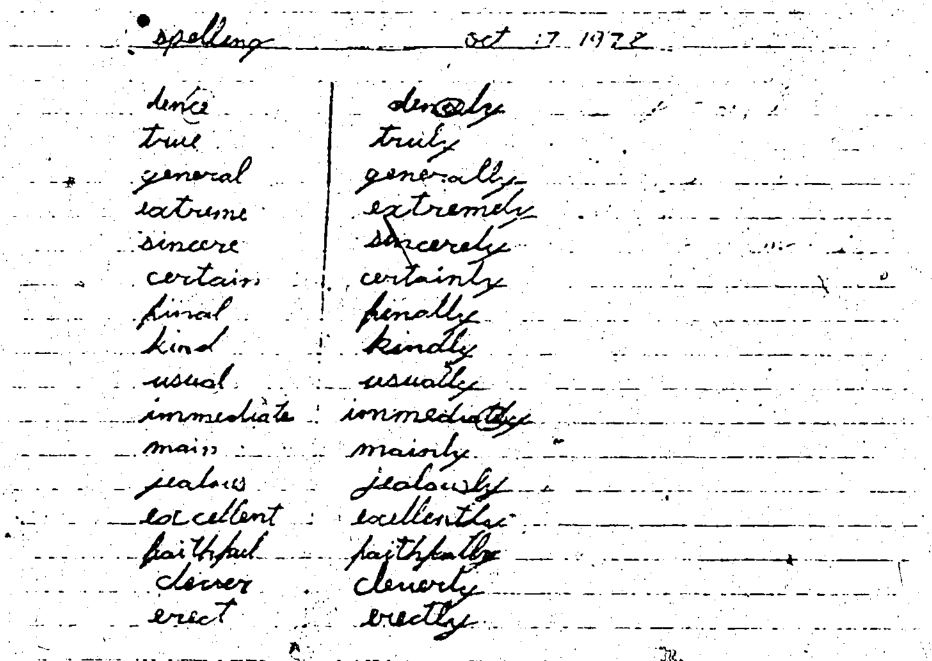


spelling oct 24 1978

1 incident ✓
2 racket ✓, racket ✓
3 risk ✓
4 major ✓
5 stole ✓
6 strikes ✓
7 league ✓
8 signal ✓
9 immediately ✓
10 extremely ✓
11 finally ✓
12 jealous ✓
13 usually ✓
14 luncheon ✓
15 grocery
16 aerial ✓
17 dictionary ✓
18 interesting ✓
19 sandwiches ✓
20 pitcher ✓

Accompanies Figure 67

Kevin **Written Language Exercise** 17.10.78

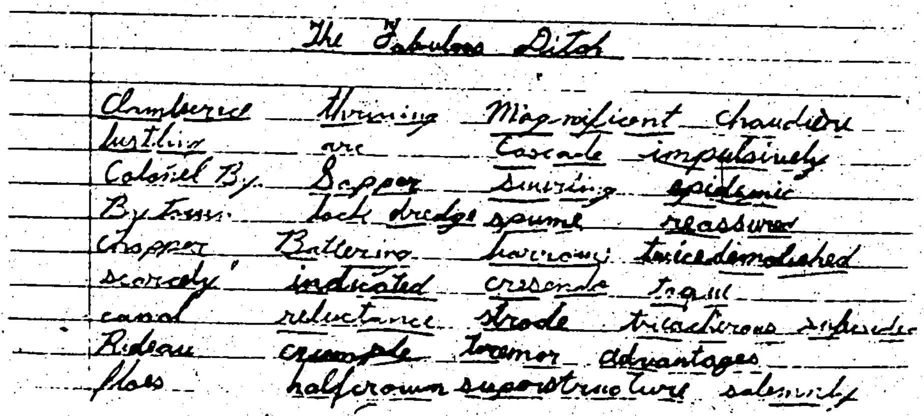


spelling oct 17 1978

dence	dencly
true	truly
general	generally
eatreme	extremely
sincere	sincerely
certain	certainly
final	finally
kind	kindly
usual	usually
immediate	inmediatly
main	mainly
jealous	jealously
excellent	excellently
faithful	faithfully
clever	cleverly
erect	erectly

Accompanies Figure 68

Kevin **Written Language Arts Activity** 19.10.78

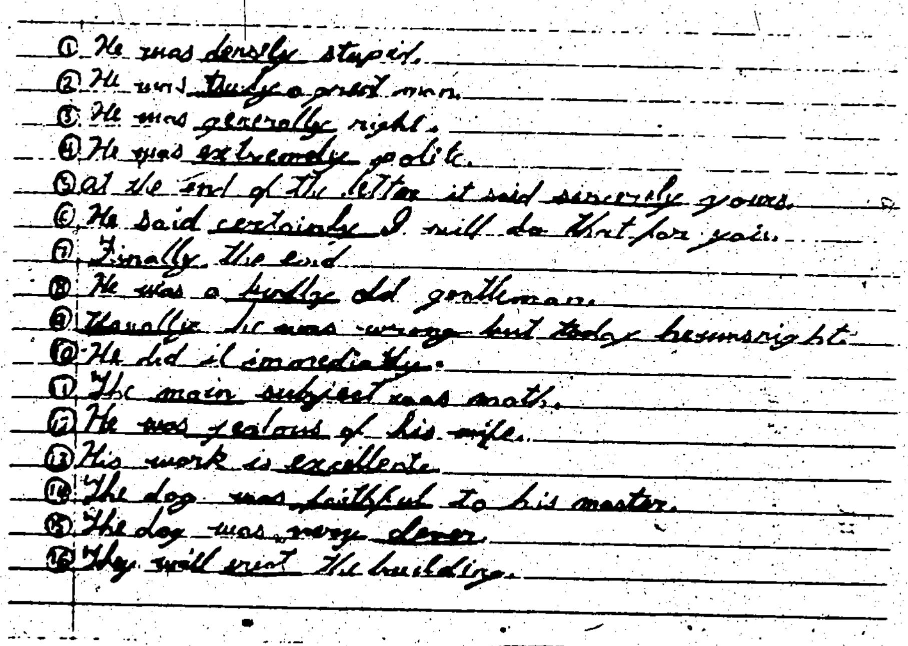


The Fabulous Ditch

Amberice thriving Magnificent chaudière
bustling are Cascade impulsively
Colonel By. Sapper sinking epidemic
Bytown. lock dredge spume reassure
Chopper Battering harrowing twicedemolished
scarcely' indicated crescendo traqu
canal reluctance strode treacherous [illegible]
Rideau crumple tremor advantages
floss halfcrown superstructure solemnity

Accompanies Figure 64

Written Language Exercise 18.10.78



① He was densely stupid.
② He was truly a great man.
③ He was generally right.
④ He was extremely polite.
⑤ at the end of the letter it said sincerely yours.
⑥ He said certainly I will do that for you.
⑦ Finally the end
⑧ He was a kindly old gentleman.
⑨ Usually he was wrong but today he was right.
⑩ He did it immediately.
⑪ The main subject was math.
⑫ He was jealous of his wife.
⑬ His work is excellent.
⑭ The dog was faithful to his master.
⑮ The dog was very clever.
⑯ They will visit the building.

Accompanies Figure 69