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ABSTRACT

This report describes the conceptual background, design, and methodology for a study of management of academic tasks in junior high school. Previous research suggests that tasks students accomplish in classrooms determine what they actually learn, and acquisition of higher cognitive skills related to interpretation and planning is essential for curriculum content mastery. Daily observations focusing on academic tasks will be made for one grading period in junior high school classes in each of three subject areas: science, mathematics, and English. Teachers will be selected for their effectiveness as determined by subject coordinators' nominations, class mean achievement gains during the preceding two year period, and preliminary classroom observations. Data on academic tasks will be obtained from classroom narrative records, instructional materials used, and graded student assignments and tests. Teachers and selected students will be interviewed concerning their perceptions of academic tasks accomplished in their classes. The study will generate information about structuring and directing student work, translating academic content and objectives into classroom tasks, and assessing task outcomes. This report contains a survey of related literature in cognitive psychology and classroom research, a description of the structure and schedule for the study, and a specification of the observation and analysis procedures. (Author/DWH)

RESEARCH ON CLASSROOM LEARNING AND TEACHING

Managing Academic Tasks in Junior High School: Background, Design, and Methodology

Walter Doyle
Julie P. Sanford
Edmund T.Emmer

R&DCTE
Research and Development Center for Teacher Education
The University of Texas at Austin

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Walter Doyle
Julie P. Sanford
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The University of Texas at Austin

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The University of Texas at Austin

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Abstract

This report contains a description of the conceptual background, design, and methodology for a study of how academic tasks, especially tasks involving higher cognitive processes, are managed in junior high school classes. Previous research on student mediating processes and curriculum content suggests that the tasks students accomplish in classrooms determine what they actually learn. In addition, acquisition of higher cognitive skills related to interpretation and planning is essential for mastery of the content of the secondary school curriculum. Tasks which engender such skills, however, are often difficult for teachers to manage in classroom environments.

In this study, daily observations focusing on academic tasks will be made for a 6-week grading period in junior high school classes of two teachers in each of three subject areas: science, mathematics, and English. Teachers will be selected for their effectiveness as determined by such indicators as subject coordinators' nominations, class mean achievement gains during the preceding 2-year period, and preliminary classroom observations. Data on academic tasks will be obtained from classroom narrative records, instructional materials used, and graded student assignments and tests. In addition, teachers and selected students will be interviewed concerning their perceptions of academic tasks accomplished in their classes. The study will generate information about structuring and directing student work, translating academic content and objectives into classroom tasks, and assessing task outcomes.

The first section of the report contains a discussion of the conceptual background for the study and a survey of related literature in cognitive psychology and classroom research. The second section consists of a description of the overall structure and schedule for the study and a specification of the observation and analysis procedures. Appendices include a sample narrative, illustrative analyses of academic tasks, and a manual for observers.

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This report contains a description of the rationale, design, and methodology for a study of how academic tasks are managed in junior high school science, mathematics, and English classes. The core of the research will be intensive case studies of two classes in each subject area. The study represents an extension of the research program on classroom management which has been conducted over the past 5 years by the Research on Classroom Learning and Teaching Program (RCLT). In this instance, however, there is a particular focus on academic work, on the content of the curriculum and how it is managed by teachers and students in the classroom.

The first section of the report is directed to the conceptual foundations of the study, with particular reference to work in cognitive psychology and recent classroom studies which shed light on how academic work is accomplished in these settings. The second section is focused on the overall structure of the study and the observation and analysis procedures that are to be used.

1. CONCEPTUAL FOUNDATIONS

Research on teaching has focused on dimensions or characteristics of teacher and student behavior in classrooms. It was generally assumed that these variables could, in principle, be traced to student learning. In other words, conventional variables in classroom studies (such as praise, lecturing, questioning, clarity, and enthusiasm) served as markers of or proxies for processes about which a great deal of information could be extrapolated from systematic studies of human learning and development.

The broad themes of motivation and practice have traditionally played a major role in explaining classroom learning. Investigators

with a special interest in developmental or personality theory have tended to see motivation, in the form of such constructs as expectations, attributions, and learning styles, as a key mediating process. In addition, they have advocated teaching methods which allow for personal preference and choices or which pose puzzles for students in order to energize "intrinsic" motivation (see Joyce & Weil, 1972; Weiner, 1979). On the other hand, investigators grounded in learning research, with its focus on the acquisition of specific skills, have emphasized practice and the prompting and feedback conditions which enhance the benefits of practicing. In teaching research, a learning perspective has drawn attention to time on task, modeling, knowledge of results, and reinforcement contingencies (see Gage, 1978).

Recent analyses have indicated that process models derived largely from laboratory research, however plausible they may seem, may not adequately account for classroom phenomenon. In a carefully reasoned critique of the literature Brophy (1982) argued that praise typically does not function as a reinforcer in classrooms and thus does not have the effects on performance in these settings that one would expect from basic research. Along similar lines, Blumenfeld, Pintrich, Meece, and Wessels (1982) have observed that task and feedback conditions in classrooms differ in fundamental ways from those which operate in laboratory studies of children's self-attributions of ability. Thus, laboratory-based models in this area are not always useful for understanding or predicting classroom effects. It would seem, then, that the conventional models of treatment effects in research on teaching are potentially inadequate as guides to inquiry or as justifications for classroom practices.

Movement toward more adequate process models of teaching effects has accelerated dramatically in recent years. In part this is a result of an emphasis on naturalism and situationalism in teaching research. This emphasis has turned attention toward the stream of behavior in classroom settings and the natural segments or units of classroom experience. Within this framework discrete actions by teachers and students are viewed as "realizations of larger plans" (Ervin-Tripp, 1982). At the same time, there has been a sharp increase in attention to students in research on teaching (see Weinstein, 1982, in press). The traditional emphasis on teachers in research on teaching tended to foster a reception theory of student learning. Such a theory "posits that test performance is a function of the amount of information that is received by the learner [and the] amount received is a function of such instructional factors as the amount and speed of presentation and of such internal factors as the motivation of the learner" (Mayer, 1979). Such a theory does not provide a foundation for analyzing the processes that occur when students learn in classrooms.

Most of the current work on students in classrooms is based on some form of a mediating process paradigm according to which learning outcomes are seen to be a function of student processes, or what Harnischfeger and Wiley (1976) called "pupil pursuits." Teaching processes, in turn, are seen as factors which influence pupil pursuits. In this view, teaching does not affect learning directly. Rather, teaching effects are mediated by what students do in instructional settings. This way of thinking has promoted interest in examining directly the processes which connect teaching events to outcomes (see Doyle, 1977).

Cognition and Teaching

An emphasis on general psychological mechanisms has fostered a neglect of curriculum content in research on teaching. For example, studies have focused on the amount of lecturing rather than the content of lectures, in part it appears because of implicit models which imply that too much lecturing deadens initiative or precludes opportunities for practice. Recently, however, there has been more interest in how content shapes teaching and how subject matter is experienced by students (see Buchmann, 1982; Confrey, 1982), that is, in the form and substance of academic work in classrooms (Doyle, 1982). Three factors have probably contributed to this increased interest in subject matter. First, students work on academic content in classes. One important aspect of the analysis of student responses in instructi has been directed, therefore, to subject matter processing (see Doyle, 1980). Second, studies of effective teaching have typically found that variables such as content coverage and opportunity to learn criterion material have consistently correlated with achievement (Rosenshine, 1979), suggesting that content is an important facet of teaching. Finally, investigators have realized that although engaged time is a reliable predictor of achievement it is essentially an "empty" variable (Gage, 1978). More needs to be known about how time in classrooms is spent, i.e., about what students do when they are engaged.

The analysis of student mediating processes has been facilitated recently by the rapid growth in cognitive psychology (for reviews see Calfee, 1981; Doyle, 1980). This emerging work has contributed substantially to our knowledge about human cognition and provided concepts and models for explicating the content of students' thoughts

and tracing the processes they use to interpret classroom events and teaching behaviors.

The conceptual framework for the RCLT research program is constructed around the concept of academic tasks (see Doyle, 1980, 1982). Academic tasks are considered to be the central organizing unit for students' experience of the curriculum. This concept makes it possible to pull back some of the layers from the "official" curriculum to examine the curriculum in use, i.e., how teachers structure students' encounters with subject matter in classrooms. An appropriate place to begin, then, is with a definition of this basic construct.

Academic Tasks

One major problem in studying the content of students' work is to arrive at a definition of what that work is. The concept of "task" provides a general analytical framework for approaching this problem, but the term has been used in a variety of ways in the few studies which exist in this area. Bossert (1979), for example, used the concept of task to refer primarily to social arrangements for working. King (1980), on the other hand, emphasized grades as the factors which defined the "real" tasks in classes. Anderson (1981) focused on work-sheets completed during seatwork segments of classes but did not specify the academic tasks contained in these assignments. Finally, Morine-Dershimer (1982) defined tasks in terms of the types of questions teachers asked during whole-class discussions, but it was not clear in her study how discussion questions related to other tasks students accomplished on worksheets, tests, or written assignments or whether discussions tasks affected the grades students received.

A coding system for academic tasks and the set of procedures for gathering task-relevant data have been devised by Bennett, Desforges, Cockburn, and Wilkinson (1981) at the University of Lancaster in England. Tasks were classed by these investigators in terms of the cognitive demands they placed on a particular learner. To make such classifications, coders examined the objective for the work, the work itself, and the appropriateness of the work for the stated objective and the level of learning of an individual student. Information about teachers' intentions or objectives and about appropriateness for students was gained by pre-task interviews with teachers, observation of target pupils while they were working on a task, clinical interviews with students concerning their perceptions of the task, and post-task interviews with teachers concerning outcomes and students' task performance. By using this scheme, the investigators were able to identify five types of academic tasks: incremental (acquisition and consolidation of new learnings), re-structuring (new ways of looking at familiar material), enrichment (use of familiar knowledge in unfamiliar contexts), practice (repetitive and rapid application of familiar knowledge and skills to familiar problems), and revision (working with knowledge and skills that have been set aside for some time).

The Bennett et al. approach provides some leads for analyzing tasks in classrooms. In particular, the methods are clearly directed to academic tasks rather than to the organization of groups of students in classroom settings. At the same time, the approach is focused on individual students and on discreet assignments. As a result, the approach tends to produce more information about learning conditions than about teaching process, and highlights the characteristics of

separate assignments rather than the overall task system operating in a class. Such methods are not directly applicable to the present study in which emphasis is being placed on (a) what teachers do to structure and guide information processing for a group of students and (b) the task system which integrates separate tasks across time.

The basic components of the academic tasks model which underlies the present study can be summarized as follows:

1. Students are guided in processing information in classrooms by the tasks they are required to accomplish with subject matter. Whether information from the teacher (or from textbooks or other resources) is attended to and processed by students depends upon its relation to the academic tasks which students are working on.

2. A tasks is defined by a goal, a set of operations to achieve the goal, and resources available in the situation.

3. Four broad types of academic tasks can be distinguished on the basis of the operations necessary for accomplishment: (a) memory tasks in which information previously encountered must be reproduced; (b) routine tasks in which a predictable procedure or algorithm (e.g., addition of fractions) previously learned must be applied to standard cases; (c) opinion tasks in which a personal preference or attitude must be expressed; and (d) understanding tasks in which transformed versions of information must be recognized as equivalent, inferences must be drawn from available information, or complex higher-order operations such as analysis or problem-solving must be used.

4. In classrooms, academic tasks are defined by (a) the nature of the products teachers accept and (b) the operations allowed and the resources available for generating these products. For example, the

task of producing a composition by following a model provided by the teacher or a fellow student is obviously different from a task in which an original composition must be generated without such models.

5. Academic tasks in classrooms, because they are embedded in an evaluation system, are accomplished under conditions of ambiguity and risk. Ambiguity refers to the extent to which a precise formula for generating a product can be defined. (This is not ambiguity which results from a lack of teacher clarity; rather it is an inherent property of academic work.) Risk refers to the stringency of the evaluation criteria and the likelihood that these criteria can be met on a given occasion. A task of memorizing 50 lines of poetry is low on ambiguity--one clearly knows what has to be learned--but high in risk (if accountability is strict) because of the factors that might interfere with a successful recitation on a given occasion.

6. Attempts by students and by teachers to manage ambiguity and risk either by increasing explicitness or by modifying accountability affect the course of task accomplishment and the character of a task itself. Especially for higher-level cognitive operations, tasks often change as teachers and students struggle with inherent demands (see Carter & Doyle, 1982).

In sum, the task model provides a comprehensive framework for studying academic content under the costs and benefits that operate in classrooms.

The Psychology of Subject Matter Instruction

Considerable effort has been expended in recent years to define the cognitive components of "real life" school tasks (see Anderson, Spiro, & Montague, 1977; Calfee, 1981; Glaser, 1978; Klahr, 1976; Resnick, 1981).

This work is part of a broader movement in psychology toward the analysis of cognitive processes which underlie various aspects of human aptitude and performance (see Curtis & Glaser, 1981; Greeno, 1980; Resnick, 1976). In this section, some of the general concepts and findings emerging from this research will be reviewed and illustrated. The central purpose of this selective review is to define more fully the nature of school work, that is, the character and range of learnings that are contained in the curriculum of elementary and secondary schools.

Schemata and comprehension. Modern cognitive psychologists have argued that a person's knowledge of the world is organized into associational networks or schemata (see Rumelhart, 1981). A schema is a relatively abstract representation of objects, episodes, actions, or situations which contains slots or variables into which specific instances can be fit in a particular context. This organizational view of knowledge emphasizes the multiple associations of information in long-term memory. The word "apple," for instance, is embedded in a network of associations referring to shape, color, texture, use, and relation to other foods. In contrast, the word "brick" elicits quite different associations.

From this perspective, comprehension of textbooks and other materials is a constructive process, i.e., it involves an active construction of a cognitive representation of events or concepts and their relationships in a specific context (see Bransford & Franks, 1976; Kintsch & van Dijk, 1978; Schank & Abelson, 1977). As words are encountered in a text they activate associations which establish expectations and enable a reader to construct a propositional

representation of the text in memory. The process of comprehension, then, "can be considered to consist of selecting schemata and variable bindings that will 'account for' the material to be comprehended, and then verifying that those schemata do indeed account for it. We say that a schema 'accounts for' a situation whenever that situation can be interpreted as an instance of the concept the schema represents" (Rumelhart & Ortony, 1977, p. 111).

Schemata play an especially important role in accounting for ambiguities in passages or situations and in making inferences (see Shank & Abelson, 1977; Trabasso, 1981). Passages or episodes are seldom fully specified. In building a cognitive representation, therefore, a person must make inferences to complete the picture of associations and causality among concepts and events. Thus, in reading the sentence, "George entered a restaurant," a reader can use a restaurant schema to fill in what is likely to happen.

From this perspective, then, the task of learning subject matter means learning to construct semantic representations of the content. The processes involved operate at two levels. First, learners must know facts and routine procedures in a discipline, much as a beginning reader must eventually be able to recognize that printed symbols represent sounds and then become proficient in interpreting these symbols rapidly in continuous text. At the same time, they must semantically integrate factors and procedures into broader interpretative frameworks which represent the meaning of the elements that make up the discipline. Further examples of the operation of these two levels of cognitive processes are given in the following sections.

The central role of prior knowledge. Much of the work on general comprehension skills in subject matter domains, such as science and mathematics, has focused on differences between the performance of experts and novices. The purpose of this work is to identify the competencies and knowledge structures required for gaining mastery, an interest which is directly related to understanding and improving academic work in schools (see Glaser, 1978).

One of the major findings of research in this area is that domain-specific knowledge plays a central role in problem solving and learning within a content area. Domain-specific knowledge consists not only of a well-formed semantic network of valid information in an academic discipline but also of strategies for using this information to represent (i.e., comprehend) problems, search for and select algorithms, utilize resources from the task environment, and evaluate the adequacy of answers (see Resnick & Ford, 1981, pp. 196-237, for a discussion of this point with reference to mathematics).

The operation of these factors is evident in studies comparing the performance of experts and novices in solving physics problems. In a series of studies Larkin (1981) found several differences between experts and novices in speed, number of errors, and the immediacy of access to a variety of solution strategies. Her results also hinted at a qualitative difference in the way problems were initially analyzed and represented by the two groups. Chi, Glaser, and Rees (1981) conducted studies designed to explicate more fully how experts represent problems. They found that the difficulties novices encountered in solving physics problems stemmed primarily from deficiencies in their knowledge of physics rather than in their information-processing strategies or

capacities. Experts, because they understood physics better, were able to represent problems in terms of underlying principles. Novices, on the other hand, focused on the literal details of the problems and their knowledge seemed to be organized around isolated events and concepts rather than underlying principles. As a result, they were unable to make key inferences necessary for arriving at a solution or knowing when to use what they did know.

Similar results have been reported for expert-novice differences in cognition during writing (see Flower & Hayes, 1981; Matsuhashi, 1981; Perl, 1979). Both experts and novices spend a good deal of time thinking about individual sentences as they actually produce text. But experienced writers combine sentence planning with planning addressed to the audience, the genre, and the semantic structure or schema of the entire essay. Novices, on the other hand, were concerned about what to write next and limited their planning to thinking about the topic or assignment and about the last sentence they had written. Thus they failed to develop an adequate goal structure for the total work to guide their sentence planning.

Studies focusing on the understanding that novices bring to science have also pointed to the key role of prior knowledge in academic work. Eaton, Anderson, and Smith (1982) studied the way preconceptions of how light enables us to see objects influenced science learning among fifth-graders. They conducted a case study of the way a textbook unit on light was taught in two fifth-grade classes. In general the students had a preconception that light brightens objects so we can see them. The accurate conception is that we see objects because light is reflected off them to our eyes. The researchers found that students'

preconception about light and vision persevered during teaching, in part because neither the teacher nor the textbook specifically addressed this preconception. As a result, many of the students never really understood the content in the unit.

These studies suggest that performance on academic work, especially in technical subject matter areas, is dependent upon domain-specific knowledge rather than general problem-solving strategies alone. Thus, attention needs to focus on the schemata that students bring to their academic work. In the absence of appropriate knowledge structures students are likely to either (a) memorize text to accomplish tasks or (b) fail to be able to apply what they know about a field to solve problems (see Resnick & Ford, 1981). In such cases, they are not likely to understand what they are being taught.

Invention: Algorithms and systematic "errors". Research in academic areas has also focused on the acquisition of specific computational skills or algorithms, such as addition and multiplication routines in mathematics or decoding skills in reading (see Beck & McCaslin, 1978; Resnick & Ford, 1981). Of particular interest are studies of students' invention of computational routines, and studies of the systematic nature of students' errors. A brief review of these areas will demonstrate their contribution to an understanding of the nature of academic work.

Research on the acquisition of arithmetic routines has recently shown that students acquire knowledge about solution strategies "naturally" from their experience of trying to solve various types of problems and that they use this knowledge to invent procedures for solving routine problems. A study by Groen and Resnick (1977) provides

a clear example of this invention. Preschool children were taught an addition algorithm in which problems of the form $\underline{m} + \underline{n} = \underline{x}$ were to be solved by counting out $\underline{m}$ blocks, counting out $\underline{n}$ blocks and then counting the combined set. This procedure represented the structure of mathematics well and was easy to teach and to learn. However, the procedure was often cumbersome for generating answers. With practice, but without further instruction, the children transformed the procedure into a more efficient routine in which they began with the larger number and then counted out the smaller number. This "invented" routine was more efficient for solving addition problems but was very difficult to explain directly to the children.

In Groen and Resnick's study, invention led to a deeper understanding of content and a more efficient procedure for solving problems. But interview studies with children have demonstrated that invention can have deleterious effects. Peck, Jencks, and Chatterley (1980) found, for example, that average-ability elementary students could successfully solve workbook problems with fractions but could not represent fractions accurately on diagrams. One common mistake was to assume that the denominator was the number of segments a circle was divided into, even though the segments were unequal. Thus, a circle divided into one half and two fourths was interpreted as being divided into thirds. These and other answers about the diagrams indicated some fundamental misconceptions about fractions, misconceptions which prevented the pupils from recognizing that an answer was clearly wrong. Even more dramatic evidence was uncovered by Erlwanger (1975) in his interviews of students considered successful by their teachers. When these students were probed carefully about their understanding of mathematics, they showed

basic misconceptions. One student in particular, who spent 4 years working in an individualized mathematics program, invented a large number of rules which he used to produce answers which matched the answer key. From the perspective of mathematics, however, these rules were fundamentally erroneous.

In addition to acquiring misconceptions of content, students have also been found to invent "buggy" algorithms, that is, solution strategies which are systematic but wrong (see Brown & VanLehen, 1979; Davis & McKnight, 1979, in mathematics; Spiro, 1979, argues that "bugs" operate in reading comprehension). One example of a bug in multi-digit subtraction occurs with problems in which the top digit in a column is smaller than the bottom digit: e.g.,

Instead of borrowing, the student subtracts the top digit, which is smaller, from the bottom digit, which is larger, to get an answer of 419 rather than the correct answer of 381. Bugs probably derive from a least two sources: (a) different algorithms which have a similar appearance (e.g., rules for forming the demoninator in adding and in multipying factions) are erroneously blended or one is substitute for the other; and (b) an algorithm is "repaired" by a student when he or she encounters an impasse while solving a particular problem. What is important in both cases is that bugs are systematic (that is, they have all the properties of a correct procedure) and therefore are not perceived as erroneous by students who use them. Thus, simply telling a student that an answer is wrong does not help correct the bug which produced it. Rather, the incorrect answer must be analyzed to discover

the rule which is being followed. Unfortunately, buggy algorithms are often practiced for a relatively extended period before they are recognized and thus correcting them is difficult.

Task complexity. Studies of the cognitive processes underlying academic work have revealed the enormously complex character of the operations and decisions that academic competence entails, a complexity that is often overlooked when the goals of schools are discussed. This complexity is evident in the areas of reading and domain-specific problem solving that have already been discussed. The complexity of academic work is also apparent in recent analyses of the composing process (see collections by Cooper & Odell, 1978; Frederiksen & Dominic, 1981; Gregg & Steinberg, 1980; Nystrand, 1982). Research has focused on the phases of writing (e.g., prewriting, composing, revising, and editing), various types of written products, the development of writing ability, and differences between proficient and unskilled writers. Text production is seen as a recursive process which combines knowledge about a subject, an audience, vocabulary, and syntax with strategies for planning sentences, paragraphs, and texts for particular purposes. Frederiksen and Dominic (1981) summarize the elements of composing as follows:

> As a cognitive activity writing involves the use of specific kinds of knowledge that a writer has and is able to discover in constructing meanings and expressing them in writing. Underlying and enabling this use of knowledge are a variety of cognitive processes, including: discovering or generating an intended propositional meaning; selecting aspects of an intended prepositional meaning; selecting aspects of an intended meaning to

be expressed; choosing language forms that encode this meaning explicitly and, simultaneously, guide the writer/reader through different levels of comprehension; reviewing what has been written, and often revising to change and improve meaning and its expression. (p. 2)

From this description it is clear that writing "is among the most complex of human mental activities" (Flower & Hayes, 1981, p. 39). In turn, it is not surprising that many students find writing tasks in school difficult to accomplish.

The influence of age and ability. The subjective complexity of any task obviously depends upon the age and ability of the learner. Proficient readers, for example, use decoding processes automatically (LaBerge & Samuels, 1976), that is, they are able to recognize printed letters and words rapidly with a minimum of information from the surface of the text itself. Beginning readers, on the other hand, are confronted with a complex array of markings which are often difficult to distinguish. Until a beginning reader learns the code of letter-sound correspondences, reading is a baffling task. To understand academic work, then, it is essential to review briefly some of the recent research on how developmental factors affect task performance.

Research on general cognitive development (see e.g., Brown, 1975; Paris, 1975) as well as development within content areas (e.g., Bereiter, 1980) indicates that mature students are selective and efficient in using available cues to extract information relevant to accomplishing a task, and this efficiency increases as they become familiar with a task. Less mature students, on the other hand, attend to a broader range of stimuli and are less likely to select and process

information to fit the demands of a particular task (see Pick, Frankel, & Hess, 1975).

Ability appears to affect task performance at the level of information processing capacity as well as domain-specific knowledge for doing academic work. As indicated in the expert-novice studies reviewed earlier, less able students typically fail to understand tasks and often focus attention on specific details of an assignment or a problem. As a result, they have little chance of accomplishing the task successfully or of recognizing when or where they have made a mistake. In writing, for example, Perl (1979) found that poor writers concentrated on the immediate problems of what to write next, showed little flexibility in thinking about a writing problem, and attended to editing prematurely. Proficient writers, on the other hand, appear to combine localized thinking with whole-text planning, monitor their own writing processes, and defer revising until the text is nearly completed.

In sum, school tasks, even at the level of basic skills, are inherently complex for all students. This complexity is much more severe, however, for young students and those who lack either the information or the skills required to understand tasks, process information in specific ways, or decide when to use the ctratgeies they possess.

Direct instruction in cognitive processes. One of the most common reactions to results of research in cognitive science is to recommend direct instruction in the processes used by expert readers, writers, mathematicians, or scientists (see Anderson, 1977; Glaser, 1978; Resnick & Ford, 1981, for general discussions). For example, several investigators have been working to devise and test methods for teaching children to monitor their own comprehension and make inferences while

reading (Collins & Smith, 1980; Hansen, 1981; Laboratory of Comparative Human Cognition, 1982; Pearson & Camperell, 1981; Tierney & Pearson, 1981). These recommendations are consistent with proposals for direct instruction that have become prominent in early childhood education (Becker, 1977) and research on effective teaching (Rosenshine, 1979). One clear finding of cognitive research is that direct instruction must operate at different levels of cognitive processing. For example, planning for writing ranges from thinking about individual sentences to monitoring one's own writing processes and making decisions about a goal structure for an entire text (Flower & Hayes, 1981). Similarly, memorizing a list of words involves specific routines for rehearsing items as well as broader "metacognitive" operations to decide which strategies to use and whether mastery has been achieved. Finally, solving problems in mathematics and physics involves not only skill in specific computational routines but also an ability to represent problems accurately and to select solution strategies appropriately.

Available training research suggests that direct instruction which concentrates on specific operations for accomplishing a task will produce immediate effects, but it is not likely to engender the knowledge structures or strategies required for the flexible use of these operations. A series of training studies by Brown and Campione (1977, 1980) have provided especially important insights into the effects of specificity in direct instruction. They began with a remedial program focusing on teaching low ability children to use memorization strategies. The evidence from several sources had suggested that such learners have a production rather than a capacity deficiency: They are able to use mnemonic strategies, but in contrast

to high-ability children, they do not use them spontaneously. With prompting, low ability children will use mnemonic strategies, but this improvement is temporary, lasting only while the instructional prompts are available. Moreover, they do not use the memorizing strategies flexibly to transfer to other memory tasks for which prompts are not supplied. There is, in other words, a "heart pacer" effect in which performance is maintained only because the instructional program does most of the work for the students. The investigators found that durability could be increased through training in specific memorizing strategies, although the amount of training required was much greater than originally expected. In addition, training to achieve durability reduced flexibility. The skills became welded to the items used in training and did not transfer to new items. Consistent with the general work in cognitive psychology, these findings suggested that low ability children have special problems with access to what they know and the flexible use of that knowledge. In addition, training which is focused on specific memorizing skills does not produce flexibility.

A very similar pattern of findings for specific direct instruction is apparent in research with other populations of students. Asher and Wigfield (1980) reported that specific training for young children in referential communication skills (i.e., the ability to adapt speech to an audience) was effective for immediate performance but the skills did not transfer to new tasks. Mayer and Greeno (1972) found that instructional methods which focus on acquiring specific information or a specific computational procedure result in superior performance on "near transfer" tests which require reproduction of information or solutions to problems similar to those used in instruction. On the other hand,

methods which focus on comprehension of information or procedures appears to result in superior performance on "far transfer" tests which require application of concepts and procedures to novel problems. There were, in other words, important qualitative differences in outcomes from methods which aimed at different levels of cognitive processing (see also Marton & Saljo, 1976).

A case can also be made for the specificity of corrective feedback. Research on "buggy" algorithms suggests that errors are often the result of systematic procedures which have the appearance of correct algorithms and which often work for a restricted range of problems. To correct a specific mistake without attending to the higher-level cognitive processes which led to the error is not likely to be effective. Indeed, Perl's research indicates that a focus on specific errors can be detrimental. She found that unskilled college writers, apparently as a result of years of teaching which emphasized correct spelling and syntax, concentrated prematurely on editing to the extent that it interfered with other writing processes.

These findings support the view that direct instruction focusing on specific skills alone is not likely to have long-term consequences unless instruction in higher-level regulatory processes is also provided. In other words, direct instruction which is likely to improve the quality of academic work must be oriented toward processes which generate meaning rather than routines or "surface algorithms" (Davis & McKnight, 1976) which are used without an understanding of what the procedure does or why it is applicable to a particular situation (see Good, 1982). Emig (1981) has described the latter type of thinking

"magical" since students have no sense of why the routines they are using work.

It is important to realize, however, that direct instruction in higher-level processes and knowledge structures will probably take a long time and have fewer immediate effects. Nussbaum and Novick (1982) found, for example, that a detailed and intensive instructional program designed specifically to modify preconceptions which interfere with learning a science concept was only moderately successful in achieving its objectives. They concluded that the naive scientific ideas of students evolve rather than change abruptly, a pattern which is also true of ideas in the scientific community itself.

Indirect instruction in cognitive processes. The push toward higher-level processes and meaning or understanding places direct instruction in a territory that is usually occupied by what might be called "indirect instruction" (see Joyce & Weil, 1972, for example). Such instruction emphasizes the central role of self-discovery in fostering a sense of meaning and purpose for learning academic content. From this perspective, students must be given ample opportunities for direct experience with content in order to derive generalizations and invent algorithms on their own. Such opportunities are clearly structured on the basis of what is known about an academic discipline and about human information processing. However, the situations are only partially formed in advance. Gaps are left which students themselves must fill. In other words, the instructional program does only part of the work for students to open up opportunities for choice, decision making, and discovery (see Shulman, 1970; Resnick & Ford, 1981, for good analyses of the contrast between direct and indirect methods).

One example of indirect instruction (although the authors would probably not use this term) is the work of Graves and his colleagues in children's writing (see Calkins, 1980; Graves, 1979; Sowers, 1979). In this project, the development of writing is viewed as a three-phase process beginning with playfulness and spontaneity as children "mess around" with words, followed by planning which emphasizes form and correctness, and then a rediscovery of playfulness. To provide opportunities for these phases to evolve, teachers are advised to allow students to select their own topics and forms of writing (letters, essays, descriptive paragraphs) and to be free from an excessive emphasis on correctness of spelling and syntax.

An emphasis on invention in learning is certainly consistent with the basic premise in cogitive psychology that knowledge and understanding are "constructed" by individuals. But, as Resnick and Ford (1981) point out, there is little evidence that indirect instruction is the most suitable or efficient way to obtain this outcome deliberately, especially in the case of lower ability students. Moreover, as will be seen shortly, there are several questions concerning the use of these methods in classroom environments.

Summary. The existing research in cognitive psychology leads to the following general conclusions about academic work in schools:

1. Direct instruction in identified cognitive processes and knowledge structures is probably an appropriate instructional strategy, especially for teaching novices, low ability students, and pupils in the early elementary grades. Nevertheless, direct instruction which is focused on specific skills is likely to have few long-term consequences unless combined with instruction, either direct or indirect, in higher-

level executive processes and knowledge structures for representing tasks and selecting solution strategies. If specific skills are taught in isolation, students can develop either magical thinking or an excessive concern for details, both of which interfere with task accomplishment and learning. It would seem to follow, then, that tasks involving higher cognitive proceses are a necessary component of the curriculum, especially at the junior and senior high school levels.

2. Indirect instruction is one way of providing practice in higher-order executive routines and the use of knowledge structures to represent problems. Indeed, some degree of "unstructuredness" is essential even in direct instruction to ascertain whether students really understand how and when to use their knowledge and skills. In other words, explicit signals for solution strategies obviate the need for employing executive routines and thus students are not able to practice these higher-level processes or demonstrate mastery of them. In addition, many operations which constitute expertise in academic areas either have not been identified yet or are difficult to formulate into clearly teachable propositions. In such cases, the only alternative is to allow students to experience content so that they can invent procedures and construct knowledge structures on their own. Considerable research is needed, however, concerning ways of structuring such experiences so that invention will be productive.

3. Resnick and Ford (1981) have observed that "Transitions in competence that emerge without direct instruction may be more common in children's educational development than we have thought up to now" (p. 82). That is, students invent their own algorithms and conceptions of content whether instruction is direct or indirect. This propensity

to invent can have both advantages and disadvantages. As indicated, invention enables students to learn routines and concepts that are difficult to teach directly. At the same time, invention can lead to "buggy" algorithms and misconceptions of content. This possibility underscores the need to know more about the academic tasks students work on in various subject areas and the way these tasks are managed.

Classroom Studies of Academic Work

To this point academic work has been discussed largely from the perspective of laboratory research in cognitive psychology. Recently, however, there have been some studies of aspects of academic work in classrooms. Such studies are directly related to the RCLT program of research and form the core of the present review.

Cognitive mediation studies. Research on academic tasks in classrooms is related to studies of cognitive processes which mediate teaching effects (see Doyle, 1977; 1979; 1980; 1982; Winne, in press). One approach in this area involves the use of stimulated recall techniques in which students view video playbacks of lessons and are asked about their thoughts at various points. In a study of thought processes during direct instruction, Peterson and Swing (1982) interviewed 72 fifth and sixth grade students to ascertain their thoughts during critical incidents of two specially designed lessons on probability. They also coded student engagement during lessons. Student interview responses were coded for attending, understanding, reasons for not understanding, and students' cognitive strategies. In addition, student engagement during the lessons themselves was coded. The results indicate that attending as measured by interview responses was a better predictor of achievement than observed engagement. In addition,

students who reported that they understood the lesson tended to do well on the achievement test regardless of initial ability, and those who could not explain why they did not understand tended to do poorly on seatwork problems and the achievement test. Further, students who articulated specific rather than general cognitive strategies and those who reported using strategies of relating information being taught to prior knowledge and attempting to use higher level processes to understand the problem tended to have higher achievement scores. Finally, students who reported motivational self-thoughts (e.g., "I thought I could do that problem if I tried my best") had more positive attitudes toward mathematics although such attitudes were not related to achievement.

Winne and Marx (1982) studied the cognitive processes elicited by specific instructional stimuli, such as orienting instructions or cuing remarks. In their study of regular lessons at the upper elementary grades, they found that students did not always respond to instructional stimuli in the way teachers intended, and this effect was especially noticeable when teachers attempted to establish affective states. Indeed, students tended to ignore or misinterpret affective cuing. In addition, students were more likely to process information in the intended way if the concept was very specific or familiar. Finally, students attributed some meaning content being presented regardless of whether the teachers specifically intended to cue specific responses during the lesson. In other words, students "will construct meaning for classroom activities regardless of whether the teacher. . .does" (p. 515).

The studies by Peterson and Swing and by Winne and Marx provide insights into the cognitive processes students use to think about specific instructional stimuli or specific units of content. But little information is given about the way content is organized for students, the nature of what students learn about content, or how students decide when to process information and what strategies to use in the absence of immediate teacher cues. In other words, we learn very little from these studies concerning what students have to think about in classrooms and what teachers can do during classroom lessons to organize and direct information processing. To address these issues it is necessary to move beyond student reactions to specific instructional stimuli to study the tasks students actually encounter in classrooms and how these tasks influence student perceptions and learning outcomes.

Students' perceptions of academic work. Several recent qualitative studies have focused on students' perceptions of the academic work they accomplish in classrooms (for a comprehensive review, see Weinstein, in press). In these studies attention has been directed to how student cognitions are shaped by task conditions rather than specific characteristics or elements of teachers' behavior. Because of their focus on broad features of students' thinking rather than on momentary connections between instructional stimuli and cognitive responses, these studies point to the way in which tasks organize and govern students' information processing.

In an exploratory study, King (1980) examined what students think about during mathematics lessons. His sample consisted of two successful students and two less successful students in a sixth grade class. Ten mathematics lessons were recorded on videotape, and these

tapes were used in stimulated recall interviews. The analysis of interview responses indicated that an average of 47% of the time was spent in thoughts in two categories: (a) behavioral moves--self, and (b) self-performance--thoughts. These results meant that students spent almost half the time in class thinking about what they were supposed to be doing at the moment (e.g., writing notes, paying attention to the teacher, etc.) and what they were going to have to do to complete the assignment. In contrast, students spent an average of only 3.5% of the time thinking about subject matter itself and 8.5% being concerned about feelings. On the basis of these findings, King argued that:

> Students seemed desirous of successfully completing the tasks in the most efficient manner possible in order to place themselves in an advantageous position for gaining a good mark on their report card. Of necessity, students perceived the teachers to be the mediating influence in achieving this goal, and they tended to adapt their behavior with a view to presenting themselves favorably. . . . The report card seemed to be the ultimate though seldom visible goal of most student behavior in the learning process, and the implications of this for teaching seemed far-reaching. Students were aware that the taking of a unit test and even the completion of the daily work-sheets were directly related to the report card. In this respect the report card motivated students to want to work and learn (King, 1980, pp. 24, 34).

King's research documents that tasks do organize student thinking in classrooms. There is additional evidence that academic tasks influence the course of teacher-student interaction. Morine-Dershimer (1982) studied the learning processes operating during whole-class

discussions in a sample of second, third, and fourth grade classes. She found that students perceived teacher questions as signals for content that was potentially necessary for them to know. Students also attended to answers to questions, especially answers by high achieving students and to teacher reactions to these answers to obtain information that they were to know. In addition, she found that different types of classroom questions and ways of reacting to answers elicited responses from different types of students, i.e., "the teacher's selection of instructional strategy will determine to a large extent who can know the answer, and that will determine to a large extent who will participate and who you can learn from" (p. 10). In other words, the teacher's choice of a task for classroom discussions "created" different participation patterns. Thus, she found that when a teacher used strict academic criteria for answers to questions, high achieving students answered most often, and students attended to these answers as sources of information to be learned. When a teacher accepted nearly any response to questions, nearly all students participated but attention to answers was low. Finally, when a teacher asked divergent questions, low achieving students tended to participate more (high achievers seemed reluctant to take the risks inherent in divergent questions) and attention to answers was low.

DeVoss (1982) examined the students' perspective toward working time in a first grade and a fifth grade class. During "major lesson" time, the teacher was in charge and students were required to follow along even when directions were not fully sensible. In addition, responding was governed by specific rules for raising hands or choral answering, rules which enabled the event to run smoothly. During

"comfortable work" time, students were more on their own and had less need to coordinate their actions with the rest of the class or the teacher. Engagement ran in cycles as attention drifted from assignments until the noise level reached a threshold that elicited teacher interventions to restore order. During comfortable work, students often engaged in "passing time," that is, appearing to be working on the designated assignment while relaxing (e.g., erasing an entire page and starting over or walking across the room carrying a book and returning to your seat). Toward the end of comfortable work time, students often seen to "spurt," i.e., rush madly to finish the assignment. Indeed, many students did most of their actual work on the assignment during this closing segment of work time.

The picture DeVoss paints of the rituals for working time, together with King's analysis of the focus of student thinking, suggests that the substance of the work itself may not always be central to students' attention. And there is some direct evidence which is consistent with this suspicion. Anderson (1981), for example, interviewed eight first grade students to ascertain their understanding of the "content-related purposes" of their seatwork assignements. She found that most students, and especially low achievers, were simply concerned with getting the work done, with completing assignments. At the same time, they seemed to have little awareness of what the specific content purposes or outcomes of the assignments were. A similar picture of student perspectives on classroom tasks has been presented by Blumenfeld, Pintrich, Meece, and Wessels (1982).

Anderson attributes part of this effect to the emphasis teachers place on procedures rather than substance in making assignments. This

hypothesis seems reasonable, at least to the extent that teachers appear to be oriented toward procedures in thinking about teaching (for reviews see Clark & Yinger, 1979; Shavelson & Stern, 1981). In their analysis of case studies in science education, Stake and Easley (1978), for example, observed that teachers seemed to be interested primarily in making certain that work was completed. Indeed, they argue that content goals seem to have little salience for either students or teachers. Students, on the one hand, seemed primarily interested in grades as intrinsically valuable: "They did not think of themselves as mastering a certain body of knowledge, but more as mastering (and of course not mastering) those things being required by the teacher or the test. The knowledge domain was not a reality--it was a great arbitrary abstraction" (p. 15:29). Teachers, on the other hand, seemed primarily committed to socialization, to the fostering of proper deportment, work attitudes, and cooperation. As a result, "subject-matter knowledge, as an end in itself (a common assumption of the academic community), got transformed in the school to a means of meeting the socialization demands of the school" (p. 16:5).

The overall perspective which can be gleaned from these studies is that students' experience of school work and classroom processes is shaped by their perceptions of the tasks they are to accomplish. Because these tasks are carried out in a complex group environment, procedures for organizing and accomplishing work must be created. At times it appears that these procedures become ends in themselves to the extent that the substance of tasks is pushed to the side. This line of research certainly suggests a need to learn more about the nature and organization of academic work in classrooms.

Participation structures. A more complete understanding of classroom dynamics has emerged recently from studies in the sociolinguistic and ethnomethodological traditions which have focused on "participation structures," that is, the organization of turn-taking in whole-group lessons (see Au, 1980; Cazden, 1981, Erickson, 1982; Florio & Shultz, 1979; Green & Harker, 1982; McDermott, 1976; Mehan, 1979, 1980; Philips, 1972; Shultz & Florio, 1979). A central premise of this research is that social events are rule-governed and constructed on particular occasions by the actions of participants. Classroom interactions are seen as distinctive in the sense that (a) communication in lessons is typically ordered by sequences of teacher questions, student responses, and teacher evaluations; and (b) rules generally allow only one speaker at a time and require that comments be addressed to the entire group. In addition, there is a complex set of verbal, nonverbal, and spatial cues which signal appropriate times for attending to messages and gaining access to the floor for speaking.

Research on participation structures has implications for understanding academic work because it defines the context in which some work is accomplished and suggests some of the student competences that are necessary to work successfully. Studies which examine contrasts between high and low ability students have found that some students lack the interactional competence necessary to participate successfully in classroom lessons. That is, they do not have the social and linguistic skills necessary to complete interaction sequences or seek entry into conversations in acceptable ways, in part it appears because of sharp differences in the requirements for communicating at home and at school. As a result they seldom gain access to teacher attention, have oppor-

tunities to practice academic skills in public and receive adequate feedback, or receive appropriate recognition for what they know about the content. Indeed, in small groups composed largely of lower ability students, teacher talk is often directed to conduct rather than content, interruptions from outside sources occur frequently, and few sustained occasions for practicing academic skills are achieved (see Cazdin, 1981, for a review).

Studies of participation structures have provided important insights into the processes teachers and students use to sustain instruction in classroom environments. And they suggest that students' performance (e.g., answers to questions or turns at reading) is inherently ambiguous for teachers because incorrect answers may well reflect an incongruent frame of reference or a lack of social skill rather than a content deficiency (see Heap, 1980; Mehan, 1979). But there are two important limitations of this work in the context of the present study. First, most of the research in this area has focused on students in the early elementary grades where access to teachers in groups lessons is likely to be a significant factor and where students are less likely to know the routines of going to school. In junior high school, students can be expected to know the requirements of communicating in school and academic work is based to a large extent on printed materials and other media. Second, as Erickson (1982) points out, studies of social participation structures need to be supplemented by studies of academic task structures if a more complete understanding of classroom events and their consequences is to be achieved.

Classroom structures and academic work. Recently attention has been drawn to the ways in which academic work is "pushed around" by the

structures and processes operating in classrooms. Doyle (1982), in particular, has argued that academic work in classrooms is accomplished under conditions of ambiguity and risk which shape in fundamental ways students' perceptions of that work as well as their strategies for dealing with it. In the long run, these conditions define the fundamental character of academic work as it is experienced daily by students. A brief review of studies in this area will provide an important framework for the RCLT program of research.

One of the central features of a classroom is its evaluative climate, i.e., student work is frequently judged and records of these judgments are communicated to others (see Carter & Doyle, 1982; Jackson, 1968; King, 1980; White, 1971). Thus, the answers a teacher actually accepts and rewards define the real task demands in classrooms. The announced goal of an art lesson, for example, might be to learn to analyze the effects of color on emotions, a task which at least potentially involves comprehension. If, however, the teacher rewards verbatim reproduction of definitions from the textbook, the task can be accomplished by memorizing. In addition, the strictness of the criteria a teacher uses to judge answers has consequences for task demands. MacLure and French (1978) have described an incident in which a primary school teacher accepted a broad range of answers, many of which were incorrect, in a discussion of birds that were native to the students' home region. As long as a student named a bird, whether or not it actually live in the region, the teacher praised the response. Other investigators have also reported that teachers sometimes praise "wrong" answers (Bellack, Kliebard, Hyman, & Smith, 1966; Mehan, 1974; Rowe, 1974). In such instances it appears that simply giving an answer,

rather than a correct answer, is the task. However, if any answer is acceptable (or no answers are required), then the task system itself is in danger of being suspended.

The dimensions of ambiguity and risk are associated with the process of producing answers (broadly defined as the products students hand in to the teacher). Ambiguity refers to the extent to which a precise answer can be defined in advance or a precise formula for generating an answer is available. Such ambiguity does not result from poor explanations by a teacher. Rather, it is an inherent feature of academic work. Risk refers to the stringency of the evaluative criteria a teacher uses and the likelihood that these criteria can be met on a given occasion. Tasks involving understanding, for example, are high in both ambiguity and risk. To have an understanding task, some information about the character of the correct answer must be withheld so that memory cannot be used to accomplish the task. In addition, understanding tasks are often not easily reduced to a predictable algorithm. For example, writing a good descriptive paragraph is not simply a matter of following a series of predefined steps. Rather, complex procedures and higher-level executive processes must be employed to generate a product or answer. Thus, meeting task demands involves some element of risk unless the teacher is willing to accept any answer as adequate.

There is some evidence that students invent strategies for managing the ambiguity and risk associated with classroom tasks. Several studies of language use in classrooms have reported that student talk is constricted, vague, and indeterminant (see Dillon & Searle, 1981; Edwards & Furlong, 1978; Harrod, 1977; Sinclair & Coulthard, 1975).

Searle (1975), for example, examined the spoken language of high school students in English, social studies, and physics classes and found qualitative differences between academic and non-academic episodes:

> The talk which resulted from their activities as participants in school work was usually a series of short exchanges [and] was not in itself complete but required either reference to texts or movement. . . . It would seem that the students understood that there was one kind of talk to be used among themselves and another kind which was suitable for school work. (p. 280)

Along similar lines, Graves (1975), in a study of writing in the second grade, found that texts for writing assigned by the teacher were shorter than those for writing that students did for themselves. This effect was observed under both traditional and open forms of classroom organization. Finally, Rosswork (1977), in a laboratory study in which sixth-grade students were required to generate as many sentences as possible from words in a spelling list, found that students improved performance to meet specific output goals by reducing the number of words per sentence to the minimum established by the experimenter. Rosswork commented that "In some cases, specific goals might lead to inappropriate short cutting" (p. 715).

The picture painted here is one of caution: Students restrict the amount of output they give to a teacher to minimize the risk of exposing a mistake. In addition, restricted output can elicit assistance from others in a classroom. Mehan (1974) reported a case in which first-grade pupils hesitated in giving answers until either the teacher or another student answered for them. The pupils also gave provisional answers to obtain feedback from the teacher before committing themselves

to a single answer. Such tactics can elicit what Lundgren (1977) has called "piloting," i.e., a sequence in which a teacher gradually increases the amount of information useful for answering until an answer is virtually given to the student. One student in MacKay's (1978) study described piloting as follows:

> Yeah, I hardly do nothing. All you gotta do is act dumb and Mr. Y will tell you the right answer. You just gotta wait, you know, and he'll tell you.

On the basis of evidence such as this, Heap (1980) argues that correct answers are difficult for teachers to judge as evidence of achievement since they can be arrived at in ways that circumvent appropriate processes.

There is also evidence that students manage ambiguity and risk by negotiating directly the demands of school work (see Woods, 1978). Much of this negotiation involves attempts to increase the explicitness of a teacher's instructions or increase a teacher's generosity in grading final products. Davis and McKnight (1976) met with strong resistance from high school students when they attempted to shift information-processing demands in a mathematics class from routine or procedural tasks to less structured understanding tasks. The students refused to cooperate and argued that they had a right to be told what to do. A similar reaction to understanding tasks was reported by Wilson (1976) in a study of an alternative high school. Students, in other words, appear to hold teachers accountable for conducting lessons (Brause & Mayher, 1982). After their experience, Davis and McKnight commented that "it is no longer a mystery why so many teachers and so many textbooks present

ninth-grade algebra as a rote algorithmic subject. The pressure on you to do exactly that is formidable!" (p. 282).

Carter and Doyle's (1982) study of writing tasks in a junior high school teacher's classes provided insight into how students can manage the demands of academic tasks and what consequences such management has for the character of academic work. Writing tasks typically took several days to accomplish and often placed difficult demands on the teacher and the students. When the teacher introduced writing tasks, the students often asked numerous questions about requirements and the nature of the final product. Students' questions often delayed the transition from explanations to actually working on assignments and these questions continued to interrupt seatwork. These delays and interruptions produced a choppy flow of events and, in turn, threatened the management of time and activities for the teacher. To avoid management problems and to sustain working, the teacher often gave explicit prompts. She also provided opportunities to revise writing assignments, offered bonus points to count toward the final grade, and typically graded written products generously. All of these actions by the teacher reduced substantially the actual risk associated with writing. In other words, the teacher reacted to immediate management demands by adjusting the requirements for academic work. This adjusting did not occur for grammar or vocabulary tasks which typically involved memory or routine algorithms. In these cases, nearly all the students could participate readily in the tasks with a minimum of instructions or delay.

A related case of task enactment has been described by Clark and Florio (1981). In this instance a third-grade teacher attempted to introduce diary writing for a designated period of time each week. The

task was presented as a valuable opportunity to express personal ideas and feelings and to learn to write. The teacher emphasized that diaries would not be seen by anyone else. Indeed, they would be locked up in a file so that no one could look at them. The diaries would not be graded so the students were free to write whatever they wanted. During diary writing time, students frequently asked about the teacher's expectations and wanted help in spelling words correctly. In other words, they seemed to approach the task as if it were an assignment to be handed in for a grade. They seemed wary of the "ungraded" conditions of the assignment. The teacher was never satisfied with diary writing time and eventually dropped the task from the regular program.

One final example demonstrates that in addition to negotiating the demands of school work, students also substitute social and personal goals for academic goals. Members of the Laboratory of Comparative Human Cognition (1982) described a project designed to help a select group of learning disabled elementary students. Approaches to teaching reading were carefully defined on the basis of work in cognitive psychology. In one of the approaches, an attempt was made to help students learn comprehension processes by stimulating them to think about expectations set up by each element in sentences. To do this, fragments of text in the form of slips of paper containing a word or phrase were presented to the students in a small group setting and they were encouraged to guess about what information might come next. After a few weeks of this program, the staff discovered that students had changed the goal from practice in comprehension strategies to a contest to see how many fragments could be covered in a session. And in order to cover more fragments, students spent less time guessing and discuss-

ing what information they might expect to encounter next. The research team concluded from this and other experiences that it is often difficult to know what goals students are in fact working on.

Summary. The research reviewed here suggests that academic work is transformed fundamentally when it is placed in the complex social system of a classroom. Because of the key role of evaluation in classrooms, student attention is often directed to answering itself rather than simply to the content. And it appears that students sometimes invent strategies for producing answers in ways that circumvent the information processing demands of academic work: e.g., copying, offering provisional answers, requesting that the teacher make instructions more explicit or provide models to follow closely, etc. Such strategies seem to be used especially with tasks involving higher cognitive processes. Thus, the tasks which cognitive psychology suggests will have the greatest long term consequences for improving the quality of academic work are precisely those which are the most difficult to install and manage in classrooms.

It would seem clear, then, that more needs to be known about how academic tasks, especially tasks involving higher cognitive processes, can be accomplished under classroom conditions.

2. DESIGN AND METHODOLOGY

The study will examine how academic tasks, especially tasks involving higher cognitive processes, are managed in junior high school science, mathematics, and English classes. Daily observations for a 6-week grading period (January 17 to February 25, 1983) will be made in classes of two teachers in each subject area (for a total sample of six classes). Teachers will be selected for their effectiveness as

determined by such indicators as subject coordinators' nominations, class mean achievement gains during the preceding 2-year period, and classroom observations. Data on academic tasks will be obtained from classroom narrative records, instructional materials used, and graded student assignments and tests. In addition, teachers and selected students will be interviewed concerning their perceptions of academic tasks accomplished in their classes. The study will generate information about structuring and directing student work, translating academic content and objectives into classroom tasks, and assessing task outcomes.

The following sections of this report provide details concerning the overall structure of the study, procedures for selecting teachers, and methods of data gathering and analysis.

Structure of the Study

The study will focus on academic tasks, particularly tasks requiring higher cognitive operations, in junior high school classes. This focus was selected for two major reasons. First, the RCLT Program staff has had considerable experience in studying teaching effectiveness and classroom management at this level of schooling (see Carter & Doyle, 1982; Emmer & Evertson, 1980; Emmer, Evertson, Sanford, Clements, & Worsham, 1982; Emmer, Sanford, & Clements, 1981; Evertson, Anderson, Anderson, & Brophy, 1980; Evertson, Emmer, & Brophy, 1980; Evertson, Emmer & Clements, 1980). Enlarging the scope of inquiry to include information about the management of academic tasks has been a logical extension of this past work. Second, students at the junior high or middle school level are beginning to develop a capacity for formal operational thinking, i.e., the use of abstract reasoning and

generalized solution strategies (see Johnson, 1980). Th[illegible] the quality of academic work in junior high school, especially work at higher cognitive levels, has importance for developing students' cognitive abilities and preparing them for advanced work in senior high school and post secondary institutions.

The study will concentrate on academic tasks in science, mathematics, and English. These subjects were selected for four reasons. First, they represent areas of major importance in the curriculum as well as domains of national concern. Thus, information about academic tasks in these subjects will make a significant contribution to the improvement of teaching. Second, these subjects typically incorporate different types of academic tasks, from memorizing terms and using routine algorithms to complex processes of planning, problem solving, and generalizing. Thus, a large amount of information about academic tasks should be obtained from research in these content areas. Third, as indicated previously in this report, there is a considerable body of research on tasks in science (e.g., knowledge representations and solution strategies in physics), mathematics (e.g., invented algorithms in addition and subtraction and problem solving in geometry), and English (e.g., using metaphors and writing). This research is useful for identifying academic tasks in these areas, and it provides a context in which the classroom data from the study can be related to progress in instructional psychology. Finally, a contrast among tasks in such diverse areas as science, English, and math should itself provide useful information about the nature and management of academic tasks.

Two classes in each subject area will be selected for analysis. The sample is limited to six classes because previous research (Carter &

Doyle, 1982) has indicated that monitoring academic tasks in a class requires continuous daily observations. When observations are less frequent, crucial information about the history of individual tasks is lost. Although this requirement restricts the number of classes that can be studied, it will produce a large amount of information about each class.

Subject coordinators' nominations, mean achievement gain for previous classes, and preliminary classroom observations focusing on the general character of academic work will be used to select teachers who have good classroom management skills and who use a variety of instructional tasks in their classes. This selection procedure will provide a sample of classes in which effective management of a variety of academic tasks can be investigated.

Data about academic tasks will be gathered for a 6-week grading period beginning January 17, 1983, and ending February 25, 1983. A 6-week grading period was selected because it is a natural unit for beginning and ending academic tasks. Although some tasks recur throughout an academic semester or year (e.g., spelling tests) or carry across two or more grading periods (e.g., a research paper), many tasks are initiated and culminated within a grading period.

A mid-year grading period was selected because it is likely to be a time when the academic task system is in full operation. Previous RCLT management research (e.g, Emmer & Evertson, 1980) has indicated that teacher actions at the beginning of the year frequently serve to establish a functioning social and organizational system. It is likely, therefore, that if data for the present study was collected at the beginning of the school year the range of academic tasks would be

limited and management considerations would confound the analysis of academic work. On the other hand, grading periods at the end of the year are likely to be influenced by standardized testing and by special management problems associated with spring and with the closing of the school year. On the basis of these considerations, it is expected that the January-February grading period will be one of the most informative for the analysis of academic tasks.

Data for the analysis of academic tasks will consist of narrative accounts of classroom events and processes, copies of materials used in class (e.g., textbooks, work and assignment sheets, tests), and samples of completed student work that have been graded by the teacher. As indicated, this information will be obtained every day in each class during the 6-week grading period by a trained observer. In addition, informal conversations with teachers will occur as needed to clarify academic work, and formal interviews with all teachers will be conducted at the end of the first 3 weeks of observation and after the 6-week grading period is over. These interviews will focus on the teachers' perceptions of specific academic tasks that occur in the classes. Information from these interviews will help sharpen the description and analysis of academic tasks and give some insights into the way the teachers think about academic work. Finally, six students from each class will be interviewed after the end of the observation period concerning their perceptions of the academic work they have accomplished. Specific reference will be made to academic tasks which occur in the classes during the last 2 weeks of observation. Because pupils often set their own goals for classroom activities (such as competing to see how many pages are read rather than trying to compre-

hend the information in the text), it is sometimes difficult to know what tasks pupils are working on. Student interviews are included in this study to obtain information about how junior high students interpret and accomplish academic work.

Sample Selection Procedures

Two classes in each subject area (science, math, and English) will be used for the analysis of academic tasks. The classes will be of average ability (as designated by school district criteria) and will be taught by teachers who qualify on indicators of effectiveness. The procedures for selecting teachers are as follows:

1. Subject coordinators in science, mathematics, and English will be asked to nominate six teachers in their content fields. In formulating their nominations, the coordinators will be asked to consider four areas: (a) any indicators that the teachers are effective in teaching the content of the curriculum; (b) evidence that the teachers are proficient in organizing and managing classroom activities (because the coordinators are familiar with the results of previous RCLT management effectiveness studies, they are sensitive to such indicators); (c) evidence that the teachers attempt to use a wide range of classroom tasks; and (d) evidence that the teachers take an active role in district-wide or regional events such as science fairs or writing projects. These guidelines are designed to help insure that the teachers nominated will fall within the upper range of effectiveness, have few management problems which might interfere with the description and analysis of academic tasks, offer a variety of classroom tasks, and be generally committed to the advancement of learning and teaching in their curricular areas.

2. Once nominations have been secured, teachers in mathematics and English will be screened for empirical evidence of effectiveness in terms of class mean achievement gain over the past 2 years. To complete this screening process, nominations will be sent by the coordinators directly to the school district's research office. This office will then retrieve from district records achievement scores for the classes taught by nominated teachers for a 2-year period. These data, with teachers' identifications masked, will then be sent to RCLT staff for final selection of nominees.

In junior high science classes, a valid measure of class achievement gain is not available. In this content area, therefore, a somewhat different nomination and selection procedure will be followed. Nominations of effective teachers will be solicited from two sources in addition to the science curriculum cordinator: principals of all junior high schools in the District, and the University supervisor of secondary science teachers. All of the nominated teachers will be interviewed and preliminary observations will be made in one or more of their classes. Teachers nominated by two or more sources will given first consideration.

3. Nominated teachers will be contacted by RCLT project staff to invite them to be candidates for participation in the study. Teachers who agree will be visited by trained observers. The observers will talk with the teachers about their programs of academic work and will observe in their classes to describe the way academic work is carried out. In this way RCLT staff can become familiar with the events and processes in the teachers' classes and verify that the teachers are effective in managing academic work and offer a range of academic tasks in their

classes. This step is especially important in the selection of science teachers as achievement data are not available.

4. The final selection of two teachers in each subject area will be made by RCLT staff from among those who agree to preliminary observations. In addition to indications of teaching and management effectiveness and the variety of academic tasks used in classes, the staff will consider feasibility of observation schedules and contrasts between teachers' approaches in selecting the classes for the study.

The students in the teachers' classes will consititute the student sample for the study and parents' permissions will be obtained to examine their completed and graded work. In addition, at least six students from each class will be selected for interviews after the end of the 6-week grading period. Students for these interviews will be selected to provide several levels of success in accomplishing academic tasks and of participation in lessons and other interactions with the teacher.

Observation and Analysis Procedures

Defining Academic Tasks

One major problem in studying the content of students' work is to arrive at a definition of what that work is. The concept of "task" provides a general analytical framework for approaching this problem.

The system for examining tasks in this study was adapted from the methods used by Carter and Doyle (1982) and represents a qualitative approach to data gathering and analysis (see Bogan & Biklen, 1982; Erickson, 1979; McDermott, Gospodinoff, & Aron,1978). In defining tasks, the system centers attention on the products students generate for the teacher (such as test papers, completed worksheets, papers, oral

reports, etc.) and on the events leading up to the creation of these products. A student product, in other words, signifies the completion of a task. The type of task involved in the creation of a product depends upon the operations students are required to use and the conditions under which the work is done. The role of a particular task in the overall task system of the class depends upon the emphasis or weight placed on the assignment as reflected in the grading policies of the teacher.

Describing Academic Work in Classrooms

The procedures for describing academic work consist of the following:

1. Focused narrative records will be made during each class session for the 6-week grading period. (See Appendix A for a sample narrative; Appendix E contains guidelines for observing and analyzing academic tasks.) In constructing these records, observers will concentrate primarily on information which defines the nature of students' products and the conditions under which they are produced. Such information includes teachers' formal directions (written or oral) for assignments, teachers' responses to students' questions about work, resources made available to students in the form of models of finished products and opportunities to share work with other students or to get interim feedback from the teacher, statements about grading policies and accountability for work, and remarks about the relationships among various aspects of work (e.g., how a grammar lesson on adverbs is related to descriptive paragraph assignment). In addition, observers will keep a record of time and provide a running account of classroom events focusing on such dimensions as student participation and engagement (general estimates), teacher location and movement in the room,

sources of student-initiated questions, and other indicators of the flow of work in the classroom.

2. Copies of assignment sheets, worksheets, textbooks, and other materials used by the teacher and students will be collected because they play a major role in defining tasks. In addition, information on chalkboards or posters in the room will be copied.

3. Work that students have completed will be examined after it has been graded by the teacher to ascertain what the students actually did in accomplishing a task and how the teacher actually evaluated their products.

4. As necessary, observers will ask teachers on an informal basis to clarify task requirements or explain the history of routine assignments, such as those which were started at the beginning of the year.

Identifying and Analyzing Tasks

Tasks are extracted from narrative records after they have been completed. To do this, the following procedures are followed:

1. Topics or assignments for each class session are listed in the order in which they occur (see Appendix B for a sample topic list). The following example is adapted from Carter and Doyle's (1982) research on tasks in junior high school lanaguage arts classes:

12/3/79 (Monday)
- a. Vocabulary test (handed in)
- b. Description of writing assignments for 12/14 (short story report) and 12/19 (descriptive paragraphs).
- c. Introduction to "imagery"
- d. Reading of "A Christmas Memory"

2. Occasions on which students' products are handed in to the teacher for summative grading are identified on the topic list. Item a in the above example (vocabulary test) is an occasion in which a product

was handed in for grading. These occasions in which work is handed in provide an index to the tasks accomplished in a class during the observation period. In some instances it is necessary to examine subsequent narratives to determine whether the product was handed back for revisions before a grade was recorded. Carter and Doyle (1982) found, for instance, that a two paragraph assignment was handed in twice for grading but was returned each time for revisions before a grade was finally recorded.

3. A list of tasks is constructed which contains a brief descriptive title for each task, the date on which it was completed, the number of sessions in which direct time was devoted to introducing or working on the task, and the approximate time devoted to the task (see Appendix C for a sample task list). Because tasks are often intertwined in a class, several decisions are required at this point concerning the distinctiveness of individual tasks. In addition, tasks are classified as major or minor based on information from the narratives concerning the importance or weight assigned by the teacher to each task during an observation period. For this study, tasks that appear to involve higher cognitive processes will be given special attention.

4. Beginning with major tasks, each task is described in terms of six general categories: (a) time devoted directly to introducing or working on the task and indirectly to assignments which are related in substance to the task (e.g., reading a story which becomes a topic for a writing assignment); (b) the assignment as defined by teacher statements over the course of time spent working on the task, including both formal directions and answers to student questions or other remarks during work sessions; (c) prompts or other resources made available to students

during the course of working on a task; (d) accountability or grading policies, including those defined initially by the teacher, adjustments to these policies, bonus points or other opportunities to earn credit which can be applied to the task, and grades actually given by the teacher; (e) process or a brief description of the events which occurred in class during time spent working directly on the task; and (f) the cognitive demands of the task, including both intended or announced operations for task accomplishment and actual operations which could have been used to product the final product. (See Appendix D for a sample description of an academic task.)

To complete this step, all narratives related to a task are read and notes are made as information emerges for these five categories. It is important to note that many tasks, especially major ones, are accomplished over more than one class session.

5. Once all tasks for an observation period are described in terms of these six categories, general statements are formulated about the nature of the academic task system operating in the class for that period. The final product is a set of statements about what an ideally wise student could know about the nature of academic tasks and how they can be accomplished in a given class.

Analysis Schedule and Arrangements

It is clear that the analysis of academic tasks often requires information about more than one class session. At the same time, an ongoing analysis is required to prevent a large backlog of narrative information and to alert observers to possible areas to watch for. To handle these issues, a set of procedures has been devised to provide for continuous analysis of data during the observation period.

1. Each observer will be assigned to a single teacher for the duration of the study and will be responsible for generating a description of the academic tasks operating in that teacher's class during the 6-week grading period. Observers will also work in subject matter teams so that they can compare notes on a weekly basis and on two occasions (during the second and the fourth weeks of the observation period) observe in each others classes.

2. Observers will take rough notes in class and then dictate as soon as possible a complete narrative on tape. A typed copy of a dictated narrative will be produced within 2 days of an observation. This schedule will enable observers to conduct a continuous analysis of tasks in their classes.

3. All three observer teams will meet together during the first, third, and sixth weeks of observation to discuss preliminary descriptions of tasks, to share insights, and to become aware of possible dimensions to watch for in each of their classes.

4. Once all observations have been completed, each observer will draft a report about academic tasks in his or her class and these drafts will be critiqued by the other team member. Revised drafts will then be distributed to the other observer teams for reactions and feedback. This step is designed to alert analysts to possible factors in their own cases and to facilitate comparisons among subject areas.

Interview Procedures.

On two occasions all teachers in the study will be interviewed individually by the observer assigned to them. The first interview will take place during the fourth week of the study, i.e., approximately half way through the grading period. The second interview will occur after

the grading period has finished. In addition, six students from each class will be selected for interviews to be conducted after the end of the grading period.

All teacher and student interviews will focus on perceptions of the academic tasks that were accomplished in the classes. The first teacher interview will serve to clarify the observer's understanding of the academic tasks he or she is observing and provide an initial perspective on how the teacher thinks about and plans for academic work. The focus, in other words, will be on general policies, goals, and procedures for academic work. By using preliminary analyses of narratives, however, it will be possible to make specific references in the interview to academic tasks which have been assigned and/or accomplished in the class.

Compared with the first, the second teacher interview will focus more specifically on the teacher's perceptions of the academic tasks accomplished during the last 3 weeks of the grading period. As the observer becomes more familiar with the class, this specificity will be possible. In addition, the second interview will be conducted after all observations have ceased, thus avoiding potential treatment effects on the teacher. Particular attention in the second teacher interview will be placed on tasks involving higher cognitive processes. Specific questions will, of course, grow out of the preliminary task analyses that will be conducted along with observations. In general, however, teacher will be asked about their overall conceptions of academic work, their objectives for specific tasks, the operations they had in mind for students to use in accomplishing the tasks, their grading policies, and their views of the success of the tasks.

The student interviews are intended to provide some perspective on how junior high school students view academic work and its accomplishment. As indicated earlier in this report, studies have generally shown that students frequently do not understand the nature and purposes of the work they do in classes and they often substitute social for academic goals (see Anderson, 1981; Laboratory of Comparative Human Cognition, 1982). It was considered important, therefore, to gather information about how students perceived the tasks that were enacted in the classes during this study.

Students will be selected by the observer in each class to meet specific purposes. It is assumed that as the observer becomes familiar with the class certain students will become visible in terms of their roles in accomplishing academic work. Carter and Doyle (1982) found, for instance, that a few students in a class initiated most of the questions concerning work requirements and other students were aware of this behavior and used the information generated by these questions to help them accomplish work. Other roles that are likely to emerge are: (a) students who are consistently successful in accomplishing work; (b) students who frequently ask the teacher for assistance in getting work done; (c) students who are very quiet in class but who accomplish work successfully; and (d) students of high or low ability who have great difficulty in doing the work (see de Voss, 1982; Good & Power, 1976).

Several methods have been used to inverview students about their work. Anderson (1981) talked with students while they were actually working on assignments. Peterson and Swing (1982), Winne and Marx (1982), and King (1980) used stimulated recall interviews in which video

tapes of lessons were played back for students and they were asked about their thought processes at various critical points. For the present study it was decided to schedule interviews after the grading period to avoid disruptions in the natural flow of academic work in the classes. At the same time, it will be possible to make specific references to tasks which have been accomplished in the students' classes. Especially in the case of major tasks and tasks accomplished during the last 2 weeks of the grading period, students are likely to remember a considerable amount of information about their understanding of the work and how they accomplished it.

Again, specific questions for students will emerge from the information contained in narratives and other data sources. In general, however, students will be asked to describe how they understood specific tasks they encountered in their class and how they went about trying to accomplish them.

Observer Training

Observer/analysts for the study will consist of four senior researchers with experience in writing classroom narratives, namely, Doyle, Sanford, Emmer, and Clements. In addition, two junior level observers with graduate course work and teaching experience in science and English, respectively, have been hired for the project. These observers will work with senior researchers on the teams in science and English.

The staff of the RCLT Program has had extensive experience writing narrative records of observations in elementary and junior high school classes for previous studies of classroom management (see Emmer, Sanford, & Clements, 1981; Evertson, Anderson, Emmer, & Clements, 1980;

Evertson, Emmer, & Clements, 1980). To orient the staff to the specific purposes of the present study and to prepare new observers, a manual was written which gives general guidelines and specific questions to be answered in the observation and analysis phases of the research (see Appendix E).

The following steps are being followed in training observers for the study:

1. Observers read several documents related to the study of academic tasks, specifically, Anderson, Spiro, and Montague (1977); Calfee (1981); Carter and Doyle (1982); Doyle (1982); and Resnick (1981, 1982).

2. Observers met to discuss the study and explore the problems of analyzing academic tasks. In these sessions, examples from Carter and Doyle's (1982) study of academic tasks in junior high school English classes were examined.

3. Observers practiced analyzing academic tasks in a narrative of a high school biology class which included textbook and laboratory work. The format of this phase of training consisted of having each observer/analyst work independently to identify and analyze tasks and then meet to discuss findings and any differences among analyses.

4. The same procedures as in Step 3 were followed for the analysis of a narrative from the Junior High Classroom Management Study (JHCOS) conducted previously by the RCLT staff. This narrative was done on a junior high school mathematics class.

5. Observers then practiced writing narratives from a full-period video tape of a junior high school English class. This step gave observers experience in constructing narratives following the procedures

outlined for the present study. These narratives were compared closely and a high degree of agreement was found. In addition, the tasks accomplished in the class that day were analyzed by each observer and these analyses were compared.

6. Observers then practiced analyzing tasks is a set of continuous narratives. This set consisted of narratives of four consecutive classes from Carter and Doyle's (1982) study of junior high English classes. Again, the analyses were conducted independently and then compared for agreement and differences.

7. The final stage of training will occur during the preliminary observations of nominated teachers to select the final sample for the study. All observers will write and analyze narratives for at least one class. Junior level observers will be accompanied by senior researchers so that their narratives can be compared for reliability and validity.

In addition to these preparatory measures, the design of the study requires that observers work in teams so that continuous interactions can occur to maintain accuracy and to sensitize observers to dimensions of academic tasks which need attention. Moveover, members of each team will on two occasions observe in each other's classes. Finally, the entire staff of six observers will meet at least three times to discuss cases and preliminary drafts of task analyses.

Reports. The final phase of the analysis will consist in the preparation of reports about the nature of academic tasks with special attention to differences among task types and ways teachers manage these tasks in classrooms. In June, 1983, an Interim Report will be completed. This report will describe the kinds of tasks observed in the classes and give preliminary findings about strategies for introducing

and structuring different tasks. A companion report is planned for publication at the end of August. This report, focusing on student responses to tasks, will present case studies of the development of competence on specific tasks for a small number of individual students. In this analysis of case studies, special attention will be given to contrasting pairs of students.

A full report of academic tasks in junior high classes will be published at the end of October, 1983. This report will summarize study procedures, the task analysis sytem, and findings from the study, including conclusions about teacher management of tasks and about what teachers can do to organize and direct information processing during classroom instruction.

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Appendix A

MAT Narrative Record for Teacher A

M A T Narrative Record

Teacher A, School 1, 12/16/82, Period 04, Science, Grade 8, 29 Ss, Doyle

Time	Narrative Record
	T remains in the room during passing period; arranges papers and mateirals. Ss enter and move toward seats, talking quietly. At
10:39	10:39, T announces that they will be tardy if they are not in their seats before the bell. T sets up overhead cart and pulls down
10:39:50	screen. By 10:39:50, Ss are in seats, quiet, waiting for bell. Bell
10:40	at 10:40. T immediately turns on overhead with a transparency that gives the date and a list of what they will do today: Pass back reports, complete notes (procedure outline). T checks roll silently.
10:40:45	At 10:40:45, T passes back outlines, comments that some of them are shakey, and says that they should see her if they are continuing to
10:41:30	have trouble. At 10:41:30, S enters late, T asks where she has been and tells her to have a pass or she will be considered tardy, S
10:41:50	leaves. (Incident does not disrupt flow.) T says "OK" at 10:41:50 (signal to begin), pauses about 10 seconds, and then begins: Before passing out reports and collages, she wants to thank them for the return of the lens to her projector. Does not know who did it. but
10:42:35	appreciates having it back. At 10:42:35, T comments that grades on collages and reports were excellent, enjoyed reading most of them. There is a scale on the north board with letter grades and numerical equivalents, e.g., A+ = 98. T goes over this scale. Asks that they not take these reports and collages home because she has arranged to have them displayed in the cafeteria. T then talks about how she graded the papers. Categories were grammar, punctuation, complete

Time — Narrative Record

sentences, written in own words, sources there and correct. One point off for grammar; comments about how they need to use capitals and periods; one point for spelling, and many lost points here. If a sentence was incomplete or did not make sense, 2 points off. If it was clear that report was not in your own words, was copied out of a book, 5 points. Sources: if no sources, 10 points; if title of a source was not underlined, 2 points; if no copyright date, 2 points; if no author, 2 points. Ss grumble; T comments that she explained all of this before reports were due; considers being able to follow directions is part of the assignment. Then she notes that if they failed to turn in one or the other of the assignments, they got a zero on the missing assignment. She gives example of one in with an A+ (98) and one missing which means that the grade of 98 will be divided by 2 to equal 49. It is best to turn in something! The zero will wipe grade out every time. This time she gave separate grades,

10:46:39 which will hurt even more. At 10:46:39, T says that if there are any questions to see her before or after school, not between classes when she is usually busy. Question: extra credit. T comments first that there was no extra credit for the charts (apparently expected by Ss), but 5 points were given for the outline. T passes back papers

10:48:30 (reports and collages). Class is quiet. At 10:48:30, T tells them to get out notebooks, they will do more on digestive system. Tomorrow they are to bring a notebook and pen or pencil, no textbook. At

M A T Narrative Record

Teacher A, School 1, 12/16/82, Period 04, Science, Grade 8, 29 Ss, Doyle

Time	Narrative Record
10:49	10:49, Q at NE, and another 15 seconds later and center front. T
10:49:32	turns overhead on. Finally at 10:49:32, says she will take questions later (these are apparently about the reports and collages just handed back). Begins lesson by asking for someone to tell her wh happen to food on the way to the stomach. Answer without looking at notes. Gets a partial, colloquial answer in nontechnical terms ("mash," etc.). T asks what happens when we chew; S gives partial answer, jokes about terms, and prompts answer. Inserts, nearly as a side comment, that she is trying to make them think. T reacts to the nontechnical terms Ss are using to take about science. Wants strict
10:51:30	adherence to scientific explanations. At 10:51:30, T reviews in a technical language all that has gone before. Asks what is the size of food that the cells can use, gets a wrong answer, prompts the
10:52:15	correct answer (molecule). At 10:52:15, T again signals "OK" and puts a transparancy on overhead. Transparency contains text written in cursive (difficult to see from observation point in SE section behind the class). Tells them she wants them to asks questions, but
10:53	make them relevant to the topic: digestive system. At 10:53, starts through notes, reviewing chewing again. Basically lecturing over the material they've already discussed. Asks about the muscle that allows food to pass into stomach: sphincture. Asks why stomach contracts and expands: gets partial answer. (Answers are given primarily by volunteers.) Stomach is a muscle, thus can only

Time	Narrative Record
	contract and relax; it is remarkable in that it can expand greatly.
10:55:20	(10:55:20) This contraction and expansion functions to break down food into smaller pieces and mix food with juices. (Format is still questions to elicit their answers at beginning of a set, then she reviews and polishes answers into scientific form.) She now begins to discuss digestive juices; this appears to be new material: T begins to lecture and attention shifts to information on overhead; fewer review-type questions; Ss take notes. T talks about hydrochloric acid, describes characteristics (burns, strong, dissolves), explains that stomach won't burn stomach because it is coated.
10:57	(10:57) T pulls down the overhead transparency to reveal new information; Ss groan; T reacts to groan by saying she didn't tell them they had to copy down all of this information. She then talks about
10:58:30	juices and heartburn. At 10:58:30, T tells them they don't have to copy the next part down, but she thought they would be interested. Relates heartburn to gas, discusses causes [eating habits and stress cause increased activity; some foods produce gas (beans, cheese)].
11:00	At 11:00, T recites a jingle of her grandmothers: "Beans, beans, the magical fruit, etc..." A student tries to initiate another jingle; T holds it down by pushing on to explain that acid on gas bubbles touches esophagus and causes heartburn. S asks why it is called heartburn when does not involve heart. T answers that at one time they probably thought it was heart-related because of location of

Time | Narrative Record

pain. Another S asks what makes you burp: T answers that it is probably some muscle. S asks why heart is said to be on left when it is really in the middle; T answers that it leans to the left. Several
11:02:30 heart questions follow. At 11:02:30, T says OK, you got me off the topic, we are discussing digestion not circulation. She then tells them to copy this down for their own best interests: many of you are setting yourself up for ulcers by what you do now. Explains that stomach produces 1-2 qts. of digestive juices each day; needs something to work on or it will work on lining and make a hole, which is
11:04:15 an ulcer. At 11:04:15, a hand is raised, T says no questions now, let her get through this. She then gives them examples of ways to get ulcers: gulping food down too fast; not eating so as not to get vitamins, etc. (tells them she expects them to know the food groups
11:05:30 even though they did not get notes on this); (11:05:30) talks about diet (some Ss from the outside interrupt with no consequences for flow of events) and need to eat regular meals. These effects will
11:06:45 show up later in life. At 11:06:45, talks about nervous tension placing system in high gear, produces acid. Need to loosen up. At
11:08 11:08, talks about skipping meals, again no food for juices to work
11:09 on. Mentions that these are all things they can control. At 11:09, S asks about what happens to people in hospitals who are fed intervenously, T answers that this is a problem, but metabolism probably slowed down, trade off of ulcers for benefits of treatment;

Time	Narrative Record
	medication can probably be given. Says she is not sure. S asks if the hole can be repaired; T answers that if it is small the stomach can repair it itself; if it gets bigger then problems arise. Tells them that taking aspirin on an empty stomach is bad; drink with milk to coat stomach. (At this point she is using some inserted questions
11:11:20	to develop points.) At 11:11:20, S asks if medication needs to be digested before it can have effects. T mentions that capsules are designed to have medication by-pass stomach and be broken down in
11:12:15	small intestine. At 11:12:15, S asks whether alcohol can cause ulcers; T says yes, but has greatest effect on liver. Then says her pitch for the day is that the worse thing you can do is drink and take medication, even aspirin. We do not know the side effect of
11:13:30	medications with alcohol. At 11:13:30, S asks why chicken soup recommended for ulcers; T answers that she has not heard of that; milk is usually recommended. Or Pepto-Bismo, etc. S asks if stomach acid gets through lining, why not through rest of wall. T answers that it is neutralized in the small intestine; doesn't go through
11:14:30	lining. At 11:14:30, S asks what milk can do to you if you are allergic to it. T doesn't know. S comments that you can get rickets; T says no, rickets are caused by a vitamin D deficiency.
11:15:48	Discussion drifts off a bit here and at 11:15:48, T tells them to hold questions, write them down, the are going on to the small intestine. Ss grumble, T asks if they want to do this tomorrow, no.

Time	Narrative Record
11:16:20	At 11:16:20, they move on; new notes on overhead. T lectures: acid neutralized in small intestine. Digestion is complete here, not in stomach. Liver important. This part is not in text, tells them to copy it; they do. Liver part of digestion and excretion. Makes reference to news item about a girl who needs a liver transplant or machine. Liver produces bile and it stores sugar. Mentions pancreas, tells them it was the pink organ on the diagram they did.
11:18:30	(11:18:30) Body runs on sugar. (Ss are taking notes now.) T uses examples of fasting for two days. With no food, brain signals liver to release sugar into blood; then if this runs out, body uses up fat cells; then... Asks them what's left; gets several answers pointing
11:21:20	toward "you"; wants protein. At 11:21:20, gets question about fasting; says that most do not abstain completely. T gets a question about what happens to all the juices produced, reacts immediately that this is a science class, use scientific terms; then when student is finished asking the question, T tells him to listen to what she
11:22:45	just said, viz., small intestine neutralizes acid. At 11:22:45, T tells them she is at the tail end of notes. Food is absorbed in the small intestine; describes how food is absorbed into blood to be carried to cells in molucule form. What is left is undigested food.
11:23:50	At 11:23:50, last part. Undigested food is held in the larger intestine until eventually pushed out of body. Water is absorbed in large intestine and returned to body: asks what would happen if it

Time	Narrative Record
	wasn't; several answers about dying, etc. Finally get dehydration. Dehydration is one of the most serious consequences of diarrhea. (T repeats the same information several times as she goes through the
11:25:45	material.) At 11:25:45, T gives summary. Gets question: what if intestine is cut: you have 20 feet to work with. Q: what causes
11:26:50	diarrhea: bacteria. Q, at 11:26:50, doesn't the water need to be cleaned? T says they will talk about that later when they get to the excretion processes. T calls attention to the front board and tells them to write down phrase: large intestine rids body of solid waste. S asks if T knows how Jerry Lee Lewis's stomach burst: T doesn't
11:28:20	know. At 11:28:20, T tells them to take out diagram of digestion. Tells them she is 100% sure that the an essay on their test will be about what happens to food when you stick it in your mouth. She then puts diagram on the overhead and tells them here is how to attempt an answer (i.e., she is giving them a sample answer). She then reviews the processes they have discussed in class. Only two Ss are taking notes now, rest listen quietly (T has told them they don't need to
:30:46	take this down). At 11:30:46, T asks if there are any questions. None. This is it. Monday after Christmas they will do excretion. Test will be on Friday of that week since there is a lab during the
11:31:20	week. At 11:31:20, puts up overhead sheets for those who still need to copy notes. General talk breaks out. T checks a note a student

Time	Narrative Record
11:32:30	had (absence or something). Ss talk. At 11:32:30, T announces that they know they have the last five minutes to talk, but it must be
11:34	quiet. At 11:34, noise is getting louder, some walking around. T looks across class (is talking to two Ss are front) but does not
11:34:38	intervene. At 11:34:38, tells them to listen up. Tomorrow notes books and something to write with for what they are going to do (does
11:35	not tell). Mentions paper on floor. Bell at 11:35. Waits for silence and then dismisses them.
	(End of observation).

Appendix B

Topic List for Class Sessions in

Class A1--12/3/79 to 12/19/79

(Adapted from Carter & Doyle, 1982)

Topic List for Class Sessions in Class A1--12/3/79 to 12/19/79

12/3/79 (Monday)

1. Preparation for vocabulary test.

2. Description of writing assignments for 12/14 (short story reports) and 12/19 (6 descriptive paragraphs).

3. Introduction to "imagery."

4. Reading of "A Christmas Memory."

12/4/79 (Tuesday)

*1. Final revision of paragraph based on "Flowers for Algernon" (done as homework).

2. Writing of 5 compound sentences about "A Christmas Memory."

12/5/79 (Wednesday)

*1. Writing of a paragraph of 5 sentences based on "A Christmas Memory."

*2. True-False test on "A Christmas Memory."

12/6/79 (Thursday)

*1. Journal writing

2. Two paragraph assignment on "A Christmas Memory."

12/7/79 (Friday)

*1. Vocabulary test.

2. Revision of 2 paragraph assignment on "A Christmas Memory."

12/10/79 (Monday)

1. Preparation for vocabulary test.

*2. Final revision of 2 paragraph assignment on "A Christmas Memory Memory."

3. Introduction to short story "Mateo Falcone."

12/11/79 (Tuesday)

1. Reading of "Mateo Falcone."

*2. Word study combined with a "paragraph of reason" (i.e., use words listed at end of story in sentences to make a paragraph.

12/12/79 (Wednesday)

1. Explanation of 12/14 (short story reports) and 12/19 (descriptive paragraphs) assignments.

12/13/79 (Thursday)

*1. Paraphrase of two quotations.

*2. Grammar exercise on clauses.

12/14/79 (Friday)

1. Work on short story assignment.

12/17/79 (Monday)

1. Description of 12/19 (descriptive paragraphs) assignment.

*2. Vocabulary test, combined with paragraph to "compare two things."

*3. Short story assignment handed in (no class time).

12/18/79 (Tuesday)

1. Work on descriptive paragraphs and illustrations.

12/19/79 (Wednesday)

*1. Descriptive paragraphs handed in (no class time).

*2. Introduction to Poe, with notes handed in.

*3. Writing of 2 sentences on why people enjoy being terrified.

(*indicates that work was handed in for a grade)

Appendix C

Academic Tasks Accomplished from

12/3/79 to 12/19/79 in class A1

Academic Tasks Accomplished from
12/3/79 to 12/19/79 in class A1

Major Tasks:

1. Two-paragraph assignment comparing Christmas in Capote's story "A Christmas Memory" with Christmas today

   Date handed in: 12/10/79

   Sessions: 3 (12/6, 12/7, 12/10)[a]

   Time: 105 minutes (20% of total task time)[b]

2. Short story report on a story not read in class

   Date handed in: 12/17/79

   Sessions: 3 (12/3, 12/12, 12/14)

   Time: 87 minutes (16% of task time

3. Six descriptive paragraphs with illustrations

   Date handed in: 12/19/79

   Sessions: 4 (12/3, 12/12, 12/17, 12/18)

   Time: 84 minutes (16% of task time

Minor Tasks:

4. Descriptive paragraph based on the story "A Christmas Memory"

   Date handed in: 12/5/79

   Sessions: 2 (12/4, 12/5)

   Time: 40 minutes (7% of task time)

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[a]Refers to the number of sessions in which some time was spent either introducing the task or actually working on it.

[b]Refers to the total time spent introducing the task and working on it. All times are approximate.

Academic Tasks Accomplished from

12/3/79 to 12/19/79 in class A1 (continued)

5. Revision of paragraph based on the story "Flowers for Algernon"

   Date handed in: 12/4/79

   Sessions: (Revisions done for homework)

   Time: None during observation period

6. Vocabulary test

   Date handed in: 12/7/79

   Sessions: 3 (12/3, 12/6, 12/7)

   Time: 30 minutes (5% of task time)

7. True-false test on "A Christmas Memory"

   Date handed in: 12/5/79

   Sessions: 1 (12/5)

   Time: 8 minutes (1% of task time)

8. Word study combined with a paragraph of reason based on the short story "Mateo Falcone"

   Date handed in: 12/11/79)

   Sessions: 1 (12/11)

9. Vocabulary test combined with a paragraph to compare two things

   Date handed in: 12/17/79

   Sessions: 2 (12/10, 12/17)

   Time: 51 minutes (9% of task time)

Academic Tasks Accomplished from

12/3/79 to 12/19/79 in class A1 (continued)

Minor Tasks (cont.) 10. Grammar exercise on clauses

Date handed in: 12/13/79

Sessions: 1 (12/13)

Time: 40 minutes (7% of task time)

Exercises: 11. Journal writing

Date handed in: 12/6/79

Sessions: 1 (12/6)

Time: 10 minutes (2% of task time)

12. Paraphrase of two quotations

Date handed in: 12/13/79

Sessions: 1 (12/13)

Time: 13 minutes (2% of task time)

13. Literature notes on Poe presentation

Date handed in: 12/19/79

Sessions: 1 (12/19)

Time: 39 minutes (5% of task time)

14. Two sentences on why people enjoy being terrified

Date handed in: 12/19/79

Sessions: 1 (12/19)

Time: 13 minutes (2% of task time)

Appendix D

Description of Task 1: Two paragraphs comparing Christmas in "A Christmas Memory" with Christmas today

Description of Task 1: Two paragraphs comparing Christmas in "A Christmas Memory" with Christmas today

A. Time

1. 12/10/79 (day handed in): introduction-10.5 minutes; getting started-3 minutes; work-20 minutes; total-33.5 minutes.
2. 12/7/79: introduction-5.5 minutes; getting started-7 minutes; work-19.5 minutes; total-32 minutes.
3. 12/6/79: introduction-12 minutes; getting started-10 minutes; work-18 minutes; total-40 minutes.
4. Time necessary to get started working decreases over the three days spent on this assignment.
5. Work on 12/3 (reading "A Christmas Memory"), and 12/4 and 12/5 (writing sentences about "A Christmas Memory" was related to this task.

B. The Assignment

1. Write two paragraphs comparing and contrasting Christmas in "A Christmas Memory" with Christmas today.
2. There is to be a total of 5 active verbs in the final product and these are to be underlined.
3. There is to be one compound sentence in each paragraph and it is to be underlined.
4. There is to be as many transition words as possible and these are to be circled.

5. Avoid indefinite reference pronouns such as "this," "that," or "they (as in "they say").

6. No length requirement.

7. Do not use expression such as "I think" or "I feel."

8. Do not use linking verbs.

9. Watch out for elementary errors such as spelling, run ons, fragments, etc.

Requirement 1 was initially open-ended with a suggestion that students "may want to consider" doing comparisons in the first paragraph and contrasts in the second paragraph. Later, this suggestion became a requirement. Requirements 2 and 3 did not change during the course of the task. Requirements 4, 5, 6, and 7 were added across the first two days as students worked on the assignment. Requirement 8 was added on the last day. Requirement 9 was a general requirement for all writing assignments and was specifically mentioned each day for this task.

C. Prompts

1. Directions for the assignment were repeated for the whole class immediately after they were given and then for several students if contacts were private. If the contact was public and came from one or two specific students, the teacher refused the request for a repeat.

2. Corrected copy was handed back twice, the second time with a list of common errors made on first two drafts.

3. The teacher became increasingly more explicit about requirements for content of paragraphs.

4. Students were given models, on the board after the first draft and then a dittoed copy after the second draft.

5. Many suggestions for possible comparisons and contrasts were given during the reading of the story, instructions for the assignment, and seatwork on the assignment.

6. During the last few minutes of each working period, the teacher inspected individual papers (by roving around the class or accepting papers brought up to her) and made private and public suggestions.

D. Accountability

1. This was described as a major assignment by the teacher and was graded. Students were told initially that the drafts on 12/7 would be graded, but these were returned for revisions because they did not meet her standards.

2. Daily grades were given as follows: the rough copy on the first day of the assignment (12/6) was to count as a zero and the student would loose 10 points from the daily grade for the trimester if not completed (on the next day it was announced that this draft was not graded); the draft on the second day (12/7) was to have a similar effect on the daily grade.

3. Progress checks, on which the students were graded, were made on the third day of the assignment.

4. Ten extra points could be earned for the title, if creative.

5. Several students used bonus points (24 this week) from the Cowboy game; the teacher reminded the class of these bonus points on the last day of the assignment.

6. Actual grades: for content the mean grade was A- and 16 of the 20 students got A's; for grammar, the mean grade was a C, the highest was B+, there were four B's and 7 D's. The most common comments were directed at punctuation and proofreading. It was not clear how the bonus points were actually used in calculating grades.

E. How It Went

This assignment took three days to complete. On the first day, the teacher gave "suggestions" about content for the assignment and she had a sample written on the board. They were to do a rough copy. When she turns it over to the class to work, there is a 10 minutes period during which there are questions about the meanirg of "comparison" and "contrast" and considerable talking among the students. Leo creates an interesting incident in which immediately after the teacher completes her direction he asks what he is supposed to do. The teacher resists this attempt to have the assignment repeated by noting that she has already repeated the directions three times. He continues to ask for directions and she ignores. Eventually, he starts to write his heading on the paper and calls out this information to himself (but at a middle to public range) as he writes. The teacher ignores this action. She

does, however, repeat the information privately to students in the west region of the class. The class settles down by 11:22, but Leo is still talking out while the teacher is at the podium correcting papers. As the class settles into work, student questions continue, but at a reduced rate. Leo continues to talk out periodically. Between 11:30 and 11:35, the class is fairly quiet and the teacher works with individuals. Then students begin to bring papers up for checking by the teacher. The teacher begins to make public comments about the work and circulates around the room making comments. Papers are collected at the bell. On the second day, drafts are handed back for corrections; no grades were given. On this day, instructions are more explicit: what was optional yesterday is not required and the teacher calls explicit attention to her examples written on the board. Again, after directions from the teacher, there is a 7 minute start up time with students approaching the teacher with questions and with talking among students. There is a fire drill at 11:14, and the students settle in to work after this. There are 12 student questions during seatwork, mostly about procedures and spelling. The teacher begins to rove during the last part of seatwork, and comments on the errors on the papers she has seen. Most of her comments are about form. At the end of the day, the teacher comments that several have lost points because of conduct. On the third day, the teacher hands back drafts, without grades (although these were supposed to be graded), and says that the paragraphs were "mangled." She also hands out a list of errors she found. She tells

them they will be working on writing a two paragraph assignment over the next several weeks but that today they are to put together two paragraphs "as I intended." She hands out a dittoed example. She then offers a series of bonus questions. After a 10 minute introduction, students get to work. Student questions last for only about 3 minutes. Today she does a progress check (which is usually done to control conduct) during which she takes a few private questions. Work time is quiet today. After the progress check, the teacher works at the podium on papers.

Appendix E

MAT Manual for Observers

Walter Doyle

MAT Manual for Observers

This manual is designed to guide observers in the MAT study through the processes and procedures for writing and analyzing narrative records and other data concerning academic tasks and for interviewing teachers and students. It is assumed that the reader is familiar with the conceptual background and the design for the MAT study. Readers should also be familiar with Doyle's (1982) review of research on academic work and Carter and Doyle's (1982) report on tasks in junior high English classes. Finally, useful information about qualitative methods can be found in Bogan and Biklen (1982).

Introduction

Three major data sources will be be used to obtain information about academic tasks. The first is the narrative records of classroom observations which will be written on a daily basis for each class during the six-week grading period from January 17 to February 25, 1983. Copies of assignment sheets, worksheets, textbooks, and other instructional materials will also be consulted in constructing narrative records. These narratives will form the main resource for analyzing how academic tasks are realized in the actual clasroom situation. Second, students' completed papers, tests, worksheets, etc. will be examined after they have been graded by the teacher. Finally, formal interviews with teachers and selected students will be conducted to gain information about their perceptions of the academic tasks which are accomplished in the classes during the grading period.

The system for describing and analyzing tasks in this study centers on the products students generate for the teacher (such as tests, completed worksheets, papers, oral reports, etc.) and on the events

leading up to the creation of these products. A student product, in other words, signifies the completion of a task. The type of task involved in the creation of a product depends upon the operations students are required to use and the conditions under which the work is done. The role of a particular task in the overall task system of the class depends upon the emphasis or weight placed on the assignment as reflected in the comments of the teacher and his or her grading policies.

The essential responsibility of each observer/analyst is to describe, in the analytical language of the study, the academic tasks which operated in a class during the grading period and how these tasks were accomplished by the teacher and the students. Two major obstacles must be faced in generating such a description. First, tasks often have a life history that extends over two or more class sessions and during this time important information about task accomplishment is communicated to students. Tasks are identified, therefore, retrospectively from their terminal points and then the events leading up to this terminal point are traced. This factor complicates the job of constructing narrative records because it is often difficult for an observer to know at any given moment where things are going or what information will eventually be used to define or accomplish a task. Second, tasks are often interconnected thematically. For example, a short story read in class can become a basis for a test over the content of the story, a vocabulary exercise, and a writing assignment. This linking complicates the process of identifying distinctive task units and analyzing the factors which contribute to accomplishing a particular task.

In the following pages, steps for completing an academic task description are identified and the procedures for working through these steps are delineated. Particular attention is given to the questions which should guide the analysis at each point in the process.

Constructing Narratives

Focus during class sessions. In writing a narrative record in the classroom concentrate primarily on information which defines the nature of students' products and the conditions under which they are produced. See the section on procedures for analyzing narratives for specific questions which will eventually need to be answered about aspects of tasks. Also see Appendix A of the design report for a sample narrative. Areas for special attention during class observations include:

1. Teachers' directions (written or oral) for assignments. Pay particular attention to formal statements the teacher makes about the nature of assignments and the requirements for completing work. Copy such information down if it is written on the chalkboard and then note whether the teacher refers to this written information in class. Also, collect a copy of any assignment sheets or worksheets that are handed out to students for the assignment. Copies of textbooks or workbooks used by the students will be obtained from teachers at the beginning of the observation period. In addition, record the teacher's responses to students' questions about work or informal comments during work time which seem to define or alter the nature of an assignment. Such comments are often made while teachers are inspecting students' papers while monitoring seatwork. In essence you want to be able to describe the requirements for a task as these were announced to students during the course of working on a task. A useful frame of mind is to imagine

that you are a student in the class and ask yourself whether you know what to do and how to get it done.

2. Resources made available to students in the form of textbooks or other resources, hints or clues for accomplishing parts of assignments, models of finished products supplied by the teacher or by students who are asked to read answers or reports to the class, and opportunities to discuss work with other students or to get interim feedback from the teacher. Also, note whether students can consult notes taken previously or see posters, chalkboard messages, or other sources of information related to accomplishing a task. Teachers often give prompts as they move around the classroom assisting individual students. Try to record what type of information is being given by the teacher (e.g , the exact answer or a hint about how to get to the answer) and whether the information can be heard by more than one student. Also if work is corrected in class, note if it is possible for students to write their answers during this activity. Finally, note any remarks the teacher makes about relationships among various aspects of work (e.g., a mention of a grammar lesson on adjectives in assigning a descriptive paragraph).

3. Statements about grading policies and accountability for work Record any comments the teacher makes about whether a product will be graded how much weight it will have in the grade for the term and what particular features of the product are most important. Also, note whether bonus points or extra credit is available for use with the assignment. Eventually these statements will be verified when completed and graded products are actually examined (procedures for this step are explained in the section on student work samples). Be alert for

occasions of public accountability in which students are required to perform in front of their peers (even though formal grades may not be recorded). During recitation activities note approximately how many students actually participate and whether participation is voluntary.

4. A running account of classroom events focusing on such dimensions as student participation and engagement (general estimates), teacher location and movement in the room, sources of student-initiated questions, and other indicators of the flow of work in the classroom. This account should include frequent recordings of time (a digital display watch simplifies this recording). Pay particular attention to the flow of events during transitions from teacher instructions for assignments until the time students "settle in" for work (i.e., at least 75% of the class is working on the task). Record students' names whenever possible. You will not be able to produce a complete record of classroom management or activity flow, but capture as much of the ongoing process as possible without missing direct task-related information.

Rules and conventions. The following general procedures have been defined to regulate the process of obtaining classroom information and getting it converted into a finished narrative record:

1. During the class session, take notes in rough form using whatever shorthand notations suit your own style and purposes. It is often helpful to use bound pads of paper (such as legal pads) so that pages can be turned easily and the order of pages is not lost. Try to quote task-related statements by the teacher or students as closely as possible (although a verbatim record is not always feasible or necessary). Use quotation marks only for direct quotes; otherwise use

some phrase to indicate that the record is an approximation of the actual statement made in class. Also, if you miss something (such as how many pages are to be read for homework), record whatever you think is the accurate information and indicate in the final narrative that you are estimating what happened.

2. During the first few observations you may be confused about certain aspects of the class, such as whether an assignment is to be graded or what the requirements of a routine task are. It is acceptable to ask the teacher after class about such matters, but use this approach judiciously. In particular, make sure that your questions do not imply a negative judgment of the teacher or a recommendation for an alternative practice. You may have an inadvertent treatment effect on the class. In many cases, the requirements will become clear as you become more familiar with the class and hear or see the teacher's comments or grades for work. Finally you will be able to examine the grade book at the end of the term to ascertain whether an assignment was actually graded. You can then go back and add an addendum to your narrative(s).

3. <u>As soon as possible after the class session, dictate a complete narrative record on tape and give it to the designated typist</u>. We will make every effort to produce a typed narrative within two days of the observation. Label your notes, stapling each observation seperately, and turn them in with your tape. These notes will be used in case any part of the tape is unclear or, God forbid, the tape is lost. Your notes will be returned to you with a security copy of the typed narrative. Do not get behind in dictating narratives or you will soon become swamped with notes that are no longer decipherable.

4. Keep notes (with dates) about any policy decisions you make in labeling classroom events or recording specific types of information. In addition, record any thoughts, insights, reactions, etc., which emerge as you reflect on what you are seeing. These notes will be very helpful in keeping track of your thinking. Also, if the teacher initiates any comments to you during or outside of class, make a record of them as soon as possible. In many cases, supplementary notes can be dictated with narratives.

5. For the final report, you will need to write a general description of the physical setting of the classroom, including the location of desks, chalkboards, posters, bookcases, podiums, etc. Beginning with the first class meeting, make a class map. Update this map as necessary to record changes in seating, location of furniture, or content of subject-related posters. It is not necesary to include a description of the physical setting in each narrative.

Examining student work. Completed and graded student products will be examined, as well as the teacher's grade book, so that tasks can be traced to their actual termination, i.e., to the completion of an "exchange of performance for grades." You will find that this information is quite valuable in identifying and analyzing task units.

Permissions will be obtained to examine completed and graded student work and teachers will be asked to route graded papers to observers before they are given back to students. In cases in which permission is not granted for a particular student or students, this work must be excluded from the analysis.

The logistics for examining work can become complicated so you will need to work out some system with the teacher to handle this flow of

papers. Our general policy is to avoid delaying the return of papers to students or inconveniencing the teacher. In some cases, graded papers will be available for you to examine them after class. In most cases you will need to arrive early to check a set of papers. And, there will be times when it will simply be impossible to inspect a set of papers.

If you decide that it is vitally important to have file copies of particular student product, try to arrange with the teacher to bring papers to the Center for copying. In such cases, exercise extreme caution. Do not misplace papers or allow them to be seen by anyone other than RCLT staff. And get them back to the teacher as soon as possible.

In examining student work, look for the following:

1. the correspondence between stated task requirements and the final products (i.e., how well did the students do in comparison with what the teacher seemed to establish as criteria in the announced requirements);
2. patterns of student's errors or areas of difficulty;
3. the focus and general character of teacher comments;
4. the grades students received and;
5. any correspondence between prompts or models given by the teacher in class and the content of student products.

Analyzing Narratives

The process of analyzing the narrative records consists of a search for patterns related to what the academic tasks are and how they were managed by the teacher and the students during the grading period being observed. The process is to be continuous during the observation period to prevent being overwhelmed by narratives at the end of observations,

to discover as you go along dimensions which need to be examined in the class while you are still there (i.e., early observations serve to structure in part later ones), and to formulate a basis for interviews with the teacher and the students. The following description of procedures will focus first on the general schedule and arrangement for the analysis and then turn to specific questions to guide the process.

Schedule and arrangements. The following structure has been established to facilitate the analysis process:

1. A preliminary task list and analysis should be done in conjunction with each narrative and a cumulative analysis should be done at the end of each week. Include a brief summary of "how it went" with each day's analysis.

2. Subject matter teams are to meet at least once per week during observations to discuss their cases and review drafts of task analyses. These meetings are designed to share perceptions and alert team members to possible dimensions to watch for in subsequent observations.

3. During the second and fourth weeks of the grading period, observers on a team are to arrange to observe together in both classes. Each observer should prepare a narrative and a preliminary task analysis for this observation.

4. During the first, third, and sixth weeks, all teams will meet together to discuss cases. More frequent meetings will be held if they are considered necessary.

5. Once all observations are completed, each observer will draft a report about academic tasks in his or her class and these drafts will be critiqued by the other team member. Revised drafts will then be distributed to the other teams for reactions and feedback. This step is

designed to alert analysts to possible factors in their own cases and to facilitate comparisons among subject areas.

6. The final phase of the analysis will involve the preparation of a report about the nature of academic tasks with special attention to differences among task types and ways teachers manage these tasks in the classroom.

Identifying tasks. Tasks are extracted from a set of narrative records using the following procedures:

1. Topics or assignments for each class session are listed in the order in which they occur (see Appendix B for a sample topic list). The following is an example of a topic list from a single session in a junior high school lanaguage arts class (adapted from Carter & Doyle, 1982):

12/3/79 (Monday)

*a. Vocabulary test (handed in)
b. Description of writing assignments for 12/14 (short story report) and 12/19 (descriptive paragraphs).
c. Introduction to "imagery"
d. Reading of "A Christmas Memory"

2. Occasions on which students' products are handed in to the teacher for summative grading are identified on the topic list by an asterisk (*). Item a above (vocabulary test) is an example of an occasion in which a product is handed in for a grade. In some instances it is necessary to examine subsequent narratives to determine whether the product was handed back for revisions before a grade was recorded. Carter and Doyle (1982) found, for instance, that a two paragraph assignment was handed in twice for grading but was returned each time for revisions before a grade was finally recorded.

This set of "answering" occasions when products are handed in is an index to the tasks accomplished in a class during the observation period.

3. A list of tasks is constructed which contains a brief descriptive title for each task, the date on which it was completed, the number of sessions in which direct time was devoted to introducing or working on the task, and the approximate time devoted to the task (see Appendix C for a sample task list). Since tasks are often intertwined, several decisions are required at this point concerning the distinctiveness of individual tasks. Tasks are then classified as major or minor based on information from the narratives concerning the importance assigned by the teacher to each task during an observation period. Significance of a task for a teacher can be estimated from statements made in class about its importance and about the "weight" the grade for the product carries in calculating the grade for the term (e.g., 1/4 of the final grade). For this study, tasks which appear to involve higher cognitive processes will be given special attention.

Questions for analysis. Beginning with major tasks, each task is described in terms of six general categories (see Appendix D for a sample task description):

1. How much class time was devoted directly to introducing or working on the task and indirectly to assignments which are related in substance to the task (e.g., reading a story which becomes a topic for a writing assignment)? The purpose here is to give a general picture of the blocks of time that were devoted to a task rather than a detailed accounting of time use in specific categories. Time estimates can only be approximate since precise times for the beginning and ending of work

periods are difficult to determine. A listing of times gives the analyst a useful overview of how time was distributed across tasks and some indication of the "emphasis" given to various tasks. The time list provides in other words, a backdrop for the rest of the analysis focusing on individual tasks. Specific questions to answer in this category are:

a. How much class time was spend introducing the task by giving content instruction (i.e., what cognitive operations to use to produce a product), directions for procedures (e.g., headings, length, deadlines, etc.), or otherwise talking about the requirements of an assignment? Count only segments which are devoted primarily to formal presentation in which the responsibility of the students is to listen to the teacher (include, of course, time in which students ask questions during such a segment to clarify instructions). Do not count teacher comments inserted into seatwork segments as instructional time.

b. How much time was spent actually working on the assignment in class?

c. How much time was spent in transitions from formal presentations about a task to a period when students appear to "settle in" to working on the task?

d. How much class time was spent in feedback for finished products before they were handed in for a grade? Include here time in which students check their own papers or examples are read publicly by the teacher or students before papers are collected.

e. How much time was spent in class grading the final product after all opportunity for working on it was over? Include here time spent checking work when papers have been exchanged or other restrictions are placed on modifiying finished products after feedback.

f. How many class sessions (time amounts are not necessary) contained content that was related indirectly to this task? Do not count sessions here in which direct instructional or work time was spent on the task (such times have already been recorded above). Include only sessions in which there was some substantive connection (e.g., a short story was read which eventually was used as a basis for a descriptive paragraph) but not those which are related only in some remote way to the content of the present task (e.g., weekly spelling tests which emphasize the importance of correct spelling). In answering this questions, include all sessions in which there is a substantive relationship, regardless of whether the teacher specifically mentions the connection or not.

2. What was <u>the assignment</u>, i.e., what was the character of the final product students were to hand in? The focus here is on the "official" or "announced" requirements as defined by teacher statements over the course of time spent working on a task. In answering this question examine both formal directions and answers to students' questions or other remarks during work sessions. Do not include prompts or resources which may change the cognitive demands of an assignment but

do not define the official character of the finished product. For example, a teacher might mention that students can consult a grammar handbook in completing a worksheet. The handbook is a resource but not part of the assignment unless the teacher requires that students make specific reference in the final product to relevant sections of the handbook. If, however, a teacher redefines the final product over the course of working on an assignment (e.g., suggested features of a short essay become required elements), then note this change. Also, note any requirements that might be omitted, e.g., no mention is made of the length of an essay. In some cases, references to the requirements of an assignment may be made several class sessions in advance of working on the task so several narratives may have to be consulted. Specific questions to answer here are:

a. What was the final product supposed to be? List each distinct feature separately (see Appendix D for an example).

b. Were there any standing requirements in the class which affected this assignment? For example, were all assignments supposed to have a particular heading or were only two spelling errors allowed on all writing assignments in this class?

c. What changes, if any, occurred in the definition of the final product during the time spent working on the assignment?

d. Were there any features not specified that you might reasonably expect to have been, e.g., length of written assignments?

3. What prompts or other resources were made available to students during the course of working on a task? Here the focus is on what students were told about how to produce the final product. The analysis is to include both (a) direct instruction on the cognitive operations and resources that were to be used "officially" to accomplish the task and (b) any clues or resources that were made available incidentally (e.g., through teacher answers to student-initiated questions during seatwork) or indirectly (e.g., through opportunities to inspect work accomplished by other students). In analyzing incidental or indirect prompts and resources, you are looking for ways in which task requirements or cognitive demands could have been circumvented by students in the class. Specific questions to answer include:

   a. What specific information, in addition to that which defined the character of the final product, did the teacher communicate formally to students about how to accomplish the task? The primary focus here is on public or whole class statements during formal presentations of the assignment or during work periods. In other words, what "direct instruction," as defined in Doyle's (1982) paper on academic work, was given?

   b. What resources or models of the final product did the teacher designate explicitly for use on this assignment? Include here any mention by the teacher during formal presentations or work periods of texts, handouts, notes, or previous lessons relevant to producing the final product.

c. What incidental comments were made at a private or middle range level which served as a clue or a model for getting the work done? Such comments are often made in response to student-initiated questions at the end of formal presentations of tasks or during seatwork segments. Teachers also make such comments after they have inspected student papers. These comments supplement official instructions and can, at times, inadvertently open routes to answers which circumvent the official requirements of the task. When describing incidental comments, try to estimate how many students were likely to have had access to this information, i.e., how far did the teacher's comments penetrate the class.

d. What official or unofficial opportunities were available to discuss work with fellow students or inspect what others had already done in accomplishing the task? Were students permitted or encouraged to help each other or was order in the class loose enough to permit students to share information or resources in getting the work done?

4. What means of <u>accountability</u> were used in conjunction with this task? The focus here is on grading policies for the task, including those defined initially by the teacher, adjustments to these policies over the course of work time, bonus points or other opportunities to earn credit which can be applied to the task, and grades actually given by the teacher. Specific questions to be answered include:

a. What did the teacher say about how the final product would be graded? Include any statements about the significance

or "weight" of this assignment in the final grading for the term. In some cases the teacher may be vague about whether a product will be graded at all or no mention will be made of grading. Note these conditions if they occur.

b. Were there any standing grading policies which applied to this product (e.g., all grammar exercises are kept in folders and graded at the end of the term)?

c. For assignments which take more than one class period to complete, were there any interim grades (daily grades or progress checks) given for partial products or for evidence of working on the product?

d. What opportunities were available to earn or use extra credit or bonus points for this assignment?

e. How were the final products actually graded by the teacher? Here you can use general summaries, e.g., average grade for the class, number of A's, B's, etc.

f. What was the focus of teacher comments, if any, on the graded papers? For example, were comments on a written assignment directed to mechanics or content? Were comments congruent with announced requirements or goals?

5. How did it go, i.e., what happened in the classroom during time in which this task was accomplished? In this section you are to write a summary of the events and processes which occurred in class during time spent introducing or working directly on the task. The central focus here is on the ways in which the task was managed by teachers and students in the actual clasroom situation. Specific questions to be answered include:

a. What was the general character of the activity flow during this assignment? Did things run smoothly or did the teacher have to expend considerable energy to get work started and accomplished? Was there a noticeable delay between introduction to the task and student engagement in working on the task?

b. What was the general sequence in which information about the requirements of the task or the prompts and resources to be used was given to the students? Were there any major changes in the requirements or resources after the task was initially presented to the class?

c. How many complaints or student-initiated questions about procedures occurred in response to this task? That is, was there any resistance to the task? If so, how many students participated?

d. Was the task easy or difficult for the students to accomplish?

e. What general attitude did the teacher convey about this task? Was strong emphasis placed on the importance of the task or was the impression given that any form of product would be acceptable as long as it was completed?

f. How did the teacher monitor class progress or performance during this task?

6. What cognitive operations appeared to be involved in accomplishing this task? Include here a description of both the stated or "intended" operations and the "actual" operations that could have been use (in so far as these dimensions are apparent from the

narratives). You are obviously being asked to infer these intentions and operations based on the statements and the performance of the teacher and students. Refer here to Doyle's (1982) report on academic work and to Resnick's (1981, 1982) reviews of instructional psychology. Your inferences will be checked in part in interviews with the teacher and selected students. Specific questions to be answered include:

a. What cognitive operations did the teacher specify as applicable to this task? Were such words as "memorize" or "think" or "analyze" used to describe this task?

b. What ways were afforded to students to accomplish the task? That is, was it possible to accomplish the task by copying models or otherwise circumventing task demands?

Some suggestions for analyzing tasks. To answer the questions under these six categories, all narratives related to a task are read and notes are made as information related to any category emerges. You may use whatever format or procedures fit your style or preferences. One useful device is to use 4X7 index cards to jot down information relevant to any of these categories or questions as you come across it when reading through narratives. This file can then be used to write more formal descriptions of tasks.

The first "cut" for task descriptions will be organized around these five catergories and guided by these questions. It is important to emphasize, however, that surprises are expected in qualitative analyses. Don't limit yourself to only these considerations. If you become aware of patterns or dimensions which have not been anticipated in these guidelines, develop a description and share it with the rest ofthe staff as soon as possible. Such "discoveries" are a valuable part of the method we are using.