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Question-answer sequences: Effect of repair in response to communication breakdowns

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Question-Answer Sequences: Effect of Repair in Response to Communication Breakdowns

A

by

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ABSTRACT

Question-Answer Sequences: Effect of Repair in Response to Communication Breakdowns

by

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The research presented here attempted to make a radical shift from studying repair within naturally occurring conversation to studying it within a highly structured experimental methodology. Employing a structured intervention experimental design, the study investigated the relative effectiveness of various repair types in helping children who respond to a question with a dispreferred response (DPRS) to produce a preferred response (PFRS).

The study integrated aspects of research on naturally occurring conversation, classroom discourse, story recall and inferencing. It was designed to investigate the relationship between repair effectiveness and repair strength, question type and student grade level.

The general hypothesis of the research was that repairs of different types would have implications for what could

occur in next turn slots. The specific questions were: 1) whether isolated repairs of different levels of strength were more effective in enabling a child to produce the experimenter's preferred response when the child offered a dispreferred response to different question types, including, product, process, choice and metaprocess questions; 2) whether experimenter initiated repair sequences were more effective than isolated repairs in enabling a child to produce the experimenter's preferred response; and 3) whether there were developmental trends in children's productions of subject initiated sequences, which included requests for repetition and requests for clarification.

The results provided limited support for the hypothesis that repair effectiveness is related to the amount of information or strength contained in the repair. No significant relationships were found between repair effectiveness and grade level, and no relationship was found between repair strength and either grade level or question type. In addition, when the number of requests for repetition and clarification rather than the number of subjects in each grade level was investigated, developmental trends were not observed in the tendency to request repetition or clarification. Further, no significant relationship was observed between question type and requests

for repetition or clarification. These results were interpreted as suggesting that the concept of repair strength is relevant only in the context of recursive sequences, and not for isolated repair exchanges.

Post hoc analyses examined the inference demands of repairs as a possible predictor of repair effectiveness. These analyses indicated that the inference level of the repair tended to match the inference level of the question. Surprisingly, those repairs in which the inference type of the repair did not match the inference type of the question were significantly more effective than those in which the inference types were the same. This finding was interpreted as suggesting that the provision of additional information to a child giving a dispreferred response may not be as helpful as one might suppose, if the inference level of the repair does not differ from that of the original question.

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DEDICATION

I dedicate this dissertation to my parents who have always been there for me...to my mom for her endless care, concern, and for always making sure that I was well nourished and to my dad, my role model, whose life was an inspiration and source of hope to me. His presence continues in my life even beyond his passing. Thank you both for everything.

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Chapter 1

INTRODUCTION

Overview

Conversation is organized by speaker and listener turns at talk. The structure of turns and rules for taking turns vary with different conversational situations. For example, naturally occurring conversations are typically composed of adjacency pairs, such as questions and answers, greetings and greetings, and offerings and acceptances. In contrast, classroom conversations are characterized by three part initiation-reply-evaluation (I-R-E) turn sequences. Turn taking within naturally occurring conversation is mutually negotiated by speaker and listener. In the classroom, turn taking is primarily preallocated and managed by the teacher.

Regardless of the situation, when engaged in conversational turn taking, speakers and listeners must be sensitive to each other's conversational needs and background knowledge. When presented information is misheard or miscomprehended, the listener must request a repair to reinstate communication. Repair is a conversational mechanism that is operable within or between turns at talk. The ability to respond to and produce repair is developmental. Within conversations, there is a preference for the speaker to self-initiate a self-repair. Classroom discourse is characterized

primarily by the teacher, as the "other," other-initiating a child self-repair. When repairs are used in sequences within conversational exchanges, it has been proposed that they follow a natural ordering from weakest to strongest.

Conversational comprehension, therefore, requires the ability to request repair. It also requires the ability to make inferences linking new information presented by the speaker to the listener's old information or background knowledge. Within classroom settings, students are confronted frequently with written language in the form of narratives or stories. Narrative comprehension is also dependent upon the individual's ability to make inferences linking elements of a story grammar or propositions in an event chain.

The current study integrated research findings from conversational analysis, classroom discourse, the developmental literature on production and processing of repairs, and inferencing and story recall. The efficacy of a model of repair strength as an index of repair effectiveness was tested in a structured intervention task.

Theoretical Rationale

Turn Taking in Naturally Occurring Conversations and Classroom Discourse

Turn taking and repair are organized differently within naturally occurring conversations and classroom-type interactions (McHoul, 1978; Mehan, 1979 and 1983).

Conversation is an informal, locally managed kind of talk. In contrast, classroom talk represents a mixture of locally managed talk and primarily, pre-allocated turns (Sacks, Schegloff and Jefferson, 1974). Locally managed means that operations regarding turn order and turn size take place on a "turn by turn basis, organizing just the transition from current speaker to next" and are administered at the time of and by the parties involved in the conversation (Levinson, 1983). In the classroom, there is a tendency toward pre-allocation of turns marking the differentiation in participants' rights. Turns are not locally managed as they are in conversations.

The internal organization of turns is also different in the two contexts (Mehan, 1973). Naturally occurring conversation is characterized by adjacency pairs, which are two adjacent utterances, spoken by different speakers, sequenced as a first part and a second part, and ordered so that a particular first part requires a particular second part of range of parts (Coultard, 1977; Goffman, 1976; Schegloff and Sacks, 1973).

Repair in Naturally Occurring Conversation

As studied in naturally occurring conversations, repair is a device that works routinely within and across turns. Schegloff, et al. (1977) defined repair as a "device for the correction of misunderstandings, mishearings or indeed non-hearings." They proposed a rank ordering of repairs: 1) self initiated self repair, 2) other initiated self repair and 3)

other initiated other repair. Self-initiated repair is repair by a speaker without prompting from another speaker. Other-initiated repair is a repair after prompting by another speaker. Self-repair is repair accomplished by the speaker of the repairable item. Other-repair is accomplished by another speaker. Within naturally occurring converations, repair is the responsibility of both the speaker and the listener. Speakers should be alert to possible trouble spots in conversation and should be responsive to their listener's request for clarification. Listeners should indicate when their understanding is in jeopardy and identify the source of misunderstanding for the speaker.

Classroom Lessons

Classroom lessons are characterized by three part I-R-E sequences which contain two coupled adjacency pairs. The initiation-reply is the first part of the adjacency pair. When the reply is obtained for the initiator, this pair becomes the first pair part of the second adjacency pair. The second pair part of the second adjacency pair is the evaluation of the initiation reply pair (Mehan, 1979). Three part sequences are also present in naturally occurring conversations, but the third feature in this context functions to acknowledge rather than to evaluate a speaker's contribution. This is tied to the differences between "answer seeking" questions in conversations and "known information" questions in classroom lessons (Mehan, 1979).

Questioning in classroom lessons. Questions, one of the

basic procedures used in teaching-learning situations, evaluate a student's knowledge (French and MacLure, 1981; Hammersley, 1977). Bruner (1983) theorized that teachers as the experts, scaffold or shape a child's environment to facilitate learning. Scaffold, a metaphorical term introduced by Ninio and Bruner (1978) describes interactions between children and adults or between children and more experienced peers in which the child first accomplishes what she or he can without assistance, followed by adult assistance in the activity. Within the instructional phase of lessons, teacher questions are the first part of the I-R-E sequence typical to instructional discourse. Teacher initiations focus the student on features of academic content and are an important part of the construction of most scaffolds (Cazden, 1988). Teacher evaluations, the third part of the I-R-E sequence, do more then evaluate the student's reply. They provide scaffolding. By providing repair within the (E) slot of the I-R-E sequence, the teacher can either help a student produce a particular answer or gain conceptual understanding which could be used to answer similar questions at a later time.

Repairs within initiation-reply-evaluation sequences.

The current study focused on the scaffolding or "help" provided by the teacher in the (E) slot of the I-R-E sequence with the belief that the type of repair that the teacher used within that slot would help a child produce a preferred response (PFRS). Repair was studied as a social structure rather than one which facilitated the acquisition of academic

content. Studying repairs from this perspective is tied to their function of enabling teachers and students to "get through" a lesson (Bloome and Knott, 1985).

The difference between the third component of the I-R-E sequence in conversation has implications for the use of repair. In conversations, partners repair in order to insure their listener's understanding. Teachers also repair for this reason, but the third component in classroom discourse primarily evaluates the student's reply, contributes information to students about the teacher's initiation, and contributes to the "negotiation of a mutually acceptable reply" (Mehan, 1979, p. 290).

Within classrooms, the responsibility for repair rests primarily with the teacher. Limited opportunities are afforded for self-repair (Spinelli and Ripich, 1985). The teacher in the (E) slot other-initiates a child self-repair. If the child requests a repetition or clarification in the (R) slot, he or she is other-initiating a teacher self-repair. By so doing, the child is actually self-initiating a self repair, a behavior infrequently occurring in teacher-child interactions (Brinton and Fujiki, 1989; Wells and Montgomery, 1981).

Development of Repair

Research (Clark and Anderson, 1979; Gallagher, 1977; Garvey, 1977; and MacLachlan and Chapman, 1988) has demonstrated that the ability to request repair in conversation develops gradually. In the current study, the

children's contributions within the (R) slot were examined, and their effectiveness was compared to the experimenter's repair in the (E) slot. If it could be shown that the children's contributions in the (R) slot were more effective than the experimenter's contribution in the (E) slot, a case could be made for a similar preference of repair within naturally occurring conversations and classrooms discourse. That is, the preference of self-initiated self-repair rather than other-initiated self repair could be recommended.

Repair Strength

Schlegloff, Jefferson and Sacks (1977) developed the concept of strength of repair. They defined strength of repair in terms of the amount of information or power within the repair to locate a repairable item. These researchers demonstrated that when repairs were used in conversational sequences, the repairs followed a natural ordering proceeding from weakest to strongest. Based on their research, McTear (1985) proposed a hierarchy of strength for isolated repairs used in sequences.

In the current study, repairs were taken out of sequence and their potency as isolated repairs of different levels of strength to elicit a predetermined preferred response (PFRS) was tested. Prior investigations of adult-child use of and response to repair had been descriptive. Repair was studied within naturally occurring conversations, picture description tasks and children's narrations. Garvey and Bendebba (1978) had examined a repair's ability to predict a response. But,

the effectiveness of isolated repairs had not been previously tested.

Problem Statement

The question-answer sequences in the current study resembled a conversational format. They mixed together some of the characteristics of naturally occurring conversation with some of the features of classroom discourse. The research presented here was based on the findings of repair as described in the literature of naturally occurring conversations, picture description tasks and children's narrations. These previous research findings were shaped into a highly structured experimental methodology. The current research employed a structured intervention design within a conversational format to test the effectiveness of repairs of different levels of hypothesized strength. If this design had been successful, it would have provided a synthesis between the study of repair within naturally occurring conversations and the study of repair within experimental research designs.

The subjects in the study, 30 normal children (15 boys and 15 girls) ranging in age from 4.9 to 10.0 years individually viewed the same six minute videotape story entitled Morris's Disappearing Bag. After watching the video, each child was asked individually the same set of 36 questions focusing on story content. To effect breakdowns in the I-R-E sequences, the quality and degree of children's question answering ability was manipulated pre-experimentally by

embedding less familiar vocabulary words into several of the questions. In addition, a predetermined PFRS consistent with and constrained by the story content was developed for each question. When the child did not produce the experimenter's PFRS in the (R) slot, the experimenter reformulated the question in the (E) slot by using one of the randomly assigned repairs of different levels of strength. If in the (R) slot, the child produced a request for repetition (RQRP) or a request for clarification (RQCL) of the question in the (I) slot, the experimenter responded to this request. If the child's request resulted in a PFRS, the sequence was coded as subject initiated (SI). If the child's request resulted in a DPRS, the experimenter introduced a randomly assigned repair, and the sequence was coded as experimenter initiated (EI). This procedure continued until all 36 questions were asked.

Certain outcomes were predicted on the basis of repair as previously studied in conversation. In testing the research hypotheses, however, a problem arose with respect to missing data. Since subjects produced variable numbers of dispreferred responses, participants varied with respect to the number of repairs which were available for analyses. This complicated the data analysis procedure. These unexpected occurrences reflected the fact that it is difficult to control conversations and predict breakdowns within conversational sequences. If the structured intervention conducted in this research had been effective, it would have provided a model for the study of repair within a context that reflected

characteristics of both naturally occurring and classroom conversations.

In analyzing the data statistically, it also became apparent that repair strength was differentiated theoretically when repairs were used in sequence within conversations. However, when used in isolation within a structured intervention task, strength did not appear to be an adequate index of effectiveness.

The experimental task was a test-like intervention based on the recall of information from a six-minute videotape story. A subject's ability to produce a PFRS with or without repair must have been related to a subject's ability to recall the story, decide on a PFRS within the constraints of the story, and make inferences between and among propositions within the story. Based on a taxonomy of inferences developed by Warren, Nicholas and Trabasso (1979), inferencing was therefore examined as a factor other than strength which might describe the interaction among the components of the I-R-E sequence. Post hoc analyses investigated the relationship of preferred responses to subject initiated (SI) sequences and experimenter initiated (EI) sequences and inference demands of questions and repairs. The inferencing demand of the experimenter's questions in the (I) slot was compared to that of the repairs in the (E) slot. The rationale for this was that although repairs might have had different levels of hypothesized strength, their inference demands might have been similar. Studying this would enable the current researcher to

make statements concerning inferencing as a factor which must be considered when teachers provide repairs within the (E) slot of I-R-E sequences.

Definitions

Repair strength was defined as the amount of information the teacher provided in a repair to assist a child in producing a preferred response. Based on the research of McTear (1985), three levels of strength were identified and placed on a continuum from weakest to strongest. The relative strength was defined as levels 3, 4 and 5. Using Garvey's (1977) contingent query types, specific requests for specification (S-S) were the weakest and were classified as level 3 repairs. They provided the least amount of information regarding the preferred response. Specific requests for confirmation (S-C) were level 5 repairs and were the strongest. They provided the most amount of information and typically required a yes/no response. Potential requests for elaboration (P-E) required mutual negotiation by the experimenter and subject and were level 4 repairs. The relative strength of repair was inversely related to the scope of the child's responsibility. A repair sequence or an experimenter-initiated sequence was defined as any combination of levels 3, 4 or 5 repairs. A repair of any level of strength or a repair sequence was defined operationally as effective if it resulted in the predetermined preferred response in the next turn slot.

A preferred response occurred in the (R) slot of the I-R-E sequence. Based on Omanson, Warren and Trabasso (1978), the response is consistent with and constrained by story content and defined operationally as one predetermined and preferred by the examiner. If a subject responded with a request for repetition or a request for clarification in the (R) slot and it resulted in the preferred response in the next turn slot, it was classified as a subject-initiated sequence. A dispreferred response, one other than a preferred response, could occur either in the initial (R) slot or in the (R) slot immediately following the experimenter repair.

The thirty-six experimental questions represented nine of each of four question types: product, process, choice and metaprocess. These elicitations are characteristic of classroom discourse. Mehan (1979) provided the following definitions for each question type. Product questions solicit factual pieces of information about objects and events. Process questions solicit opinions and interpretations. Metaprocess questions invoke reflection on the rule, procedure or mental process by which the response content was formulated. Choice questions elicit either/or evaluations, and/or agreement/disagreement statements regarding question content, or solicited evaluation of specific information presented within the question.

For the post hoc analysis, the 36 questions were recoded into three inference types: logical, informational and evaluative. Definitions for these terms were taken from

Warren, Nicholas and Trabasso (1979). Logical inferences are made in response to why or how questions and involve the motivations, causes and conditions which cause events to occur. Informational inferences are made in response to who, what, when and where questions and concern specific instruments, objects, people, times, places and contexts of events. Value inferences are based on the reader's or listener's world knowledge about the actions, objects and events specified in the narrative.

Significance of the Study

The manner in which a teacher responds to a student's attempt at question answering is important for several reasons: 1) it may affect the student's comprehension of the presented material; 2) it may affect the flow of conversation within teacher-student I-R-E turn sequences; and 3) it may affect the student's ability to generate the teacher's preferred response.

A systematic study of different repair types used in response to a child's dispreferred response may enable researchers to make claims regarding the effectiveness of repairs and the interaction between specific question types and repair types.

The actual function of repair as either a facilitator of student learning or as a device which enables teachers and students to "get through" a lesson (see below) is difficult to describe. Answers to the above research questions may

contribute to the understanding of repair as a social structure whose purpose is to help a student produce a particular answer in order to help the teacher "get through" the lesson.

Chapter 2

LITERATURE REVIEW

The study described here used a structured experimental design to investigate the relative effectiveness of various types of repairs in helping children who respond to a question with a dispreferred response (DPRS) to produce a preferred response (PFRS). In this chapter the literature on repairs is reviewed. The review has been structured under five major headings, as follows: turn taking and repair in naturally occurring conversations, classroom language and lessons, research on teacher and children repair, development of repair in children and inferencing and story recall.

Turn Taking and Repair in Naturally Occurring Conversations

Turn Taking in Naturally Occurring Conversations

Conversation is an informal, locally managed kind of talk. In contrast, classroom talk represents a mixture of locally managed and pre-allocated turns (Sacks, Schegloff and Jefferson, 1974). According to these researchers, turn taking is the basic form of organization in conversation. They proposed a model of turn taking which is locally managed, party administered, interactionally controlled and sensitive to recipient design (Sacks, Schegloff and Jefferson, 1978). Locally managed means that operations regarding turn order and turn size take place on a "turn-by-turn" basis, organizing

just the transition from current speaker to next. Turns are administered at the time of and by the parties involved in the conversation (Levinson, 1983). Party administered refers to the notion that the rules constituting local management are subject to variability of the parties involved in the conversation. The term, interactionally controlled, is related to both local management and party administered, in that any contribution to turn order is contingent on and oriented to the contributions of the other parties in the conversation. Because turn size and turn order are locally managed, party administered and interactionally controlled, they reflect the notion of recipient design. This term refers to the ways in which talk by one party in a conversation is constructed so as to display orientation and sensitivity to others in the conversation.

Based on the Sacks et al. (1974) model, three facts emerge about conversation: (1) one person speaks at a time within a turn construction unit; (2) speaker change occurs at the end of this unit, that is, at a transition relevant point (TRP); and (3) conversation is accomplished with precision timing which implies no gapping (silences) or overlapping (two speakers speaking simultaneously). Sacks et al. propose a set of rules which operate on the turn units of conversation. The following is a simplification of those rules by Levinson (1983 p. 298). "C" is current speaker; "N" is next speaker; and TRP is the transition relevant point or recognizable end of turn

construction unit.

Rule 1 Applies initially at the first TRP of any turn.

A. If C selects N in the current turn, then C must stop speaking, and N must speak next, transition occurring at the first TRP after N selection.
B. If C does not select N, then any (other) party may self-select, with the first speaker gaining rights to the next turn.
C. If C has not selected N, and no other party self-selects under option B, then C may (but need not) continue (that is, claim rights to a further turn construction unit).

Rule 2 Applies to all subsequent TRP'S.

When Rule 1C has been applied by C, then at the next TRP Rules 1A and C apply, and recursively at the next TRP, until speaker change is effected.

Adjacency pairs are utterances such as question-answer, offer-acceptance, and greeting-greeting. Coultard (1977) and Goffman (1976) suggested that adjacency pairs constitute the fundamental units of conversational organization. Schegloff and Sacks (1973) described adjacency pairs as sequences of two utterances which are adjacent, spoken by different speakers, sequenced as a first part and a second part, and ordered so that a particular first part requires a particular second part or range of second parts. The researchers provided a rule for usage of adjacency pairs which stated that the current speaker, having produced the first part of the adjacency pair, must stop talking, and the next speaker must at that point produce the second part of the pair.

Adjacency pair parts are not bound by any one-to-one correspondence between first and second pair parts. Rather

they are bound by the notion that certain expectations are set up and must be accounted for between pair parts. This concept gives rise to the fact that a range of potential second pair parts exists for first pair parts. However, given the notion of preference organization, not all potential second pair parts are of equal standing: "there is a ranking operating over the alternatives such that there is at least one 'preferred' and one 'dispreferred' category or response" (Levinson, 1983 p. 307). Characteristics of dispreferred seconds include delays in the form of a pause before delivery and/or displacement over a number of turns through use of repair initiators (Levinson, 1983 p. 334). The delay characteristic of a dispreferred second can be actualized in a next turn repair initiator (NTRI). This invites repair of the prior turn in the next turn.

Repair in Naturally Occurring Conversations

The organization of repair is a conversational device that routinely works within and across turns. Schegloff, Jefferson and Sacks (1977, p.366) defined repair as a "device for the correction of misunderstandings, mishearings or indeed non-hearings." The device provides a number of slots across at least a three-turn sequence in which repair or at least prompting can be initiated. "T" is turn.

T1 (Includes repairable item) = First opportunity: Here for self-initiated self-repair

Transition Space between T1 and T2 = Second opportunity:
Here again for self-initiated self-repair

T2 Third opportunity: Either for other repair or for other-initiation of self-repair in T3

T3 Fourth opportunity: Given other initiation in T2 for other-initiated other-repair

Self-initiated repair is repair by a speaker without prompting from another speaker. In contrast, an other-intiated repair is a repair made after prompting by another speaker. Self-repair is repair accomplished by the speaker of the repairable. Other-repair is done by another speaker.

Conversational contributions can be unsuccessful in a number of ways (Rees and Wollner, 1982). From the speaker's point of view, these include slips of the tongue, word finding difficulty, word or phrase selection errors, sentence construction errors or speaker overlap. These may cause the speaker to self-repair within the current turn of talk. Speaker self-repair in the subsequent turn of talk may result from listener feedback reflecting the speaker's errors in clarity of production, linguistic style, or errors in estimates of shared knowledge with relation to the listener.

Given the notion of recipient design, another aspect of repair involves the responsibility of both the speaker and listener engaged in conversation. The speaker should be alert to possible trouble spots and should be prepared to deal with them and be responsive to the listener's request for clarification. The listener, on the other hand, should

indicate when understanding is in jeopardy and identify the source of misunderstanding for the speaker.

However, repair apparatus is strongly biased by a preference for self-initiation of repair and self-repair over repairs by others. Schegloff, et al. (1977) offered a set of preferences which set up a rank ordering across the opportunity set or repair possibilities:

> Preference 1 is for self-initiated self-repair in opportunity 1 (speaker's own turn).
> Preference 2 is for self-initiated self repair in opportunity 2 (transition space).
> Preference 3 is for other-initiation, by NTRI, in opportunity 3 (next turn), of self-repair (in the turn after that).
> Preference 4 is for other-initiated other-repair in opportunity 3 (next turn). (p. 367)

This ranking corresponds to the ranking from the most frequently used repair type, Preference 1, to the least use type, Preference 4. In many conversational occasions, even when listeners can do the required repair, they produce a next turn repair initiator instead of doing the repair for the speaker.

Repair sequences. When other-initiated self repairs are used in conversational sequences, the repairs are not presented in random order. Schegloff et al. (1977) stated that these repairs have a "natural ordering, based on their 'strength' or 'power' on such parameters as their capacity to 'locate' a repairable item. The researchers described the "natural ordering" as one with a preference for "strong over weaker initiators" (1977, p. 369 footnote 15). They offered

two pieces of evidence to support their claim. The first is that when weaker forms are used, they can get self interrupted in production and can be replaced by stronger forms. Second, when more than one other-initiated repair is used, they are used in order of increasing strength.

McTear (1985 p. 174) proposed a sequential ordering of repairs based on the research of Schegloff et al. (1977). McTear's ordering is presented below:

1	Non-specific request for repetition	(NRR)	weak
2	Specific request for repetition	(SRR)	weak
3	Specific request for specification	(SRS)	weak
4	Potential request for elaboration	(PRE)	weak
5	Specific request for confirmation	(SRC)	weak
6	you mean + specific request for confirmation (p. 174)	(+SRC)	strong

In McTear's data for two preschool youngsters and an adult engaged in conversations, 14 of 17 clarification request sequences conformed to this proposed ordering. He suggested, however, that specific requests for confirmation (5) and specific requests for confirmation introduced by "you mean" (6) may occur freely anywhere within sequences. These results offered some confirmation for Schegloff, et al's. (1977) strength hypothesis for the ordering of repairs in sequences. McTear also concluded that children acquire the ability to order their requests non-randomly in sequences.

In commenting on McTear's sequential ordering or hierarchy of strength, Brinton and Fujiki (1989) suggested that the determining power of a repair may change depending on its position within a sequence. Accordingly, they stated that

"the effect of any clarification request that follows another request for clarification of the same message is likely to differ from the effect of that request used singly" (p. 74). They concluded that when an initial repair attempt is unsuccessful, the entire repair process is influenced.

Spilton and Lee (1977) also studied other-initiated repairs within recursive or "elaborative" sequences in conversations of four year olds. An elaborative sequence consisted of an unclear utterance followed by a request for clarification, followed by a response to that request, then a second clarification request, and then a subsequent response. According to the researchers, these sequences showed the mutual efforts of both conversational partners to communicate and each partners successive approximations in order to reach understanding. Completing a recursive sequence requires cooperation and negotiation in order to communicate. According to Spilton and Lee (1977), single repair exchanges are not characterized by these same aspects of conversation.

In summary, conversation takes place across turns at talk. Generally, conversation is characterized by adjacency pairs which are sequences of two utterances which are spoken by two different speakers and which are ordered so that the first part of the pair requires a particular second pair part or range of second pairs parts. Not all second pair parts are of equal standing. Some are preferred and some are dispreferred.

Within the category of dispreferred second pair parts is the conversational device of repair. It functions to correct mishearings, misunderstandings, and/or non-hearings of conversational contributions made by the speaker and/or listener. Repair operates within and between turn at talk. There is generally in conversation a preference for self-initiated self-repair or other-initiated self-repair rather than repair by others. Repairs can occur within single exchanges or within recursive sequences. When used in sequences, it is suggested that repairs follow a natural sequential ordering or hierarchy in which they proceed from weakest to strongest.

Whether used singly or within sequences, repairs take into account the issue of recipient design. Both speaker and listener share the responsibility to make conversational contributions which are relevant, clear, and sensitive to the needs and abilities of their conversational partners. Speakers should be alert to possible trouble spots in conversation and should be responsive to their listener's requests for clarification. On the other hand, listeners should indicate when their understanding is in jeopardy and identify the source of misunderstanding for the speaker.

In summary, conversation occurs primarily within the two adjacency pair conversational unit. When there is a mishearing or misunderstanding, the listener and/or speaker may request a repair. This functions to enlarge the two unit

sequence into an extended sequence in which the final part will generally be an acknowledgement of the information received.

Classroom Language and Lessons

Turn Taking in the Classroom

The turn taking mechanism used within classroom discourse is different from that used in naturally occurring conversations. Mehan (1979 and 1983) stated that the pattern outlined by Sacks, et al. (1978) is not duplicated in classroom lessons. Mehan (1979) delineated these differences:

(1) The teacher initiates the speech act and allocates turns by individual nomination, inviting a reply or inviting a bid to reply; therefore, speaker allocation is not open for negotiation as it is in conversation. Given this, there is a predominance of "speaker selects next speaker" types within the classroom setting which is a significant difference between classroom and everyday discourse.

(2) Everyday discourse does not have many features typical to classroom discourse, for example, the invitation to bid and invitation to reply.

(3) Turn change junctures are also different in that in everyday conversation, the transition relevant place (TRP) comes at the end of each turn. In the classroom, however, the TRP comes only at certain junctions, specifically, at the end of the initiation-reply-evaluation (IRE) sequence or at the end of a topically related set of sequences.

In another study comparing turn taking in classrooms and naturally occurring conversations, McHoul (1978) highlights three technical differences between the two contexts:

(1) The potential for gap and overlap is maximized because (a) the teacher and only the teacher has the right to decide how long the student he selected will have to answer the question; (b)

intra-turn pauses for the teacher can be as long as the teacher expects them to be because no one can self-select nor overlap (implying that students have no rights); and (c) intra-turn pauses for students are also longer because the student realizes that another student will not overlap. This maximizes the potential for gapping in classroom conversations.

(2) The potential for overlap is minimized in that the student must listen to the entire question before the teacher nominates him or her to respond.

(3) Changing of turns is minimized in that (a) eighty percent of the turns are taken by the teacher; (b) there is a tendency toward pre-allocation of turns in the classroom marking a differentiation in participants' rights and (c) turns are not locally managed as they are in naturally occurring conversations.

Mehan (1979) also stated that another difference between classroom discourse and naturally occurring conversations is in the internal organization of turn sequencing. As previously stated, conversation is characterized as having two-part sequential structures, that is, adjacency pairs in which the speech of one party is coupled with the speech of the other party. Interactional sequences within classroom lessons are characterized by three-part initiation-reply-evaluation (I-R-E) sequences which contain two coupled adjacency pairs.

According to Mehan (1979), the initiation-reply is the first adjacency pair. When the reply is obtained for the initiation, this pair becomes the first pair part of the second adjacency pair. The second pair part of the second adjacency pair is the evaluation of the initiation-reply pair (p. 287). The evaluation component comments on the completion

of the response, and is a distinguishing feature of classroom conversation. The evaluation slot in the classroom is tied to the teacher's educational function of evaluating the quality of the students' responses.

The evaluation component has been viewed in the literature on classroom interaction as both an optional part of the elicitation sequence (Bellack, Kleibard, Hyman and Smith, 1966; Sinclair and Coultard, 1975) and as an obligatory component of instructional sequences (Mehan (1979). He claimed that this difference in perspective is tied to differences between positive and negative evaluation acts. Accordingly, Mehan stated that positive and negative evaluation of student replies...

> do not fulfull equivalent functions in elicitation sequences. Positive evaluations occur as soon as a correct reply appears; while, negative evaluations, prompts, or corrections may or may not appear after incorrect or incomplete answers. Thus, the positive evaluation is a terminal act; it marks the completion of an instructional sequence. Ending one sequence, it signals that another is to begin.
>
> Negative evaluations, prompts, or corrections are continuation acts. They do not appear at the end of instructional sequences, only in their interior. They function to keep the interaction moving until the answer demanded by the initial interaction is obtained. Thus positive evaluation acts are an obligatory part of elicitation sequences; while, negative evaluations, prompting and the like, are optional parts of these sequences (p. 290).

Mehan (1983) pointed out that three-part sequences are also present in naturally occurring conversations, but in this context, the third feature functions as an acknowledgement rather than as an evaluation. The differences between

sequences followed by acknowledgements or evaluation are typically due to the differences between "known information" questions typical of classroom discourse and "answer seeking" questions characteristic to naturally occurring conversation.

In summary, these different question types characterizing naturally occurring and classroom discourse lead to differences between the turn unit and turn allocation procedures within these two contexts. The latter is characterized by a three-part turn sequence, with the third component being an evaluation of the student's reply. Naturally occurring conversation is defined primarily by adjacency pairs. However, at times, there is a third pair part. Its function, however, is to acknowledge a conversational partner's response to an answer-seeking question.

It would appear that answer-seeking questions of conversation would have a wider range of acceptable responses than known information questions characteristic of instructional discourse. Because the teacher knows the answer, there is a more limited range of acceptable responses. Therefore, one can assume that it would be more difficult for the child to provide an acceptable response. This issue highlights the notion of recipient design characteristic of everyday discourse.

This characteristic of classroom discourse, along with the difference between the third turn component in the two

contexts, has implications for the use of repair. In conversation, partners repair in order to insure their listener's understanding. Within instructional discourse, a teacher repairs for this reason, but also to insure that their student has learned the information and to get through a lesson.

The Study of Classroom Language

During the past few decades, there have been several approaches to the study of classroom language. These have included frequency distribution studies such as the Flander's System of Interaction Analysis (1967), correlational studies, experimental approaches (Bellack et al. 1966,; Sinclair and Coultard, 1975) and constitutive ethnographies (McDermott, Gospodinoff and Aron 1978). Frequency distribution studies focus on the teacher. Correlational studies search for the effects of school on the students' later life. Neither of these approaches accounts for the interactive nature of the learning environment. Experimental approaches regard teacher and student verbal interactions as interrlated sequences of acts. While this approach represents a step forward from the earlier count studies, it is limited because it is based on data collected in experimental situations in which teachers conducted predetermined lessons. Constitutive ethnographies describe participants' (teacher and student) activities and locate them within the contexts of their occurrence. These

studies define rules and processes for participation and membership in the classroom, and they describe the social organization of classroom events.

The discussion of various aspects of classroom language and lesson construction from such a social perspective characterizes classroom discourse as an interindividual communication process (Cazden, 1988). The classroom is viewed as a communicative environment that is characterized by academic and social demands for participation and learning. The participants, teacher and students, co-construct learning contexts.

Conceptualizing the process of teaching-learning as a communicative process suggests that

> children acquire knowledge of social and communicative strategies needed to gain access to the academic content of lessons simultaneously with the acquisition of the academic content (Green and Harker, 1982, p. 183).

Carrying this notion further, Erickson (1982) stated that teachers and students engaged in a lesson draw upon two kinds of knowledge: that of the structure of the academic task and that of the rules for social participation. The students' knowledge of the academic content structure coupled with the knowledge of social norms or structure and conversational demands constitute a second type of classroom curriculum, "the curriculum of social processes and strategies for learning" (Green and Harker, 1982, p. 183).

Thus to participate successfully within a lesson, the student must exhibit a blend of academic knowledge and social

knowledge. The student must know the academic content and know how and when to contribute that knowledge according to socially acceptable rules for classroom interaction (Gilmore, 1987; and Mehan, 1979).

Investigations of Classroom Lessons

Lessons are the most frequently documented classroom event. Recent research (Bellack, et al., 1966; Bloome and Knott, 1985; Erickson, 1982; Green and Harker, 1982; Green and Weade, 1987; Green and Weade, and Graham 1988; Mehan 1979; Sinclair and Coultard, 1975) has presented comprehensive lesson analyses. Bellack et al., (1966) viewed teachers and pupils as playing different "but complimentary roles in the classroom game" (p. 46). They analyzed lessons in terms of pedagogical moves, teaching cycles and categories of meaning. All verbal behavior of teacher and pupils was coded as falling into one of four categories of moves: soliciting, responding, structuring and reacting. Teacher and pupil roles were delineated clearly, with teachers responsible for structuring the lesson, soliciting responses and reacting to students. The fundamental pedagogical pattern identified was teacher solicitation followed by pupil response frequently followed by teacher reaction (p. 55).

Sinclair and Coultard (1975) discussed form/function relationships in lessons, that is, how particular words (forms) have particular interpretations (functions) in the classroom. Their model of lesson analysis was hierarchial.

The lesson, the highest rank, was composed of transactions. The transactions were in turn composed of exchanges, which were composed of moves, which were composed of acts. Similar to Bellack et al. (1966), teaching exchanges were characterized by teacher initiations, pupil responses and teacher feedback.

Mehan (1979) presented a formal statement of lesson structure. He described a typical lesson as having the following phrases: opening, instructional and closing. Each phrase served a different function and was composed of different teacher-student interactional sequences. Directives and informatives were primarily used in the opening and closing phases of lessons. Elicitations were the principle sequence type used in the instructional phase of the lesson. Mehan identified four such elicitations: product, process, choice and metaprocess. These questions were characterized by a three part I-R-E exchange between teacher and student.

Much of the subsequent research on lessons (Bloome and Knott, 1985; Erickson, 1982; Green and Harker, 1982; Green and Weade, 1987; Green, Weade and Graham, 1988) has continued to develop Mehan's theory. His research emphasized that successful participation in a lesson is characterized by a weaving of both interactional and academic requirements.

Lesson Construction

Viewed from a social perspective, lessons are dynamic and are constructed and negotiated during teacher-student interactions. Lessons are not "scripts to be followed" (Green and Weade, 1987, p. 6). Teachers and students engaged in lesson construction must

> monitor what is occurring as the lesson develops in order to gain access to the information, to present information in appropriate ways, and to participate in (students) or conduct (teacher) lessons. Lessons, then, are defined by what occurs, with whom, in what ways, for what purpose, under what conditions, and with what outcome (Green, Weade and Graham, 1988, p. 13).

As described by Green and Weade (1987), lessons are composed of three components: social structure, academic content structure and an activity (context) structure. As academic content is presented, and teachers and students work to accomplish academic goals, there is a simultaneous signaling of activity and social structures of the lesson. To participate successfully in a lesson and gain access to learning, students must provide appropriate content information in ways that match the activity structure and social expectations of the lesson.

According to Bloome and Knott (1985), an aspect of lesson construction that surfaces when using this perspective is that the focus of lessons for some teachers and students becomes that "production of a series of discourse events that can be counted as classroom lessons" (p. 56). While participating in lesson construction, teachers and students engage in a

phenomenon called "procedural display." As such, they display a set of academic and/or interactional procedures to each other that represent the accomplishment of a lesson (Bloome, 1987). Procedural display occurs when students and teachers are interested primarily in "displaying to each other that they were 'getting the lesson done'" (p. 128). If academic learning occurs, it is accidental or secondary (Bloome, 1987).

Procedural display is rooted in the notion that lessons are routines. Although lessons are dynamic and co-constructed by teachers and students, consistent patterns of academic and social participation structure do develop over time. As these patterns emerge, they may result in ritualized discourse routines. As discourse becomes ritualized, teachers and students may become primarily concerned with "getting through" the lesson as they "work to complete the ritual rather than working for academic learning" (Bloome and Knott, 1985, p. 57). Therefore, procedural display does not describe a learning process. Rather, it describes a "social and communicative process" (Bloome, 1987, p. 129).

Questions Within Classroom Lessons

Questioning is one of the basic procedures used in teaching-learning situations to evaluate a child's knowledge (French and MacLure, 1981; Hammersley, 1977). Within educational contexts, children are confronted with known information or examination type questions for which teachers

already know the information requested and the answer they prefer (Mehan, 1983). Because of the distribution of knowledge between teacher and students and the teacher's role of judging students' performance, there is a preponderance of known information questions in educational discourse. According to Mehan (1979), because there is often

> only a single correct response to known information questions, and this answer is known in advance of the questioning, teachers often find themselves searching for that answer, while students provide trial responses which are in search of validation as the correct answer (p. 291).
>
> As a result of the teacher's search for the one correct answer to her question, it is difficult to determine whether the child's answer stemmed from a mastery of the conceptual demands of the academic task, or stemmed from a mastery of the conversational demands of questioning style (p. 293).

French and MacLure (1981) stated that asking and answering questions are central to the entire schooling process because children are judged more or less competent by their success in providing answers which the teacher considers appropriate and correct. A paradox of the question/answer sequence, however, is that although children's answers are essential for the lesson to progress, the answer expected by the teacher is rarely obvious to the child. French and MacLure stated that any question, even the most simple one, "Who is it?" has many potential answers. Providing the right one requires not only knowledge, but also, "contextualized interpretive work" (p. 33).

In attempting to provide an acceptable answer, the

children are faced with the fact that the teacher already knows the answer and has decided on the kind of answer she or he will accept. In asking the question, however, the teacher provides the child no clues as to what this answer may be. Because of the type of question, the child cannot use the same sort of clues they use in answer-seeking questions of naturally occurring conversations.

As previously stated, Mehan (1979) identified four types of elicitations used by teachers during the instructional phase of lessons: choice, product, process and metaprocess. Choice, product, and process elicitations ask for factual information, opinions, and interpretations. Specifically, choice questions provide the respondent with the information which she or he needs to reply. The respondent evaluates the specific information by agreeing or disagreeing, for example, "Was the boy happy or sad at the beginning of the story?" Product elicitations solicit factual responses about events, attributes, time, quantity, actions, and location, for example, "When did the story take place?" Process elicitations solicit the respondent's opinions and interpretations, for example, "Why was the boy sad?" Metaprocess elicitiations ask respondents to provide the procedure or rule by which they arrived at the response, for example, "How did you remember what presents the boy received for his birthday?"

The elicitation types are characterized by three part

I-R-E sequences which contain two coupled adjacency pairs. In Mehan's (1978) investigation of classroom lessons, once an instructional speech act was initiated, it continued until there was symmetry between the initiation and reply acts, because conditional relevance dictates that initiation acts compel replies. Symmetry was defined as a match between an initiation and a reply. Asymmetry implied that the student's reply was inappropriate or inaccurate relative to the teacher's intent. Symmetry was achieved by the teacher through prompting, repeating and/or simplifying strategies which created an extended sequence. Educationally, then, the presence of the third feature evaluates the completing of the preceding two-part initiation-reply pair. The evaluation act plays a significant role in classroom discourse in that it contributes information to students about "the teacher's initiations and contributes to the negotiation of a mutually acceptable reply" (Mehan, 1979, p. 29).

Scaffolds Within Lesson Construction

Scaffold is a metaphorical term introduced by Ninio and Bruner (1978). It describes those interactions between children and adults or more experienced peers in which the child first accomplishes what she or he can without assistance followed by adult assistance in the activity. As the experts, teachers scaffold or shape the child's environment to facilitate learning (Bruner, 1983). This type of learning

grounded to interaction with a helpful expert who provides the novice with hints or clues is described by Fuerstein (1980) as a "mediated learning experience." Brown and Palincsar (1987) describe the process of reciprocal teaching, which is also based on the concept of expert scaffolding (Bruner, 1978; Cazden, 1979). In reciprocal teaching, there is mutual responsibility for the expert teacher and the student novice. They each take turns leading the dialogue. They use four comprehensive strategies; summarizing, questioning, clarifying and predicting. Brown and Palincsar's research has shown that this shared teacher-student approach incorporating scaffolding has resulted in significant increases in language comprehension.

Teacher questions, the first part of the I-R-E sequence, are important parts of the construction of most scaffolds (Cazden, 1988). Initiations focus the student on features of academic content. Evaluations, the third part of the I-R-E sequence, do more than evaluate the student's reply. Frequently, they serve to "induct the learner in a new way of thinking about, categorizing, reconceptualizing, even recontextualizing whatever phonemena (referents) are under discussion" (Cazden, 1988, p. 111). Scaffolding provided by the teacher within the evaluation slot of the I-R-E sequence could help the student either to answer the question or to produce a particular answer or to understand. Understanding means to gain some conceptual knowledge which could be used to

answer a similar question at at later time. (Cazden, 1988). The production of the right answer would be related to procedural display within the lesson. In contrast, understanding is related to actual academic learning.

Research on Teacher and Children Repair

Teacher Repair Within Question-Answer Sequences

If the child does not self-initiate a self repair, it becomes the teacher's responsibility as the listener to realize that the child has responded less than adequately and to request clarification (RQCL) of the child's initial response. Recognizing a breakdown, the teacher should request clarification by repairing or reformulating his or her initial question to facilitate the child's question comprehension and reinstate communicative interaction (Anselmi, Tomasello and Acunzo, 1986; Cherry, 1979; Corsaro, 1979; French and MacLure, 1981; Mehan, 1978). In the event of a breakdown, the teacher must other-initiate a child self-repair, a strategy more common to teacher-child interaction. The child, as the speaker of the repairable utterance which is the teacher's dispreferred response, performs the repair in response to the teacher's RQCL. Ripich and Spinelli (1985) have demonstrated that the classroom affords limited opportunities for child self-initiated self-repair.

Teacher repair procedures for "fixing up" (Dore, 1979)

what is not understood can be categorized as either preformulative or reformulative procedures. French and MacLure (1981) describe these two interactive strategies which provide guidelines for children in their attempts to provide the teacher's preferred answer. In preformulating, teachers "preface the question they want the children to answer with one or more utterances which serve to orient the children to the relevant area of experience which they must draw upon in order to supply an appropriate answer" (p. 35). Preformulators function to establish shared knowledge between the teacher and the child. The prefacing utterance is the preformulation. The question on which it is focused is the nuclear utterance. The second strategy, reformulating, is used by teachers to "repair breakdowns in the ideal sequence of question-followed by (correct) answer" (p. 38). The sequential organization of the reformulation is as follows:

Teacher (T): Nuclear Utterance (NU) (wh-question)

Student (S): Breakdown (B) (No/inappropriate answer)

Teacher (T) Reformulator (RE) (more specific question)

French and MacLure (1981) identified five types of reformulators according to the degree to which they made the original question more specific. Definitions, examples and the sequential organization of the five reformulators are taken from French and MacLure (1981, pp. 40-42) and presented below.

Reformulator Type 1: The reformulated question becomes more linguistically specific. [Teacher and group are looking at a picture of people planting rice in a paddy field.]

NU: T: What are those people doing?
(no response)

RF: T: What are they planting?

Reformulator Type 2: The teacher produces a yes/no question to make the original wh-question more specific. The teacher represents an inappropriate value for the variable expressed in the original question. [The following sequence followed the breakdown of the question, "What was Elmer like?]

NU: T: What was he--what kind of an elephant apart from being patchwork?
(no response)

RF: Well, was he a very SAD elephant?

Reformulator Type 3: The teacher uses a yes/no question and presents an appropriate value for the variable expressed in the original question. That is, the preferred answer to the reformulator is the positive choice.
[T and class have been to visit a castle and are looking at a brochure, while T asks individuals what they saw in a particular room. Another child has already said he saw a chest of drawers.]

NU: T: What else did you see?
(no response)

RF: T: Did you see the chest of drawers?
S: (nods)

Reformulator Type 4:		The teacher presents a pair of values for the variable. One of them is the preferred, appropriate values, and one is an inappropriate value. [T is asking about a story she has just read to the class.]
	NU:	T: How did they go, Gary? (no response)
	RF:	T: By bus or by car?
Reformulator Type 5:		The teacher actually states the correct answer and merely requires the child to confirm it.
	NU:	T: That color have you used? (no response)
	RF:	T: It's brown, isn't it? S: (nods)

In theory, the reformulators progressively decrease the complexity of the cognitive task faced by the child. For this reason the researchers predicted that teachers would use the less specific versions (lower numbers) first. They suggested that their hierarchy of reformulators from type 1 through type 5 be used in sequential order processing from type 1 to type type 5.

This strategy of reducing or controlling cognitive complexity is similar to a model of classroom discourse developed by Berlin, Rose and Blank (1980). Briefly, these researchers examined dialogue in terms of its complexity and proposed a four level framework in which the teacher reduces question complexity systematically by simplifying or reformulating question content to reduce the mismatch between the child's ability and the semantic complexity of the question. The goal is for the adult to provide scaffolding, thereby guiding the child toward successful problem solving.

This model is based on the principle of perceptual language distance. That is, as the distance between the material and language widens, increasingly greater demands are placed on the child to abstract the available information.

Reformulations are therefore, interactive strategies used by adults in an instructional role when the expected, preferred response does not occur. Mehan (1979) stated that reformulations extend turn-taking and function as a means for restoring symmetry to an initiation-reply sequence. They are intended to function as clues for child to help them direct their information search to select the reply being sought (Silliman, 1984). Frequently used reformulation strategies are (1) prompting of inappropriate or inadequate replies and/or prompting of replies when initiations do not receive uptake and (2) simplifications in the form or content of the original teacher elicitation. According to Silliman (1984), "the effectiveness of these procedures for soliciting relevant and appropriate content remains unresolved in relation to their efficacy for meeting the goals of either language intervention or the educational process" (p. 310).

Very little research has been done regarding the effect of individual teacher repair types in response to breakdowns in question-answer sequences.

Teacher Repairs in Classroom Discourse

In the present study, the effectiveness of five different

individual repairs was examined: (1) acknowledgements, (2) prompts, (3) simplifications or reformulators (French and MacLure, 1981), (4) additions, and (5) cues. Repair sequences which were combinations of individual repairs were also studied. Repair types were studied specifically in response to communicative breakdowns in question-answer sequences. A breakdown occurred when the child did not produce the experimenter's predetermined PFRS. Repairs were studied as methods of assisting a child to produce a predetermined PFRS. Repairs were concerned with the possibility of helping the child "learn how to answer" (Cazden, 1979). The purpose of the present study was to measure the effect of specific individual repair types for eliciting a more immediate and predetermined PFRS.

Repair types utilized in this study emerged from the research of Brinton, Fujiki, Loeb and Winkler (1986), French and MacLure, (1981), Gallagher (1977), Garvey (1979), and Mehan (1978). Individual repair types, subtypes and their definitions are presented below in Figure 1.

Figure 1. Identification and definition of teacher repair types.

ACKNOWLEDGEMENT:

Teacher acknowledges child's reply by imitating all or part of the reply in response to child's dispreferred reply to the original elicitation.

1. Acknowledgment/imitation with rising intontation
   T: How do Indians make war paint?
   CH: with water
   T: with water↗
   CH: with clay

2. Acknowledgement/imitation with falling intonation
   T: How do Indians make war paint?
   CH: with water
   T: with water↘
   CH: with water and clay

3. Imitation plus expansion of child's reply
   T: How do Indians make war paint?
   CH: with water
   T: with water, and do you remember anything else they use?
   CH: clay

PROMPT:

Teachers changes initial elicitation to provide an external memory cue to assist child in reestablishing symmetry of the I-R-E sequence.

1. Phonemic prompt: Teacher offers child initial phoneme of preferred reply.
   T: What is it?
   CH: (no response)
   T: "b"
   CH: ball

2. Lexical fill-in: Teacher provides partial answer to child
   T: Were they big?
   CH: (no response)
   T: They were _____.
   CH: big and strong

3. Gesture: Teacher presents child with gesture or sign language prompt to facilitate response.
   T: Where is Mike?
   CH: over there
   T: Sign language gesture for "under"
   CH: under

SIMPLIFICATION:

Teacher alters her original initiation in order to reduce the range of possible replies when the original initiation fails to elicit a preferred response.

Alterations in elicitations' form reduce cognitive complexity of the original initiation through more specific reformulations of that initiation.

1. Yes/no question with inappropriate value: Teacher's original wh-question is reformulated to a yes/no question with an inappropriate value.
   T: What kind of toy is that?
   CH: a plane
   T: Is it a ball? [knowing it is a kite]
   CH: No, it is a kite.

2. Yes/no question with appropriate value: Teacher's original wh-question is reformulated to a yes/no question with an appropraite value.
   T: What kind of toy is that?
   CH: a plane
   T: It is a kite. [knowing it is a kite]
   CH: Yes.

3. Choice question: Teacher's initial wh-question is reformulated to a choice question.
   T: What kind of toy is that?
   CH: a plane
   T: Is it a plane or a kite? [knowing it is a kite]
   CH: It's a kite.

4. Confirmation: Teacher's original wh-question is reformulated to a statement which the child confirms.
   T: What kind of toy is that?
   CH: a plane
   T: It is a kite.
   CH: uh huh

ADDITION:

Teacher repairs by adding specific information to the original elicitation. Nature of the added information is described according to the semantic relations(s) the addition represents with respect to the orignal elicitation.

1. T: How do you think Morris felt?
   CH: don't know
   T: How do you think Morris felt after his sisters and brothers shared their toys with him? [+temporal]
   CH: He felt happy.

2. T: What is Mike doing?
CH: (shrugs shoulders)
T: What is Mike doing with his steam shovel, Mary Ann?
[+agent]
CH: Mike is digging a big hole.

CUE:

Teacher repairs by either defining terms in the original elicitation or by offering background context that could precede the original message.

1. Defining terms: Teacher defines terms used in the original elicitation.
T: What's the name of the playground toy that goes up and down?
CH: a swing
T: It's something that one person sits on one side and you go up and down on it. Do you know what it's called?
CH: A seesaw

2. Background context: Teacher presents information a) in the form of a past event that both teacher and child shared or b) that is assumed to be common knowledge.
a) T: What do you call an animal with stripes?
CH: a giraffe
T: Remember when we went to the zoo and we saw a horse with black and white stripes, what was its name?
CH: a zebra

b) T: When did the story take place?
CH: in the morning
T: It was on a special holiday that comes in December -- when Santa comes. Do you remember the name of this special day?
T: Christmas

REPAIR SEQUENCE:

Teacher uses different types of repairs in sequence.
T: What day is today?
CH: Thursday
T: [addition] It's the day that comes after Tuesday.
CH: Monday

T: [simplification] Is it Wednesday or Sunday?
CH: Sunday
T: [phonemic prompt] It's W . . .
CH: Wednesday

As illustrated in Figure 1, the researcher further divided each repair type into subtypes which varied in their relative strength. Relative strength was defined by McTear (1985) as the amount of information or support contained in the repair to assist the child in producing the experimenter's PFRS. For example, simplification subtype 4 in which the experimenter provides the answer and the child merely confirms it, is stronger than an addition subtype 1, in which the experimenter provides some information, but the child is left with a wider range of possible responses. Thus relative strength refers to how much information is provided by the experimenter to help the child produce the PFRS. Relative "strength" is inversely related to the scope of the child's responsibility in the production of the experimenter's PFRS. Predictions of relative repair strength in the present study were based on McTear's (1985) hierarchical categories of strength.

Repair types were further classified as specific contingent queries as described by Garvey (1977). Specific contingent queries require the child to clarify or repair only the part of his or her initial reply as requested by the teacher. Figure 2 represents types of specific contingent queries used in the current study. On the basis of McTear's

Figure 2. Three categories of repair types used in the current study.

REPAIR TYPE [a]	DEFINITION [b]	STRENGTH (INFORMATION LOAD) [c]	REQUIREMENTS OF CHILD [c]
Specific Request for Specification (S - S)	Requests a response that specifies the queried element and uses falling intonation. Occurs when there is insufficient information regarding listener's knowledge. Listener specifies aspect of utterance that is unsatisfactory. Speaker supplies appropriate requested specification.	III (Strong) WEAKEST in terms of amount of information given by adult: least amount of information.	Requires considerable degree of interactional and linguistic competence. Adult reformulates but response generation depends primarily on child
Potential Request for Elaboration (P - E)	First speaker (child) does not give all information. Second speaker (adult) proposes additional information that is relevant; First speaker adds to second speaker by accepting, rejecting, modifying or complimenting discourse of previous turn. Focuses on elements missing in surface form of child's response.	IV (Stronger) Both partners provide information.	Requires considerable degree of interactional and linguistic competence, but less than S - S because potential response is jointly constructed.
Specific Request for Confirmation (S - C)	Proposes a response, requests confirmation of that material and uses rising intonation. Usually requires yes/no response.	V (Strongest) Provides child with most amount of information.	Places minimal linguistic demand on child.

[a] Garvey (1977)
[b] Garvey (1977) McTear (1985)
[c] McTear (1985)

(1985) hierarchical ordering, each query was assigned a relative strength. The relative strength was identified as levels 3, 4, and 5. Level 3 represented the weakest level in that the least amount of information regarding the PFRS was given. Level 5 repairs were the strongest, because the experimenter provided the most amount of information. Typically, a level 5 repair required a yes/no response on the part of the child. Additionally, as indicated in Figure 2, each query type was qualitatively different with regard to possible implications for the interactional and linguistic requirements placed on the child.

A closer look at the three levels of strength reveals that level 3 repairs, which supply the child with the least amount of information, require more linguistic and interactional skills of the child than levels 4 and 5. The preferred response for level 4 repairs is mutually negotiated by the teacher who provides some information and the child who must also provide information. Level 5 repairs give the child the most information pertaining to the original question. Therefore, they require the least amount of linguistic or interactional work of the child.

Figure 3 displays the fifteen subcategories of repair collapsed into a three point continuum. Specific requests for specification (S-S) were given a level 3 strength (strong); potential requests for elaboration (P-E) were given a level 4 strength (stronger); and specific requests for confirmation

(S-C) were given a level 5 strength (strongest).

Figure 3. Teacher repair types along a continuum of strength.

(S-S) Level 3	(P-E) Level 4	(S-C) Level 5
AK 3	AK 2	AK 1
	P 2	P 1 P 3
S 1	S 3	S 2 S 4
AD 1 C 1 C 2a	AD 2 C 2b	

Note. AK=acknowledgement; P=prompt; S=simplification; AD=addition; C=cue.

Simply stated, a level 3 repair provided the child with less information and/or support relative to the teacher's initial question than a level 5 repair. This is illustrated in the following examples:

(A) Move 1: [Teacher's (T) original question]
What kind of playground toy is that?

Move 2: [Child's (C) initial response, including a breakdown]
A Slide

Move 3: [T's repair of the original question]
It's something that a person sits on and each side goes up and down. [Level 3 cue, subtype C1]

Move 4: [C's production of PFRS or DPRS]
A swing

Move 5: [Another round of Moves 3 and 4]
or
[T evaluation]

(B) Move 1: What kind of playground toy is that?

Move 2: A slide

Move 3: It's a seasaw, isn't it? [Level 5 simplification, subtype 2]

Move 4: uh huh

Move 5: [T evaluation] Yes, it is! Very good!

In example (A), the teacher provides some information to the child; however, response generation continues to demand heavily on the child's linguistic and interactional skills. In example (B), the teacher provides the child with the answer thereby giving the child a large amount of information and support relative to generating the PFRS. The child merely confirms the teacher's repair which requires a minimal amount of linguistic and interactional skill, that is, the ability to mutually negotiate and co-construct a preferred response.

Development of Repair in Children

Production of Repair

Research on normal children's ability to deal with communicative failure with peers and adults suggests a developmental nature to children's ability to use repair strategies (Brinton and Fujiki, 1989; Clark and Anderson, 1979; Evans, 1985; Fey, Warr-Leeper, Webber and Disher, 1988; Gale, Liebergott and Griffith, 1981; Gallagher, 1981; Garvey, 1977; Ironsmith and Whitehurst, 1978; Johnson, 1980; Langford, 1981, MacLachlan and Chapman, 1988; Peterson, Danner and

Flavell, 1972; Webber, Fey and Disher, 1984). This ability is tied to the children's desire to have their listener understand them, the emergence of their language system, and their metalinguistic ability to monitor and check that system. These studies have also revealed that children use individual repairs following a particular sequence. Generally, the proportion of phonological repairs decreases with age, while the use of lexical and syntactic repairs increases with age; Clark and Anderson, 1979).

Gallagher (1981) studied children's production and response to clarification requests. She studied nine children, three in each of Brown's Stages I, II, and III. Her findings suggested that children between 2 and 3 years of age used requests for confirmation more frequently than neutral requests in their interactions with their mothers. Requests for repetition of an element occurred in only three of the nine children. Gallagher concluded that the frequency of clarification requests varied greatly between her subjects. She did not attribute this effect to the child's syntactic stage. In a similar study, Johnson (1980) reported on 18 month old to 3 year old children's production of requests for clarification while interacting with their mothers. The 18 month olds in the study who had not yet reached Brown's Stage I infrequently used requests for confirmation. By Stage I, neutral requests for clarification appeared and were the most frequent type of clarification request employed by five of the

eight subjects. Johnson suggested that specific requests for specification were later developing. As with Gallagher's (1981) study, the number of requests varied between the children and did not appear to be a reflection of the child's syntactic development.

Garvey (1977) observed 48 dyads of children ranging in age from 2 years 10 months to 5 years 7 months. Each dyad was videotaped in a playroom with no adults present. In contrast to Gallagher's (1981) findings, Garvey's dyads produced neutral requests more frequently than requests for confirmation at all ages. The 3 year old to 5 year old peer dyads had higher rates of production overall than the younger subjects. But, all dyads produced all types of contingent query sequences: specific and nonspecific requests for repetitions, specific requests for confirmation and specification, and potential requests for confirmation and elaboration.

The development of the clarification request is an important component of pragmatic competence and an integral part of the language acquisition process (Porter and Conti-Ramsden, 1987). A request for clarification (RQCL) is one "whose referent is the preceding utterance of the other speaker" (Cherry, 1979). It functions to resolve misunderstandings in conversations, to make children aware that their utterances are in some way inadequate, and encourages children to try again to participate in

conversation (Cherry, 1979; Porter and Conti-Ramsden, 1987).

Researchers (Gale et al. 1981; Webber et al., 1984; Brinton and Fujiki, 1989; Markman, 1981) have examined older children's ability to use repair. This ability is especially important when children participate in question-answer sequences characteristic of classroom lessons. Many factors affect the child's ability to provide the teacher with a preferred answer to a specific question. For example, as a listener, the child may not have comprehended the question because of its semantic or syntactic complexity, or the child may have misheard the teacher's question. Both of these would contribute to an incorrect or less than adequate response (Evans, 1985; Langford, 1981; MacLachlan and Chapman, 1988). If the child has reached a metalinguistic level which enables him or her to self-regulate or self monitor question comprehension, the child, as a speaker, may request the teacher to clarify his or her initial question so as to facilitate the child's comprehension (Peterson, et al., 1972; Ironsmith and Whitehurst, 1978). Evans (1985) showed an increase in the frequency of self-repair in second graders as opposed to kindergarten children. Corrections and postponements were more frequent among second graders. Repetitions were the most frequent form of repair for both groups. Evans suggested that age and self repairs are related in an "inverted U-Effect" (p. 368). With age, self repairs increase with the child's increased monitoring ability. Then

as speech planning skills develop, repair begins to decrease. Evans concluded that developmental changes in children's ability to handle communicative failure may reflect developmental changes in their metalinguistic ability independent of their lingustic ability.

Silliman (1984) stated that the child's ability to use repair strategies reflects a metalinguistic ability of conscious intervention and awareness of the linguistic entity causing the communicative breakdown. In requesting a clarification or repetition of the teacher's question, the child is self initiating a self repair which is a behavior infrequently realized in teacher-child interaction (Wells and Montgomery, 1981).

Discussing children's initiation of repair from a slightly different perspective, Brinton and Fujiki (1989), Gale et al. (1981),and Webber et al. (1984) speculated that children's inconsistent use of request for clarification neither reflects a lack of monitoring nor an inability to initiate repair. They suggested that the pragmatic factors operating within child-adult interactions influence a child's willingness to request clarification of an adult. In the Gale et al. (1981) study, preschool subjects ignored trouble spots 45% of the time. When confronted with sentences containing irrelevancies or nonsense words, the 3 to 10 year-olds in the Webber et al. study requested experimenter clarification only 58% of the time. Similar findings resulted in the Brinton and

Fujiki (1989) study in which children were given directions in which critical elements were replaced with nonsense words. The 3 to 9 year-olds in their study requested clarification inconsistently.

In summary, the ability to use repair in conversation is tied to the child's ability to request clarification. Both use of repair and the ability to request clarification develop sequentially and vary from child to child. It is suggested that the ability to repair in older children is not constrained by linguistic form. Rather, it appears to be related to the social and pragmatic demands of the situation.

Responding to Repair

Other researchers (Anselmi, Tomasello and Acunzo, 1986; Gallagher, 1977 and 1981; Ironsmith and Whitehurst, 1978; Peterson et al., 1972) have studied the development of children's responses to adults' requests for clarification. Anselmi et al., examined children's responses to specific and neutral contingent queries. The 22 children who ranged from 20 months to 44 months responded differently to the two types of adult queries. For neutral queries, children generally repeated the adult's entire utterance. In response to specific queries, children generally responded with only the information specified in the query.

Gallagher (1977) studied children's responses to "what?" spoken by an adult. The children, in Brown's Stages I, II and

III either repeated or revised their original message. Regardless of language stage, revisions were the most commonly used child response. "No responses" occurred very infrequently. Phonetic revisions were usually consonantal substitutions in final word positions. Developmental differences emerged among the three language stages with regard to specific revision types. Stage I children revised by altering the phonetic form of the original message or by adding morphemes to the message. Stage II children revised by adding morphemes or deleting parts of the original message. Stage III subjects deleted consitituents, added morphemes or substituted parts from the original message.

In a subsequent study, Gallagher (1981) observed nine adult-child dyads in a naturalistic setting. She studied the children's responses to neutral and specific adult queries. Her results showed that all of the subjects had general knowledge of the appropriate replies to neutral queries and confirmation requests. Only five of the nine children gave any responses to specific queries that were different from their responses to neutral queries. The children in Stage II who received specific queries rarely responded to these by providing only the requested information. Similar responses occurred with the subjects in the Anselmi, et al. study (1986) reported above.

Using a referential communication task, Ironsmith and Whitehurst (1978) examined the responses of kindergarten,

second, fourth and sixth grade students to adults' messages which were either informative or ambiguous. Developmental as well as sex differences emerged. Girls were more likely than boys to provide feedback in response to ambiguous messages. In terms of age differences, the youngest children responded identically to both types of adult messages. Second graders responded with general requests for more information. In contrast, fourth and sixth graders produced more specific requests for information about the potential referents.

Wilcox and Webster (1980) also studied children's responses to two kinds of adult feedback. In one condition, the adult indicated that the child's message was ambiguous by responding "What?". In the other condition, the adult indicated that the intent of the message was not understood and answered the child's requests as if they were declarative sentences. The 16 subjects ranged in age from 17 to 24 months and were all within Brown's Stage I of language development. Their responses to adult feedback were coded as recodings, repetitions or abandonments. The two types of adult feedback influenced the form of the children's response. Results showed that children were aware of the socially acceptable responses to the different types of adult feedback. In response to "what?," they responded equally with recodings and repetitions and rarely offered abandonments. In response to the "misunderstood" adult feedback, children used recodings, rarely repeated and more frequently used abandonments. The

children's vocabulary size and syntactic ability did not influence their tendency to recode or abandon communicative intents. The researchers suggested that structural aspects of language may develop independently of the rules which govern socially appropriate communication.

Peterson et al. (1972) also examined children's responses to three kinds of adult feedback: one nonverbal in the form of facial expression and two verbal in the form of implicit and explicit responses. The 48 children, 24 preschoolers and 24 first graders responded differently to the three kinds of feedback. Neither group interpreted facial feedback effectively. The seven year olds (first graders) were more accurate in assessing implicit requests than the 4 year olds (preschoolers). The researchers suggested that the preschoolers understood the implicit requests, but were not skilled enough to know what form of "help" would help the adult. Both groups responded to the explicit feedback with 4 year olds, primarily recoding only after this type of feedback.

Children's ability to respond to recursive or stacked requests for clarification of the same message has been examined by several researchers (Brinton, et al., 1986; Brinton, Fujiki and Sonnenberg, 1988; McTear, 1975; Spilton and Lee, 1977). Brinton, et al., (1986) studied 3, 5, 7, and 9 year olds ability to respond to stacked sequences of neutral requests for clarification of the same message. Three neutral

requests were used by the adult in response to a child's attempts at a picture description task. These were "Huh?", "What"?, and "I didn't understand that." Age differences emerged with the 7 and 9-year olds responding to the entire sequence of requests. Three and 5 year-olds demonstrated difficulty in responding as the sequence progressed. Subjects' difficulty appeared to be linked to ability to persist in the sequence rather than to the recognition that a response was required of them. The age groups also used different repair strategies in response to the neutral requests for clarification. Younger children generally repeated their response. The older children added information. In response to the third request, the nine year olds sometimes defined lexical terms, supplied background context, or commented on possible sources of difficulty in their original message. The researchers concluded that the ability to respond to stacked sequences continues to develop throughout middle childhood.

Brinton et al. (1988) studied conversational repair strategies used by eight language impaired children and their linguistically normal age- and language-matched peers in response to the same three stacked repairs used in the previous study. Rather than a structured conversational task employed in their earlier (1986) study, the 1988 research looked at children's responses within conversational formats. While all subjects noticed the obligatory nature of the

neutral request, there were differences noted among the three groups: a group of normal children, a group of language impaired children matched to the normals on chronological age, and a group of impaired children matched on language age (who were chronologically older). The language age matched and the language impaired children repaired by revising the form alone more often than that of the chronological age-matched peers. These children most frequently used repair to supplement the information in the original message by using additions or cues. Types of responses to the three neutral requests also varied. Repetitions were frequently used initially, but decreased as the sequence progressed. The researchers suggested that the determining nature of the adult's request differed as the requests were stacked. The children's linguistic maturity affected their ability to produce additions to the stacked sequences.

As described above, Spilton and Lee (1977) also demonstrated four year-old children's ability to respond to communicative failure within laborative sequences. Their research showed that four year-old dyads were able to adapt successively their contributions in conversations in order to reach an understanding.

In summary, children's ability to respond to requests for clarification develops relatively early. Children are aware that requests for clarification require some kind of modification of their message. They are also aware that

certain types of requests, neutral or specific requests, require different types of answers. In terms of recursive sequences, children as young as three respond to them, but this ability continues to improve throughout childhood. These findings support an hypothesis of a developmental trend in the use of requests for clarification and repetition.

Inferencing and Story Recall

Inferencing in Conversation

Whether it takes place in naturally occurring contexts or in classroom settings, conversation is cooperative. As described above, repair is one of the mechanisms conversational participants use to ensure the smooth give and take of information. Along with repair, one of the underlying tenets of successful communication described by Grice (1975) is the Cooperative Principle. Simply stated, this principle requires people to "be cooperative" in their verbal interactions with others. Grice proposed four ways in which conversationalists are to be cooperative:

> Quantity: Make your contribution no more and no less informative than is required.
>
> Quality: Say only that which you both believe and have adequate evidence for.
>
> Relation: Be relevant.
>
> Manner: Make your contribution easy to understand; avoid ambiguity, obscurity, and prolixity.

The cooperative principle, along with the four maxims, form a social contract between speaker and listener. The speaker

agrees to follow these maxims, and the listener agrees to assume they have been followed.

The "given-new contract" (Clark and Haviland, 1977, p. 3) is part of the cooperative principle. As described by Clark and Haviland, the given-new contract is a comprehension strategy used by the listener to help him understand sentences. According to this model,

> the listener represents the content of conversations, as well as other knowledge, in a relatively permanent memory. This knowledge consists of a set of propositions interrelated by indices indicating which propositions are embedded in which, which entities are identical, and so on. This information structure includes not only those propositions underlying the sentences of conversation--and perhaps not even all of these--but also propositions inferred from these sentences and from the extralinguistic context of the conversation (p. 5).

The given-new strategy is a three-step procedure used to relate the current sentence to the listener's knowledge base. In the first step, the listener isolates the given and new information in the current sentence. In step two, the listener searches memory for a "direct antecedent, a structure containing propositions that match the given information precisely" (p. 5). In the final step, the listener integrates the new information into the memory structure by attaching it to the information found in the second step. This three-step procedure works well as long as the listener can find a direct antecedent in his memory. But, if the speaker has not followed the maxim of antecedence, the listener must form some kind of indirect antecedent in step 2 by building "an inferential bridge from something he already knows" (p. 6) or

he must construct a new antecedent. It is only when the listener finds or constructs the antecedent in memory that he can attach the new information to it, thereby integrating the new information with the old (what he already knows) (Haviland and Clark, 1974). When this occurs, comprehension of sentences within conversation is achieved.

Inferencing in Story Comprehension

Construction and modification of inferences are also essential for story comprehension (Johnson and von Hoff Johnson, 1986). Because inferences based on contextual and real-world knowledge play such a significant role in understanding stories as well as discourse, Warren, Nicholas and Trabasso (1979) offered the notion of an event or inference chain as an approach to story comprehension. This represented an alternative to the structural analysis or story grammar approach used in narrative analysis.

Story grammars. According to Mandler (1983), the general idea of the story grammar approach is that traditional stories are characterized by an underlying structure consisting of a setting component in which the protagonist and background information are introduced, followed by one or more episodes which together form the skeletal plot structure of the story. Although there are some variations among different grammars, they basically all include similar components (Westby, 1984). Episodes have a beginning or initiating event, a reaction of

the protagonist or characters to this event, an action or attempt by the characters to deal with the initiating event, an outcome of that attempt (successful or failure) and an ending.

Recall within story grammars. Based on the research of Rumelhart (1980), several variations and elaborations of story grammars have been developed (Mandler and Johnson, 1977; Stein and Glenn, 1979). These offered an organized way of analyzing stories into meaningful parts so that results could be compared across different stories and different populations. People use the canonical story structure to facilitate inferencing, recall, and comprehension of stories.

Mandler and Johnson (1977) presented a grammar with rewrite rules to describe the underlying structure of simple stories. They used the term "story schema" to refer to the internal representation of the parts of the story and the relationship between these parts. They claimed that schemata were used to guide comprehension during encoding and as retrieval mechanisms during recall. They also presented a developmental study of story recall. Their results indicated that the schemata used to guide encoding and recall were related but not identical, and that retrieval was dependent on the schemata operative at the time of recall. In terms of recall, both children and adults were sensitive to story structure. The children generally exhibited highly accurate ordering of story information in their recall. The amount of

information recalled increased with age. Elementary age children focused their recall on settings, beginnings and outcomes, but demonstrated poor recall of the protagonist's internal reactions and goals. Children also added information in recall that was not present in the original story.

Stein and Glenn (1979) specified a set of story grammar rules. Their grammar proposed a set of six story components and the relations between these components. The components included (1) settings, (2) initiating events, (3) internal responses, (4) attempts, (5) direct consequences and (6) reactions. According to the researchers, these components are either directly conveyed or inferred by the reader and are temporally and causally related. Because the components are related logically, they are described as cognitively based and are linked to the schema theory of memory and knowledge storage. They are used to guide the person's interpretations, expectations, and inferences about the possible relations in a story. In addition to describing their story grammar, Stein and Glenn looked at story recall in a series of experiments. Similar to Mandler and Johnson (1977), Stein and Glenn also found that story recall ability increased with age. Fifth graders recalled a greater proportion of statements than first graders for the immediate recall task. Similar to the findings of Mandler and Johnson (1977), not all parts of the story were recalled equally and children added information during the recall task. In their

summary, Stein and Glenn made predictions about children's ability to make inferences based on the story's grammatical structure. Since some story categories are more structurally important than others, the researchers predicted that if these are missing, the subjects would tend to inferentially add them more frequently than other, less important categories. They predicted developmental differences, with children below the age of six or seven being less skillful at inferencing than older children.

From a structural analysis viewpoint, therefore, narratives are joined together in predictable rule-governed ways with organizational patterns respresenting specific types of temporally and causally related information. The rules define the story grammar and form a cognitively based framework or schema. A schema helps a speaker to generate a story and guides a listener in comprehension and retelling of stories.

Schema theory is basically a theory of knowledge (Rumelhart 1980). According to Pearson (1982), a basic premise of the schema theory is that human memory is organized semantically. Schemata for abstract entities and objects are like concepts. For actions and events, however, schemata have an episodic or sequential dimension. Event schemas are cognitive structures that describe sequences of necessary and optional actions for particular events. They are activated automatically whenever familiar events are encountered, and

they provide sets of expectations to guide behavior in real world situations. Actors, actions, locations, and props are represented in terms of slots that can be filled by various slot fillers. Depending on the event, different slot fillers are more or less likely to occur (Nelson and Gruendel, 1981; Schank and Abelson, 1977).

One of the common ways for a reader to select a schema is to recognize a specific value, for example, a character in a story, as one that usually fills a particular variable slot in a schema. The reader guesses if that schema is appropriate. In so doing, the reader takes an "inferential leap" (Pearson, 1982, p. 28) to decide what the text is about. Once a schema is selected, filling slots is usually simple. Much slot filling takes place through inferencing.

Inference in event chain representation in narratives. Warren, Nicholas and Trabasso (1979) stated that inferences serve two functions in understanding narratives: (1) they fill in missing slots in the structure and (2) they connect elementary events in the structure with other events in order to provide a higher level of organization" (p. 23). In explaining their comprehension model, Warren et al. described a narrative as a series of propositions. A proposition is "an utterance that contains only one predicate relation and constitutes an event in an event chain" (p. 24). In their analysis, unlike the story grammar researchers, the narrative was represented as a string of numbered propositions with one

focal event. From this focal point, inferences are made backward linking the focal point with previous events in the chain similar to Clark and Haviland's (1977) "bridging" described above, or forward predicting subsequent events. Inferences, therefore, play a critical role in connecting events explicitly stated in the text or in filling in missing events. They are "acts of comprehension" (Omanson, Warren and Trabasso 1978). An inference is "slot filling" if it generates an event not explicitly stated in the text. It is "text connecting" if it generates relations between events which are explicitly stated in the text. According to Omanson et al., the measurement of inferences provides an alternate assessment of the listener's or reader's understanding of a text.

Warren, et al., (1979) classified inferences in terms of their functional relations between events. Three types of relations were described, as follows:

> (1) Logical relations involve the causes, motivations, and conditions which enable events and are made in response to the questions Why? or How?
>
> (2) Informational relations involve the specific people, instruments, objects, times, places, and contexts of events, and these inferences are made in answer to the questions Who? What? When? and Where?
>
> (3) Value relations involve the understander's world knowledge about the objects, action, and events specified in the text. World knowledge is knowledge about the words employed, the things referred to, and the functional relations among them (p. 26).

Using these relations, Omanson et al. (1978) studied inferential comprehension and recall of stories in five and

eight year-old children. They were presented with three different story versions which varied according to the kind of information provided about the protagonist's goals and actions. Goals were socially desirable (positive), socially undesirable (negative) or absent (neutral). After listening to each story, the subjects were presented with a free recall task and a series of inference questions. The results showed that the inclusion of the three goal types led to better inferential comprehension as measured by the probe questions. However, these manipulations did not affect the children's story recall. The study also demonstrated that the ability to make inferences improves with age. Omanson et al. concluded that inferential comprehension may be independent of surface recall of text and that inference probes are better measures of text comprehension than free recall tasks.

Inference Types in Current Study.

The 36 experimental questions and repair types used in the dissertation study were recoded according to the definitions of inferences as outlined above by Omanson et al. (1978) and Warren et al. (1979). Examples of these are presented below. The numbers in parentheses represent the question number as presented in the study. A complete listing of the question inference types used in the current study can be found in Appendix A.

LOGICAL INFERENCES
Question Examples:

(2) Why did the children receive presents?
(19) Why did Morris opt not to dine with his relatives?

Repair Examples:

Melancholy means sad. Why was Morris sad?
After all the children were playing with their toys, why did Morris opt not to dine with his relatives?

INFORMATIONAL INFERENCES
Question Examples:

(10) What did Rose acquire for Christmas?
(3) Did the story take place in Morris's house or outside?

Repair Examples:

A season is a time of year. Did it occur in summer?
Did you see anything happen in the living room or to the furniture once he was in the disappearing bag?

VALUE INFERENCES
Question Examples:

(17) What did Morris crave?
(4) How do you remember who the characters were in the story?

Repair Examples:

Do you think he felt happy or sad?
Did he want to play with his brother's and sisters' toys or did he want to be left alone?

The Structure of Event Chains.

Warren et al (1979) described three components in the event chain representation: (1) proposition types, (2) connectives and (3) connection rules. Propositions are broad classes of events designed with reference to a particular character in the narrative. Warren, et al. described seven

proposition types: state, event, action, cognition, display, impulse and goal. They also identified six connectives. Each logical inference type in the taxonomy is represented by a connective: motivation, physical cause, psychological cause, enablement, temporal succession (then), and temporal coexistence (and). Regarding connection rules, there are certain rules which constrain the permissible combinations of propositions types and connectives.

Morris's Disappearing Bag, the story used in the dissertation study, was rewritten into an event chain with a series of 67 propositions based on Warren et al's. theory. Proposition definitions and examples from Morris's Disappearing Bag follow. The numbers in parentheses represent the proposition numbers in the event chain. The entire chain representation can be found in Appendix B.

STATE: an objective condition, a state of affairs which pertains to the physical world or to the physical condition of a character in the story. A state is a condition which may exist either prior to or as the result of a character's action (p. 30).

(1) It was Christmas morning.
(16) Morris was too young to play with chemicals, said Betty.

EVENT: refers to occurrences or changes of state rather then to a stative condition (p. 30).

(3) Morris's brother, Victor, got a hockey outfit.
(6) And Morris got a bear.

ACTIONS AND COGNITIONS: are voluntary activities on the part of the protagonist. They are referred to as responses when motivated by other propositions, but they may also occur

spontaneously without explicit cause. A COGNITION is the internal counterpart of an ACTION, a voluntary cognitive act or voluntarily induced state (p. 32).

(7) All Christmas day Victor played hockey.
(30) "I think he hit himself with the hockey puck," said Victor.

DISPLAYS AND IMPULSES: are called reactions, the involuntary counterparts to responses. A DISPLAY is an involuntary external movement by the protagonist.

(28) Morris wouldn't eat his dinner.

An IMPULSE is an involuntary occurrence or state internal to the protagonist, and includes feelings, affects, beliefs, intuitions, dreams and hallucinations (p. 32).

(2) "Wow!" said Morris.

GOAL: is a special type of internal mental event which may either voluntary or involuntary. It is an imagined condition or occurence that the protagonist desires to achieve (p. 32).

(54) "I want to use it," shouted Victor.

Development of Children's Inferencing Skills

When engaged in conversations or reading or listening to a narrative, listeners and readers make inferences to comprehend the new information. They used their background knowledge, understanding of real world relations, and experience to "read between the lines" (Wallach and Miller, 1988, p. 116). Inferential processing is an active process, one which helps organize and assign meaning to stimuli. The ability to make inferences "is necessary for survival"

(Johnson and vonHoff Johnson, 1986, p. 622). Research on inferential processing has been conducted on both children and adults (Blanchowicz, 1978; Crais and Chapman, 1987; Johnson and von Hoff Johnson, 1986; Paris and Carter, (1973); Paris and Lindauer, 1976; Paris, Lindauer and Cox, 1977). According to Wallach and Miller (1988), more is known about mature inferential processing patterns than about children's developmental patterns. Two patterns emerge from the research on normal processing. Both children and adults frequently demonstrated difficulty separating inferred information from explicit or literal information provided in memory tasks. Secondly, children are first able to make inferences at about age six, but they become more proficient and comfortable with inferential processing during their school years, after the age of seven or eight years.

Blanchowicz (1978) examined 120 school age children's and 30 adults' comprehension of sets of related sentences from which inferences could be drawn. All subjects were asked to read silently short paragraphs which suggested spatial relationships. After reading the paragraphs, the subjects were given a recognition test containing items not previously read but congruent to the content of the passage. Subjects were instructed to mark "yes" for those sentences that were exactly like the ones they had read. The results demonstrated that there was a strong tendency for all subjects to recognize the true inferences whether or not they appeared in the

original paragraphs. Blanchowicz concluded that these types of inferential errors reflect the normal developmental course of processing. While the second graders exhibited the weakest performance, the second and fifth graders formed a homogeneous group making the same kind of recognition errors.

Crais and Chapman (1987) examined ability to recall information and draw inferences from orally presented narratives among 16 language learning disabled children and 32 nondisabled children. Short fable like stories were presented to the children. The stories were followed by a series of premise and inference questions which were half true and half false. Either before or after answering the questions, the children were asked to recall the story in their own minds. The results showed that both nondisabled and learning disabled children experienced more difficulty answering inferential questions than premise questions about the stories. Making inferences across sentences was more difficult than making inferences within sentences. Recall of the story prior to answering questions had no effect on question answering.

Johnson and von Hoff Johnson (1986) pointed to the important role vocabulary plays in making inferences. To make inferences from written text, readers must "examine important vocabulary in the passage and relate these word clues to their own prior knowledge and experience" (p. 624). These researchers proposed that students be taught to inference. They identified ten inference types which they considered

basic for most students to handle inferential requirements of most reading comprehension tasks. Based on these, they proposed a three-step training procedure: (1) teach, (2) practice and (3) apply. They concluded their article by commenting that everything read requires making inferences. They recommended that direct instruction in the inference types and process of inference making will facilitate inferencing.

Paris and Carter (1973) studied children's ability to infer information not presented in individual sentences. They presented short paragraphs to 10 second graders and 10 fifth graders. Each story consisted of three simple, active declarative sentences. After hearing the stories, the children were presented with four sentences which were related to the story in some way. The children were to decide which sentences they had heard before. The results showed that the children could not discriminate true premises from new true inferences. This pattern of errors was identical for both grade levels. The second graders did make considerably more errors than the fifth graders. The primary result was the strong tendency for children to recognize the semantically congruent true inferences as being identical to the sentences given during the initial task. The findings suggest that children between seven and ten years old actively construct relations and make inferences as they attempt to organize and remember information.

Paris and Lindauer (1976) looked further into developmental changes in inferential processing. They studied children between the ages of six and 12 years. The children were told that they would be given a list of sentences and that they should try to remember as many as they could. A cued recall procedure was employed to assess the relative effectiveness of implicit and explicit word prompts for sentence memory. The results showed that implicit cues were much less effective than explicit cues for the six and seven year-olds. Cue types did not differ in effectiveness among 11 and 12 year-olds. These results provided some information about the possibility of developmental changes in inferential processing on a sentence memory task. The researchers also instructed the six and seven year-olds in the study to act out a new list of sentences to explore the possibility that children younger than 10 or 11 use inferential processing. These instructions eliminated the memory difference for the young children. They performed as well as the older children under this gesture condition. This suggests that gesture or acting out facilitates inferential processing.

Paris et al. (1977) were interested in the generalizability of the previous study. They conducted another study using a sentence memory and prompting task similar to the one used by Paris and Lindauer (1976), but employing different inferential sentences. Two cued recall experiments were used. For the adults and the 11 year-olds,

retrieval cues derived from implied information were as effective as explicit words from the sentences as memory aides. However, they were significantly inferior cues for the seven and eight year-olds. The younger children performed better with the explicit sentences. Paris et al. also investigated whether younger children could be induced to make inferences. The children were asked to generate little stories about the stimulus sentences. The results showed that story generation enabled inferential processing, even in the youngest subjects. When developing stories, the children included inferred consequences, and they recalled explicit and implicit cues equally well.

In summary, the ability to make inferences is essential for narrative comprehension. The ability first emerges when a child is about six years old, but development continues throughout the school years. Studies have shown that making inferences across sentences is more difficult than within sentences. While story generation facilitates inferential processing, story recall prior to questions has no effect on question answering.

Conclusion

A comparison of turn taking and repair mechanisms operating in naturally occurring conversations and classroom discourse has been presented. Characteristics of classroom language and lessons, questioning within lessons, and teacher

and student repair have also been studied. The ability to make inferences between information in conversational turns and between and within propositions in a story has also been described.

The review of the literature has demonstrated that the turn unit, the turn taking mechanism, and repair strategies differ within naturally occurring conversations and classroom discourse. The turn unit in the classroom consists of a three turn initiation-reply-evaluation, I-R-E sequence. Teacher repair occurs within the (E) slot of the I-R-E sequence. Repair was described as a conversational mechanism that operates within and between turns at talk. The research suggested that when repairs are used in sequences within conversations, the repairs follow a natural ordering from weakest to strongest.

Classroom lessons have been described as dynamic co-constructed teacher-student interactions. To participate successfully in lessons, students must demonstrate a blend of social and academic competence. Examination questions characterize the instructional phase of classroom lessons. A student's question comprehension depends on his metalinguistic ability to request teacher repair and on his ability to make inferences between information presented in turns at talk or between propositions in a story. The ability to repair emerges in preschool years and becomes more sophisticated as the child's metalinguistic skills continue to develop through

the school years. Inferencing ability first appears at about age six and proceeds to develop through the school years.

The current study investigated the effectiveness of various types of repairs in helping subjects who responded with a dispreferred response to a question to produce a preferred response. Using a question-answer test like conversational routine framed in a story recall paradism, the current research investigated the efficacy of a model of repair strength as an index of repair effectiveness.

Research Hypotheses

Based on the literature reviewed, it is clear that in naturally occurring conversations, repairs tend to follow a progression from weak to strong. The study described here represented an attempt to use a structured intervention task to make possible the formal testing of hypotheses relevant to the effectiveness of repairs representing different levels of strength. In addition, hypotheses were generated relevant to the relative effectiveness of specific repair types for children at different developmental levels, as well as the likelihood that children at these levels would self-initiate repairs. Specifically, the following hypotheses were tested in the structured intervention design of the present investigation:

Hypothesis 1 (H1) Repair types containing greater amounts of information (level 5 strength) related to the preferred response should be most effective in eliciting the experimenter's preferred response regardless of the student's age level or question type.

Hypothesis 2 (H2) Because level 4 repairs require mutual negotiation of the preferred response, a developmental trend of effectiveness of level 4 strength repairs should emerge with preschool students being least successful and third graders being most successful for all question types.

Hypothesis 3 (H3) Because of differences in the amount of information provided and the degree of linguistic and interactional skills required of repairs of different levels of strength, the effect of the three levels of strength provided by individual repairs in eliciting the preferred response will vary with age and question type.

Hypothesis 4 (H4) Because repair sequences are composed of repairs of different levels of strength and incorporate the child's response into the experimenter's reformulation, these repairs may be more effective than individual repairs for achieving the preferred response.

Hypothesis 5 (H5) Based on a pilot study, a) a developmental trend is expected to emerge regarding children's responses to questions in that older children will more often self-initiate self repair of the original question when they do not understand its intent; b) a relationship is expected between children's requests for clarification and the experimenter's question type;

c) a relationship is also expected between the children's request for repetition and the experimenter's question type.

CHAPTER 3

METHOD

The study employed a structured intervention task in an effort to determine how to repair children's incorrect responses to questions so as to enable them to produce a preferred response. In this chapter the methods employed in the study are organized and described under the following headings: subjects, procedures, materials, scoring, and methods of data analysis.

Subjects

Subjects of the study consisted of 30 normal children (15 boys and 15 girls) ranging in age from 4.9 to 10.0 years who were distributed across three grade levels: prekindergarten (n=10), first grade (n=10), and third grade (n=10). The children attended a parochial school in a middle class New Jersey suburb. All the children were Caucasian, monolingual speakers of English with no history of physical, intellectual, hearing or emotional problems. None of the children was receiving speech-language therapy, special education, or other remedial programming. All parents provided written consent for their children to participate in the study. The parents also indicated whether their children were familiar with the story used in the experimental task: a six minute videotape entitled Morris's Disappearing Bag.

The subjects were selected randomly from the populations of students in each of the three grade levels in the school.

The random selection process was accomplished by assigning an identifying number to each student in each grade. These numbers were written on three-by-five-inch index cards. The cards for each grade level were placed in a large jar and ten cards were drawn for each class.

Table 1 presents the sex and chronological age of each subject. For first and third graders, Table 1 also indicates the subjects' percentile scores on the Reading, Language Expression, and Math subtests of the Comprehensive Test of Basic Skills (CTBS; Mc-Graw Hill, 1981). The CTBS is administered yearly as a part of the regular testing program of the school. The scores presented in Table 1 are from the April, 1987 administration of the test. These scores suggest the students in the sample are all performing above the 50th percentile. Among the first graders, percentile scores on Reading, Language Expression, and Math ranged from 64 to 97, 61 to 95, and 62 to 97 respectively. Percentiles for Reading, Language and Math for third graders ranged from 62 to 95, 63 to 97, and 63 to 91 respectively. Third grade subjects also received a Cognitive Skills Index Score. This is a deviation score, based on a norm mean of 100 and a standard deviation of 15. The scores of the third graders on the Cognitive Skills Index also suggested they were a superior group. The scores ranged from 111 to 141.

Setting

All experimenter-child interactions were conducted in the

Table 1.

Sex, Chronological Age, and CTBS Scores of 30 Participating Pupils

Identifying Number	Sex	Age	CTBS Subscale: Total(b) Reading	Language(b) Expression	Total(b) Math	Cognitive(c) Skills Index
			Prekindergarten (n=10)			
24	M	5.2				
26	F	5.3				
21	M	5.2				
13	M	5.1				
20	F	5.0				
9	M	5.7		(Not Available for Prekindergarten)		
12	F	5.8				
27	F	4.10				
10	F	4.1				
30	M	5.4				
			First Grade (n=10)			
29	F	7.2	83	87	68	
11	M	7.2	86	95	78	
18	M	7.0	68	78	97	
7	F	6.11	97	95	97	
23	M	6.6	66	61	83	
22	F	8.6	69	86	66	
19	M	7.5	67	67	65	
8	F	6.6	64	70	84	
25	F	6.8	73	78	62	
28	M	7.1	76	85	63	

Third Grade

1	M	8.10	62	94	76	119
2	M	9.6	81	91	70	117
3	M	10.0	63	68	69	111
4	F	8.8	68	97	78	131
5	F	9.6	81	64	74	115
6	F	8.8	95	98	74	138
16	M	8.8	89	69	91	129
14	F	9.2	95	63	79	116
15	M	9.4	95	97	85	141
17	F	9.2	75	70	63	113

(a) California Test of Basic Skills, first and third grade only
(b) Percentile Scores
(c) Deviation Scores

school's carpeted library. The library contained tables and straight-legged chairs. An audio recorder used to collect data for later transcription and analysis was on the table. A videocassette recorder and monitor used for viewing the experimental story were in front of the table in clear view of both the child and the experimenter. The experimenter sat across from the child. All interactions took place during regular school day hours.

Procedures

Instructions

The same procedures employed in the pilot study were used in the larger dissertation study. The same experimenter, a speech-language pathologist with 11 years experience, ASHA certification, and New Jersey licensure, interacted individually with each of the 30 children who also formed 30 dyads. Initially, the experimenter developed rapport and then explained to each child that she or he would be playing some games. The following directions were given to each child: "We are going to play three games. First, let's play with the tape recorder. (At this point, the experimenter recorded a few words of the child and played them back.) Now you are going to watch a story on T.V. Try to listen closely and watch carefully. After the story, I'm going to ask you some questions about what you saw and heard. Do you understand? O.K., let's watch T.V.!"

Viewing and Questioning

After the instructions were given, each of the 30 children individually viewed the same six-minute videotape story entitled Morris's Disappearing Bag by Rosemary Wells (1975). The six-minute video was played using an RCA VLT 450 videocassette recorder and a 12-inch Panasonic Color T.V. Model CT 228. After each child watched the videotape story, the experimenter continued the instructions by saying, "Now, let's play the question game." Each child was asked the same set of 36 questions focusing on story content. The order of question presentation was the same for all subjects.

Since the study was designed to examine repairs of breakdowns or dispreferred responses (DPRS), it was necessary to effect such responses in the initiation-reply-evaluation (I-R-E) sequences. To effect breakdowns in the I-R-E sequences, less familiar vocabulary words were embedded into several of the questions. In addition, a predetermined preferred response (PFRS) consistent with and constrained by the story content was developed for each question. When the child did not produce the experimenter's PFRS in the (R) slot, the experimenter reformulated the question in the (E) slot by using a repair drawn from one of five sets of repairs for the 36 questions. These sets were assigned randomly to the children. This procedure continued until all 36 questions were asked. The development and pilot testing of the 36 experimental questions and the repairs are described in the section on materials below.

Recording

All experimenter-child verbal exchanges were audiotaped using a Panasonic RQ 309AS portable audiocassette recorder with an external microphone. The microphone was placed on a stand and positioned between the child and the experimenter. TDK Normal Position Type 1 D 60 Dynamic Cassettes were used for recording all interactions. Audiocassette transcriptions were done by three graduate students in speech-language pathology who were trained by the experimenter.

Materials

The Story

Morris's Disappearing Bag (Wells, 1975) is a professionally produced 1/2 inch videotape distributed by Weston Woods of Connecticut. The characters in the story are a family of rabbits. The protagonist is Morris, one of the children in the family. The story takes place on Christmas morning, and the central issue in the story is that Morris's brother and sisters do not want to share their toys with him. This problem is resolved when Morris finds a disappearing bag which his siblings want to use. Figure 4 presents the story map of Morris's Disappearing Bag, indicating each of the nine primary story events.

The Comprehension Questions

A set of 36 comprehension questions was developed and piloted for the study. These questions are presented in Figure 5. The story map which was used to generate these

Figure 4. Story map of Morris's Disappearing Bag.

SETTING: Place: Morris's house
Time: Christmas Morning
Characters: Morris
Victor, Morris's brother
Rose and Betty, Morris's sisters
Morris's mother and father

PROBLEM: Neither Morris's brother nor his two sisters wanted to share their gifts with him.

GOAL: Morris wants to play with his brother's and sisters' toys.

Event 1: All of the children receive their Christmas toys.

Event 2: Each of the children plays with his or her own toy as well as shares his or her toy with each other.

Event 3: No one would share with Morris.

Event 4: Morris's mother and father offer to play with Morris and his bear.

Event 5: Morris refuses to eat dinner with his family.

Event 6: Morris finds a disappearing bag.

Event 7: Morris disappears.

Event 8: Morris's siblings search for him and find him as he comes out of his disappearing bag.

Event 9: The siblings want to share their toys and use Morris's bag.

SOLUTION: Morris shares his disappearing bag with his sisters and brother, and they share their toys with him.

Figure 5. Thirty-six (36) questions and preferred responses developed from story map.

	QUESTION TYPE	ORIGINAL QUESTION IN PILOT	REWRITTEN QUESTIONS	EXPERIMENTER'S PREFERRED RESPONSES ORIGINAL	REWRITTEN
1.	PD	When did the story occur?	During what season did the story occur?	Christmas Day	Winter
2.	PS	Why did the children receive presents?		Because it was Christmas.	
3.	CH	Did the story take place in Morris's house or outside?		In Morris's house	
4.	MP	How do you remember who the characters were in the story?		Because ... I saw them. Because of my family.	
5.	CH	Does Morris have a greater number of sisters or brothers?		Sisters	
6.	PD	Who is the protagonist in the story?		Morris	
7.	PS	Why was Morris downtrodden?	Why was Morris melancholy?	Because he could not play with his brother's and sisters' toys.	Same answer
8.	CH	Was Morris downcast or felicitous at the beginning of the story?		Downcast	
9.	MP	How do you remember what Morris's brother and sisters received for Christmas?		I remember ...	
10.	PD	What did Morris acquire for Christmas?	What did Rose acquire for Christmas?	A teddy bear	A beauty set

	QUESTION TYPE	ORIGINAL QUESTION IN PILOT	REWRITTEN QUESTIONS	EXPERIMENTER'S PREFERRED RESPONSES ORIGINAL	REWRITTEN
11.	MP	How did you know that Victor prohibited Morris from playing with his hockey set?		Because...Morris was too little and would get hurt	
12.	PS	Why did Rose inform Morris that he could not play with her beauty set?		He was too silly and would waste lipstick	
13.	PD	What was Betty's rationale for not sharing her chemistry set with Morris?	What were two components of Betty's gift?	He was too young and might blow up the house.	Test tubes, acids, chemicals.
14.	PS	How do you suppose Morris felt when his brother and sisters would not share their toys with him?		Alone and sad	
15.	MP	How do you know that what the other children did might have hurt Morris's feelings?		Because they played with their toys in front of him and would not let him share.	
16.	CH	Was it necessary or unimportant for Morris to come up with a plan so that he could share his brother's and sisters' toys?		It was necessary	
17.	PD	What did Morris desire to do?	What did Morris crave?	To play with his brother and sisters.	Same answer
18.	PS	Why did Morris's mother offer to make the bear a hat and his father offer to take him for a walk?		To make Morris feel happy.	
19.	PS	Why did Morris not join his family for dinner?	Why did Morris opt not to dine with his relatives?	He was sad and wanted to be alone.	Same answer

	QUESTION TYPE	ORIGINAL QUESTION IN PILOT	REWRITTEN QUESTIONS	EXPERIMENTER's PREFERRED RESPONSES ORIGINAL	REWRITTEN
20.	CH	After dinner, did Morris find an opened or unopened gift?		An unopened gift.	
21.	PD	What happened when Morris unwrapped the disappearing bag?		He jumped inside.	
22.	PD	Where did Morris find the disappearing bag?		Under the tree.	
23.	PS	Why did Morris's sisters and brother have to search for him?	Why was morris transferred into an invisible character?	Because he was in the bag and had disappeared.	Same answer
24.	MP	How did you figure out where Morris was hiding?	How did you deduce where Morris was concealed?	Because the bag was moving around.	Because the cushions on the chair were squeezed down and puffed up and/or the chair was rocking.
25.	PD	What did Morris have to do prior to his siblings finding him?	What did Morris remove from the Christmas tree and later consume.	Get out of the bag.	A candy cane.
26.	PS	How do you imagine Morris's brother and sisters felt when they discovered what Morris had found?		They were jealous and wanted to play with the bag.	
27.	MP	How did you figure out what would happen because Morris found the disappearing bag?		I figured that they would share their toys with him because he was having fun.	
28.	PS	Why did they offer to share their toys with him?		Because they wanted to play with his bag.	

	QUESTION TYPE	ORIGINAL QUESTION IN PILOT	REWRITTEN QUESTIONS	EXPERIMENTER's PREFERRED RESPONSES ORIGINAL	REWRITTEN
29.	CH	Does Morris's behavior change or remain the same subsequent to his brother's and sisters' offer to share their toys with him?		It changes. He becomes happy.	
30.	CH	Did Morris use lipstick or chemicals to beautify himself?		He put lipstick on.	
31.	MP	How do you remember what Morris did with Victor's hockey skates?		I remembered because.. I saw him zoom through the house.	
32.	MP	How did you know that Morris was playing with Betty's chemistry set?		Because he was mixing different chemicals.	
33.	CH	Do you think Morris felt internally happy or sad when he was given permission to play with his siblings' toys?		Happy	
34.	CH	Does Morris's family sleep upstairs or downstairs?		Upstairs	
35.	MP	How did you know that they slept upstairs?		Because they all went up the steps at bedtime.	
36.	PD	What happens to Morris at the conclusion of the story?		He fell asleep and was happy.	

experimental questions was developed according to the procedure described by Pearson (1984). This procedure involves the identification of the story's setting, problem, and goal, as well as events related to the goal and the story resolution. The comprehension questions were based on story content and reflected the parts of the story map.

The 36 questions were written so that nine questions represented each of four question types: product, process, choice, and metaprocess. As discussed in the review of the literature, these four types of questions are characteristic of classroom discourse. The question types have been defined as follows by Mehan (1979): product questions solicit factual pieces of information about objects and events. An example of a product question in the present study is question 1, "When did the story occur?" Process questions solicit opinions and interpretations. An example is question 2, "Why did the children receive presents?" Metaprocess questions required the child to reflect on the rule, procedure, or mental process by which the response content was formulated. For example, question 4 asks, "How do you remember who the characters were in the story?" Choice questions required the child to make either/or evaluations, to agree or disagree with question content, or to evaluate specific information presented within the question. Examples are question 3, "Did the story take place inside Morris's house or outside?" and question 8, "Was Morris downcast or felicitous at the beginning of the story?"

A predetermined preferred response (PFRS) was designated

for each question. These PFRSs are indicated in Figure 5. Each PFRS was consistent with and contrained by the story content.

As noted in the procedures section above, the questions were written specifically to effect breakdowns. This was accomplished by including less-familiar vocabulary words in the questions. For example, question 6 uses the term "protagonist," question 7, the word "melancholy," and question 8, the words "downcast" and "felicitous." These words were determined to be less-familiar through the Ginn Word Book for Teachers (1983). In addition, teachers were asked whether the students in their grades should be familiar with the words. Only words which did not appear on the Ginn list for grade three and only words which the teachers agreed would be less-familiar were included for this purpose.

The comprehension questions were piloted to be certain that they did in fact lead to breakdowns or DPRSs. Based on the results of the pilot study, nine of the questions were rewritten and repiloted to increase the likelihood of a breakdown or DPRS. The nine questions which were rewritten and repiloted included five product, three process, and one metaprocess questions. These questions were selected based on the criterion that fewer than two breakdowns occurred across the three children in the pilot study. Figure 5 indicates which questions were rewritten and shows both the original and revised wording. During repiloting on three different children, 35 of the 36 questions resulted in at least two

breakdowns. Although choice questions resulted in breakdowns least frequently, they remained in the study to demonstrate that subjects could produce the PFRS when the demand characteristics of the questions were reduced.

Repairs

Five sets of repairs were prepared so that one set could be assigned randomly to each child. Within each set, there were five types of repairs including acknowledgements, prompts, simplifications, additions, and cues. An acknowledgement occurred when the experimenter acknowledged the child's reply by imitating all or part of the reply in response to the child's DPRS to the original question. A prompt occurred when the experimenter provided the child with an external memory cue to assist the child in reestablishing symmetry in the initiation-reply sequence. Simplifications occurred when the experimenter changed the form of the original wh-question thereby reducing the range of possible replies. Additions provided specific new information to the experimenter's original question or provided background information that was assumed to be common world knowledge.

Repairs were also classified according to relative strength, based on the system described by McTear (1985). Strength was defined in terms of the amount of information provided in the repair. Level 3 repairs, referred to as specific requests for specification, are the weakest repairs. In this type of repair, the experimenter provides the child

with the least amount of information. Generation of the preferred response depends primarily on the child. An example of a level 3 repair is as follows: "Melancholy means sad. Why was Morris melancholy?" In this level 3 repair, a cue subtype 1, a less familiar vocabulary word, "melancholy" is defined for the subject.

Level 4 repairs, referred to as potential requests for elaboration, involved a mutual negotiation between the experimenter and the child. An example of a level 4 repair is as follows: "Did the story happen in summer or winter?" In this level 4, simplification subtype 3 repair, the experimenter's original wh-question, "During what season did the story occur?" was reformulated into a choice question.

Level 5 repairs, referred to as specific requests for confirmation, are strong repairs in which the experimenter actually provides a yes/no answer. An example of a level 5 repair is as follows: "Morris had a greater number of sisters than brothers, didn't he?" In this level 5, simplification subtype 2 repair, the experimenter's original wh-question, "Does Morris have a greater number of sisters than brothers?" is reformulated into a yes/no question with an appropriate value, that is, the PFRS.

The final level of repairs, level 6, is that of the experimenter repair sequence. In a repair sequence, the experimenter used several types of repairs in sequence. An example of a repair sequence is as follows:

E. Who is the protagonist in the story?

Ch. (No response)

E. The story was about a bunny rabbit and his family, right? (Level 5)

Ch. Yes.

E. Protagonist means the main character. So, who was the main character? (Level 3)

Ch. Morris?

E. Yes.

Figure 6 provides several examples of each of the five types of repairs. Note that there are several subtypes within each of the five types. Figure 3 also indicates the strength of each of the repairs listed. Note that level 3 repairs include one subtype of acknowledgements (subtype AK3), one subtype of simplifications (subtype S1), one subtype of addition (subtype AD1), and two subtypes of cues (subtypes C1 and C2a). Level 4 repairs include one subtype of acknowledgements (subtype AK2), one subtype of prompts (subtype P2), one subtype of simplifications (subtype S3), one subtype of additions (subtype AD2) and one subtype of cues (subtype C2b). Level 5 repairs included one subtype of acknowledgements (subtype AK1), two subtypes of prompts (subtypes P1 and P3) and two subtypes of simplifications (subtypes S2 and S4).

Appendix C presents the five sets of repairs developed for the study. Within each set, the repair type used with each of the 36 questions is indicated. These five sets were developed following a pilot study. In the pilot study, the

Figure 6. Identification and description of experimenter repair types.

ACKNOWLEDGEMENT

Experimenter acknowledges child's reply by imitating all or part of the reply in response to child's dispreferred reply to the original elicitation.

AK 1 Acknowledgement/imitation with rising intonation

E: What did Morris remove from the Christmas tree and later consume?
CH: a ball
E: a ball↗ (Level 5)
CH: a candycane?

AK 2 Acknowledgement/imitation with falling intonation

E: Does Morris have a greater number of sisters or brothers?
CH: brothers
E: brothers↘ (Level 4)
CH: sisters?

AK 3 Imitation plus expansion of child's reply

E: Was Morris downcast or felicitous at the beginning of the story?
CH: sad
E: He was sad; so, was he downcast or felicitous?
(Level 3)
CH: downcast

PROMPT

Experimenter changes initial elicitation to provide an external memory cue to assist child in reestablishing symmetry of the I-R-E sequence.

P 1 Phonemic prompt: Experimenter offers child initial phoneme of preferred reply.

E: What did Morris remove from the Christmas tree and later consume?
CH: (no response)
E: "ca" (Level 5)
CH: candy cane

P 2 Lexical fill-in: Experimenter provides partial answer to the child.

E: Why did Morris opt not to dine with his relatives?
CH: because
E: He felt _____. (Level 4)
CH: sad and wanted to be alone.

P 3 Gesture: Experimenter presents child with a gesture or sign language prompt to facilitate response.

E: Where did Morris find the disappearing bag?
CH: by the tree
E: (Sign gesture for "under") (Level 5)
CH: under the tree

SIMPLIFICATION

Experimenter alters her original initiation in order to reduce the range of possible replies when the original initiation fails to elicit a preferred response. Alterations in elicitations' form reduce the cognitive complexity of the original initiation through more specific reformulations of that initiation.

S 1 Yes/no question with inappropriate value: experimenter's original wh-question is reformulated to a yes/no question with an inappropriate value.

E: What did Rose acquire for Christmas?
CH: I don't remember.
E: Was it a beauty set? (Level 3)
CH: No. I think it was a chemistry set.

S 2 Yes/no question with appropriate value: experimenter's original wh-question is reformulated to a yes/no question with an appropriate value.

E: Why was Morris melancholy?
CH: I don't know.
E: Do you think he was melancholy because he couldn't play with his brother's and sisters' toys?
(Level 5)
CH: Yes.

S 3 Choice question: experimenter's initial wh-question is reformulated to a choice question.

E: During what season did the story occur?

CH: (no response)
E: Was it summer or winter? (Level 4)
CH: winter

S 4 Confirmation: experimenter's original wh-question is reformulated to a statement which the child confirms.

E: What were two components of Betty's gift?
CH: lipstick
E: They were test tubes and chemicals. (Level 5)
CH: Oh, that's right!

ADDITION

Experimenter repairs by adding specific information to the original elicitation. Nature of the added information is described according to the semantic relation(s) the addition represents with respect to the original elicitation.

AD 1 E: What did Morris crave?
CH: I don't know.
E: What did Morris crave after his brother and sisters got their toys and were playing with them? (Level 3)
CH: To play with their toys?

AD2 E: What did Morris remove from the Christmas tree and later consume?
CH: (shrugs shoulders)
E: What did Morris remove from the Christmas tree and later consume with his mouth? (Level 4)
CH: a candy cane?

CUE

Experimenter repairs by either defining terms in the original elicitation or by offering background context that could precede the original message.

C 1 Defining terms: experimenter defines terms used in the original elicitation.

E: Why was Morris melancholy?
CH: (no response)
E: Melancholy means sad. (Level 3)
CH: Because no one would play with him.

C 2 Background context: experimenter presents information a) in the form of a past event that both teacher and child shared or b) that is assumed to be common knowledge.

C 2a
E: How did you deduce where Morris was concealed?
CH: He was in the bag?
E: Remember in the movie we saw something happening to the furniture in the living room? (Level 3)
CH: The pillows were going up and down?

C 2b
E: During what season did the story occur?
CH: I don't know that one.
E: It was the season when it is cold and snowy. (Level 4)
CH: Winter?

REPAIR SEQUENCE

Experimenter uses different levels of repairs in sequence.

E: During what season did the story occur?
CH: (no response)
E: It's the season after fall. (AD 1, Level 3)
CH: Uh. Huh.
E: Was it winter or summer? (S 3, Level 4)
CH: Winter

experimenter spontaneously assigned one of the individual repairs or a repair sequence. This procedure was problematic in that it often resulted in a long latency between the child's initial response and the experimenter's reformulation, that is, the repaired original question. Therefore, the five sets of repair types were developed. Each subject was assigned to one of the five repair type sets on a random basis. Using an assigned set for each subject, the experimenter knew immediately what type of repair to use on each question with each participant.

Coding

Scoring Preferred Responses and Dispreferred Responses

Each child had a protocol (see Appendix D) which listed the 36 questions, the experimenter's PFRS for each question, the specific repair type used, the child's response, and a score of (+) or (-). Transcription procedure notations were based on those outlined by Ochs (1979) and Silliman (1984). The following scoring procedures were utilized:

(1) If the experimenter's initial elicitation resulted in a DPRS in the (R) slot, the experimenter randomly assigned a repair to that question in the (E) slot. If the repair were effective, that is, resulted in the PFRS in the next turn slot, it was scored (+).

(2) If the initial elicitation resulted in the PFRS in the (R) slot, it was also scored (+).

(3) If a repair were used in the (E) slot but was unsuccessful, that is, it did not result in a PFRS in the next turn slot, it was scored (-) and the sequence was terminated.

The following procedures were employed in the case of subject initiated repairs:

(4) If the child responded with a request for repetition (RQRP) or clarification (RQCL) in the (R) slot, the experimenter provided the response to the request for repetition or clarification (RSRP or RSCL) in the (E) slot. If the child produced the PFRS in the next turn slot, the exchange was coded as a subject-initiated sequence (SI) and scored (+).

(5) If the experimenter's response to an RQRP or RQCL was followed by a DPRS on the part of the child, an experimenter initiated (EI) repair was used in the next turn slot. The (EI) repair could result in either a PFRS or a DPRS. If it resulted in the child's production of a PFES, it was scored (+). If it resulted in a DPRS, it was scored (-) and the sequence was terminated. This same procedure was used for each of the 36 questions for each of the 30 children.

Reliability of Scoring and Repair Type Coding

After the 30 experimenter-child interactions were transcribed, the experimenter and two other ASHA certified

speech-language pathologists independently reviewed the 30 protocols, coded each repair, and scored each question. Inter-rater agreement scores were obtained for both accuracy of scoring and repair type. These scores were the percentages of repairs for which all three judges agreed. With respect to the scoring of responses as PFRS or DPRS, the three judges agreed perfectly on 100% of repairs across all questions for all 30 children. With respect to the coding of level of repair, the percent of perfect agreement among the three judges was calculated for each level. The percentage of agreement for each level was as follows: level 3, 95%; level 4, 95%; level 5, 100%; and level 6, repair sequences, 100%. The overall percent of perfect agreement across all repairs was 97.5%.

Coding Variables for Post Hoc Analyses

Because few significant findings were obtained with respect to the research hypotheses, a number of post hoc analyses were carried out. These analyses involved a number of variables which were coded from the transcripts, including the inference level of the question, whether the PFRS of the question was explicitly stated or inferred in the text, repair inference type, number of clauses in the question, and number of less familiar vocabulary words in the question. The coding of these variables is described in the sections which follow.

Inference type of question. Three speech-language

pathologists independently rated each of the 36 questions with respect to the inference demand of the question. In rating the questions, they used the typology of Warren et al. (1979) which specified three inference types: logical, informational, and value. Logical inferences are made in response to why or how questions and involve the motivations, causes, and conditions which cause events to occur. Informational inferences are made in response to who, what, when, and where questions and concern specific instruments, objects, people, times, places, and contexts of events. Value inferences are based on the reader's or listener's world knowledge about the actions, objects, and events specified in the narrative. In assigning the questions to these categories, the three raters agreed perfectly on 31 of the 36 questions, and two out of the three coders agreed on the remaining five questions. In these five cases the question inference type was assigned based on the majority coding.

Explicit or inferred preferred response. The story was recorded as an event chain with 67 propositions (see Appendices B and E). The experimenter's predetermined PFRSs to the 36 questions were related to specific propositions within the text (see Appendix A). Based on the propositions, the PFRSs were classified as explicitly stated or inferred in the narrative. The three speech pathologists coded each of the 36 PFRSs as either explicit or inferred. In making this assignment, all three judges agreed on 17 questions, and two

out of three agreed on 19 questions.

Repair inference type. The three speech pathologists also used the Warren et al. (1979) inference typology to code the inference type of all the repairs contained in the 5 sets of repairs. The three raters achieved perfect agreement on 95% of all repairs, and two out of the three raters agreed on the remaining 5%. In those cases where perfect agreement was not achieved, the decision of the majority (2 of the 3 raters) determined the inference category to which the repair was assigned. The percent of perfect agreement for determining the inference types of the repairs was as follows: logical, 90%, informational, 100%, and value, 95%.

Number of clauses in question. The researcher, a committee member, and a graduate student independently rated each of the 36 questions for the number of clauses. All three of these raters agreed with respect to 29 of the 36 questions. For the remaining seven questions, two of the three judges agreed.

Number of less familiar vocabulary words. Each question was rated with respect to the number of less familiar vocabulary words. Two procedures were used. First, 20 teachers, five each at the PK, 1st, 2nd, and 3rd grade levels individually identified words within the 36 questions which they considered less familiar to children at their respective

grade levels. All teachers had a minimum of five years teaching experience at the particular grade level. Second, The Ginn Word Book For Teachers: A Basic Lexicon (1983) was used. Vocabulary words were coded as less familiar if they were either (1) identified by the teachers as less familiar, or (2) did not appear on kindergarten, 1st, 2nd, or 3rd grade word lists in the lexicon. Using these criteria, there was 100% agreement that 19 of the 36 questions had less familiar vocabulary words.

Statistical Analyses

Available Data

The potential number of DPRS was 1080 (30 subjects x 36 questions). Frequency counts from the transcripts revealed a total of 585 DPRSs. Across all subjects and question types, there were 74 SI level 1 (RQRP) and level 2 (RQCL) repairs, 202 EI level 3 repairs, 131 EI level 4 repairs, 95 EI level 5 repairs, and 83 EI level 6 repair sequences. The number of DPRSs varied from subject to subject. Although there were 36 possible DPRSs per subject, the actual number ranged from 16 to 31 for prekindergarten subjects, from 13 to 24 for 1st grade children, and from 6 to 19 for third graders. None of the subjects had repairs for every combination of question type (product, process, metaprocess, and choice) and repair level (3 through 6).

The method planned for the analysis of the breakdowns was a three-way mixed model analysis of variance. The independent

variables envisioned for this analysis were repair type, question type, and grade level group. Of these measures, repair type was a within subjects variable having four values (strength levels 3, 4, and 5 plus repair sequences). Question type was a within subjects factor having four values as well (product, process, choice, and metaprocess). Grade level group was a between subjects variable having three values (prekindergarten, first grade, and third grade). The dependent variable was the number of turns used to elicit the preferred response and the children's requests for clarification and requests for repetition. Because of the missing data, however, it was not possible to conduct the ANOVA which was planned. Instead, t-tests were employed. Furthermore, since the numbers of DPRSs for each group were so variable, proportional data were used for the analyses to test the hypotheses. An arc sine transformation was conducted on each of the proportions, and parametric independent and correlated t-tests were performed. When assumptions of a t-test were violated, nonparametic tests using the arc sine transformed data were employed. The Mann Whitney U-Test was used to compare independent samples, and the Wilcoxin Matched Pairs Signed Ranks Test was used to compare correlated samples. The dependent variable was the arc sine transformed proportion of effective repairs for each combination of repair level and question type. The three independent variables were age, as measured by grade level, question type, and level of repair. The section which follows specifies the techniques

used to test each of the research hypotheses.

Tests of Research Hypotheses

Hypothesis 1. The first hypothesis stated that level 5 repairs would result in more PFRSs than level 3 and 4 repairs. This hypothesis was tested by means of eight pairwise correlated sample t-tests. Level 5 repairs were compared to level 3 repairs and to level 4 repairs across all age groups for each of the four question types. Because of the large number of statistical tests performed, it was necessary to control for the probability of Type I error using the Bonferroni technique. Using this criterion an alpha level of .006 was adopted for each test.

Hypothesis 2. The second research hypothesis stated that a developmental trend should emerge with respect to the effectiveness of level 4 repairs. It was expected that for each of the 4 question types, preschool students would demonstrate the lowest success in producing PRFSs after level 4 repairs, while 3rd grade students would demonstrate the highest success. This hypothesis was tested by a series of 12 independent sample t-tests. A series of three pairwise comparisons compared PK to 1st grade, PK to 3rd grade, and 1st to 3rd grade with respect to the proportion correct of level 4 repairs for each of the four question types. When the assumptions of the t-test were violated, a Mann Whitney U-Test was used instead. Here again, the large number of tests

required that the probability of Type I error be controlled using the Bonferroni technique. Given that 12 different tests were performed, an alpha level of .004 was adopted for each test.

Hypothesis 3. The third research hypothesis proposed that there would be effects due to level of repair (levels 3, 4, and 5) and that these effects would vary as a function of grade level and question type. This hypothesis was tested by 36 correlated sample t-tests. Three pairwise comparisons of repair levels (3 to 4, 3 to 5, and 4 to 5) were conducted for each of the four question types in each age group. Thus, 12 correlated t-tests were conducted for each age group. In some cases, the assumptions of homogeneity of variance were violated. In these cases, Wilcoxin Matched Pairs Signed Ranks Tests were substituted. The Bonferroni method was used to control the probability of Type I error. Given that 36 separate tests were performed, an alpha level of .001 was adopted for each test.

Hypothesis 4. Hypothesis 4 stated that repair sequences (level 6 repairs) would be more effective in eliciting a PFRS than the other three repair levels (levels 3, 4, and 5). This hypothesis was tested by means of 12 pairwise correlated sample t-tests. Each of the three levels of individual repair (levels 3, 4, and 5) was compared to a repair sequence (level 6 repair) for each of the four question types. The Bonferroni

method was used to control the probability of Type I error. Given that 12 tests were conducted, an alpha level of .004 was adopted for each test.

Hypothesis 5a. This hypothesis stated that requests for repetition (RQRP) and requests for clarification (RQCL) would vary as a function of age, as measured by grade level. To test H5a, five dependent variables were employed: (1) frequencies for individual RQRPs, (2) frequencies for individual RQCLs, (3) arc sine transformed proportion correct scores for individual RQRPs (4) arc sine transformed proportion correct scores for indiviual RQCLs and (5) pooled frequencies of RQRPs and RQCLs. These data were used in pairwise comparisons of the three age groups (PK to 1st, PK to 3rd, and 1st to 3rd) for each of the four question types. Twenty Mann Whitney U-Tests (5 dependent variables x 4 question types) were done for each of the three level comparisons. The Bonferroni method was used to control the probability of Type I error. Since a total of 60 tests were performed, an alpha level of .0008 was adopted for each test.

Hypothesis 5b. This hypothesis stated that a relationship existed between question type and RQRPs. This hypothesis was tested by means of 36 Wilcoxin Matched Pairs Signed Ranks Tests. For each of the three age groups, the following 12 pairwise comparisons were made, six for frequencies and six for arc sine proportions: PDCL to PSCL,

PDCL to CHCL, PDCL to MPCL, PSCL to CHCL, PSCL to MPCL, and CHCL to MPCL. The Bonferroni method was used to control the probability of Type I error. Given that 36 tests were carried out, an alpha level of .001 was required for each test.

Hypothesis 5c. Hypothesis 5c suggested that a relationship existed between question type and RQCLs. This hypothesis was tested similarly by means of 36 Wilcoxin Matched Pairs Signed Ranks Tests. According to the Bonferroni criterion, an alpha level of .001 was adopted for each of these tests.

Post-Hoc Analyses

Given that few significant results were obtained in analyses carried out to test the research hypotheses, a number of post-hoc analyses were carried out. Qualitative analyses of the transcripts included the examination of subject initiated sequences, i.e., RQRPs and RQCLs and the comparison of these sequences to experimenter initiated level 6 repair sequences. In the post hoc analyses, repair levels and question types were described in terms of inference demands. On the basis of these descriptions, a series of ten post hoc analyses were conducted. These analyses are described below:

(1) In order to determine whether repairs of different levels of strength had similar inference demands, repairs at each level of strength were classified into one of three inference types (logical, informational, or value) as

described in the section on coding above. A chi-square was calculated to determine whether or not there was a significant relationship between repair level and inference type.

(2) An analysis was conducted to determine whether the inference levels of the questions tended to be the same as that of the repair. The questions and the repairs were coded for inference level, and a chi-square test was used to determine whether there was a significant relationship between these variables.

(3) An effort was made to determine whether repair effectiveness was greater when the repair type matched the question inference type than when there was no match. To accomplish this goal, the proportions of repairs which were effective were calculated for those repairs in which the inference type matched the question and for those in which the inference type did not match. The test for two independent proportions (Guilford and Fruchter, 1973) was used to determine whether these proportions differed significantly.

(4) Subject-initiated repairs were compared to experimenter initiated sequences. The proportion of SI repairs leading to a PFRS was compared to the proportion of EI sequences leading to a PFRS. The test for two independent proportions was used to ascertain whether these proportions differed significantly.

(5) An analysis was carried out to determine whether any relationship existed between the subjects' grade level and the occurrence of SI sequences. The number of subjects in each

grade level producing no SI sequences, and the number producing either or both types of SI sequences (RQRPs and RQCLs) were analyzed. Using a chi-square test, the likelihood of occurrence of one or more SI sequences among PK children was compared to the likelihood of occurrence of one or more SI sequences among the combined 1st and 3rd grade children.

(6) An effort was made to determine if repairs used within SI and EI sequences followed a hierarchy of strength. Transcripts were analyzed to determine which sequences followed hierarchies.

(7) The relative effectiveness of repairs which followed and did not follow a hierarchy was investigated. For SI sequences, a Fisher Exact Probability Test was used to compare repairs which did and did not follow a hierarchy. For EI sequences, a chi-square test was used for the same purpose.

(8) The relationship between the inference level of the question and the occurrence of SI sequences was examined. For each of the three question inference types (logical, informational, and value) the proportion of questions leading to SI sequences was calculated. Then three correlated sample t-tests were carried out. These compared the mean arc sine transformed proportions of questions leading to SI sequences on (1) logical and informational inference types, (2) logical and evaluative inference types, and (3) informational and evaluative inference types.

(9) The relationship between the nature of the PFRS as explicit or inferred and the occurrence of SI sequences was

examined. The proportion of questions having explicit PFRSs which led to SI sequences was calculated for each subject. The proportion of questions having inferred PFRSs which led to SI sequences was also calculated. These proportions were transformed using the arc sine transformation. Then the transformed proportions were compared using a t-test for correlated samples.

(10) A three-way cross classification table was prepared to assess possible confounding effects of (a) the nature of the preferred response (explicit vs. inferred), (b) the number of clauses in the question, and (c) the number of less familiar vocabulary words. The scoring of these variables is described in the section of this chapter on coding, above.

CHAPTER 4

RESULTS

This study was designed to answer the question: "How do you enable a child who responds to a question with a dispreferred response (DPRS) to produce a preferred response (PFRS)?". A PFRS was based on story content and operationally defined as a response predetermined and preferred by the examiner.

To answer this question, the data were first analyzed based on a theory of relative strength of repair. The first set of analyses focused on general surface patterns within initiation-reply-evaluation (I-R-E) sequences with an emphasis on the experimenter's (E) slot. Five specific research hypotheses were tested in these analyses. A second set of analyses focused on the underlying dynamics or inference interactions within I-R-E sequences with an emphasis on the child's (R) slot. These analyses were of a post hoc nature. In this chapter, the results of the study are described. The results have been organized under two major headings, corresponding to the research hypotheses and the post hoc analyses. Subsections correspond to the specific hypotheses and post hoc research questions.

Strength of Repair

Based on the research of McTear (1985), three levels of strength were identified and placed on a continuum from weakest to strongest. Using Garvey's (1977) contingent query

types, specific requests for specification (S-S) were the weakest and were classified as level 3 repairs. Specific requests for confirmation (S-C) were level 5 repairs and were the strongest. Potential requests for elaboration (P-E) required mutual negotiation of the experimenter and subject and were level 4 repairs.

Specific Requests for Confirmation

The first research hypothesis stated that level 5 repairs would result in more PFRSs than levels 3 and 4 repairs irrespective of the subjects' grade level and question type. The rationale for this hypothesis was that level 5 repairs were the strongest, that is, had the most amount of information of the three repair levels. In using a level 5 repair, also known as a specific request for confirmation (S-C), the experimenter selects a particular component of the child's response, proposes another response and requests confirmation of it. The child's response is generally a simple "yes" or "no." Level 5 repairs place the least demand on the responding child and provide the most amount of information relating to the experimenter's initial question. Because of these two factors, it was hypothesized that it would be easier for a child to produce a PFRS in response to a level 5 repair.

Because the number of dispreferred responses (DPRS) varied from subject to subject, the number of repairs at each

of the three levels also varied from subject to subject and from question to question. For this reason, this hypothesis was originally tested based on proportions. The proportion of effective repairs was calculated for each combination of repair level and question type. An arc sine transformation was then conducted on each of these proportions.

These arc sine transformed proportions were then compared by means of eight pairwise correlated sample t-tests. Two pairwise comparisons of level 5 repairs to levels 3 and 4 repairs were made across all age groups for the four question types. Because of the large number of tests that were done, it was necessary to control for Type I error using the Bonferroni method. Using this criterion, a probability of .006 was required for significance. The results of these tests are presented in Table 2.

Based on the p=.006 criterion for significance, only one significant result was obtained. Level 5 repairs were more effective than level 3 repairs in response to DPRS in metaprocess (MP) questions at the .005 level of significance. The mean for MP questions with level 5 repairs was 1.13 compared to mean of .63 for level 3 repairs. (See Table 2)

Based on this finding, hypothesis 1 was only partially supported, but not totally supported. Level 5 repairs were not significantly more effective than level 4 repairs, and they were significantly more effective than level 3 repairs only on metaprocess questions.

Table 2.

Eight Pairwise Comparisons for Correlated t-tests Used to Investigate Hypothesis 1 (n= 10 PK; n 10 GR. 1; n= 10 Gr. 3)

Question Type	Repair Level	M[a]	Repair Level	M	n[b]	t	df	p
PD	5	1.19	3	.84	19	1.52	18	.147
	5	1.14	4	.73	17	1.68	16	.112
PS	5	1.15	3	1.08	16	.29	15	.779
	5	1.22	4	1.34	18	-.62	17	.542
CH	5	.39	3	.79	4	-1.00	3	.391
	5	.00	4	1.05	3	-2.00	2	.184
MP	5	1.13	3	.63	19	3.24	18	.005*
	5	1.09	4	.83	12	.84	11	.420

* Significant at p <05 level. Controlling for Type 1 error, p=.006.

a Means are greater than 1 because arcsine transformed proportions were used.

b These subjects had at least one occurrence of each level of repair in response to a dispreferred response for each question type in the pairwise comparison.

Additional results pertinent to this hypothesis were provided by means of a mixed repeated measurements analysis of variance. The ten subjects' percent correct scores within each grade level were added, and a mean proportion correct for each question type and repair level was calculated. Mean proportions for each question type and repair level for each of the three grade levels were then tested with a mixed repeated measurements design with one between and two within subjects variables. In this analysis, the between subjects variable was grade level, having the values prekindergarten, first, and third. The within subject factors were question type, having the values product, process, choice, and metaprocess, and repair level, having the values strength level 3, 4, 5, and repair sequence. The results of this analysis are presented in Table 3. As indicated in the Table, the analyses did not yield significant main effects for grade level or repair level. It yielded only a significant main effect for question type (F-critical=5.09, df=3 and 18, alpha=.01). The percent correct was higher for process (PS) questions than for the other three question types.

The Differential Effect of Grade Level on Potential Requests for Elaboration

The second hypothesis predicted a developmental trend of effectiveness for level 4 repairs (potential requests for elaboration) such that prekindergarten (PK) children would demonstrate the lowest proportion of successful repairs and

Table 3.

Mean Proportions Correct for Collapsed Data by Question Type, Grade and Repair Level

Question Type	Grade	Repair Level 3	4	5	6	Marginal for Question Type
PD	PK	.417	.406	.689	.500	
	1st	.683	.592	1.00	.875	.690
	3rd	.536	.900	.750	.937	
PS	PK	.611	.650	.722	.722	
	1st	.875	1.00	.875	1.00	.841
	3rd	.833	1.00	.800	1.00	
CH	PK	.647	.728	.250	.500	
	1st	.833	1.00	.670	1.00	.705
	3rd	.500	.330	1.00	1.00	
MP	PK	.373	.500	.750	.225	
	1st	.500	.833	.875	.266	.580
	3rd	.583	.750	.500	.805	

ANOVA Summary Table

Source	df	SS	MS	F
Question Type (A)	3	.411	.137	12.45*
Repair Level (B)	3	.126	.342	1.5
Grade Level (S)	2	.635	.317	
A x B	9	.300	.033	.804
A x S	6	.065	.011	
B x S	6	.168	.028	
A x B x S	18	.741	.041	

*p<.01

third (3rd) graders would be the most successful across all question types. The rationale for this hypothesis was that level 4 repairs required a considerable degree of interactional and linguistic competence, because the PFRS is co-constructed between the child and the experimenter. When using a (P-E), the experimenter selects material potentially relevant to but not explicitly stated in the child's reply. The experimenter proposes additional information, and the child accepts, rejects or modifies it in forming a second reply. In order for such a repair to be effective, the child must have a certain level of interactional and linguistic competence. It was expected that this competence should be developmental, with PK children demonstrating the least success and third graders, the most success.

This hypothesis was tested using arc sine transformed proportion correct scores. A series of twelve independent sample t-tests was conducted. The three grade levels, PK, 1st and 3rd were compared to each other using a series of three pairwise comparisons with respect to the proportion correct of level 4 repairs and the four question types. In some cases, the assumption of homogenity of variance was violated, suggesting that a t-test ought not to be used. In these situations, Mann Whitney U-Tests were used instead. Because of the large number of tests that were done, it was necessary to control for Type I error using the Bonferroni method. Using this criterion, a probability of .004 was required for

significance. The results of these tests are presented in Table 4. As indicated in the Table 4, based on the criterion of p=.004, no significant results were obtained. Thus hypothesis 2 was not confirmed. It could not be concluded that level 4 repairs were more effective among children in the higher grade levels.

Interaction of Repair Strength With Grade Level and Question Type

The third hypothesis stated that the relative effect of level 3, 4, and 5 repairs would vary with grade level and question type. This hypothesis was based on the claim that each of the three levels of repair had different amounts of information and therefore different interactional and linguistic demands. Additionally, it was reasoned that repairs with different levels of strength might be more or less effective with different types of questions. Research has shown that responding to different repair types follows developmental trends (Anselmi et al., 1986; Gallaghar, 1977 and 1981; Ironsmith and Whitehurst, 1978; Peterson et al., 1972).

Arc sine transformed proportion correct scores were compared by means of 36 pairwise correlated sample t-tests. Three pairwise comparisons for each of the 4 question types and each of the 3 repair levels were conducted for each of the three age groups. Thus, for each grade level, there was a series of 12 correlated t-tests. In some cases, the

Table 4.

Independent Sample t-tests and Mann Whitney U Tests Comparing Grade Level Groups on Proportion of Effective Level Four Repairs for Each Question Type (Hypothesis 2)

Comparison of PK to First Grade Subjects

Question Type	PK n	PK M (c)	1st n	1st M	t	df	p
PD	8	.493	9	.75	-1.02	15	.324
PS	10	.99	9	1.57	-2.40	17	.040* .0387(b)
CH	8	1.00	0	.00	4.49	8	.003
MP	8	.79	5	.42	.86	11	.410

Comparison of PK and Third Grade Subjects

Question Type	PK n	PK M (c)	3rd n	3rd M	t	df	p
PD	8	.49	6	1.22	-2.57	12	.027*
PS	10	.99	7	1.57	-2.40	15	.040(b)
CH	8	1.01	3	.52	.85	9	.462
MP	8	.79	4	1.18	-.80	10	.453

Comparison of First and Third Grade Subjects

Question Type	1st n	1st M (c)	3rd n	3rd M	t	df	p
PD	9	.75	6	1.22	-1.67	13	.124
PS	9	1.57	7	1.57	.00	14	1.00
CH	0	.00	3	.52	-1.00	3	.423
MP	5	.42	4	1.18	-1.53	7	.177

* Not significant at p=<.05 level after controlling for Type 1 error. Using Bonferroni method for all 12 t-tests, p=<.004.
a) Mann Whitney U Test substituted if assumptions of t-test violated.
b) Probability associated with Mann Whitney U Test.
c) Means are greater than 1 because arcsine transformed proportions were used.

assumptions of homogeneity of variance were violated suggesting that a t-test should not be used. In these cases, Wilcoxin-Matched Pairs Signed Ranks Tests were used. Once again, because of the large number of tests that were done, the Bonferroni method was used to control for Type I error. Based on this criterion, a probability of .001 was required. The results of these tests indicated no significant differences. These findings lend no support to hypothesis 3. It could not be concluded that the relative effect of repair strength varied with age as measured by grade level or question type.

Repair Sequences

The fourth hypothesis suggested that repair sequences, level 6 repairs, would be more effective than individual repairs in eliciting a PFRS.

The rationale for this hypothesis was twofold. First, repair sequences contain individual repairs of different levels of strength. Second, level 6 repairs include the child's reply which might direct the experimenter to provide the kind of information the child would need to provide a PFRS.

Arc sine transformed proportion correct scores were compared by means of 12 pairwise correlated sample t-tests. Each of the three levels of individual repair, levels 3, 4, and 5 was compared to a repair sequence, level 6, for each of

the four question types. Because of the large number of tests that were done, it was necessary to control for Type I error using the Bonferroni method. Using this criterion, a probability of .004 was required for significance. Based on this criterion, no significant differences were obtained.

These findings lend no support to hypothesis 4. It could not be concluded that level 6 repairs were more effective in eliciting a PFRS than level 3, 4, or 5 repairs.

Requests for Clarification (RQCL) and Requests for Repetition (RQRP)

Effects of grade level. Hypothesis 5a predicted that a developmental trend would emerge regarding subjects' production of RQCLs and RQRPs. The rationale for this hypothesis was that such trends had been previously reported in the literature.

Frequencies for individual RQRPs and RQCLs, arc sine transformed proportion correct scores for individual RQRPs and RQCLs and pooled frequencies for RQRPs and RQCLs were used in a total of 60 Mann Whitney U-Tests. These data were used in comparison of the three grade levels to each other: PK to 1st, PK to 3rd and 1st to 3rd for each of the four question types. Twenty Mann Whitney U-tests were performed within each grade. Because of the large number of tests that were done, it was necessary to control for Type I error using the Bonferroni method. Using this criterion, a probability of

.008 was required for significance. The observed differences did not meet this criterion. Thus it could not be concluded that there was any developmental trend for RQCL or RQRP.

Relationship Between Requests for Clarification (RQCL) and Question Type

Hypothesis 5b posited a relationship between subjects' RQCLs and the question type. The rationale for this hypothesis was that more difficult questions, such as metprocess (MP) questions might result in more RQCLs than easier questions, such as choice (CH) questions.

Frequencies and arc sine proportion correct scores were compared by means of 36 Wilcoxin Matched Pairs Signed Ranks Tests. For each of the three grade level groups, the following 12 pairwise comparisons were made, six of each for frequencies and six of each for proportions: PDCL to PSCL, PDCL to CHCL, PDCL to MPCL, PSCL to CHCL, PSCL to MPCL and CHCL to MPCL. The Bonferroni method was used to control for Type I error. Using this criterion, a probability of .001 was required for significance. Based on this criterion, no significant results were obtained, leading to a lack of support to hypothesis 5b.

Relationship Between Requests for Repetition (RQRP) and Question Type

Hypothesis 5c predicted a relationship between RQRPs and question type. This was based on the claim that the

complexity of certain question types might cause a child to request a clarification of that question.

Frequencies and arc sine proportion correct scores were compared by means of 36 Wilcoxin Matched Pairs Signed Ranks Tests. The same 12 pairwise comparisons were made for each age group as outlined in hypothesis 5b. The Boneferroni method was used to control for Type I error, with the result that a probability of .001 was required for significance. Based on this criterion, no significant results were obtained. It could not be concluded that requests for clarification were related to question type.

Summary

The results of the analyses yielded only limited support for hypothesis 1. Level 5 repairs were more effective than level 3 repairs but only on metaprocess questions. Level 4 repairs, potential requests for elaboration were not related significantly to grade level. The relative effectiveness of repairs of different levels of strength did not vary as a function of grade level or question type. However, a significant main effect was obtained for question type, with performance on process questions significantly higher, than performance on any other question type. Repair sequences were not more effective in eliciting PFRSs than were individual repairs. Requests for repetitions and clarifications were not related to grade level or to question type.

Post Hoc Analyses

Because the tests of the research hypotheses resulted in a general pattern of nonsignificant findings, a series of additional analyses was conducted to attempt to identify other factors related to repair effectiveness. These analyses are described below.

Question 1: Inference Demands of Level 3, 4, and 5 Repairs

Since repairs of different levels of strength did not appear to be differentially effective, the researcher investigated the question of whether they might be similar with respect to the type of inference represented. To address this question, the repairs at each level were classified into one of three inference types representing logical, informational and value inferences. It was expected that if the repairs were similar in terms of inference demands, it might explain the lack of differentiation of repair strength in the original analyses.

Frequencies of inference type and repair level were crosstabulated, and a chi-square was calculated to determine whether or not there were significant relationship between these variables. This crosstabulation is presented in Table 5. The chi-square test was found to be significant (x^2 (4)= 11.87, $p<.05$). Thus, level 3,4, and 5 repairs differ in terms of inference demands. This suggests that repair level may be confounded by inference demands.

Table 5.

Crosstabulation and Chi-Square Analysis of Strength of Repair by Inference Type of Question for 387 Repairs

	Inference Type						
	Logical		Informational		Value		Total
Level of Strength of Repair	n	%	n	%	n	%	
3	27	16	76	42	76	42	179
4	15	12	62	50	47	38	124
5	16	19	22	26	46	55	84
Total	58		160		169		

$x^2(4)=11.87$, $p<.05$

Question 2: The Relationship Between Question Inference Type and Repair Inference Type

Since the original analyses showed no differences in repair effectiveness across question type, it seemed reasonable to ask whether the inference demands of the four original question types, product (PD), process (PS), choice (CH) and metaprocess (MP) were actually different from the inference types represented in the three repair types. To address this issue, the four question types were classified into one of the same three inference types used to classify the repair levels.

Frequencies of repair and question inference types were crosstabulated, and a chi-square was calculated to determine whether or not there was a significant relationship between these variables. This crosstabulation is presented in Table 6. The chi-square was significant (x^2 (4)= 335.01, $p<.001$). The column percentages in the table indicated that most often the inference level of the repair tended to match the question type. On repairs involving informational questions, 98 percent of repairs were informational. For repairs involving value inference questions, 83 percent of repairs were value. Only on repairs involving logical questions was there much variability in inference type. Here 39 percent of repairs were logical, 16 percent were informational, and 44 percent were value. This finding suggests that the inference level of the question itself may be an important factor in determining the inference level of the repair.

Table 6.

Crosstabulation and Chi-Square Analysis of Question Inference Type by Repair Inference Type for 387 Repairs

	Repair Inference Type						
	1 (Logical)		2 (Informational)		3 (Value)		Total
Question Inference Type	n	%	n	%	n	%	
1 (Logical)	43	39	17	16	48	44	108
2 (Informational)	1	1	133	98	2	1	136
3 (Value)	14	10	10	7	119	83	143
Total	58		160		169		

$x^2(4)=335.01$, $p<.001$

Question 3: The Interaction of Repair Inference Type With Question Type

It was expected that a match between the inference level of the repair and the question might result in a higher proportion of PFRS. To test this hypothesis, the proportions of repairs which were effective were calculated for those repairs in which the inference type matched the question and for those in which the inference type did not match. Of the 295 repairs which matched the questions for inference type, 171 (57.9%) were effective. Of the 97 repairs which did not match the questions with regard to inference type, 65 (67.1%) were effective. Thus repairs which did not match the questions with regard to inference type were actually more effective than those which did match. The test for two independent proportions (Guilford and Fruchter, 1973) showed that these proportions differed significantly ($z=2.88, p<.01$). This finding suggests that when the repair inference type does not match the question inference type, the PFRS is more likely to result.

A series of post hoc questions were also formulated with respect to differences between subject-initiated (SI) and experimenter-initiated (EI) sequences. These analyses are described below.

Question 4: The Relative Effectiveness of Subject Initiated and Experimenter Initiated Sequences

Examination of the transcripts suggested that SI and EI

sequences might be differentially effective. To test this notion, the proportion of SI sequences leading to a PFRS was compared to the proportion of EI sequences leading to PFRS by means of a test for two independent proportions. Of the 74 SI sequences, 66 (90%) were successful. In contrast, of the 71 EI sequences, 38 (54%) were successful. These two proportions differed significantly ($z=4.84$, $p<.001$).

Question 5: Grade Level Effects

Although the original analyses showed no significant age effects, research predicted developmental differences in children's use of and response to repair strategies. Examination of the transcripts of I-R-E sequences of the three grade levels with particular emphasis on (SI) sequences within the (R) slot and (EI) sequences within the (E) slot suggested that children in the higher grade levels might be more likely to produce SI sequences. To determine if there were differences in the use of SI sequences (including both RQRPs and RQCLs) by the three age groups, the number of subjects in each grade level group producing no SI sequences and the number producing either or both types of SI sequences was calculated. The two oldest groups were combined, and production of SI sequences was crosstabulated by grade level group. This crosstabulation is shown in Table 7. Using a chi-square test, the likelihood of occurrence of one or more SI sequences among PK children was compared to the likelihood

Table 7.

Crosstabulation and Chi-Square Analysis of Production of SI Sequences by Grade Level Group (1st and 3rd grade collapsed)

Production of SI Sequences	PK n	PK %	1st and 3rd n	1st and 3rd %
Yes	1	10.0	13	65.0
No	9	90.0	7	35.0
Total	10	100.0	20	100.0

$x^2(1)=6.04$, $p<.05$

of occurrence of one or more SI sequences among 1st and 3rd grade children. The analysis demonstrated a significant effect for grade level with the older children more likely than the younger children to produce one or more SI sequences ($x^2(1)=6.04$, $p<.05$). Only one of the ten children in the PK group produced any SI sequences, compared to 13 of the 20 children in the 1st and 3rd grade groups.

Question 6: Hierarchical Repair Sequence

Previous research suggested that EI and SI sequences tended to follow a hierarchy of strength (McTear, 1985). The investigation analyzed the transcripts for the present study to determine if this was the case for this data set.

Examination of the transcripts of the combined 145 (EI) and (SI) sequences showed that the repairs fell into four categories. Repair sequences: 1) followed a hierarchy, 2) followed a reversed hierarchy, 3) were two directional or 4) were of equal strength. Examples of these four patterns are presented in Figure 7. Specific discussion of these patterns is found in the Discussion Chapter.

Figure 7. Four patterns of repair sequences.

1. Sequence Followed Hierarchy of Strength

E: During what season did the story occur?

C: (.) (No Response) (DPRS)

E: It's the season after Fall/ (Level 3)

C: Uh huh/ (DPRS)

E: Was it summer or winter? (Level 4)

C: Winter/ (PFRS)

E: Good, winter/ (Eval)

2. Sequence Followed a Reversed Hierarchy of Strength

E: Who is the protagonist in the story?

C: (.) (No Response) (DRPS)

E: The story was about a bunny rabbit and his family, right? (Level 5)

C: Yes/ (C-Ackn)

E: Protagonist means the main character. So, who was the main character? (Level 3)

C: Morris/ (PFRS)

E: Yes, good! (Eval)

3. Two Directional Sequence

E: Why was Morris transformed into an invisible character?

C: I don't know that one/ (DPRS)

E: O.K. That's fine. Pretty far into the story Morris found the disappearing bag, didn't he? (Level 5)

C: Yeah/ (C-Ackn)

E: And after he found the disappearing bag, he jumped in/ (Level 3)

C: Yeah/ (C-Ackn)

E: O.K. So how come Morris was changed into a person we couldn't see? (Level 3)

C: Cause/ (DPRS)

E: Did he stay out of the bag or did he jump into the bag? (Level 4)

C: Jumped in the bag/ (PFRS)

E: O.K. Terrific/ (Eval)

4. Sequence with Repairs of the Same Level of Strength

E: Why did Rose inform Morris that he could not play with her beauty set?

C: I don't know/ (DPRS)

E: O.K. In the beginning, Rose told Morris that he couldn't play with her beauty set, right? (Level 5)

C: Right/ (C-Ackn)

E: Was it because he was silly and would waste the lipstick? (Level 5)

C: Yep/ (PFRS)

E: O.K. (Ackn)

Of the 12 SI sequences which led to repair, five followed a heirarchy. Of the 69 EI sequences which led to repair, 38 followed a hierarchy. Thus in the present study, it would appear that sequences are hierarchical only about half the time.

Question 7: Effectiveness of Hierarchical and Non-Hierarchical Sequences

For both SI sequences leading to repair and EI sequences leading to repair, the effectiveness of hierarchical and non-hierarchical sequences was compared. These comparisons are presented in Table 8. A Fisher Exact Test indicated no significant difference in the likelihood of success between those sequences which followed a hierarchy and those that did not. Twenty four of the 38 EI sequences which followed the hierarchy were successful (63.1%) compared to 13 of the 31 EI sequences which did not (41.9%). A chi-square test indicated this difference was not significant (x^2 (1)=2.29, p>.05).

This pattern suggested that although the observed proportion of repairs that followed the hierarchy was greater than the corresponding proportion that did not, the difference was not large enough to be significant. This implies that sequences whose repairs follow a hierarchy of strength are no more effective than those that do not.

Question 8: Inference Level of Question

To determine whether the inference level of the question was related to the likehood of occurrence of SI sequences, a series of correlated t-tests was conducted. For each subject, the proportion of questions for each of the three inference types leading to SI sequences was determined. These proportions were transformed using the arc sine transformation to make the distribution conform more closely to the

Table 8.

Crosstabulation and Chi Square Analysis of Repair Effectiveness for SI and EI Sequences According to the Repair Sequence Hierarchy of Strength

SI Sequences (n = 12)

Effective	Followed Hierarchy n	Followed Hierarchy %	Did Not Follow Hierarchy n	Did Not Follow Hierarchy %
Yes	3	60.0	4	57.1
No	2	40.0	3	42.9
Total	5	100.0	7	100.0

Fisher Exact Test, $p>.05$

EI Sequences (n = 69)

	Followed Hierarchy n	Followed Hierarchy %	Did Not Follow Hierarchy n	Did Not Follow Hierarchy %
Yes	24	63.1	13	41.9
No	14	36.9	18	58.1
Total	38	100.0	31	100.0

$x^2(1)=2.29$, $p>.05$

assumptions of normality. Then, the mean transformed proportions of questions leading to SI sequences for logical questions was compared to that of informational questions, informational was compared to value, and logical was compared to value. These three correlated sample t-tests yielded no significant differences for SI sequences, after the probability of Type I error was controlled using the Bonferroni method. Based on these results, it was concluded that the inference type of the question was unrelated to the likelihood that an SI sequence would occur.

Question 9: Explicitly Stated or Inferred Preferred Response

A second possible predictor of SI sequences concerned the question of a relationship between the explicit or inferred nature of a PFRS and the occurrence of SI sequences. It was theorized that questions with inferred PFRSs would have a higher occurrence of SI sequences. To test this hypothesis, the proportion of questions having explicit and inferred preferred responses resulting in SI sequences was calculated for each subject. These proportions were transformed using the arc sine transformation, and a correlated sample t-test was conducted to compare the two transformed proportions. This test was significant ($t=4.93$, $df=13$, $p<.001$) even after controlling for Type I error ($p=.0056$). However, before concluding that inferred PFRSs are more likely to elicit SI sequences than explicit PFRSs, it was necessary to investigate

the possibility that other factors, namely, the number of clauses in the question and the number of less familiar vocabulary words in the question, could be confounding factors.

Question 10: Confounding Variables

In order to investigate this possibility, a three way cross classification table was prepared. Each question was classified with respect to type of PFRS (explicit or inferred), number of clauses (1 versus 2), and number of less familiar vocabulary words (none versus 1). (Nine questions with more than two clauses or more than one less familiar vocabulary word were dropped from this analysis, since there were too few such questions to allow for meaningful statistical analysis). The cross-classification of questions is presented in Table 9.

Confounding is evident in the Table. Of six questions having inferred PFRSs, five (83.3%) were one clause questions. In contrast, of 21 questions having explicit PFRSs, only 10 (47.6%) were one clause questions. Thus the greater likelihood that inferred responses would lead to an SI sequence may have been a function of the fact that questions having inferred responses tended to have one clause. This possibility is supported by the additional finding that one clause questions were significantly more likely to lead to SI sequences than two clause questions ($t=5.13$, $df=13$, $p<.001$).

Table 9.

Crosstabulation of Questions (n= 27) by Nature of PFRS, Number of Clauses, and Number of Less Familiar Vocabulary Words

Nature of PFRS	0 Less Familiar Vocabulary Word	1 Less Familiar Vocabulary Word
	One Clause	
Inferred		#1, #6, #7, #17 #19
Explicit	#2, #3, #5 #20, #22, #34	#10, #13, #23 #36
	Two Clauses	
Inferred	#14	
Explicit	#4, #9, #28 #31, #35	#11, #12, #21 #25, #30, #32

Similarly, the effect of the explicit or inferred nature of the PFRS is confounded with the number of less familiar vocabulary words. Table 9 indicates that five of the six questions having inferred responses (83.3%) had one less familiar vocabulary word. In contrast, 10 of the 21 questions having explicit responses (47.6%) had one less familiar vocabulary word. Thus the greater proportion of inferred responses leading to an SI sequence may also have resulted from the greater proportion of questions with inferred responses having one less familiar vocabulary word. A t-test comparing the proportion of questions with a less familiar vocabulary word leading to SI sequences to the proportion of questions without a less familiar vocabulary word which led to SI sequences was significant ($t=5.65$, $df=13$, $p<.001$). Questions with one less familiar vocabulary word were more likely to produce an SI sequence.

In sum, the data do not allow one to determine whether increased likelihood of SI sequences arises from the fact that the preferred response is explicit or inferred, the fact that the question has one clause, or the fact that the question has a less familiar vocabulary word.

Summary

The results of the post hoc analyses revealed that although repairs had different hypothesized levels of strength, they were not mutually exclusive in terms of their

inference demands. It was also shown that the inference level of the repair tended to match the inference level of the question. A mismatch between the type of inference required in that question and the required in the repair facilitated production of the experimenter's preferred response.

Qualitative analysis demonstrated four different patterns of subject initiated and experimenter initiated sequences. The presence or absence of a hierarchy of strength within these sequences was not related to the sequence's effectiveness in producing a preferred response. Although significant differences emerged, no definitive statements can be made regarding effectiveness of SI versus EI sequences. The effects of confounding between variables suggest caution in making statements regarding possible predictors of SI sequences. The analysis did support developmental trends for the production of SI sequences.

Chapter 5

DISCUSSION

The purpose of the study was to examine the repair strength model which claims that, when repairs are used in sequence, they follow a natural ordering from weakest to strongest. The ordering is based on their "strength" or "power" to locate a repairable item. Strength was defined as the amount of information in the repair relative to an initial question. A structured intervention experimental design was used to investigate the relative effectiveness of three levels of repair strength to help children who responded to a question with a dispreferred response (DPRS) to produce a preferred response (PFRS).

The results of the study provided limited support for the hypothesis that repair effectiveness is related to the amount of information or strength contained in a repair. No significant relationships were found between repair effectiveness and the grade level of the subjects, and no relationship was found between repair strength and either grade level or question type. Theory suggests individual repairs used in sequences have abstractly clear levels of strength. However, when these repairs were taken out of sequence and their potency was tested in isolation, strength was not related to the likelihood of eliciting a predetermined PFRS. This suggests that the concept of repair strength may be relevant only in the context of recursive sequences, and

not for isolated repair exchanges.

In this chapter, the results of the study will be discussed in relation to the literature in the field. The theoretical implications for future research and practical applications will be discussed. The chapter has been structured under six major headings as follows: repairs used in isolation, repair sequences, inference types, grade effects, conclusions and implications for future research.

Repairs Used in Isolation

Three research hypotheses were concerned with the effectiveness of isolated repairs of three different levels of strength. The first hypothesis stated that level 5 repairs (strongest) would result in more preferred responses (PFRSs) than level 3 (weakest) or level 4 repairs regardless of the subjects' age and question type. Hypothesis 2 stated that there would be a developmental trend for the effectiveness of level 4 repairs (potential requests for elaboration). It was predicted that PK children would be the least successful, and third graders the most successful for all question types. The third hypothesis stated that the effect of repairs of different levels of strength to elicit a PFRS would vary as a function of grade level and question type. The results of these three hypotheses suggested that in general, repairs were equally effective for all grade levels and for all question types. The only exception was on metaprocess questions. On

these questions level 5 repairs were more effective than level 3 repairs.

The latter finding makes sense theoretically, since level 5 repairs provided the most amount of information or strength relative to a previous utterance in a question-answer sequence. It suggests that the difference in the amount of information between level 3 and level 5 repairs was sufficient to make a difference in eliciting a PFRS for MP questions. The finding also implies that the strength of level 4 repairs was similar to that of level 5 repairs.

All three repair levels employed in this study were modeled on Garvey's (1979) study on contingent queries. The query had three parts: the MO was the utterance produced by the child (the response (R) in the current study), the M1 was the contingent query offered by the adult (the repair in the (E) slot in the current study), and the M2 was the child's reply to the adult query (the subject's response to the experimenter's repair in the current study).

Both level 3 and level 5 repairs select a particular component from the child's response (MO) in the (R) slot, but the determining functions of the two repair levels are different. According to Garvey (1979), specific requests for specification (S-S), the level 3 repairs investigated in the current study, request a response that will specify the querried element in the child's initial response. Specific requests for confirmation (S-C) the level 5 repairs in the

current study, propose a response and request confirmation of it.

The lack of more significant findings with respect to hypothesis 1 could reflect the fact that the relation between the child's initial response in the M0 and the subsequent response in the M2 is the same for level 3 (S-S) and level 5 (S-C) queries. For both, the selected element in the M0 is referentially equivalent to an element in the M2.

The difference between the significant finding obtained for metaprocess questions and the nonsignificant results on other question types could be explained by comparing the answering requirements of the other three question types (product, process and choice) to those of metaprocess questions. The latter require an awareness of or knowledge about a mental state or process. As such, the type of verb used in MP questions, for example, "remember," "figure out," "know," involves an act of metacognition on the part of the child (Hall and Nagy, 1987, p. 171). The other three question types either solicit factual information, reasons, or judgments on the part of the child. They do not require metalinguistic ability to produce a preferred response.

This relatively more difficult nature of metaprocess questions offers another possible explanation for the lack of more significant findings. The other three question types might not have been sufficiently demanding to reflect

the differences in information between level 3 and level 5 repairs. The strength difference only became significant for the more difficult MP questions.

The methodological issue of question construction must also be addressed. With the exception of MP questions, the subjects were able to respond to all question types and repairs equally effectively. This suggests that both the question types and repair levels used were easy enough for the children in the three grade levels to handle. If the questions had been more difficult, the children might not have been able to respond to them as easily, and the differential effect of repair strength might have been detected.

Hypothesis 2 predicted a developmental trend for the effectiveness of level 4 repairs. The disconfirmation of this hypothesis was also an unexpected finding. Theoretically, level 4 repairs used in the current research were constructed cooperatively. Both conversational partners, the experimenter and the child, provided information, thus co-constructing the PFRS.

McTear (1985) and Garvey (1979) stated that level 4 repairs, potential requests for elaboration, require a considerable degree of interactional and linguistic competence on the part of the child. Specifically, since the experimenter in providing level 4 repairs does not select a specific element explicitly stated in the child's

reply, the child must infer the PFRS given his/her background knowledge coupled with the information presented by the experimenter. To produce the PFRS, the child must be able to discriminate the given-new information provided in the experimenter's repair. Since this information is only potentially available in the experimenter's repair, the child's task of PFRS production becomes more difficult. Thus it was anticipated that older children would be more likely to produce a PFRS following a level 4 repair.

A possible explanation for the lack of differential age effects of level 4 repairs as measured by grade, is that the language of the repair was sufficiently simple and understandable to the PK children. In other words, whatever effect the repair had with the 3rd graders, it had about the same effect with the PK subjects. Similar to results obtained with respect to hypothesis 1, all three grade levels responded equally well to the four question types and level 4 repairs. This suggests that the PK children in the study had already mastered the linguistic and interactional skills necessary to negotiate a level 4 repair. Once again, a methodological issue relating to the age of the participants and the difficulty level of repair language may have contributed to the lack of significant findings for hypothesis 2. If younger subjects had been used, perhaps stronger statements could have been made about the hypothesized developmental nature of level 4 repairs.

The results obtained with respect to hypothesis 3 further confirmed that the effects of repair strength were not related to age as measured by grade level or to question type. This was an unexpected finding because the strength model predicts that the amount of scaffolding or information that the experimenter provided in the three repair levels within the (E) slot would have had differential effects for age and question type.

The nonsignificant findings could be attributed also to methodological problems relating to the small sample size and to the fact that only 585 or 54% of the experimental questions resulted in dispreferred responses. It is possible that repair strength is related to repair effectiveness, but the power of the tests given the sample size was not sufficient to detect this relationship.

Another possible explanation is provided in the research of Brinton and Fujiki (1989). These authors suggested that "the determining power of a clarification request may change, depending on the position of the request within a sequence" (p. 74). They further postulated that the "effect of any clarification request that follows another request for clarification of that same message is likely to differ from the effect of that request used singly" (p. 74). The lack of differential effect of the three levels of isolated repairs used in the current study is consistent with Brinton and Fujiki's explanation. The three levels of repair strength

were equally potent when used in isolated repair exchanges. This suggests that repair strength is contingent on repair use within recursive sequences. It also suggests that strength may only be a viable construct when examined within sequences.

A third possible explanation for the lack of significant findings is related to contextual differences. The notion of strength as developed by McTear (1985) and Schegloff et al. (1977) was based on repairs used in sequences within naturally occurring conversations. The current study had a different discourse context, one that could be defined as a test-like task. That is, the subjects listened to a story and were asked 36 questions relating to its content. When a subject produced a DPRS in the (R) slot of the I-R-E sequence, the experimenter responded with an isolated repair of a particular level of strength within the (E) slot. When repairs were used in isolation, there was little evidence of a relationship between repair strength and repair effectiveness. Since I-R-E sequences occur within classroom lessons, which are also social structures, a practical implication of this study is that repair strategies should follow those used in everyday conversations. Because of the interactional nature of a lesson, repairs should be used as part of recursive sequences with both teachers and children participating in the production of a PFRS. The findings of the current research suggest the value of a follow-up study comparing the effectiveness of isolated repairs used within a structured

intervention context and similar repairs used within conversational exchanges.

In summary, the nondifferentiated effects of the three levels of strength when repairs were used in isolation could be related to (1) methodological issues of question construction, the number and age of the subjects as measured by grade level, and the language of the repair and (2) to the contextual differences of the experimental design and past research. The results obtained with respect to the first three hypotheses suggest that the construct of repair strength is viable only when repairs are used within the context of recursive sequences, and not for isolated repair exchanges.

Repair Sequences

Experimenter Initiated (EI) Sequences Versus Isolated Repairs

Having determined that isolated repairs of different levels of strength were equally effective in eliciting a PFRS, the effectiveness of these repairs was compared to that of experimenter initiated repair sequences. Hypothesis 4 predicted that repair sequences would be more effective than isolated repairs in eliciting a PFRS. This hypothesis was not confirmed. Repair sequences and isolated repairs were equally effective for all four question types.

It was assumed that repair sequences would have been more effective, because they provided more explicit adult scaffolding and were co-constructed by the subject and the

experimenter. According to Brinton and Fujuki (1989), sequences "illustrate aspects of conversation that are not evident in single repair exchanges" (p. 74). Repair sequences included the child's reply (M0 and M2), which then directed the experimenter's response in the next turn slot (M1). Unlike individual repairs, sequences illustrate mutual efforts of conversational partners to communicate as well as to reach understanding through a PFRS (Spilton and Lee 1977). Given the Schegloff et al. (1977) theory of the natural ordering of repairs based on strength, i.e., that more specific repairs would follow general requests, and given the conversational nature of repair sequences, one would have expected them to have been more effective than isolated repairs.

The nonsignificant differences between repair sequences and isolated repairs, coupled with the nonsignificant differences between isolated repairs of different levels, leads to an important question. The issue concerns whether the repairs were in fact different enough to make a difference in effectiveness. This issue was examined in the post hoc analyses and will be discussed below.

Effectiveness of Experimenter Initiated (EI) Sequences Versus Subject Initiated (SI) Sequences

Although there were not significant differences between repair sequences and isolated repairs, informal examination of the study's transcripts suggested (1) different patterns within experimenter initiated sequences and subject initiated

sequences and (2) differences in the effectiveness of experimenter initiated and subject initiated sequences to elicit a PFRS. Subjects' requests for repetition and requests for clarification were classified as subject-initiated sequences.

Patterns. One of the issues examined in the post hoc analysis was whether repairs used within (EI) and (SI) sequences followed a hierarchy of strength as described by McTear (1985) and Schegloff et al. (1977). These researchers showed that within conversations, other-initiated self repairs used in sequences followed a natural ordering from weakest to strongest. Fourteen of the 17 sequences in McTear's (1985) study conformed to this proposed ordering.

When the 145 combined SI and EI sequences in the current study were analyzed, they fell into four sequential patterns. The sequences: (1) followed a hierarchy of strength, (2) followed a reversed hierarchy, (3) were two directional, or (4) used repairs of the same level of strength. This finding conflicts with the findings of McTear (1985) and Schegloff et al. (1977).

Examples of the four sequential patterns which emerged in the current study are presented in Figure 8.

Figure 8. Sequential patterns of repair sequences.

1. A Sequence That Followed Hierarchy of Strength:

   E: During what season
   did the story occur?

C: (.) (No Response) (DPRS)

E: It's the season after Fall/ (Level 3)

C: Uh huh/ (DPRS)

E: Was it summer or winter? (Level 4)

C: Winter/ (DPRS)

E: Good, winter/ (Eval)

2. A Sequence That Followed a Reversed Hierarchy of Strength

E: Who is the protagonist in the story?

C: (.) (No Response) (DPRS)

E: The story was about a bunny rabbit and his family, right? (Level 5)

C: Yes/ (C-Ackn)

E: Protagonist means the main character. So, who was the main character? (Level 3)

C: Morris/ (PFRS)

E: Yes, good! (Eval)

3. A Two Directional Sequence

E: Why was Morris transformed into an invisible character?

C: I don't know that one (DPRS)

E: O.K. That's fine. Pretty far into the story Morris found the disappearing bag, didn't he? (Level 5)

C: Yeah/ (C-Ackn)

E: And after he found disappearing bag, he jumped in/ (level 3)

C: Yeah/ (C-Ackn)

E: O.K. So how come Morris was changed into a person we couldn't see? (Level 3)

C: Cause/ (DPRS)

E: Did he stay out of the bag or did he jump into the bag? (Level 4)

C: Jumped in the bag/ (PFRS)

E: O.K. Terrific/ (Eval)

4. A Sequence With Repairs of the Same Level of Strength

E: Why did Rose inform Morris that he could not play with her beauty set?

C: I don't know/ (DPRS)

E: O.K. In the beginning, Rose told Morris that he couldn't play with her beauty set, right? (Level 5)

C: Right/(C-Ackn)

E: Was it because he was silly and would waste the lipstick?
(Level 5)

C: Yep/ (PFRS)

E: O.K.
(Ackn)

In the first example, the experimenter initially used a temporal addition, "after," which was a level 3 repair. The child's DPRS to this repair led to a level 4 repair, which theoretically carried more information regarding the original question, "During what season did the story occur?" In this repair, the experimenter changed the form of the original wh-question to a choice question, thereby providing the child with more information. The second example represents repairs used within a sequence following a reversed hierarchy. In the first repair, the experimenter changes the original wh-question, "Who is the protagonist in the story?" to a yes/no question with an appropriate value, a level 5 repair. In effect, the experimenter was providing the child with a partial answer to the question. This was followed by a level 3 repair, a cue which provided the definition of a vocabulary word in the original question. In this case, the reversed hierarchical structure effected the PFRS.

A two-directional sequence is presented in example 3. Once again, the experimenter begins the sequence by changing the form of the original wh-question, "Why was Morris transformed into an invisible character?" to a yes/no

question with an appropriate value, a level 5 repair. This was followed by two level 3 repairs, one a temporal addition, and one a definition, "changed into," of a word in the original question. Neither of these provided sufficient information to result in a PFRS. The subsequent level 4 repair, a choice question, provided more information, but still required the child to make a judgment and infer the PFRS. This two directional sequence also resulted in the PFRS. The final example presents repairs of the same level of strength used within a sequence. In this instance, the original wh-question was changed to a level 5 repair, a yes/no question with an appropriate value. The second repair adds information to the initial one enabling the child to produce the PFRS.

As with isolated repairs, the contextual difference between the experimental task of the current study as compared to the conversational nature of the previous research may have contributed to the likelihood of sequences following a hierarchy of strength. Both McTear (1985) and Schegloff et al. (1977) reported on data which were collected during naturally occurring conversations. Given the different conversational nature of classroom discourse as reported by Cazden (1988); Mehan (1979 and 1983); Ripich and Spinelli (1985) and Wilkinson and Calculator (1982), one might not expect similar findings regarding recursive sequences within a structured test-like situation. This is related partially

to the fact that the type of questioning is different in the two contexts. Conversation is characterized by genuine answer-seeking questions. While known-information or examination questions characterize school discourse. Therefore, the differences may be related to the educational nature of the experimental task.

The function of the (E) slot in these two contexts also differs. In conversation, the third part of turn sequences generally acknowledges the contribution in the (R) slot. In school discourse, the teacher evaluates in the (E) slot and induces the students to new ways of thinking about, categorizing or reconceptualizing the content of the teacher's question in the (I) slot (Cazden 1979; Mehan 1979). The type of question characteristic of educational discourse and the function of the third turn slot may explain the emergence of the four different sequence patterns observed in the current study. Further study on the hierarchical nature of sequences within I-R-E sequences is warranted.

Differences in effectiveness of patterns. The issue of effectiveness of sequences following a hierarchy of strength was an extension of previous research. As part of the post hoc analysis, EI and SI sequences which followed a hierarchy of strength were compared to those which did not follow a hierarchy to determine if the former were more effective in eliciting a PFRS. No significant differences in effectiveness resulted between these two types of sequences. As with

strength for isolated repairs, the hierarchical nature of repair sequences was also unrelated to the likelihood of eliciting a PFRS.

This finding could also reflect the methodological issues noted above, i.e., whether repairs are actually different in terms of strength, and the question of statistical power associated with the small number of EI and SI sequences which were used to test issue of effectiveness.

Effectiveness of experimenter initiated sequences versus subject initiated sequences. Some additional post hoc analyses were carried out to determine whether EI sequences were more effective than SI sequences in eliciting a PFRS. While SI sequences were found to be more effective, these results must be interpreted with caution, because there are factors which make EI and SI sequences not necessarily comparable.

In the present study, SI sequences within the (R) slot were either requests for repetition (RQRP) or requests for clarification (RQCL). Experimenter initiated sequences were assigned randomly and contained individual repairs of different levels of strength. While SI sequences were more effective than EI sequences in eliciting a PFRS, it cannot be assumed that the source of initiation of the two sequence types was similar.

Within conversations, RQCLs function to "allow either speaker to bring a misunderstanding to the attention of the other." They function to "indicate that the speaker has

failed to communicate" (Cherry 1979, p. 273). As a conversational repair mechanism, RQCLs allow the listener to "diagnose a problem and request clarification; the speaker of the repairable utterance carries of the repair" (McTear 1985, p. 164-165).

Causes of breakdowns in conversation or DPRSs in I-R-E sequences may include the following characteristics of the spoken message: articulatory intelligibility, inadequate volume, completeness of information, degree of lexical and syntactic complexity, appropriateness of information, failure to hear and/or mishearings, failure to comprehend, unsuccessful lexical access for words and failure to supply necessary information to the listner. (Anselmi et al. 1986; Brinton et al. 1986; Brinton and Fujiki 1989; Cherry 1979; MacLachlan and Chapman 1988; McTear 1985; Roth and Spekman 1984).

In the present study, regardless of the cause of breakdown, the experimenter within the (E) slot initiated a sequence whenever the child produced a DPRS. The reason for the child's initiation of a RQRP or RQCL in the (R) slot was unknown. Some SI sequences may have been initiated by a child for the purpose of clarification rather than because an actual DPRS would have occurred. This speculation is supported by examination of the study transcripts.

Of the 17 RQRP and 57 RQCL subject initiated sequences, 76% and 86% respectively resulted in no need for experimenter

repair. This suggests that the child may have produced the SI sequence as a monitoring device or check to facilitate question comprehension. It also demonstrates that the information the child received from the experimenter as a result of the RQRP or RQCL helped the child produce the PFRS. This is shown in the two examples presented below in Figure 9.

Figure 9. Subject initiated sequences not requiring experimenter repair.

Request for Repetition

E: Why was Morris melancholy?

C: Can you please say it again? (RQRP)

E: Sure, why was Morris melancholy? (RSRP)

C: Because he wasn't old enough to ride on the uhm use their toys that they got/ (PFRS)

E: Excellent/ (Eval)

Request for Clarification

E: What did Morris crave?

C: What does crave mean? (RQCL)

E: Really want/ (RSCL)

C: He wanted to play with their toys/ (PFRS)

E: Right/ (Eval)

In each of these sequences, the subject-initiated request for either repetition or clarification resulted in an experimenter response which elicited the PFRS from the child. The need for experimenter repair is precluded by the SI sequences.

There were SI sequences which did require experimenter repair. When compared to EI sequences used to repair the same question for different subjects, SI sequences required fewer turns to elicit a PFRS. Ten of the 13 questions repaired by both types of sequences resulted in longer EI sequences. An example of this is presented in Figure 10.

Figure 10. Number of turns to elicit a PFRS for the same question in subject initiated and experimenter initiated sequences.

Experimenter Initiated Sequence

E: Why did the children receive presents?

C: Cause Jesus got presents when he was first born/ (DPRS)

E: O.K. Was it Easter or was it Christmas? (Level 4)

C: Christmas/ RRS)

E: Do you think children usually get presents at Christmas time? (Level 4)

C: Mmhuh/ (RS)

E: So, why do you think the children received presents?

C: Because it's Christmas/ (PFRS)

E: Good/ (Eval)

Subject Initiated Sequence

E: Why did the children receive presents?

C: What does that mean? (RQCL)

E: Why did the children get presents? (RSCL)

C: Because (.) um (.) on Christmas they always h-ha um (.) they a l w a y s supposed to have 'em (.)/ (PFRS)

E: Good/ (Eval)

In this example, the child's request for clarification results in the PFRS within two turns at talk. In contrast, the EI sequence requires four turns at talk to elicit the PFRS.

This also suggests that SI sequences are more effective than EI sequences. Porter and Conti-Ramsden (1987) reported similar findings regarding length of turn sequences in their comparison of mother versus child initiations.

Examination of the transcripts of the questions that were repaired by both SI and EI sequences shows that within the (R) slot, the subjects in requesting repetition or clarification used specific requests for specification or confirmation.

That is, they identified the specific vocabulary item in the experimenter's question and requested its repetition or definition. The experimenter in the (E) slot provided the requested information and enabled the subject to produce the PFRS. Examples of these are presented in Figure 11. These child-driven sequences portray the child as an active learner and participant in the question-answer process. The child directs the experimenter's search for the information necessary for production of the PFRS.

Figure 11. Subject initiated sequences leading to the preferred response.

Request for Clarification

E: Who is the protagonist in the story?

C: What does protagonist mean?(RQCL)

E: It means the main character/ (RSCL)

C: Morris/ (PFRS)

E: O.K. (Eval)

Request for Clarification and Repetition

E: How did you deduce where Morris was concealed?

C: What do you mean deduced? (RQCL)

E: Figure out/ (RSCL)

C: And what do you mean by concealed? (RQCL)

E: Hidden

C: Now, can you repeat the question? (RQRP)

E: How did you deduce where Morris was concealed? (RSRP)

C: Uhm, could you say like deduced and concealed in like my words so it would be easier? (RQRP + RQCL)

E: Sure, how did you figure out where Morris was hiding? (RSRPCL)

C: I figured it out because I saw him crawl into the invisible bag to see him disappear/ (DPRS)

E: O.K. You saw him crawl into the bag. You saw him disappear, but then something happened in the room after he crawled into the bag and disappeared, remember? (Level 3)

C: Yeah/ (C-ACKN)

E: What happened?

C: His brother and his two sisters were looking for him/

E: Right/ and what did they see?

C: They all they saw is like him (.) his uhm (.) what he's doing like if uhm on the (.) when he was bouncing on the couch they saw the couch moving? (PFRS)

E: Excellent, real nice. J! (Eval)

Although the transcripts and statistical analysis suggest the differential effectiveness of SI versus EI sequences in eliciting a PFRS, the unresolved issue of the source of initiation of SI sequences precludes such a conclusion. Further study is required. Experimenter initiated sequences are examples of other-initiated self-repair which occur within the (E) slot. The experimenter is the other who is doing the initiating for the child's self repair. This is typical of classroom discourse. Subject-initiated sequences occur within the (R) slot and are also other-initiated self-repairs. However, here the other who is doing the initiating is the child. By requesting a clarification in the (R) slot, the child is in essence initiating a self-repair. This behavior is infrequent in teacher-child interaction (Wells and Montgomery 1981). Literature on repair preference within conversation Schegloff, Jefferson and Sacks (1977), Levinson (1983), and Porter and Conti-Ramsden (1987) has shown that self-initiated self repair is the most preferred form of

repair, followed next by other-initiated self repair and then by other initiated other repair.

If SI sequences are more effective than EI sequences, and if they support the repair preference for self-initiated self-repair, environments should be structured to encourage children to request repetition and/or clarification. The results of the present research suggest that in experimenter initiated repairs, the experimenter provides scaffolding within the (E) slot, but the experimenter does not know what is causing the child to produce a DPRS. By requesting repetition or clarification in the (R) slot, the subjects in the current study were providing their own scaffolds. They identified the trouble spots in the experimenter's question and asked the experimenter to provide the specific information necessary to produce the PFRS. If the relative effectiveness of SI over EI sequences can be demonstrated in a follow-up study, statements can be made regarding recommended teaching styles in which the child is an active learner rather than a passive responder in the I-R-E sequence can be made.

One such procedure, reciprocal teaching, was described by Brown and Palincsar (1987). It is based on the concept of expert scaffolding (Bruner 1978; Cazden 1979). In it, teaching is a mutual responsibility of the expert teacher and the student novice. As they attempt to comprehend a story text, teachers and students take turns leading the dialogue. Four comprehension strategies are used: summarizing,

questioning, clarifying and predicting. These researchers have shown that reciprocal teaching has resulted in significant increases in comprehension. Continued research on the effectiveness of SI sequences for eliciting PFRSs within I-R-E sequences maybe relevant to this theory.

Predictors of Subject-Initiated Sequences

As previously stated, SI sequences were either requests for repetition or requests for clarification. Hypotheses 5b and 5c investigated whether there was a relationship between the subjects' production of RQRPs and RQCLs and question type. No significant findings resulted from the analyses.

This was an unexpected finding, because it was anticipated that process and metaprocess questions would have resulted in more RQRPs and RQCLs. Each of these question types ask the children to look at a character's internal response. This is a difficult task for children, because it requires that they place themselves in the characters' places and infer how they would feel or think.

The experimental question types used in the current study were based on Mehan's (1979) four elicitation types which take place within the instructional phase of classroom lessons. He defined a process (PS) elicitation as one which asks for opinions or interpretations. Metaprocess (MP) questions require the responder to reflect on the procedure, rule or mental process used to generate response content. Product (PD) questions solicit factual information and require single

or short phrase replies. Choice (CH) questions the fourth type of elicitation used in the current study elicit either/or evaluations of question content.

The absence of significant differences in the number of RQRPs and RQCLs in response to these types of questions may be interpreted as suggesting a lack of differentiation among the four question types. When these four question types were examined in the post hoc analysis, it was determined that they were not mutually exclusive with regard to inference demands. Product and choice questions were either informational or value inferences. Process and metaprocess questions were logical or value inferences.

As can be seen in Figure 12, questions of the same type, PD, PS, CH and MP, made different inference demands on the subjects. This suggests that if the four question types are not really different, a relationship between RQRPs and RQCLs and a particular question type would be unlikely.

Figure 12. Confounding of question types and inference categories.

Question	Type	Inference Category
During what season did the story occur?	PD	2 Informational
What did Morris crave?	PD	3 Value
Did the story take place in Morris's house or outside ?	CH	2 Informational

Was Morris downcast or felicitious at the beginning of the story?	CH	3 Value
Why did the children receive presents?	PS	1 Logical
How do you suppose Morris felt when his brother and sister would not share their toys with him?	PS	3 Value
How do you know that they slept upstairs?	MP	1 Logical
How do you know that what the other children did might have hurt Morris's feelings?	MP	3 Value

Given the findings of hypothesis 5b and 5c, a series of post hoc analyses was carried out to identify other possible predictors of SI sequences. Those examined were question inference type, whether the PFRS were explicitly stated or inferred, the number of clauses in the experimental questions and the number of less familiar vocabulary words in the questions.

Question inference type. The 36 experimental questions represented three different inference types: logical, informational and value. A question considered in the post hoc analysis was whether the value inferences would tend to elicit more SI sequences. Results of the statistical analysis showed no significant differences among the three inference types in effecting an SI sequence. Thus, it did not appear that the type of inference involved in the question was

related to the likelihood of whether the subject would request a repetition or request a clarification, that is, initiate an SI sequence.

Since questions having value inferences concerned metaprocess issues and judgments regarding the characters' internal reactions and goals, this type of question might lead the subject to have a greater need of some clarification or repetition. This prediction was not supported by the post hoc analysis. In light of children's story recall ability, this was a surprising finding. Mandler and Johnson (1977) had demonstrated that children had poor recall of the protagonist's internal reactions and goals. Crais and Chapman (1987) showed that children had difficulty answering inferential questions. Given these findings, one would have expected that children would have requested clarification or repetition.

A possible explanation for the disconfirmation of the prediction may be related to the reasons for requesting repair. Subjects may initiate a repair sequence either because they do not know the PFRS or because they misheard the question. Regardless of the reason, the subjects could not offer the PFRS on the first attempt. This implies that the question was too difficult. If this is the case, one could really not expect that a value inference would be any more likely to result in a SI sequence. The other questions which may have required a different type of inference nevertheless

also had something about them that made the question too difficult and prevented the subjects from providing a PFRS.

Any possible effect there might have been due to the nature of the inference was probably masked by the fact that all of these questions were sufficiently difficult that the subjects could not provide the PFRS on the first attempt. Because of this, it was probably no more likely that a subject would request a clarification or repetition in the case of one as in the case of another.

Examining this possibility in an objective and controlled fashion would allow possible statements about the relationship betwen inference type and the occurrence of SI sequences. Future research would have to employ an experimental story recall situation structured so as to control for the difficulty level of the question. The questions would have to involve various types of inferences that were similar in terms of the overall proportion of subjects who could or could not produce the PFRS on the first attempt. After matching the children on this criterion, each subject could receive a large number of questions of each inference type at each level of difficulty. This might lead to a sufficient number of questions producing a DPRS in each of the three inference type categories at the same level of difficulty. This would enable the researcher to control for any confounding between the effects of inference type and level of difficulty of the question. Such a study would look for the possibility of a

relationship between children's ability to make inferences with their developmental pragmatic ability to produce requests for repetition and requests for clarification.

Blanchowicz (1978) and Westby (1984) claimed that although children can make inferences at the age of six, they become more skillful and comfortable with inferential processing during their school years when thay are older than 7 or 8. The ability to use repair strategies reflects a metalinguistic ability of conscious intervention and awareness of the linguistic entity causing the communicative breakdown (Silliman 1984). Although children can use repairs at an early age, Gallagher (1977), Johnson (1980) and van Kleek (1984) report that this metalinguistic ability becomes most productive when the child reaches approximately age six. Future research with a structured task could look for the possibility of a relationship between children's developing inferential skills and their ability to request repair of different types of inference questions.

Inferred or explicit nature of the preferred response. Another possible predictor of SI sequences was whether or not the PFRS was stated explicitly within the event chain or had to be inferred from the combination of the relationships between the propositions in the event chain and subjects' world knowledge. The results showed that preferred responses which had to be inferred were more likely to elicit SI sequences than those which were explicitly stated. This

finding would have supported the research of Crais and Chapman (1987) who found that children had more difficulty answering inferential than literal questions about stories. Tangenitally, it would have also offered support to the findings of Paris and Lindauer (1976) and Paris et al. (1977) who showed the explicit cues were more effective than implicit prompts for sentence memory. However, before coming to this conclusion, it was necessary to investigate possible confounding variables which might have affected question comprehension and the production of an SI sequence. The variables included the number of clauses and the number of less familiar vocabulary words in the question.

Confounding between the number of clauses, number of less familiar vocabulary words and the nature of the preferred response. A three way classification table was prepared to investigate the possible confounding among these three variables. It was found that explicit and inferred preferred responses differed with respect to the number of clauses and the number of less familiar vocabulary words. Therefore, it was not possible to know for certain whether the observed difference between the explicit and inferred nature of the preferred responses in eliciting an SI sequence was due to the nature of the PFRS per se, or to the number of clauses or the number of less familiar vocabulary words in the question.

As will be demonstrated below, age as measured by grade level was the only factor which appeared to predict the occurrence of SI sequences. The other variables which may be

related to SI sequences are confounded. Further research is required to determine which of these variables actually contribute to the production of SI sequences. To tease apart which of these variables is most closely associated with the production of SI sequences, designs would have to be used which employ questions having all the possible combinations of confounding variables.

Inference Types

The 36 question-answer sequences, isolated repairs and repair sequences, and predetermined preferred responses to these questions were originally studied as if they occurred within isolated I-R-E sequences. However, the experimental task was a test-like intervention based on the recall of information from a six-minute videotape story. The subjects' ability to produce a PFRS with or without a request for repetition or clarification of a question must have been related to their ability to recall the story and make inferences between and among the propositions in the story. Based on this viewpoint and the nondifferentiated effects of repair strength as an index of repair effectiveness, a series of post hoc analyses were performed to determine if inference type was related to repair effectiveness. The three levels of repair strength as well as the four original question types were recoded into three inference types: logical, informational and value inferences (Warren et al. 1979). The

inference level of the question was then studied in relation to that of the experimenter's repair. In the final analysis, the effectiveness of repair inference type in relation to question inference type was studied. A discussion of these three sets of analyses is presented below.

Relationship Between Strength of Repair and Inference Type of Repair

A striking finding from the reclassification of the repairs was that the three inference types were similar across levels of repair strength. The analysis showed that the different levels of strength were in fact confounded by repair inference type. Examples of these confounding effects are presented in Figure 13.

Figure 13. Confounding of repair strength and inference type.

Repair	Level of Strength	Inference Type
After all the children were playing with their toys, why did Morris opt not to dine with his relatives?	3	Logical 1
What did Morris take off the Christmas tree to eat?	3	Informational 2
Felicitious means really happy. Do you think Morris was really happy at the beginning of the story?	3	Value 3

In the first example, three level 3 repairs each with theoretically the same amount of information or power to locate the repairable item require three different inference demands of the subject. The first level 3 repair, is a temporal addition: "After all the children were playing with their toys, why did Morris opt not to dine with his relatives?" responding to this repair required a logical inference. The second level 3 repair, a cue, requires an informational inference. A value inference was required to respond to the third level 3 repair "...Do you think Morris was really happy at the beginning of the story?"

Similar confounding of repair strength and inference level is illustrated in Figure 14.

Figure 14. Confounding of repair strength and inference level.

Repair	Level of Strength	Inference Type
Did he eat a candy cane or an ornament?	4	Informational 2
Did he want to play with his brother's and sister's toys or did he want to be left alone?	4	Value 3
He has more sisters, doesn't he?	5	Informational 2
Was he sad and wanted to be alone?	5	Value 3

In the first level 4 repair, the initial wh-question was reformulated to a choice question. To answer it, the child had to employ an informational inference. Similarly, the second level 4 repair was a change from a wh-question to a choice question. However, this repair required that the subject make a value inference concerning the protagonist's desires.

In the first level 5 example, the wh-question was reformulated to a yes/no question with an appropriate value. It required informational inference for the production of the PFRS. The same type level 5 repair is represented in the final example. A value inference was necessary for production of the PFRS.

These findings suggest that the effects of confounding the three inference types across the three levels of repair strength would either mask or enhance the effect of repair strength. The implication of this finding is that, although teachers and clinicians assume that they are providing more information in their repair reformulations, the inference demands which cut across these repairs might be enhancing or masking the effect of the additional information.

Relationship Between the Inference Type of the Question and the Inference Type of the Repair.

A second related finding was that inference type remained the same across the experimenter question in the (I) slot and the repair in the (E) slot.

It was determined that most often the inference demands of the (I) and (E) slots were the same. This may partially explain the lack of significant differences regarding the effectiveness of repair strength. Although repairs in the (E) slot had different hypothesized levels of strength, they placed the same inferencing demands on the child as the original question in the (I) slot. This is demonstrated in Figure 15.

Figure 15. Illustrations of the relationships between the inference (INF) levels of question and repair.

Question	INF Type	Repair	INF Type
Why was Morris melancholy?	Logical 1	Melancholy means sad. Why was Morris sad. (Level 3)	1
During what season did the story occur?	Informational 2	A season is a time of year. Did it occur in summer? (Level 3)	2
How do you suppose Morris felt when his brother and sisters would not share their toys with him?	Value 3	Do you think he felt happy or sad? (Level 4)	3

In the first example, a less familiar word was defined. In the second example, a wh-question was reformulated to a yes/no question. And in the third example a wh- question was reformulated to a choice question. However, in each case, inferencing demands remained unchanged.

The clinical implication of this is that a closer look

needs to be taken at the interaction among the three components of the I-R-E sequence. Berlin, Rose and Blank (1980), Cazden (1988), French and MacLure (1981) and Mehan (1979) have shown that repairing communicative breakdowns through simplification and provision of more information is a means of reducing the cognitive complexity of the information through more specific reformulations. The current research suggests that, while this may be occurring, the effects of the inferencing demands of these reformulations have not been sufficiently studied. By reformulating, an educator may reduce cognitive, syntactic and lexical complexity of a question in the (I) slot. However, the current research suggests that the inference demands of the repair in the (E) slot are frequently the same as that of the question in the (I) slot. Given this finding, the question arises as to whether reformulations are indeed simplifying the original initiation.

Future research should examine more closely the construct of simplification and repair techniques in light of what is actually being demanded of the child. Do repairs in the (E) slot reduce the cognitive and linguistic demands placed on the child and facilitate a PFRS? Or, are the inference demands unchanged, thereby thwarting the child's attempts at production of a PFRS?

Bruck and Ruckenstein (1981), Panagos and Griffith (1981), Silliman (1984) and Silliman and Leslie (1983) have

concluded that teachers and clinicians are frequently unaware of the specific procedures that they use to repair communicative breakdowns. Although based on one clinician, the current research supports this conclusion, and it is recommended that educators become more aware of the question-answering demands placed on students. When attempting to facilitate a PFRS, specific attention must be focused on the inferencing demands of both the initial question in the (I) slot and the reformulated question or statement in the (E) slot.

Effectiveness of Repair Inference Type in Relation to Question Inference Type

The results of this analysis suggested that a mismatch between inference type of the original question in the (I) slot and the reformulated question or repair in the (E) slot is more likely to result in a PFRS than a match between the question inference type and repair inference type. Figure 16 presents examples of matches and mismatches between the inference type of the question and the repair. If the child were unable to provide the PFRS on the first hearing of a particular question inference type, and if the demand remains the same in the repair, there is a greater liklihood for the occurrence of a DPRS. Conversely, in the following examples in which there is a mismatch between question and repair inference types, the child, in effect, is given a second chance to comprehend the question and produce the PFRS given

the changed nature of the inference demand of the repair.

Figure 16. Examples of matches and mismatches between inference (INF) types of questions and repairs.

Matches Between Question and Repair Inference Types

Question	INF Type	Repair	INF Type
During what season did the story occur?	Informational 2	Did it occur in summer or winter?	2
What did Morris crave?	Value 3	Did Morris crave a disappearing bag or did he crave to play with his brother's and sister's toys?	3

Mismatches Between Question and Repair Inference Types

How did you deduce where Morris was concealed?	Value 3	Did you see anything happen in the living room or to the furniture once he was in the disappearing bag?	2
Why was Morris melancholy?	Logical 1	Did he want to play with his brother's and sister's toys or did he want to be left alone?	3

When the inference demands of the question and repair in the (I) and (E) slots match, two questions emerge. First, is repairing or simplifying actually occurring, or is the teacher providing a "cosmetic" or "illusionary" repair? (E.R. Silliman, personal communication, May, 1990). Second, is the match an obstacle to facilitation of a PFRS?

French and MacLure (1981), Hammersley (1977), Mehan (1979 and 1983) have discussed question-answer sequences typical to educational settings. Classroom lessons are characterized by known information questions in the (I) slot. When asking these questions, the teacher knows "the actual answer he wants the pupils to give. Given this, he has to decide how many and what type of clues to provide pupils with" (Hammersley 1977, p. 78).

Repairs within the (E) slot should in theory facilitate the child's ability to answer a question and reinstate communicative interaction within a lesson (Anselmi, Tomasello and Acunzo 1986; Cazden 1988; Cherry 1979; Corsaro 1979; French and MacLure 1981; Mehan 1978). The present study suggests that when the inference level of the repair matches that of the question, neither the ability to answer a question nor the reinstatement of communicative interaction is facilitated.

Grade Effects

Developmental Trends in Production of Subject Initiated Sequences

The effects of age as measured by grade level on the production of subject initiated sequences which were either requests for repetition and/or requests for clarification were tested in both the original and post hoc analyses. Hypothesis 5a of the original analysis predicted a developmental trend in

subjects' production of RQRPs and RQCLs. It was assumed that the prekindergarten children would produce the fewest number of SI sequences; while, the third graders would produce the largest number of SI sequences. These predictions were tested based on the number of RQRPs and RQCLs for each subject. No significant differences resulted among the three age groups.

A possible explanation for the lack of significant findings in hypothesis 5a could be that it was tested based on the number of RQRPs and RQCLs. There were a total of 74 (SI) sequences. Seventeen were RQRPs and 57 were RQCLs. Of these, one PK subject produced 1 RQRP and 6 RQCLs. Six 1st graders produced 22 SI sequences: 3RQRPs and 19 RQCLs. Seven 3rd graders produced a total of 45 SI sequences: 13 RQRPs and 32 RQCLs. Proportionately, then, the older subjects produced more SI sequences. The 1st graders produced approximately 3 or 4 SI sequences, and the 3rd graders produced 6 or 7 SI sequences. The fact that one PK youngster initiated several RQRPs and RQCLs may have affected the results of hypothesis 5a.

For the post hoc analysis, developmental trends were tested based on the number of children in each age group who produced SI sequences instead of on the actual number of RQRps and RQCLs. The likelihood of occurrence of one or more SI sequences among PK children was compared to the likelihood of occurrence of one or more SI sequences among 1st and 3rd grade children. The analysis demonstrated a significant effect for

age, with the older children more likely than the younger children to produce one or more SI sequence. Of the 10 PK subjects, only one produced SI sequences. Of the 20 combined 1st and 3rd graders, 13 subjects produced SI sequences. This finding contradicted the results obtained with respect to hypothesis 5a, where developmental trends were tested on the basis of the number of occurrences of SI sequences rather than on the number of children producing them.

In summary, although the analysis based on the actual occurrences of RQRPs and RQCLs did not support an effect of grade level on the production of SI sequences, post-hoc analysis based on the number of subjects producing SI sequences did support a developmental trend.

Production of Subject Initiated Sequences in Previous Research and the Current Study

Previous research. Similar conflicting findings can be found in prior research (Brinton et al 1986; Brinton and Fujiki 1989; Bryan, Donahue and Pearl 1981; Clark and Anderson 1979; Donahue, Pearl and Bryan 1980; Evans 1985; Fey, Warr-Leeper, Webber and Disher 1988; Gallagher 1977 and 1981; Ironsmith and Whitehurst 1970; MacLachlan and Chapman 1988; Peterson, Danner and Flavell 1972). These researchers suggested a developmental trend in children's ability to use repair strategies. Other researchers (Gale, Liebergott and Griffin, 1981; Webber, Fey and Disher, 1984; Brinton and Fujiki, 1989; Wells and Montgomery, 1981) suggested that children, while having the ability to request clarification or

repetition, ignore trouble spots. They related this to the pragmatic factors involved in adult-child interactions, particularly within pedagogic situations.

Current study. The results of the current study may be viewed as supporting both of these positions. While the post hoc findings confirm the notion of a developmental trend, the test-like nature of the experimental task, might have precluded the subjects' initiations of RQRPs and RQCLs.

A closer look at the comparative data from the three grade levels indicated that the 3rd grade subjects were in fact more likely to produce the PFRS initially and more likely to respond to and request repetition or clarification when they did not produce a PFRS. This pattern is also supported by previous research, such as that of Langford (1981) and Brinton, Fujiki, Loeb and Winkler (1986) who studied children in the three to nine year age range. Brinton et al. found a developmental trend in these children's ability to respond to adults' RQCLs and in their ability to handle stacked sequences which were comparable to the experimenter initiated sequences in the current study. In the Brinton et al. study, the nine year-olds were more responsive to requests and demonstrated a wider range of strategies in providing repair. In the current study, prekindergarten subjects had the highest percentages of dispreferred responses and experimenter initiated (EI) sequences: 67% and 97%, respectively, and the lowest percentage of SI sequences: (3%). In contrast, 52 percent of

the responses of first graders were DPRSs. Eighty-eight percent of these were repaired by EI sequences and 12% by SI sequences. Third graders had the lowest percentage of DPRS and EI sequences, 44% and 72% respectively, and the highest percentage of SI sequences (28%). These findings suggest a developmental shift in the number of DPRSs and the number of SI sequences. The older children produced DPRSs less frequently and requested adult repair more frequently than the younger, PK, subjects. This could reflect the older subjects' ability to integrate academic content with pragmatic skills in their question answering. This ability would enable them to take a risk and request adult repair. It may also be related to a reluctance on the part of the older children to produce a DPRS. Before attempting to answer an question and offer an incorrect response, the older subjects may have learned to RQRP or RQCL to increase the likelihood of the production of the PFRS.

According to Evans (1985), age and repairs may be related in an "inverted U-function" (p. 369). McTear (1985) has also suggested the existence of such a relationship. As children get older, they are more likely to produce more RQCLs, because of their increased comprehension monitoring skills and their ability to manage a conversation socially. But RQCLs begin to decrease as the child's language skill becomes more sophisticated and the ability to plan and organize thoughts continues to develop. This theory was partially supported by

the current research.

Differences in the types of data used in prior research as compared to the current study help to explain the developmental shift which was observed in the current research. Much of the data reported previously were collected in mother-child play interactions, casual conversations, and controlled situations in which adults interjected ambiguous or nonsense words into their interactions with children. Unlike previous research, the current study used structured conversation, specifically within I-R-E sequences. Within this format, children's production of RQRPs and RQCLs increased with age rather than decreased as predicted in the literature.

While this finding appears to be contradictory to prior research, it is logical given the context of the current study. Appropriate to the question-answer activity, the third graders in the current research did what was expected as they got older. They used their metalinguistic ability to monitor and respond to sources of miscomprehension within the question answer sequences. Another explanation for the increased use of RQRPs and RQCLs for the third graders is related to the older children's greater ability to manage a conversation socially. If question complexity were the only variable which could lead to a SI sequence, one would predict that the younger PK subjects would have had a greater number of RQRPs and RQCLs. This prediction would be based on these

youngsters' smaller vocabularies, level of syntactic development and inferencing abilities. However, the PK subjects produced the smallest number of SI sequences. This finding can possibly be explained by the fact that these youngsters were perhaps not socially sophisticated enough to manage conversation. Therefore they would not take the right to initiate a SI sequence. Conversely, the third graders have been socialized into the conversational classroom routine and they can manage the conversation. Therefore, they initiated a RQRPs or RQCLs.

In summary, the increased number of SI sequences observed among the older children reflects the fact that this ability is related to both academic knowledge and the ability to manage socially a conversational routine. It is possible that PK subjects in the current study may not have developed fully this blend of social and academic knowledge. The third graders had developed the skill, and they used it appropriately within the question-answer context. This explanation would support Mehan's (1979) theory, which claimed that successful participation within lessons requires a blend of social and academic knowledge. It would also support the research findings of Brinton and Fujiki (1989), Gale et al., (1981), Webber et al. (1984) and Wells and Montgomery (1981).

Gale et al. (1981) and Webber et al. (1984) found that preschool children and 3 to 10 year old normals frequently ignored trouble spots and did not request clarification. In

the Webber et al. study (1984), subjects requested clarification of sentences with nonsense or irrelevant words only 58% of the time. Similar to the current study, Webber et al. (1984) found no differences in performance among the 3 to 8 year old subjects in the group. They concluded that although subjects recognized trouble spots, they did not request clarification.

Brinton and Fujiki (1989) suggested that pragmatic factors such as the child's role in adult-child interactions may influence the child's request for clarification. This communicative role may be more influential than their ability to monitor comprehension of incoming information and to initiate repair as a result of monitoring. The current research, whose structure was similar to a teacher-child question answer routine, supports Brinton and Fujiki's claim. Because of the distribution of knowledge between teacher and student within this context (Mehan, 1983), the child's role is generally one of a passive responder rather than an active initiator.

Additional support for this claim is found in the research of Wells and Montgomery (1981). They reported that children use few RQCLs in pedagogic situations, because they "experience sharp constraints," on using devices for "checking the channel of the message" (p. 233). These constraints include different turn taking rules than those operating in naturally occurring conversations and the distribution of

authority and knowledge in the classroom. The researchers concluded that children view the process of "being taught" as one in which they are not free to admit that they either did not understand or did not hear the teacher's RQCL (p. 233). However, Wells and Montgomery described these constraints as operating within school and home settings. These contexts are not parallel to the dyadic experimental situation of the current study. Because of this, it is difficult to know whether the kind of constraints operating in children in a classroom are similar to those operating in the children in this study.

In summary, although it appears that the results of the original hypothesis and the post hoc analyses were contradictory, the above discussion suggests that the results may be a logical outcome of the social and academic demands of the experimental situation. The third graders produced significantly more SI sequences than the PK subjects. Furthermore, the type of SI sequences also followed developmental trends described in the literature. Johnson (1980) and Ironsmith and Whitehurst (1978) demonstrated that children's production of clarification requests proceeds from general to specific types.

Johnson (1980) found that neutral requests for clarification develop earlier than requests for specific elements. The results of the current study were congruent with this finding. Requests for repetition were generally

neutral. Requests for clarification were specific requests. This trend is demonstrated in transcript examples presented in Figure 17.

Figure 17. Examples of requests for repetition and requests for clarification.

Requests for Repetition

Question	(RQRP)
Why was Morris melancholy?	What? Can you repeat the question?
What were two components of Betty's gift?	Could you say it again?

Requests for Clarification

Question	(RQCL)
What did Morris crave?	What does crave mean?
Was Morris downcast or felicitious at the beginning of the story?	What's downcast? You mean like sad?

The RQRPs are general requests. The RQCLs are more specific, identifying particular vocabulary items. Of the 57 RQCLs in the present study, 6 were produced by the one PK subject, and the remaining 51 were produced by the combined 1st and 3rd grade subjects. Once again, this finding suggests a developmental trend.

CONCLUSIONS

This study was designed to examine the relative effectiveness of three levels of repair strength in helping children who respond to a question with a dispreferred response to produce a preferred response. The results of the analyses showed that when repairs were used in isolation, repairs of different strength were equally effective for all grade levels and for all question types. The only exception was on metaprocess questions in which level 5 repairs, the strongest, were more effective than level 3 repairs, the weakest. Based on these results, it was concluded that strength of repair was not related to repair effectiveness when repairs were used in isolation. The research suggests that the notion of repair strength is meaningful only within repair sequences. In the current research, strength or power of repair did not facilitate question comprehension and the subsequent production of a PFRS.

Research on listener's and reader's comprehension within naturally occurring conversations and within story recall tasks demonstrated that comprehension was facilitated by the listener's or reader's ability to make inferences between turns at talk or between propositions in a story. Repairing in conversation requires the ability to make inferences between each partner's contribution. The mutual negotiation of meaning by each partner facilitates conversational comprehension. Based on this theory and the fact that the

experimental design used a story recall task, the inference level of the experimenter's original question and her subsequent repair was examined. The findings suggested that a mismatch between the type of inference required in the question and that required in the repair facilitated question comprehension and the subsequent production of the predetermined preferred response.

Related findings regarding the inference demands of repairs and questions were as follows:

Although repairs had different hypothesized levels of strength, the findings showed that these repair levels were not mutually exclusive in terms of their inference demands. The inference demand of the repair frequently remained the same regardless of the level of strength of the repair. This might explain why there were so few significant findings in the original analysis of repair strength.

It was also shown that the inference level of the repair tended to match the inference level of the question. Although more or less information was provided in a given repair, the inference demand of the repair in the (E) slot most often matched that of the original question in the (I) slot. This finding suggests that teachers must become more aware and sensitive to the inference demands of their repairs.

Qualitative analyses demonstrated four different patterns of EI and SI sequences. Repairs used in sequences followed a hierarchy of strength, followed a reversed hierarchy, were two

directional or used repairs of the same level of strength. The presence or absence of a hierarchy was not related to the sequence's effectiveness in producing in a preferred response.

With regard to the effectiveness of subject initiated versus experimenter initiated sequences, a definitive statement cannot be made, because the reason for the subject initiation is questionable. However, a qualitative examination of the sequences decribing the number of turns in each type of sequence, the type of subject initiations and the number of each initiation type requiring experimenter repair, suggested that SI sequences were more effective than EI sequences in eliciting a PFRS.

The research also supports developmental trends in terms of the subjects' productions of subject-initiated sequences, which were defined as requests for repetition and requests for clarification. The third graders in the study produced more SI sequences than the PK children. This finding was explained by the older children's metalinguistic ability to deal with miscomprehensions in question answer sequences and by the integration of their academic and social skills, which is necessary for successful participation in classroom lessons.

IMPLICATIONS FOR FUTURE RESEARCH

The findings of the current research as related to repair strength suggest the need for a follow-up study comparing the effectiveness of isolated repairs used within a structured

intervention context with similar repairs used within conversational exchanges. Such a study might contribute to a greater understanding of strength as a possible index of repair effectiveness.

The confounding of repair strength and inference type observed in this study suggests that the distribution of the three inference types across the three levels of repair strength could either mask or enhance the effect of repair strength. This confounding makes it impossible to make definitive statements about the relative effectiveness of repairs of different levels of strength. The implication of this finding is that although teachers and clinicians assume that they are providing more information in their repair reformulations, the inference demands which cut across these repairs might be enhancing or masking the effect of the additional information. Therefore, when providing a scaffold with the (E) slot, the teacher must become more aware of what she is demanding in terms of inferencing.

However, the generalizability of this finding is limited, because it is based on one experimenter. Future research with a larger sample of experimenters should explore whether teachers are actually repairing or whether they are merely providing "cosmetic" or "illusionary" reformulations of their initial questions (E.R. Silliman, personal communication, May 1990). Such a study would contribute to the generalizability of the possible existence of confounding between repair

strength and inference demands.

Based on the above discussion of the actual effectiveness of repairs, future research should be designed to substantiate the current finding regarding matches and mismatches between the inference type of the questions and repairs with the (I) and (E) slots. Repair in the present research was studied as a social structure tied to its function of enabling teachers and students to "get through" a lesson (Bloome and Knott 1985). The results suggest that a mismatch between the inference level of the question in the (I) slot and the repair in the (E) slot enables the child to comprehend and answer a question, that is, to produce a PFRS in an (R) slot. Future research might contribute to a better understanding of repair as a social construct used within the phenomenon of procedural display in which teachers and students "display to each other that they are 'getting the lesson done'" (Bloome 1987, p. 128).

The question of effectiveness of subject initiated versus experimenter initiated sequences also warrants further research. In initiating a sequence in the (R) slot, the subject is actually scaffolding the teacher and enabling both the teacher and student to get through an I-R-E sequence. In fact, qualitative examination of the current data suggests that the child is a better scaffolder than the teacher. If SI sequences are more effective as suggested, this needs to be studied further. Reciprocal teaching based on shared

responsibility between teacher and student has been shown to be an effective strategy for increasing children's reading comprehension (Brown & Palincsar 1987). The current findings suggest that reciprocal teaching might also be effective for facilitation of a PFRS in an I-R-E sequence. This would suggest that children be taught to request repetition and clarification of the teacher's question when they are unsure of its content.

The findings obtained with respect to developmental trends suggest that further research should be conducted in this area using larger samples of children, and larger samples of opportunities for production of DPRSs and subsequent requests for repetition and clarification. The larger numbers may result in more significant findings supporting previously reported developmental trends. Further research might also incorporate an interview process in which children are asked whether they understood a particular question, whether they thought about asking for clarification or repetition of a question and what they think about children who do ask for clarifications or repetitions. Answers to these questions might lend further support to the notion that children feel constraints on requesting clarification or repetition within educational contexts.

Appendix A

Characteristics of Experimental Questions

Ques. #	Orig. Code[a]	Infer. Code[b]	Ques[c]	Nature of PFRS[d]	# of clauses	# of Less Fam. Voc.	Prop #[e]
1	PD	IN	During what season did the story OCCUR?	INF	1	1	
6	PD	IN	Who is the PROTAGONIST in the story?	INF	1	1	
10	PD	IN	What did Rose ACQUIRE for Christmas?	EXP	1	1	4
13	PD	IN	What were two COMPONENTS of Betty's gift?	EXP	1	1	9, 11, 16
17	PD	VL	What did Morris CRAVE?	INF	1	1	
21	PD	IN	What happened when Morris UNWRAPPED the disappering bag?	EXP	2	1	39
22	PD	IN	Where did Morris find the disappering bag?	EXP	1	0	34
25	PD	IN	What did Morris remove from the Christmas tree and later CONSUME?	EXP	2	1	
36	PD	IN	What happens to Morris at the CONCLUSION of the story?	EXP	1	1	67

2	PS	LG	Why did the children receive presents?	EXP	1	0	1
7	PS	LG	Why was Morris MELANCOLY?	INF	1	1	
12	PS	LG	Why did Rose INFORM Morris that he could not play with her beauty set?	EXP	2	1	20, 21
14	PS	VL	How do you suppose Morris felt when his brother and sisters would not share their toys with him?	INF	2	0	
18	PS	LG	Why did Morris's mother offer to make the bear a hat and his father offer to take him for a walk?	INF	3	0	
19	PS	LG	Why did Morris OPT not to dine with his relatives?	INF	1	1	
23	PS	LG	Why was Morris TRANSFORMED into an invisible character?	EXP	1	1	39, 45
26	PS	LG	How do you imagine Morris's brother and sisters felt when they discovered what Morris had found?	INF	4	0	
28	PS	LG	Why did they offer to share their toys with him?	EXP	2	0	54, 55, 56

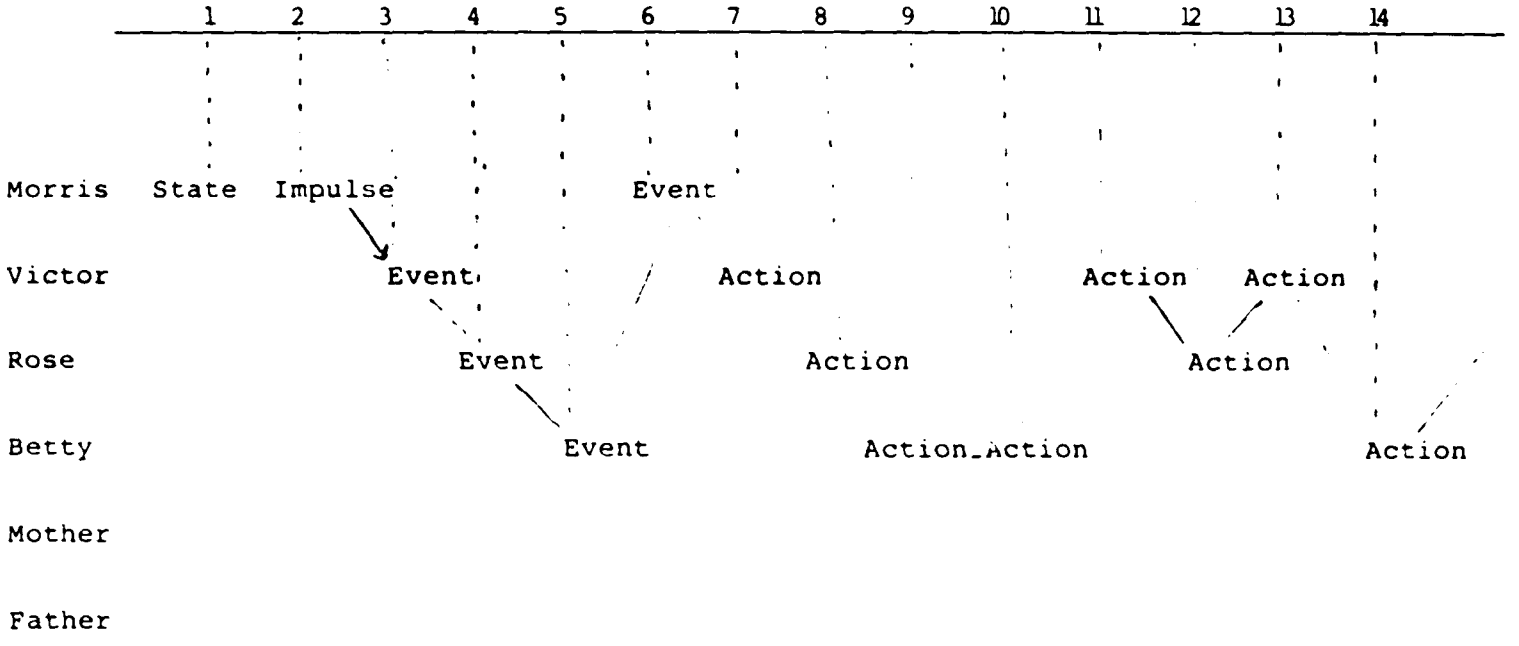
3	CH	IN	Did the story take place in Morris's house or outside?	EXP	1	0	
5	CH	IN	Does Morris have a greater number of sisters or brothers?	EXP	1	0	3, 4, 5
8	CH	VL	Was Morris DOWNCAST of FELICITOUS at the beginning of the story?	INF	1	2	
16	CH	VL	Was it necessary or UNIMPORTANT for Morris to come up with a plan to share his bother's and sister's toys?	INF	3	1	
20	CH	IN	After dinner, did Morris find an opened or unopened bag?	EXP	1	0	36, 37
29	CH	VL	Does Morris's behavior change or remain the same SUBSEQUENT to his brother's and sister's offer to share their toys with him?	EXP	3	1	59, 60 61
30	CH	IN	Did Morris use lipstick or chemicals to BEAUTIFY himself?	EXP	2	1	61
33	CH	VL	Do you think Morris felt INTERNALLY happy or sad when he was given PERMISSION to play with his SIBLINGS' toys?	INF	3	3	

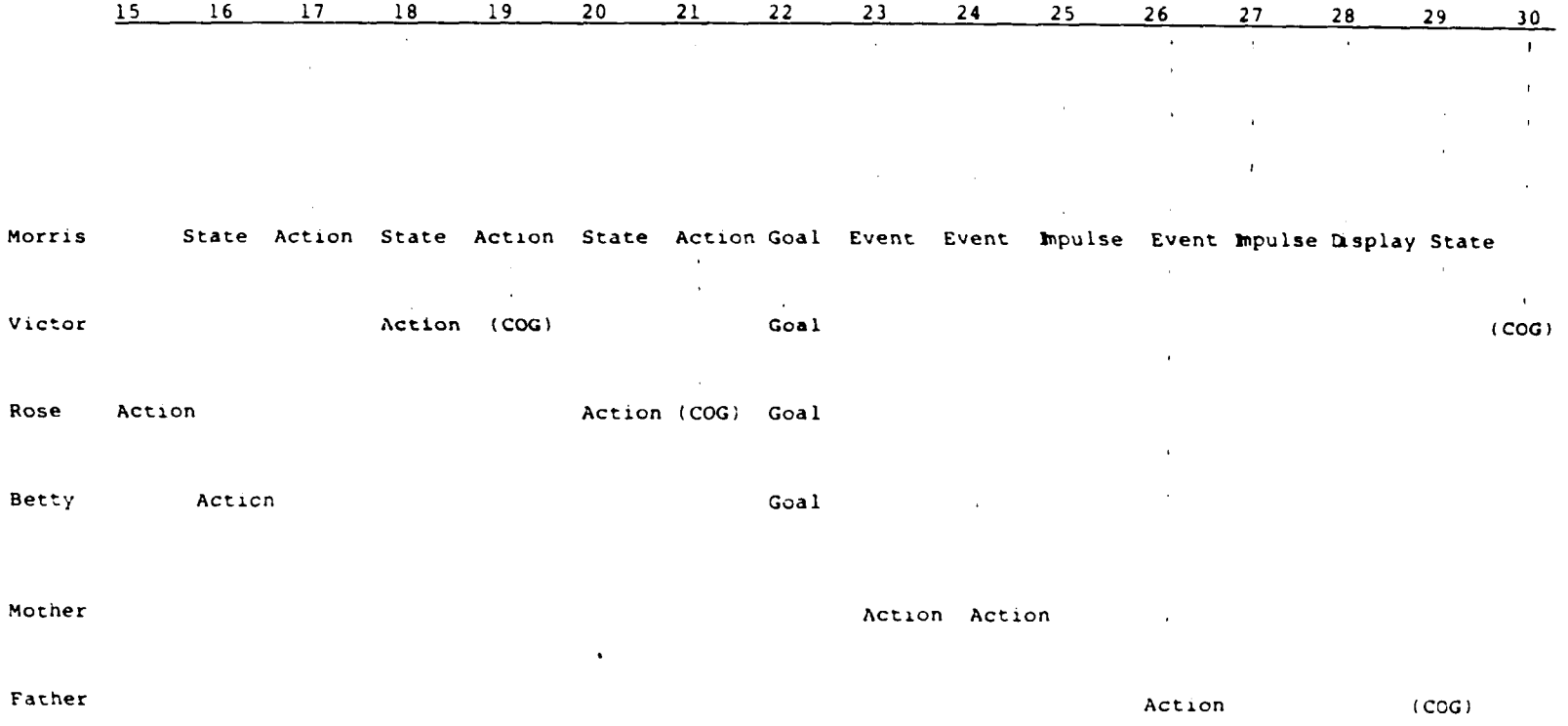
34	CH	IN	Does Morris's family sleep upstairs or downstairs?	EXP	1	0	
4	MP	VL	How do you remember who the characters were in the story?	EXP	2	0	3, 4 5
9	MP	VL	How do you remember what Morris's brother and sisters received for Christmas?	EXP	2	0	3, 4 5
11	MP	VL	How do you know that Victor PROHIBITED Morris from playing with his hockey set?	EXP	2	1	18, 19
15	MP	VL	How do you know that what the other children did might have hurt Morris's feelings?	INF	3	0	
24	MP	VL	How did you DEDUCE where Morris was CONCEALED?	EXP	2	2	
27	MP	VL	How did you figure what would happen because Morris found the disappearing bag?	INF	3	0	
31	MP	VL	How do you remember what Morris did with Victor's hockey skates?	EXP	2	0	59
32	MP	LG	How do you know Morris was playing with Betty's CHEMISTRY set?	EXP	2	1	60
35	MP	LG	How do you know they slept upstairs?	EXP	2	0	

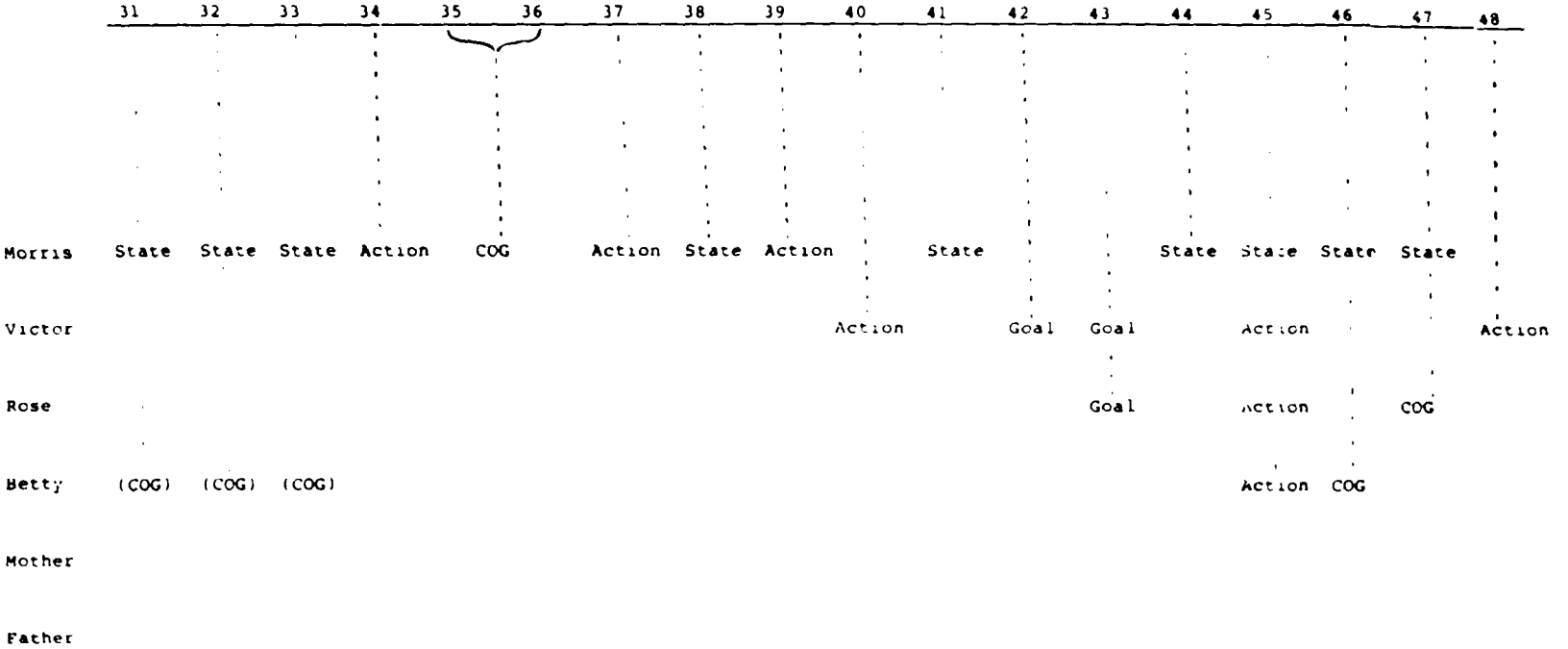
(a) Question type of original question: product (PD), process (PS), choice (CH), and metaprocess (MP)
(b) Question inference code: logical (LG), informational (IN), value (VL)
(c) Actual wording of experimental question
(d) Nature of preferred response: inferred (INF) or explicit (EXP)
(e) Number(s) of proposition(s) in event chain on which preferred response depends

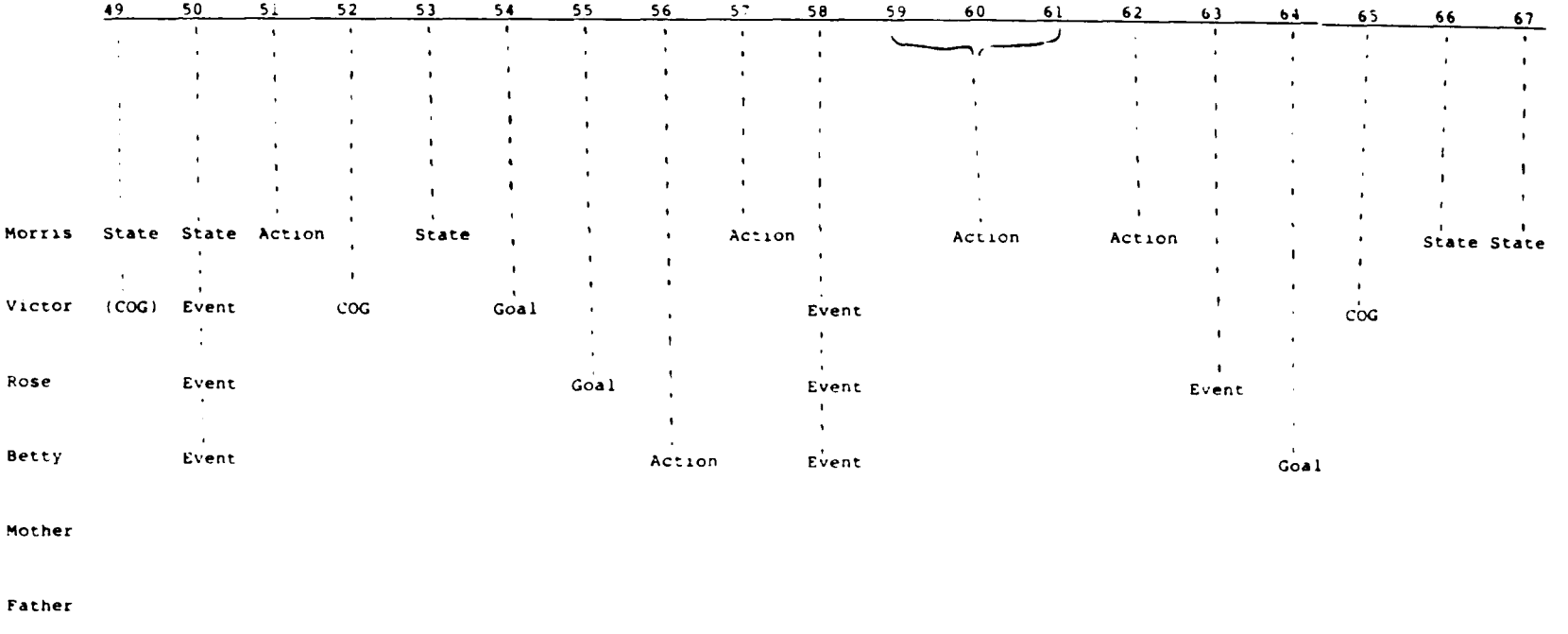
Appendix B

Event Chain for Morris's Disappearing Bag




15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
Morris State Action State Action State Action Goal Event Event Impulse Event Impulse Display State
Victor Action (COG) Goal (COG)
Rose Action Action (COG) Goal
Betty Action Goal
Mother Action Action
Father Action (COG)


31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
Morris State State State Action COG Action State Action State Goal Goal State State State State
Victor Action Action Action
Rose Goal Action COG
Betty (COG) (COG) (COG) Action COG
Mother
Father


49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67
Morris State State Action State Action Action Action State State
Victor (COG) Event COG Goal Event COG
Rose Event Goal Event Event
Betty Event Action Event Goal
Mother
Father

Appendix C
Five Sets of Randomly Determined Repair Types

SET 1 SUBJECT # _____ GRADE _____

P (01)	7	21	33							
S (02)	1	12	13	14	15	16	18	22		
SQ (03)	3	4	29	31						
AC (04)	5	8	10	11	17	20	26	28	35	36
A (05)	9	19	23	25	30	32	34			
C (06)	2	6	24	27						

SET 2 SUBJECT # _____ GRADE _____

P (01)	2	6	34	35						
S (02)	7	8	13	25	26	28	29	33		
SQ (03)	11	16	18	27						
AC (04)	4	14	17	19	20	21	22	23	24	32
A (05)	9	10	36							
C (06)	1	3	5	12	15	30	31			

SET 3 SUBJECT # _____ GRADE: _____

P (01)	18	19	29						
S (02)	13	14	17	23	25	27	30		
SQ (03)	2	3	11	12	33				
AC (04)	1	4	5	6	8	9	10	16	26
A (05)	20	21	22	24	31	34	36		
C (06)	7	15	28	32	35				

SET 4 SUBJECT # _____ GRADE: _____

P (01)	4	27	35						
S (02)	2	9	12	19	26	28	29		
SQ (03)	6	10	11	13	14	17	18	31	32
AC (04)	3	7	15	23	24	33	36		
A (05)	1	5	8						
C (06)	16	20	21	22	25	30	34		

SET 5 SUBJECT # _____ GRADE: ____

F (01)	17	23	33	34					
S (02)	2	14	15	16	22	25	27	28	36
SQ (03)	1	5	10	12					
AC (04)	3	7	8	9	13	26	35		
A (05)	4	6	11	20	21	29	30	31	32
C (06)	18	19	24						

Appendix D
Scoring Protocol

Child: _____ D.O.B.: _____ Grade: _____ Date: _____ Time: ____

#	T	QUESTION	PREFERRED CLINICIAN RESPONSE	CLINICIAN REPAIR TYPE AK	P	S	AD	C	SQ
1	PO	During what season did the story occur	In winter time						
2	PS	Why did the children receive presents?	Because it was Christmas						
3	CN	Did the story take place in Morris's house or outside?	In Morris's house						
4	MP	How do you remember who the characters were in the story?	Because						
5	CN	Does Morris have a greater number of sisters or brothers?	Sisters						
6	PO	Who is the protagonist in the story?	Morris						
7	PS	Why was Morris melancoly?	Because he could not play with his brother's and sisters' toys						
8	CN	Was Morris downcast or felicitous at the beginning of the story?	Downcast						
9	MP	How did you remember what Morris's brother and sisters received for Christmas?							
10	PO	What did Rose acquire for Christmas?	A beauty set						
11	MP	How did you know that Victor prohibited Morris from playing with his hockey set?	Because						
12	PS	Why did Rose inform Morris that he could not play with her beauty set?	He was too silly and would waste lipstick						
13	PO	What were two components of Betty's gift?	test tubes, acids chemicals						
14	PS	How do you suppose Morris felt when his brother and sister would not share their toys with him?	Alone and sad						
15	MP	How do you know that what the other children did might have hurt Morris's feelings?	Because they play ed with their toy in front of him and would not let him play						

Child: _____ P.O.P.I. _____ Grade: _____ Date: _____ Time: _____

Q	T	QUESTION	PREFERRED CLINICIAN RESPONSE	CLINICIAN REPAIR AK	P	S	AD	TYPE C	SQ
16	CF	Was it necessary or unimportant for Morris to come up with a plan so that he could share his brother's and sisters' toys?	It was necessary.						
17	PS	What did Morris crave?	Play with his brother and sisters.						
18	PS	Why did Morris's mother offer to make the bear a hat and his father offer to take him for a walk?	To make Morris the happy						
19	PS	Why did Morris opt not not to dine w/ his relatives?	He was sad and wanted to be alone.						
20	CF	After dinner, did Morris find an opened or unopened gift?	An unopened gift.						
21	PS	What happened when Morris unwrapped the disappearing bag?	He jumped inside.						
22	PS	Where did Morris find the disappearing bag?	Under the tree						
23	PS	Why was Morris transformed into an invisible character?	Because he was in the bag and had disappeared.						
24	MP	How did you deduce where Morris was concealed?	Because the cushions on the chair were squeezed down and puffed up.						
25	PS	What did Morris remove from the Christmas tree and later consume?	A candy cane						
26	PS	How do you imagine M's brother and sisters felt when they discovered what Morris had found?	They were jealous and wanted to play with the bag.						
27	MP	How did you figure out what would happen because M found the disappearing bag?	I figured that they would share their toys with him because he was having fun.						
28	PS	Why did they offer to share their toys with him?	Because they wanted to play with his bag.						
29	CF	Does M's behavior change or remain the same subsequent to his brother's & sisters' offer to share their toys with him?	It changes. He becomes happy.						

Child: _____ B.O.B.: _____ Grade: _____ Date: _____ Time: _____

		QUESTION	PREFERRED CLINICIAN RESPONSE	CLINICIAN REPAIR TYPE					
				AR	P	S	AD	C	SQ
30	CF	Did Morris use lipstick or chemicals to beautify himself?	No, put lipstick on						
31	MF	How do you remember what Morris did with Victor's hockey skates?	Because						
32	MF	How did you know that Morris was playing with Betty's chemistry set?	Because he was mixing different chemicals.						
33	CF	Do you think M felt internally happy or sad when he was given permission to play with his siblings' toys?	Happy						
34	CF	Does M's family sleep upstairs or downstairs?	Upstairs						
35	MF	How did you know that they slept upstairs?	Because they all went up the stairs at bedtime.						
36	PD	What happens to M at the conclusion of the story?	He fell asleep and was happy.						

Appendix E

Propositions In Morris's Disappearing Bag (1975)

1. It was Christmas morning.
2. "Wow!" said Morris.
3. Morris's brother, Victor, got a hockey outfit.
4. Morris's sister, Rose, got a beauty kit.
5. Morris's other sister, Betty, got a chemistry set.
6. And Morris got a bear.
7. All Christmas day Victor played hockey
8. and Rose made herself beautiful
9. and Betty mixed acids.
10. And then Betty made herself beautiful
11. and Victor sorted test tubes
12. and Rose played left wing.
13. And then Victor made himself beautiful
14. and Betty played goalie
15. and Rose invented a new gas.
16. Morris was too young to play with chemicals, said Betty,
17. he might blow up the house.
18. He was too little to play hockey, said Victor,
19. he might get hurt.
20. And he was too silly to use the beauty kit, said Rose,
21. he would waste all the lipstick.
22. Nobody wanted Morris's bear.

23. "Come," said Morris's mother,
24. "let's make a hat for your bear."
25. "No!" said Morris.
26. "Let's take your bear for a walk," suggested Morris's father.
27. "No!" said Morris.
28. Morris wouldn't eat his dinner.
29. "What's the matter with Morris? asked his father.
30. "I think he hit himself with the hockey puck," said Victor.
31. "Maybe he ate the lipstick," said Rose.
32. "It was the gas," said Betty.
33. "He breathed it in."
34. Morris sat under the Christmas tree.
35. Suddenly he noticed a package
36. that had been overlooked.
37. He opened it.
38. In it was a Disappearing Bag.
39. Morris crawled right in.
40. "Morris?" said Victor.
41. "Right here," said Morris.
42. "Where?" asked Victor.
43. "Where's Morris?" asked Betty and Rose.
44. "Over here," said Morris.
45. But they couldn't find him.
46. "Maybe he blew himself up," said Betty.

47. "Do you suppose he's so beautiful we wouldn't recognize him?" asked Rose.
48. "Dad! shouted Victor,
49. "Morris is skating so fast
50. we can't see him."
51. Morris came out of his bag.
52. "Where were you?" shouted Victor.
53. "I was in my Disapperaing Bag," said Morris.
54. "I want to use it," shouted Victor.
55. "Me first," said Rose.
56. "You can use my chemicals," said Betty.
57. Morris held open his bag.
58. Everybody disappeared at once.
59. Then he zoomed
60. and mixed
61. and beautified until bedtime.
62. "Bedtime!" said Morris.
63. "May I use the bag tomorrow?" asked Rose.
64. "I want to sleep in it tonight," said Betty.
65. "Morris," said Victor, "I hope you remember
66. where you put the bag."
67. But Morris was already fast asleep.

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