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Classroom climate and teacher questioning strategies: Relationship to student cognitive development

Beamon, Glenda Ward, Ed.D.

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U·M·I
300 N. Zeeb Rd.
Ann Arbor, MI 48106

CLASSROOM CLIMATE AND TEACHER QUESTIONING STRATEGIES: RELATIONSHIP TO STUDENT COGNITIVE DEVELOPMENT

by

Glenda Ward Beamon

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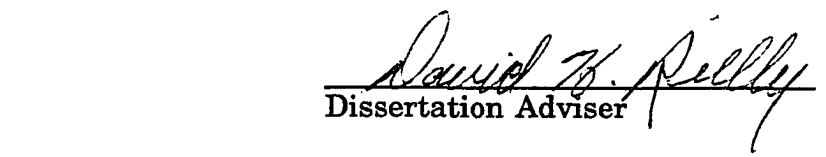

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APPROVAL PAGE

This dissertation has been approved by the following committee of the Faculty of the Graduate School at the University of North Carolina at Greensboro. The committee wishes to designate this dissertation as one that has been approved with distinction.

Dissertation Adviser _____

Committee Members _____

_____

_____

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The purpose of this research was to determine if classroom climate and teacher questioning strategies have an influence on level of student cognitive development. The three null hypotheses stated that no statistically significant differences existed between classroom climate and level of student cognitive development; between teacher questioning strategies and level of student cognitive development; and between the combination of classroom climate and teacher questioning strategies and level of student cognitive development.

Thirty students, randomly selected from eight seventh and eighth grade language arts classrooms, comprised the sample. The Classroom Climate and Questioning Strategies observation instrument was used to cluster the teachers on the basis of observed frequency of climate and questioning practices. A student cognitive test was administered individually to the 15 students in the experimental group and the 15 students in the control group as a pre- and post-treatment measure of level of student cognitive development.

A one-way analysis of variance between student cognitive pretest scores indicated no significant differences in level of student cognitive development between groups at the beginning of the study. A two-way analysis between the student cognitive pretest scores and race, sex, and Cognitive Abilities Test and California Achievement Test (CAT) scores resulted in no significant differences in level of student cognitive

development and the variables of race, sex, IQ, and achievement. A one-way analysis of variance on the student cognitive posttest scores, however, indicated statistically significant differences between experimental and control groups at the end of the study.

Once each semester of the school year the Classroom Climate and Questioning Strategies classroom observation instrument was used to continue to document the classroom climate and questioning practices of the eight teachers during 20-minute reading discussions. A Chi square analysis of the overall frequencies of observed practices revealed statistically significant differences between the experimental and control groups in both classroom climate and teacher questioning strategies practices. These data indicated that classroom climate and teacher questioning strategies, considered singularly or in combination, have a statistically significant positive influence on level of student cognitive development. The three null hypotheses were rejected.

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INTRODUCTION

Overview

Most educators agree that teaching thinking should be a priority of education (Beyer, 1987; Brandt, 1986; Prichard, 1988; Raths, Wassermann, Jonas & Rothstein, 1986). Teaching students to become better thinkers in preparation for the challenge of tomorrow's world is a clear message in the school reform literature (McTighe & Schollenberger, 1985). The "basics of tomorrow," rather than reading, writing and arithmetic, include evaluation and analysis, critical thinking, problem solving, communication, and decision making (Task Force on Education for Economic Growth, 1983; National Science Board Commission on Pre-College Education in Mathematics, Science, and Technology, 1983). Numerous reports issued by panels, commissions, and studies have endorsed the teaching of thinking as a major goal of American education (Beyer, 1987).

Teaching thinking for its utility in information processing has taken on increasing importance "as a survival skill for society ... as well as for individuals" (Beyer, 1987, p. 4). Statistics on future trends in technology in the workplace and of major economical shifts from an industrial to an informational society (Naisbitt, 1982; Toffler, 1980; Peters & Waterman, 1982), and data on high school graduates who are functionally illiterate,

unprepared for the demands of the job market, and lacking in skills to be responsible, productive citizens (Adler, 1982; Goodlad, 1984) have sharpened this focus on the intellectual development of today's students.

Thinking ability "does not just develop on its own" (Beyer, 1987). Goodlad (1984) stressed the important role of the school in the process of helping students to develop the rational abilities needed for an increasingly complex society. In his comprehensive study of 1,016 classrooms across the United States, however, he found a slim indication of intellectual challenge: "Only *rarely* did we find evidence to suggest instruction went beyond mere possession of information to a level of understanding its implications and either applying it or exploring its possible applications" (p. 239). What the schools did not appear to be doing was developing "the ability to think rationally,...use, evaluate, and accumulate knowledge, a desire for further learning" (p. 239). Clearly, "helping students know *how* to think" is perceived as a greater need in schools today than merely the traditional teaching of content, or "telling students *what* to think" (Prichard, 1988, p. 31).

Costa (1985) has identified certain teacher behaviors that invite, enhance, stimulate, and sustain student thinking in the classroom. One of these "enabling" behaviors is the teacher's use of questioning strategies. "Questions are the intellectual tools by which teachers most often elicit the desired behavior of their students. Thus, they can use questioning to elicit certain cognitive objectives or thinking skills" (pp. 125-126). Teachers can manipulate the syntactical structure of questions in such a way as "to invite students to accept information, to process or compare that information with what they already know, to draw meaningful relationships, and to apply or

transfer those relationships to hypothetical or novel situations" (p. 126). Question-and-answer discussion is the most effective strategy for student learning (Costa; 1985; Gage, 1976; McDonald, 1976).

Foley (1971) recognized that not only do teachers structure the learning experiences in the classroom, they also establish the educational climate. Discussion involves group interaction; however, if students are not given the opportunity to respond, or if they feel inhibited from participating, the discussion process is stifled. "The teacher, the discussion leader, facilitates by creating an atmosphere of freedom, clarity, and equality" (Costa, 1985, p. 125). A classroom climate for thinking is created by the way the teacher interacts with and responds to students. These response interactions determine "the degree of trust, risk-taking level of cognition, warmth, rapport, openness, and psychological safety in the classroom" (Costa, 1985, p. 131; Kahn & Weiss, 1973).

Unfortunately, Goodlad (1984) observed that in a high percentage of classrooms, teachers did most of the talking and only 4 to 8 percent of instructional time was spent in discussion. Teachers used few questioning strategies that called for students to think about their answers: "Not even 1% required some kind of open response involving reasoning or perhaps an opinion from students" (p. 229). Conversely, in responding to students, teachers infrequently used supportive, meaningful, or corrective feedback. Goodlad also expressed concern for quality of the classroom climate:

> It appears, indeed, that the environment of the classroom conveys important meanings to the student. I am struck by the fact that just a little show of teacher concern, the absence of teacher favoritism, the presence of peer esteem,...and other indices related to personal well being of individual students added up to more positive views of the class experience. Good teaching builds bridges to individuals. (p. 248)

He concluded that little opportunity existed for students to become engaged in learning that would use their full range of intellectual abilities.

The concern for stimulating students to think beyond mere recall is not limited to the current decade. John Dewey (1933) in How We Think used explicit metaphors to describe a process that puts a premium on "passivity of the mind" (p. 261). Arguing that the mind is not a piece of blot paper that absorbs and retains information automatically, he made the following observation of student learning:

> It is hardly an exaggeration to say that too often the pupil is treated as if he were a phonographic record on which is impressed a set of words that are to be literally reproduced...[T]he mind is treated as if it were a cistern into which information is conducted by one set of pipes that mechanically pour it in...(p. 260)

One cannot overlook the parallel from Dewey's early-century criticism to Goodlad's current lamentation over the quality of student learning in America's schools. Today, however, with an ever-increasing body of information, with new forms of communication that give access to new ideas and perspectives beyond parochialism (Global Education Task Force, 1987), the need for students to interpret, integrate, analyze, and synthesize knowledge in a meaningful way seems more apparent.

With this widespread concern for the intellectual development of tomorrow's citizens, one would expect to see more widespread teaching for thinking in schools. In the introduction to the second edition of Teaching for Thinking, (Raths et al., 1986), Wassermann asked the question, "Why is it that in spite of our repeated affirmation of the educational goal of developing pupils' thinking skills, it is frequently the least emphasized

activity in classroom practice?" (p. xi). Most teachers want students to be able to deal effectively with life in the twenty-first century and consider "the promotion of each pupil's capacity to think" top priority; yet, the application of thinking to classroom practices is lacking (Raths et al., 1986, p. xi).

Kuhn (1986) acknowledged the striking accord among educators as to the desirability of teaching thinking, yet questioned the "limited success in implementing such a highly and widely valued goal" (p. 496). Brandt (1984) recognized the beginnings of a major new movement to promote intellectual development, noted an uncertainty among educators about what skills students need (Brandt, 1986), yet affirmed that most practitioners believe that thinking can and should be taught within the framework of the regular curriculum (Brandt, 1988a). Weiss (1988) determined that the abundance of thinking skills literature and the variety of available programs provide no easy solution to teachers who are limited by time and information about how to balance their goals and the selection of teaching strategies.

Brophy (1986) cautioned educators against solving a complex problem by looking for oversimplified 'solutions':

> [A]ttainment of higher level learning objectives will not be achieved with relative ease through discovery learning; instead it will require considerable instruction by a skilled teacher following thorough mastery of knowledge and skills that must be integrated and applied in the process of higher level performance. (p. 1076)

Weiss (1988) concluded that "thinking is seen as a highly complex process sensitive to both internal and external factors" (p. 1) Thinking is

interactive, many-dimensional, and "affected by the well-being, experiences, and conditions at hand...While it is possible to identify different groups of [thinking] skills and strategies, it is not possible to isolate any group as the sum total of thinking" (p. 32).

Reporting the conclusions and recommendations of a literature review on thinking by the Research and Evaluation Committee of the Consortium for the Development of Thinking and Learning (CSTL), Weiss (1988) noted a variance of ideas on how thinking is defined, if, indeed, it can be taught, and just how it should be taught. This Committee, however, confirmed the important role of the teacher in the thinking and learning process and recommended that "teacher education focus on content, teaching strategies, skills, and establishing a positive environment for learning...[and]...that the classroom teacher be encouraged to use techniques that permit and require thinking such as oral discussion" (p. 5).

Brandt (1990a) reiterated the dilemma of educators when faced with the challenge of teaching thinking, yet recognized that the movement for the new decade is one of integration, consolidation, and "making connections." He recognized that educators, concerned with the disjointed nature of many inservice programs, must seek a more comprehensible framework to connect the potentially related pieces. This discovery of relationships among educational ideas and practices gives the educator the flexibility to make instructional choices: "Having a repertoire of strategies that is more than just a random collection gives us a sense of efficacy. It enables us to set priorities, and to forge meaningful connections of our own. In short, it makes us more professional" (p. 3).

The current emphasis, thus, acknowledges the complexity of the learning situation, the critical role of the teacher as decision-maker, and the many-*dimensional* aspect of thinking (Arredondo & Block, 1990; Marzano et al., 1989, 1990; Weiss, 1988). Integrating applicable and related research on learning, thinking, and teaching strategy, and linking parallel philosophies, beliefs, and assumptions, these programs offer a more comprehensive design to the teaching of thinking. In view of this current curricular approach, the following discussion proposes an instructional framework that integrates research on cognitive development, including learning theory and cognitive instruction; classroom climate, including interaction and teacher expectations; and questioning strategies, including cognitive level, feedback and follow-up techniques, and cognitive processing. In addition, an application of these elements in the context of the developmental and instructional needs of the adolescent is given.

Cognitive Development

Glaser (Segal, Chipman & Glaser, 1985, Vol. 1) has suggested that the instructional problem of teaching thinking may be related to "our knowledge of learning theory and developmental change" (p. 617), both of which are undergoing theory reconstruction. Though not disputing the sequential nature of stage development theory (Piaget, 1952), emerging cognitive development theory is placing an increasing emphasis on how an individual thinks and learns, on the external and internal factors that influence thinking and learning, and on the possibilities for expanding and

accelerating a person's thinking, learning, even intelligence (Clark, 1983; Detterman & Sternberg, 1982; Gardner, 1985; Hart, 1975, 1981, 1983a, 1983b, 1986; Kirby & Biggs, 1980; Sternberg, 1984).

> The traditional 'power' interpretations both of stage of development and of individual differences, with their limits of nativism and immunity to intervention, are replaced by more dynamic constructs which...have optimistic implications for instructional practice. (Kirby & Biggs, 1980, pp. 206-207)

Modern cognitive development theory focuses on the dynamics of the individual's capacity to think and learn and on the conditions that enhance this learning: "The significance about growth of the mind in the child is to what degree it depends not upon capacity but upon the unlocking of capacity" (Bruner, 1964). Bruner noted that the process for "unlocking" capacity depends on interaction with the environment of the culture. Mere exposure to stimulating conditions is not enough; the individual must be allowed to act upon and interact with responsive people and a responsive environment. Educators have the potential as powerful interacting agents to help to optimize students' cognitive growth (Clark, 1985).

Modern cognitive development theory has also been influenced by information available from brain/mind research. Hart (1975, 1981, 1983a, 1983b, 1986) has proposed a theory of brain-compatible learning where, in a nonthreatening setting, higher and more complex learning can be achieved. Thinking is viewed as an individualized neurological process of whole-brain functioning (Clark, 1985). The theory of left-right dichotomy in cognitive thinking has been challenged by a new concept of integrated learning, which captivates and optimizes whole-brain learning potential:

"Important for optimizing the learning experience is the discovery of the power of coherence in brain function" (p. 232).

The implications of modern cognitive development theory on education and the role of the teacher has given rise to a new model of learning called cognitive instruction (Jones, 1986; Resnick, 1984; Shulman, 1984).

> Cognitive instruction...refers to any effort on the part of the teacher or instructional materials to help students process information in meaningful ways and become independent learners... [It] has the potential to alter substantially the capability of the learner, especially the low-achieving learner, in much the same way that microchips radically altered the capability of the computer. (Jones, 1986, p. 7)

The capacity to learn can be significantly improved by instruction that seeks to build on a student's existing knowledge base and to strengthen or change his/her repertoire of thinking and learning strategies (Jones, 1986). The teacher, then, can be viewed as the mediator of student cognitive processing by helping students "link new information to prior knowledge" (p. 9). S/he can be instrumental in assisting students with the cognitive operations that activate old knowledge, organize new information by associating it with existing knowledge, and create new knowledge structures that augment or replace the old structures (Marzano, Pickering & Brandt, 1990).

Students' cognitive abilities need not be a barrier in teaching for thinking; rather, teachers must assess at what cognitive level students are thinking and design learning experiences to match and slightly exceed the current level of complexity (Barell, 1985b). With high expectations of all students, a strong emphasis on classroom interaction, and an open

exchange of ideas through discussion and inquiry, the teacher creates both an accepting and stimulating climate for increasingly complex thinking. The teacher becomes both the facilitator for and the mediator of student cognitive development.

Classroom Climate

"Teachers themselves and the way teachers run their classrooms are at the core of teaching for thinking" (Raths et al., 1986). The importance of creating a classroom climate that is both conducive and stimulating is a generally agreed-upon prerequisite to teaching students to think better (Beyer, 1987; Chance, 1986; Clark, 1985; Costa, 1985; Segal et al., 1985). "An effective classroom climate is practically invisible, but it doesn't happen by chance; it is crafted by the artful teacher in subtle but intentional ways" (Marzano et al., 1990, p. 19). A classroom atmosphere that reflects profound respect for individual students, regardless of ability, one that is accepting and supportive of students' ideas, however diverse, and one that promotes an active engagement of students in the learning process not only encourages student thinking, but gives students greater confidence in their own thinking abilities.

John Dewey (1933) wrote of a hidden or implicit curriculum that students learn just by being a member of a classroom. They may learn that teachers have the right answer and they are expected to find it out, or they may learn that the teacher is the one who talks and they are expected mainly to listen. They form perceptions about the teacher's attitude toward their ability and this perception may affect their achievement, academic

success, self concept, and cognitive growth (Aspy & Floebuck, 1977; Myers; 1989; Purkey, 1970; Purkey & Novak, 1984). The classroom climate may reflect controlled passivity and reaction or open communication and interaction: the first inhibits thinking, the latter promote thinking and active learning.

Classroom climate is affected by the nature and extent of student-teacher interactions. Acknowledging that teaching is 'an interactive process' (p. xviii), Wassermann (1986) cautioned teachers to be mindful of these interactions and their effect on student behavior and learning. Consistently judgmental or critical interactions have a long-term effect on students' feelings of self-worth. Wassermann pointed out that one of the primary goals of teaching for thinking is to "increase pupils' confidence in themselves and in their own ideas and to strengthen their ability to do their *own* thinking" (p. xviii). Studies on the relationship of interpersonal skills with a variety of student outcomes have shown a positive relation to high levels of interpersonal functioning and gains in students' emotional, intellectual, and interpersonal growth.

A second facet of classroom climate lies in teacher expectations. Teacher expectations are defined by those inferences that teachers make about the abilities and future academic success of students (Good & Weinstein, 1986b). Cooper and Tom (1984) and Good and Brophy, 1987, 1990) have acknowledged that teacher expectations, even indirectly displayed, play a significant role in how well and how much students learn. They warned against teachers forming inaccurate and inflexible expectations of students with varying abilities. A teacher who fails to see potential in a

student and does not respond or a teacher who responds negatively can create a self-fulfilling prophecy that affects a student's behavior.

This strategic and attitudinal approach supports the philosophy of one thinking skills program (Sternberg, 1984) that "almost all students can learn what only the best currently learn, if only the more typical and less able students are given appropriate learning opportunities" (p. 45). If teachers do not expect that students can take part in higher level discussion, these students are not given the opportunity (Morine-Dershimer, 1983). "The implication is that teacher judgments and expectations do impact upon student learning in terms of what is offered to students and how students perceive each other" (Stallings, 1987, p. 70).

An important goal of education is to enable all students to experience their own excellence (Morgan, 1981). A sense of security will prevail in a classroom where students are encouraged to make decisions and share ideas, and where their ideas are encouraged and respected. This classroom climate is expectant of student involvement, not passive compliance. Open interaction, active listening, appreciation of individuality, and an encouragement and acceptance of diversity are nurturing to student confidence and conducive to successful experiences with thinking (Beyer, 1987; Clark, 1985; Costa, 1985; Raths et al., 1986). A "relaxed, intellectually permissive classroom climate is necessary for productive inquiry" and higher level thinking (Wilen, 1979, p. 174).

Questioning Strategies

Questioning has been called a teacher's chief verbal tool for shaping and molding interaction in the classroom (Hudgins, 1971). "The basic language of the classroom is a dichotomy of teachers' questions and students' responses (Lange, 1982). Socrates, over 2,000 years ago, demonstrated the power of questioning to stimulate thinking (McTighe & Lyman, 1988). Today educators know that the structure of a question can influence a student's response (Good & Brophy, 1990). Strategic use of questioning lies in the ability to pose questions at various cognitive levels, the ability to ask clarifying and follow-up questions that probe and challenge student thinking, and the ability to foster a questioning aptitude in students (Barell, 1985a).

Some form of questioning exists in all classroom settings (Falkof & Moss, 1984). Chance (1986), Strother (1989) and Wilen (1984) noted that many teachers provided opportunities for students to answer factual questions requiring the use of lower mental processes, yet they fall short in asking questions that stimulate the use of higher level thinking. Little opportunity is given for developing the skills needed to draw inferences, to analyze text, to defend a point of view based on logical proof, or to answer interpretive questions. Generally, questions asked by the teacher require little thought beyond mere recall of facts and frequently have only one acceptable answer. Gall (1984) found that only 20 percent of teachers' questions require students to think; Rowe (1974) noted that many teachers also gave insufficient wait time for thoughtful responses.

Brophy (1986) warned that to assume that higher level questions, or those that called for application, analysis, synthesis, and evaluation, were categorically better than lower level questions that called for knowledge and comprehension is a simplistic notion. He recognized the value of lower level questions, in their own right, and in their use to set the stage for higher level questions. He cautioned researchers "to take into account the teacher's goals, the quality of the questions, and their timing and appropriateness" (p. 1072). Brophy (1986) and Good and Brophy (1990) suggested that teachers be more aware of the sequencing of lower and higher order questions, depending on the purpose of the discussion, of the clarity of each question, and of the post-question wait time. This latter consideration allows students time to process information and to think with more complexity.

Teachers also need to use judgment in providing feedback to students (Costa, 1985). Active acceptance involves rephrasing, paraphrasing, translating, recasting, or summarizing, not merely repeating an answer or passively accepting without any clue as to the value of an idea. Criticism, or other negative value judgments, inhibits cognitive learning. Praise should be used sparingly and judiciously; its excessive use builds conformity and dependency rather than diversity and independent thinking. Probing or follow-up questions that ask for clarification help student to elaborate or reflect upon their answers.

Gall (1984) concluded that "[t]eachers' questions that require students to think independently and those that require recall of information are both useful but serve different purposes. The challenge for teachers is to use each type to its best advantage" (p. 41). Appropriate questioning strategy

also takes into consideration the students' previously conditioned impression of the importance of the "right" answer and of their lack of experience in answering thought-provoking questions (Wilen, 1979, 1987). These students may need encouragement and practice to feel more secure about taking a risk with reflective or divergent thinking. Most importantly, the careful crafting of questioning requires the teacher to be a good listener.

Application to the Adolescent

The Carnegie Council Task report, Turning Points: Preparing American Youth for the 21st Century (1989), recognized the critical need for schools to help the adolescent to acquire "durable self-esteem, flexible and inquiring habits of mind...to find constructive expression of their inherent curiosity and exploratory energy" (p. 12). The adolescent years (11 to 14 years) are developmentally transitory and socially and intellectually formative: "schools should be a place where close, trusting relationships with adults and peers create a climate for personal growth and intellectual development" (p. 37). Contrary to much conventional belief, cognitive development during the early adolescent years is not on hold: a primary goal in choosing curricula and teaching methods should be to discipline "their capacity for active, engaged thinking...to assimilate knowledge ...challenge the reliability of evidence, or ideas presented; see relationships between ideas; and to ask what-if and suppose-that questions" (p. 43).

In developing a discipline of mind, the report communicated, the middle school teacher must depart from the traditional role of transmitter

of knowledge to a facilitator "through which young people construct knowledge themselves" (p. 43). Teachers must promote a spirit of inquiry and provide students with opportunities to think about and communicate ideas, to participate actively in their learning, and to discuss, analyze, and express opinions. In this way, the adolescent can begin to engage in critical and higher level thinking. With regard to society's transition from an Industrial to and Information Age, critical thinking is one of the most important skills teachers need to teach students (Fenwick, 1986; Johnston & Markle, 1986; Schurr, 1989)

Middle grade students display a wide range of individual intellectual development as their minds experience the transition from the concrete-manipulatory stage to the capacity for abstract thought (Schurr, 1989). They are intensely curious, favor interaction and active learning experiences, exhibit independent, critical thought, experience the phenomenon of metacognition, yet are intellectually at-risk if these needs are not met. Teachers need to understand the learning process from a psychological perspective: fear, anxiety, and failure reduce motivation; meaningful, appropriately challenging tasks, however, provide students with opportunities for success. Learning is further aided by the teacher's use of questioning to stimulate thinking and the imagination (Doll, 1982; Schurr, 1989).

Cognitive learning cannot take place in a state of affective disorder: an affective climate sensitive to the adolescent's psychological needs for security, acceptance, and personal relationship can provide the supportive setting for cognitive development (Schurr, 1989). The young adolescent

performs at a higher level academically within a more inviting environment (Van Hoose & Strahan, 1986). Professionally inviting behaviors that promote active involvement of all students include asking questions that are varied, appropriate, and reflective; waiting for students to respond to questions; and encouraging students to express personal ideas. Personally inviting behaviors include modelling courtesy and respect, demonstrating support in response to error, communicating open-mindedness, and maintaining patience and poise. "Students feel invited when they feel accepted, valued, and capable" (Schurr, 1987, p. 29; Purkey & Novak, 1988). The time is right for middle school teachers to become more professionally and personally inviting in the classroom with young adolescents (Van Hoose & Strahan, 1986; Purkey & Novak, 1984).

Statement of Problem

The discrepancy between the goal to teach students to become better thinkers and its implementation in the classroom has been and remains a problem in education (Brandt, 1990a). Marzano et al. (1990) and Marzano et al. (1988) recognized the need for a framework to integrate the related "dimensions" of thinking skills programs that is based on the general principles of how learning occurs. Weiss (1988) suggested the need for an emphasis on the thinking process: "The teacher factor and learning climate seem to be the two crucial factors to student opportunities for learning" (p. 74).

The problem, then, is to develop an instructional approach that would enable teachers to create a conducive thinking and learning climate and to

integrate specific higher level thinking strategies within the regular curriculum. An awareness of current learning theory and cognitive instruction could influence a teacher's ability to create a supportive climate for thinking and learning; the use of questioning strategies that integrate cognitive level and process could challenge the level of thinking among students. The elements of classroom climate and the teacher's use of questioning strategies could have an influence on level of student cognitive development.

Purpose of the Study

The purpose of this study was to determine if the elements of classroom climate, as characterized by teacher-student interaction, teacher expectations, and an awareness of learning theory and represented by response opportunities, and the teacher's use of questioning, which includes cognitive level and process strategies, have an influence on level of student cognitive development. Each element was considered singularly and in combination for its possible impact on student thinking ability. The focus of the study was on the following research questions:

Do statistically significant differences exist between classroom climate and level of student cognitive development?

Do statistically significant differences exist between teacher questioning strategies and level of student cognitive development?

Do statistically significant differences exist between the combination of classroom climate and teacher questioning strategies and level of student cognitive development?

Based on the research questions, the following null hypotheses were proposed and investigated:

H_0 1 Statistically significant differences do not exist between classroom climate and level of student cognitive development.

H_0 2 Statistically significant differences do not exist between teacher questioning strategies and level of student cognitive development.

H_0 3 Statistically significant differences do not exist between the combination of classroom climate and teacher questioning strategies and level of student cognitive development.

Importance of Study

If a significant influence on student cognitive development is found in classrooms where teachers have made efforts to establish and maintain a positive climate and where they provide opportunities for students to respond to stimulating questioning, implications for teacher training programs and staff development focus can be determined. Because teachers make decisions that affect classroom learning (Dreeben, 1987), they can be instructed and enlightened about which decisions impact more specifically on student learning.

Proposing the assumption that teachers do make the difference in the classroom (Weiss, 1988), staff development and teacher training programs can focus on teaching the strategies of climate setting and techniques of questioning, and teachers can be better prepared to create and maintain those conditions that stimulate students to think more independently and

more comprehensively. More concentrated training in managing the content of the curriculum, specific questioning strategies, and complex classroom interactions would be seen as specific methods to foster student thinking and to spark an attachment to learning beyond the students' years of basic schooling.

If classroom climate and questioning techniques are found to be significant factors in the teaching-learning process, implications for the administrative functioning of schools can also be drawn. "Teaching does not occur in a vacuum" (Weiss, 1988, p. 49). An effective learning environment must extend beyond the classroom into the school setting. A school climate supportive and conducive to the teaching of thinking can be established through an increased knowledge and awareness of the conditions most effective for student learning.

If the educational goal of the school is that each student be given an opportunity to learn to his/her capacity, then an awareness of and agreement by both administrators and teachers of the conditions that best foster student learning can be viewed as significant strides toward accomplishing this goal. Since teachers "ultimately control the fate of efforts to alter a school's instructional climate and process" (Purkey and Smith, 1983, p. 442), administrators need to work to establish a general school climate that includes collaborative planning and cooperative decision-making in order to set the stage for the desired teacher learning and resulting classroom follow-up. By valuing and supporting the teacher's strategic role in student learning, administrators can be more assured that the school's goal to promote student learning is carried out.

Thoughtful attention to those conditions under which students learn best can more readily ensure the transfer from training to classroom practices.

The implications of a study that helps to clarify the classroom conditions and teaching strategies most conducive to student learning would also be helpful to the administrators faced with the dilemma of finding the most appropriate means to teach students to become better thinkers. With the array and diversity of packaged programs, and the proliferation of material written on the teaching of, for, and about thinking, an administrator's task to select the program most appropriate to his/her needs and to set up a plan to ensure its implementation with the school's instructional program is a difficult one. Teachers frequently resist changes or additions to the curriculum that impose even greater restraints on their limited time. Furthermore, according to Savell, Twohig and Rachford (1986) the results of time spent in incorporating many thinking skills programs on student thinking are minimal (Weiss, 1988).

"The dilemma in today's schools is...an ever increasing body of information that students and teachers are wrestling to cover" (Weiss, 1988, p. 44). If teachers can be involved in a process of teaching students to think that allows flexibility within the established school curriculum without adding another "program" of study; if they do not have to learn the new language of a thinking skills program; and if, beyond the teacher training period, extra time is taken from an already busy day to teach thinking, the prospects of attaining a goal of stimulating student thinking may be more feasible. The goal for teaching students to think could be realized by setting and maintaining a classroom climate conducive and stimulating of

thinking, and by sparking an established curriculum through challenging and thoughtfully-asked questions.

Good and Weinstein (1986a) stated that a general finding that distinguishes effective from ineffective schools is the belief by teachers in the effective schools that all children can learn and that the school is responsible for that learning:

> High expectations for the teachability of all students are hindered by beliefs in a single intelligence that falls in a normal distribution and a heavy reliance on standardized tests. Instructional practices such as ability-based reading groups and tracking, plus accompanying lock-step curricular differentiations, further reduce the opportunities to examine the range and levels of a child's capacities and to develop high but more differentiated expectations about needed pedagogical interventions. (p. 1096).

The school's major role will likely shift from providing students with information (a factual approach) toward helping students develop analytical skills for critically evaluating information. Resnick (1984) stressed that schools, especially in light of the growing concern for future conditions, must make it possible for all students to achieve standards of educational performance once expected of only a few. Teachers who remain open-minded about students' performance levels may, in turn, make opportunities for higher level thinking available to all students.

The long-term implications of this study can also be hypothesized. One can optimistically predict that if schools today help students to become better thinkers, the potential for a long-term effect on the quality of their lives increases. The warning by futuristic writers (Naisbitt, 1982; Toffler, 1980) and the startling report card that today's schools are falling short of preparing students to be productive and fulfilling future citizens (Goodlad,

1984; Adler, 1982; National Science Board Commission, 1983) have highlighted the discrepancy between the professed goal of education to foster student thinking and its realization. Attention to specific and teacher-manageable strategies to nurture higher-level thinking among all students could result in a better-prepared future society.

Furthermore, the possibilities inherent in extending the opportunity for challenged thinking to all students in all classrooms have yet to be realized, just as the potential of the human brain under compatible and stimulating conditions is an area today's schools have yet to explore fully. The need for creating an optimal learning opportunity for all students cannot be underestimated; nor can a lack of knowledge as to what conditions are appropriate, as implied through this study, prevent directive steps in establishing these conditions.

Finally, this study can be recognized for its potential contribution to the curriculum and instruction designed to meet the developmental needs of the middle grades student. Van Hoose and Strahan (1988) proposed that "successful middle level schools are those designed to meet the needs of early adolescents and successful teachers are those who address these needs proactively" (p. 43). An interactive, expectant, positive climate integrated with specific cognitive teaching strategies such as guided discussion and strategic questioning could be recognized as appropriate instructional practices pivotal in the healthy intellectual development of the middle grades student.

Definition of Terms

For the purpose of the study classroom climate was defined by the opportunity teachers give students to participate and interact during discussions and by their treatment of students' questions and answers. Classroom climate was observed on a continuum from negative to positive, or low to high. A positive (high) classroom climate was characterized by the teacher's equitable distribution of questions among students, the acceptance of valid student responses in a nonjudgmental manner, the use of sustaining feedback to help students arrive at successful answers, and the opportunity for students to express alternate points of view, to ask questions, and to interact among themselves. A negative (low) classroom climate was characterized by the absence or low frequency of many of these practices.

Questioning strategies were defined as the teacher's use of questions of various cognitive levels and of specific cognitive process strategies that allow wait time for cognitive level and student elaboration of responses; elicit expected cognitive level responses; probe for more extensive or complex responses; ask students to explain why or give proof for answers, such as by clues, examples, or details; sequence higher and lower follow-up questions to help students recall knowledge and think more indepth; encourage metacognitive thinking; and elicit higher level questioning from students.

Student cognitive development was defined in terms of student higher level thinking ability. The development of student cognitive thinking skills are indicated by an increased ability to respond to questions beyond recall

and comprehension, including analysis, synthesis, and evaluation; an expanded ability for interpretive, logical, and inferential thinking; an improved ability for elaborative and textually substantiated responses; and an increased level of cognitive inquisitiveness, or questioning aptitude. For the purpose of the study, student cognitive development was measured by assessing the quality of student responses to oral questioning about a short story selection. The questions utilized an integration of cognitive level, process, and sequence, and were designed to elicit higher level thinking. The demonstration of student higher cognitive thinking or cognitive development was the ability to respond on a variety of cognitive levels and to specific cognitive process strategies; to respond with answers that are specific, logical, elaborative, and factually, interpretively, hypothetically, and/or evaluatively substantiated; and to ask questions that reflect higher cognitive thinking.

CHAPTER II
REVIEW OF THE LITERATURE

The teacher's strategic role in the classroom thinking-learning process is a recurrent theme throughout much of the current school reform and thinking skills literature (Costa, 1985; Goodlad, 1984; Jacoby, 1988; Marzano et al., 1989, 1990; Raths et al., 1986; Weiss, 1988). The Carnegie Forum on Education and the Economy (1986) stated that "[t]he focus of schooling must shift from teaching to learning, from the passive acquisition of facts and routines to the active application of ideas to problems. That transition makes the role of the teacher more important, not less" (p. 25). As a facilitator of learning in the classroom, a teacher's task is to create and maintain the kind of environment that both fosters and stimulates student thinking. A classroom climate that invites an open exchange of ideas and encourages active student participation gives students the freedom to take risks without the fear of recrimination or failure.

Within this supportive setting, students can begin to develop a proficiency in thinking abilities (Beyer, 1987). The teacher who has communicated that s/he is receptive to and values student inquiry, is willing to deal with questions to which there are no ready-made answers. Students are encouraged and expected to answer questions that require them to think about, analyze, and reflect upon information. Teachers "frequently respond to student statements with silence, with requests for

elaboration or supportive evidence and reasoning, with questions designed to extend student guesses and thoughts, and with alternatives that invite further exploration" (Beyer, 1987, p. 67). Teachers who support student thinking become teachers who promote and develop student thinking.

Cognitive Development

Cognitive development involves long-term intellectual growth and learning (Costa, 1985). Cognitive skills are skills used in thinking, learning, understanding, and reasoning. Developing these "skills of the mind" rests on the analysis, integration, and evaluation of a vast quantity of environmental experiences, and on an understanding of these experiences (Clark, 1985). Piaget (1952) emphasized the principles of assimilation and accommodative interaction, believing that intellectual development resulted from one's active participation in the learning process, invariably sequenced into stages (Clark, 1985). A question concerning cognitive development theorists and early childhood educators has been "Can learning, or rather the benchmarks for development, be accelerated, or is it dependent solely on maturation?" (p. 57).

Modern research in cognitive psychology has offered some new thinking on the learning process. Individual abilities are not viewed as ceilings on learning but as indices of what the learner brings to the learning situation (Kirby & Biggs, 1980). The notion that intelligence is a fixed and immutable character of the individual has been challenged by recent research that intelligence can be taught in the classroom under certain conditions (Levy, 1983). Research by Sternberg (1984) and Gardner

(1983) clearly suggested that any student's intelligence can be nurtured. Marzano and Arredondo (1986) have proposed that all students can learn well if given the benefit of thinking-oriented curriculum and instruction.

Clark (1985) stated that a child's innate ability was in constant and continuous interaction with his environment, and the strength of that interaction will determine just how much ability he will be able to develop. "By the environment we provide, we change not just the behavior of children, we change them at the cellular level" (p. 21). She explained that the brain's unique synaptic activity could be accelerated by the richness of the environment provided. She stressed that educators needed to provide for an array of experiences and should encourage the cognitive processes of understanding, analyzing, organizing, integrating, and evaluating.

Hart (1986) in response to the current emphasis on teaching thinking skills, stated: "How can anyone claim that thinking is not a brain function? How can we ignore the incredible organ where thinking occurs, or–I would hold–not begin with exploring what we now know about it and can use immediately?" (p. 46). He expressed alarm that so few of the writers of thinking skills programs were familiar with the "flourishing" field of cognitive science. New directions in cognitive psychology are just beginning to have an influence on the teaching of thinking and on educators' perception of cognitive development (Brandt, 1986; Segal et al., 1985; Clark, 1985; Gardner, 1985; Hart, 1975, 1981, 1983a, 1983b, 1986; Kirby & Biggs, 1980).

Brain theory proposes that the brain is continually attempting to categorize and pattern new information with what is already learned. At a high rate of speed, and apparently in random order on both unconscious

and conscious levels, the brain actively integrates and develops what Hart (1983, 1986) called "program structures" or "prosters." Brandt (1984), citing the research on brain-compatible learning (Hart, 1983b; Restak, 1980) explained the process of thinking and learning in this way:

> Our thinking starts with our current idea of something and changes as we accumulate impressions and information. What affects us most is direct experience. We do not absorb ideas ready made; we actually construct meaning for ourselves and reconstruct it over time. (p. 3)

The most effective learning takes place when a student is challenged to "'call up' the greatest number of appropriate programs,...expand on already existing programs, and...develop new programs" (Nummela & Rosengren, 1986, p. 50). Many factors may affect a student's thinking, including different temperament styles at birth (Thomas et al., 1970), critical periods of development and growth spurts (Clark, 1983), and cross development factors which may influence cognitive development (Piaget, 1952). However, if a lesson poses too little challenge, too little complexity, or too much threat, it will fail to stimulate the inner processing needed for more complex thinking and learning.

Levy (1983) inferred from current brain research that the human brain was built to be challenged and to understand itself. "I believe that children will learn best if their limits are stretched, their emotions are engaged, and if they are helped to understand themselves and their own special ways of thinking and seeing the world" (p. 71). Several theorists, however, have raised concerns about classroom conditions and teaching for

learning. Haglund (1981) cited findings in human development and cognitive psychology, including Hart, 1975; Bruner, 1973; Epstein, 1977, and suggested that "students do not resist learning; rather the formal classroom setting is antithetical to inquiring minds..." (p. 225). The conditions for higher-level thinking are not apparent; an insignificant number of students leave secondary school stimulated or motivated to continue the learning process.

This grim report of antithetical conditions in classrooms could be explained by prevailing attitudes of educators about students' potentiality for cognitive development. Beyer (1987) suggested that three basic assumptions must underlie the teaching of thinking: all students can and do think; all students can think better when directed; and with appropriate instruction, teachers can help all students improve their thinking. He maintained that effective thinking was the result of "deliberate, sustained, and conscious effort on the part of teacher and students in a variety of contexts for a variety of purposes" (p. 8). In many instances classroom instruction in thinking is limited to the more advantaged socioeconomic strata (Marzano & Arredondo, 1986). In other instances, the teacher may have a misconception as to how and under what conditions thinking and learning take place (Hart, 1986).

Another challenge to the successful integration of thinking skills instruction in classrooms has been the larger debate over the relative importance of content and process in the teaching of thinking (Arredondo & Block, 1990). Numerous educators examining the connection between content knowledge and thinking skills (Brandt, 1988b; Marzano et al., 1988, Presseisen, 1988) have argued that the critical question is not whether

teaching content or process is more important: both are essential. "[T]he question is how to interweave essential thinking processes into complex content knowledge in a pedagogical manner that enhances meaningful student thought" (Arredondo & Block, 1990, p. 7). The skillful blending of content and process can be achieved by moving curriculum along the continuum from teacher-controlled presentation of thinking processes to student-controlled mastery of them.

Many teachers, however, maintain a conventional approach of teacher dominance, student passivity, and limited student-teacher interaction instead of a classroom climate that is conducive to optimal learning, stimulating to thinking, and inviting to active student participation (Chance, 1980). Even in classrooms where teachers have become interested in teaching thinking and are successful in getting students to think more, students have yet to develop self-control of their thinking (Brandt, 1990b). Teachers continue to need help in understanding the principles of learning that undergird thinking, in creating classroom conditions that are conducive to the thinking and learning process (Marzano et al., 1990), and in integrating thinking process strategies within their subject matter instruction (Brandt, 1990b).

Classroom Climate

John Dewey (1933) wrote of the powerful influence of the teacher over the students in a classroom. "Everything the teacher does, as well as the manner in which he does it, incites the child to respond in some way or other, and each response tends to set the child's attitude in some way or

other" (p. 59). The influence of the teacher's personality over young children is frequently fused with the subject matter so that teacher-student interactions become unconscious measures of like and dislike. "His chief concern is to accommodate to what the teacher expects of him, rather than to devote himself to the problems of subject matter" (p. 61). The focus is on the answer or process that will please the teacher.

For teachers to accept without notice unimaginative or rote responses sends a message that endorses these tendencies and reinforces them into habits. Dewey specified that teachers should display and encourage in students an attitude of "open-mindedness [which] ...includes an active desire to listen to more sides than one; to give heed to facts from whatever source they come; to give full attention to alternate possibilities; to recognize the possibility of error even in the beliefs that are dearest" (p. 30). In this way, teachers are conveying the message to students that it is acceptable to take a risk with a new idea or to offer a different approach. The thinking becomes student-oriented rather than teacher-directed.

Beyer (1987) identified a number of similar attitudes or "dispositions that undergird effective thinking" (p. 211). These include

> a respect for, and a desire to seek and give reasons, willingness to suspend judgments, a desire to consider other points of view on a topic, a desire to identify and judge a number of alternatives before making a choice, and a willingness to revise one's opinion in light of new evidence. (p. 211)

To foster the development of attitudes associated with thinking, Beyer noted that teachers could 1) model the desired disposition by seeking a variety of views or a number of alternative answers or solutions; 2) require

that students display similar dispositions by giving reasons for their decisions or by exploring a variety of viewpoints; 3) engage students, consistently and continuously, in learning opportunities to practice the behaviors; and 4) reinforce the appropriate dispositions by valuing and rewarding the behavior, not the student. He contended that effective student thinking was not likely to develop without this attention to the affective dimension:

> Considered attention to this aspect of the teaching of thinking is as important as is attention to metacognition and to systematic teaching of...specific thinking skills and strategies, if students are to become as proficient as possible in thinking (p. 214).

Marzano et al. (1990) identified three categories of attitudes and perceptions especially relevant to learning: 1) self and climate, which includes perceptions about safety, comfort, and order within the environment; 2) self and others, which includes perceptions about teacher and peer acceptance; and 3) self and task, which includes attitudes about personal competence. In establishing an appropriate environment for learning and thinking, a teacher should provide equal opportunities for involvement, structure tasks for high success, and communicate to students a sense of confidence in their ability to accomplish classroom tasks.

Within a single classroom, students' interpretations of what is meaningful and important vary considerably, especially when social backgrounds vary (Good & Weinstein, 1986b). Frequently these perceptions have been learned in response to expectations communicated by the teacher through teacher-student interactions. Good and Brophy (1984) showed that

some teachers varied markedly in their interaction with high- and low-achieving students. These teacher behaviors toward low achieving students included calling on them less frequently; waiting less time for them to answer; either giving them the answer, calling on another without giving sustaining feedback, or giving little informative feedback; criticizing them more often for failure (as opposed to praising highs more for success); and asking them fewer higher level questions. Students are frequently aware of this differential teacher behavior, and such behavior can affect students directly, in that they have reduced opportunity to interact, think and learn; and indirectly, in that they form lowered perceptions of their own ability, and hence do not try any harder.

Weinstein (1983), in an article focusing on students' perceptions of schooling and classroom interaction patterns, cautioned teachers to be sensitive to and aware of students as active interpreters of socio-cognitive classroom interaction. Good and Weinstein (1986b) noted that ultimately, the nature of classroom interactions and communications of expectations depended on the teacher's beliefs about their own efficacy and about the limits of student abilities.

Hart (1983) explained that by creating a supportive classroom environment, a teacher could avoid the tendency of the brain to "downshift" when students feel threatened and their capacity to learn is reduced. New learning takes place primarily in the cerebrum, which works most fully in the absence of threat (Hart, 1986). His learning theory emphasized that classroom climate and instruction must be compatible with the nature of the brain, and not "brain-antagonistic" (p. 49), as many conventional

classrooms are. The teacher's ability to generate trust and to engage students in meaningful and challenging learning is a powerful invitation. Barell (1985b) noted

> Of all factors...it seems to me that creating this warm, supportive environment is perhaps the sine qua non for higher-level thinking. Without trust, open communication, and a willingness to tolerate and encourage differences, little thinking can occur. Thinking requires what Bronowski called 'this constant adventure of taking the closed system and pushing its frontiers imaginatively into the open spaces where we shall make mistakes' (1978, p. 13). Going beyond the known into those new, unexplored territories and continents where we seek to make connections is risky business. (p. 22)

Beyer noted that [c]lassrooms conducive to the teaching of thinking continuously invite–almost beg–students to think" (1987, p. 66). Seating arrangements that facilitate grouping and face-to-face interaction are more conducive to an exchange of ideas than lecterns and theater-style seating. These classrooms are typified by more student-student than student-teacher interaction. Students are expected to consider the ideas, contributions and arguments of peers and to value the quality of their reasoning. "Such classrooms virtually call out, 'It's okay to think! It's useful to think! Come on, let's think to learn!'" (p. 68).

One of the biggest challenges teachers face is to help students to develop "habits of the mind" associated with thinking (Marzano et al., 1990). These include 1) being clear and seeking clarity; 2) being accurate and seeking accuracy; 3) taking a position and defending it; 4) being sensitive to the level of knowledge and feelings of others; and avoiding impulsivity (p. 21). Ennis (1985) has declared that these and similar behaviors were at the core of critical thinking. Research and theory in

metacognition and self-efficacy (Brown, 1976; Flavell, 1976) have indicated that people could learn to be aware of their own thinking and evaluate its own effectiveness. Students develop these behaviors by interacting with adults who model such behaviors and by consciously practicing them (Marzano et al., 1990).

Questioning Strategies

A starting point for stimulating student thinking lies with the teacher's ability to handle good questioning techniques: "Asking the right questions in the right way can prompt well-developed, detailed, and thoughtful responses from all students" (Falkof & Moss, 1984, p. 4). The effect of questioning strategies on students' level of cognitive functioning, however, is not a finding limited only to the thinking skills movement. Taba (1967) wrote of the influence of appropriate questioning as a teaching strategy in advancing the level of cognitive functioning. Socrates has been heralded as a "master of the art of questioning" (Henson, 1979, p. 14) in the way that he cleverly sequenced questions to lead the learner to discover knowledge (Lange, 1982).

Beyer (1990) proposed that one major method by which individuals exercised their critical thinking abilities is dialogue, and asking and answering questions is one way that dialogue was stimulated, directed, and evaluated. Questions that require critical thinking call for sustained efforts to explain one's point of view, to give reasons or evidence for what one is saying, to give alternate ways of looking at a particular claim (Paul, 1987). Often called Socratic questioning, this process probes one's thinking and

calls for justification of one's assertions. Skillful thinkers seek reasons and evidence, suspend judgment, and examine issues from alternate points of view (Paul, 1987; Ennis, 1987).

In synthesizing the research on teacher questions, Gall (1984) noted that the literature challenges typical classroom practices. Although researchers have found that an emphasis on higher cognitive abilities generally produces better learning than an emphasis on lower-level questioning; and though there is no lack of books and pamphlets encouraging teachers to ask more higher-level questions, these suggestions have had little effect on classroom instruction. She pointed out the need for more effective ways to influence the instructional behavior of teachers in the classroom. Gall (1984) also argued that, in addition to improving the quality of teacher questions, students needed to be made aware of and learn different response requirements to different types of questions. This observation is a critical factor particularly in the higher grade levels where students have been "conditioned" to minimal response levels.

Barell (1985a) noted that the most important skills for teaching thinking lay in the teacher's ability to stimulate and nurture inquiry and discussion. The use of questioning appropriate to classroom discussion, however, is the reverse of typical classroom questioning (Dillon, 1981). Teachers control the discourse by asking many questions in a fast-paced interchange, and students answer with information known in all cases to the teacher and in most cases to the student. As questioner, the teacher is "the superordinate partner in the exchange" (p. 51). This kind of question-answer relationship, instead of stimulating thought, "fosters in the

respondent dependency, passivity, and reactivity" (p. 52). Dillon referred to this form of classroom dialogue as recitation rather than discussion. In establishing a climate of inquiry, teachers need to talk less; to ask more and higher levels of questions (Barell, 1985a; Gall, 1984; Harms, Woolever, & Brice, 1989; Lange, 1982; Wilen, 1979, 1984, 1987), and to ask more "perplexing" or interpretive questions (Dillon, 1981, 1984).

Strother (1990) indicated that teachers who have a particular reason for asking a question and who listen carefully to students' answers and shape their own responses accordingly are more skillful at helping students to understand a subject. Referencing Marylou Dantonio's (College of Education, University of New Orleans, 1989) 10-year study of teachers' questioning techniques, she quoted "'Question systems that encourage teachers to redirect questions, especially for clarification of information, verification, and support of thinking, assist in bringing substance to discussions and recitations'" (p. 324). Unfortunately, researchers do not know whether teachers consciously choose questions for specific purposes. Effective questioning appears to remain embedded in the teacher's understanding of the nature and functioning of the questioning process.

The research on teacher questioning has debated the notion of whether or not students learn more when teachers emphasize higher cognitive levels of questions over fact questions, particularly with students of lower socio-economic status (Andre, 1979; Brophy, 1986; Gall, 1984; Redfield & Rousseau, 1981; Rosenshine, 1976; Strother, 1990; Winne, 1979). Two studies in the 1970s concluded that students learned best when teachers asked questions that elicited one specific answer and gave immediate reinforcement as to the correctness of that answer (Rosenshine,

1976) and that student achievement was not significantly affected with the predominant use of higher cognitive questions (Winne, 1979). This latter study was later contradicted by Redfield and Rousseau (1981), who applied a different methodology to analyzing Rosenshine's experimental results, and reached the conclusion that higher level questions have a positive effect on student achievement.

Gall (1984) explained this seeming contradiction in terms of the student populations represented in each of the cited studies. While the Rosenshine study involved disadvantaged students in primary grades, the Redfield and Rousseau studies involved a wider range of student ability and grade level. In regard to the individual students' cognitive development levels (Piaget, 1952), which may have been lacking in the factual information needed to answer higher cognitive questions, the "low cognitive questions helped the low SES students fill in the central 'empty slots' of their schemata' (Creamer & Lorentz, 1979). Gall noted that higher level cognitive questions may be more effective for students of average and higher abilities. Teachers of young disadvantaged children might need to emphasize fact questions; however, they should "take care to include some higher cognitive questions to stimulate development of their thinking skills" (p. 41).

Gall acknowledged the need for teachers to ask both questions that require students to think independently and those that require a recall of information, for different purposes and each for its best advantage. This notion supports one of the highlights from Norris's (1985) article that surveys the critical thinking research: "Critical thinking cannot take place in a vacuum; it requires individuals to apply what they know about the

subject matter as well as their common sense and experience" (p. 44). The teacher's role would then be, through the cognitive level of questioning, to bring to mind previous knowledge and provide students with the opportunity to think about it in more depth or expand upon it.

In an effort to help students create meaning out of experience teachers frequently forget to set the stage for learning by helping students recall what they already know (Barell, 1985b). In light of Hart's (1975, 1983, 1986) proster theory (forming new patterns by relating new experiences to those known) and of Piaget's schema theory (1952) (integrating new experiences with prior knowledge), an appropriate questioning strategy in the classroom would be to ask both literal-factual and evaluative, higher-order questions (Lange, 1982; Barell, 1985b; Gall, 1984). Another strategy is to acquaint students with the expected response requirements of the particular level of question (Gall, 1984; Wilen, 1979, 1987). Many students may be unaccustomed to inquiry-oriented questions and become frustrated and anxious as to how to respond. They may also be hesitant to give up the security of the one right answer.

Wilen and Clegg (1986) suggested that students may lack an understanding of the kind of mental activity required to answer a question. If a teacher carefully designs an initial question that focuses the student on the content and on the thinking process to be used when discussing that content and then asks questions that help students to understand the operations they are using, the teacher may begin to see a stronger relationship between questioning and higher-order thinking (Strother, 1990).

Dillon (1983) claimed that questions initiated by students were an indication of learning; however, teacher questions that elicit only a recitation of facts may discourage student questions. He argued that teachers often speak in questions perpetuating the tendency among students to speak only in answers, to give brief answers, to wait after answering for the next question to be asked, and to talk only to the teacher and not other students. To avoid this tendency, he suggested that teachers stop asking so many questions and to invite, wait for, and welcome student-initiated questions.

To involve students more actively in their own learning, students should be taught to look in questions for certain words that give clues about how to process the question (Strother, 1990). Hunkins (1987, 1989) suggested that teachers should share their instructional secrets by telling which procedure and strategies they are using when teaching a lesson and why. Furthermore, as students begin to raise questions of their own, they will also begin to see the relationship to higher-order thinking: "a question is merely the vehicle by which one processes a thinking strategy" (Strother, 1990, p. 327).

Brophy (1986) suggested that the unit of analysis for effective questioning strategies be shifted from individual question to question sequence.

> For example, sequences beginning with a higher level question and then proceeding through several lower level follow-up questions would be appropriate for some purposes (asking students to suggest an application of an idea, then probing for details). A different purpose (stimulating students to integrate facts and draw conclusions from them) would require a series of lower level questions (to recall attention to the relevant facts) followed by higher level questions. (p. 1072)

Smith (1976) discussed strategies for sequencing questions by arranging them into three types: focusing questions, which elicit information needed to pursue the topic; extending questions, which are on a higher cognitive level; and raising questions, which provide the learner opportunity to develop new thoughts based on previous knowledge.

In a similar vein, Shiman (1976) suggested that teachers move back and forth among factual, conceptual and contextual modes of questioning. Factual questions elicit substantive information, conceptual questions probe, compare, generalize and analyze, and contextual questions promote judgment. Sanders (1979) developed questions using the hierarchical cognitive domain of The Taxonomy of Educational Objectives (Bloom, 1956). Questions that elicit higher level responses are questions of analysis, synthesis and evaluation.

Another classification of cognitive levels of questions is found in Cognitive Preference Questioning Inventory (CPQI) defined by Gallagher and Aschner (1963) and refined by Cunningham (1971). These classifications are cognitive-memory, in which students are asked to recall facts, define, recount, repeat, or identify; convergent, in which students are asked to combine, interpret, compare, explain, conclude, or relate information; divergent, in which students are asked to hypothesize, predict, infer, generalize or synthesize; and evaluative, the highest level, in which students are asked to judge, value, rate and opine. The latter categories evoke the higher levels of student thought.

The concept of wait time has been recognized as a significant factor in teacher questioning strategies (Rowe, 1974, 1986; Santiesteban, 1976; Tobin,

1987). Defining wait time as either the pause after a teacher asks a question or the pause after a student response, Rowe (1974) concluded that an average wait time of at least 2.7 seconds improved students' response length and frequency, logic and speculative thinking, number of student-initiated questions and student-student exchanges, and student confidence. Tobin (1987) stated that if a teacher would refrain from speaking until 3 to 5 seconds have elapsed, students may continue to speak or another student might begin to speak. Wait time gives student a pause for cognitive processing: Dillon (1982) projected that if teachers were to avoid speaking at the instant a student paused, "they would likely hear further expression of higher thought" (p. 141). Benefitting from the increased time to listen to and think about students' responses, teachers tend to ask fewer, but more clarifying, probing and complex questions (Tobin, 1987).

Other research (Good & Brophy, 1986) has suggested that wait time should vary with the complexity or cognitive level of the question. A factual question may be answered quickly and the teacher can move on to the next question, whereas a higher level question requires an extended period of thought. Wait time will also help the teacher reduce the number of questions asked during a lesson, the frequency of which is a deterrent to higher level thought processes.

Brophy (1986) and Wilen (1987) suggested some other considerations in forming effective questioning. The clarity of the teacher's question is one important factor. A teacher may ask a vague or ambiguous question, or s/he may ask two or more questions before stopping to get an answer to the first. Findings on the selection of respondents have varied with context. As

it is important to allow students in early grades and in small groups to respond overtly and often during a discussion; to call on nonvolunteers as well as volunteers; to prevent assertive students from coopting peers' response opportunities; and to ensure that reticent students participate regularly (Anderson, Evertson, & Brophy, 1979); it is less feasible to have all students participate overtly or equally in the upper grades in whole-class settings (Hughes, 1973).

Will (1984) noted that the most challenging part of leading a discussion was in asking follow-up questions to participants' responses. This calls for the teacher to be an active participant in the process of classroom communication. Thoughtful follow-up questions help students to clarify their thoughts or to answer more elaborately. Clarification also contributes to the development of students' metacognitive abilities (Brown, 1978; Costa, 1985). Students become more aware of their own problem-solving abilities.

Teachers are more likely to sustain the interaction by rephrasing the question or by giving clues rather than terminating it by providing the correct answer or by calling on some else (Anderson et al., 1979; Brophy, 1986; Clark et al., 1979; Wilen, 1987). To facilitate answers, teachers must perceive students' information needs and provide what is needed to help them respond (Costa, 1985; Wilen, 1987). Another alternative is to change the question into a lower level factual one, particularly if the question asked is higher level and seems too difficult for the student (Will, 1984). This strategy may help the student make a contribution to the discussion. Teacher judgment is important in deciding when enough time has been spent with the sustaining feedback (Brophy, 1986; Brophy & Evertson, 1976;

Good and Brophy, 1987, 1990; Good, Ebmeirer & Beckerman, 1978).

Findings on teacher reactions to student responses are less consistent (Good & Brophy, 1986). It appears important that teachers provide regular and corrective feedback so that the respondent and onlookers know the answer is correct; yet positive feedback should not include praise. Studies have shown that teachers who maximize achievement gains are sparing with praise (Brophy, 1986; Brophy & Evertson, 1976; Stallings, 1987; Wilen, 1987). Public praise may distract or embarrass the recipient. The process of taking cognitive risks is inhibited by praise (Costa, 1985).

Incorporating questioning strategies into classroom instruction requires teachers to be prepared with questions prior to the lesson; to be active listeners to students' responses; to welcome divergent responses; to probe and challenge students to think more deeply; and to encourage students to ask questions themselves. Teachers must also allow time for deliberation following the asking of questions and after student responses. The use of silence communicates to students the value of reflective, thoughtful answers. Teachers must also avoid rapid-fire recitations which are counterproductive when thinking is the focus (Glatthorn & Baron, 1985). Most importantly, teachers need to be aware of how to use questioning strategies most effectively to facilitate thoughtful classroom discussion.

Application to the Adolescent

Fenwick (1986) noted that no other point in the formal school years is more critical for students in developing thinking skills than the middle

grades. The adolescent is experiencing a rapid unfolding of intellectual capacity, and conditions are "ripe" for teaching skills such as problem solving, reasoning, analysis, and conceptualization. With the concern for the intellectual development of tomorrow's citizens and with the teaching of thinking widely advocated among middle school educators, one would expect to see a more extended implementation at this level than studies document (Johnston & Markle, 1986). Strahan (1987) observed that few programs have been developed specifically for the middle grades: teachers are encouraged to provide practice in thinking skills with little reference to the special developmental needs of this age group.

Studies on the onset of formal reasoning indicate that early adolescence is a period of predominantly concrete thinking, while approximately one-third of eighth graders consistently demonstrate formal reasoning skills (Strahan, 1986; 1987). Through the use of guided discussion and the skillful manipulation of questions, a teacher can help students in the middle grades begin to generate abstractions, to build on learned concepts, and to exercise reasoning abilities. Open discussion has proved to be helpful to adolescents in problem-solving situations (Strahan, 1987) and powerful in generating new patterns of thinking (Hart, 1983b).

An important instructional technique for enhancing the development of thinking and reasoning of the adolescent in the language arts content area is the promotion of meaningful intellectual interaction (Strahan, 1987). Teachers who are most effective in teaching thinking are those who "guide" students' reasoning processes by providing them with opportunities to explore new problems and discuss ideas and providing them with the means to extend their thinking through guided discussion

and reflection. Reasoning development during the middle grades is linked to the students' needs for exploration, discussion, and instructional guidance.

Guided thinking strategies outlined by Strahan (1987) for the reasoning development of the middle grade student are: 1) integrating new modes of reasoning experiences with content area instruction; 2) providing opportunities for students to relate new information to prior knowledge; 3) providing a framework for students to organize information and generate abstractions; 4) providing a systematic progression from concrete experiences toward abstractions; 5) providing initial opportunities to explore new information in an open fashion; 6) providing opportunities for students to discuss their observations; 7) guiding discussions with varying levels of questions and prompting to help students generate abstractions; and 8) encouraging them to reflect on their own thinking processes. These techniques are developmentally responsive to the intellectual development of middle grade students by helping them to "try out" a wide range of thinking strategies, by guiding the reasoning process, by providing opportunities to verbalize ideas, and by helping them to build new patterns of perception and analysis.

Another point to consider when integrating thinking skills into middle school instruction is that as adolescents master concrete operations and begin to develop formal operations, they begin to think reflexively: they become able to think about their own thoughts (Van Hoose & Strahan, 1989). The frustration at not being able to understand why they cannot perform a task that is beyond the current level of reasoning frequently leads to

rationalization. This defense mechanism may inhibit the students from attempting to think through challenging problems and thereby miss opportunities to extend their reasoning potential. To break this cycle, Van Hoose and Strahan (1989) have suggested that teacher create a classroom climate "where students are willing to take chances and think about their own thinking in more positive ways" (p. 17).

Establishing a classroom climate that encourages students to explore new ideas is an important element in promoting thinking and reasoning in any discipline, but particularly in language arts where the discussion mode is a thinking-generative means of interaction. A classroom atmosphere that reflects a respect for individual students' ideas, however diverse, and one that promotes an active engagement of students in the learning process not only encourages thinking, but gives students greater confidence in their own thinking abilities.

The application of modern cognitive development theory through cognitive instruction places the middle school level teacher in an active instructional role (Jones, 1986; Jones et al., 1987). By building on students' existing knowledge and attempting to enhance or change their repertoire of thinking and learning strategies, the teacher can influence the quality of learning: the emphasis is not only on content but on "the strategies required by that content to make learning meaningful, integrated, and transferable" (Jones et al., 1987, p. vii). The teacher's task is dual: s/he must consider which strategies students need in order to learn content and how students can be helped to learn to use these strategies. "The new vision of teaching is one of a strategies process in which the teacher takes the central role as both planner and mediator of learning" (p. vii).

Schurr (1989) noted, "One cannot ignore... the art of questioning and its undeniable importance in challenging the intellectual development of the early adolescent" (p. 15). The middle grades student, who is just beginning to think more abstractly, needs the concrete "building" offered through lower level questions; therefore, the teacher holds the key to higher level thinking by thoughtful questioning sequencing. A related factor is the post-question wait time. This latter consideration allows students time to process information and to think with more complexity, particularly important for the middle grades student who is "experimenting" with higher level and more abstract thought.

Rogers (1988) warned against the teacher using questioning in a way that the situation seemed more like an inquisition than an enlightened discussion. Questions need to encourage dialogue rather than inhibit thought, the latter of which happens when teachers approach the questioning process with the tone of interrogation and with an increased and rapid frequency. Rather than using questions as a form of verbal evaluation, he suggested making discussions more conversation-like, at times stimulating thought with declarative statements, deliberately pausing for more extended students responses, and encouraging students to ask questions of the teacher and other students. Since most adolescents interact more freely with other students than with teachers, by encouraging more student-student discussion and questioning, students' responses may become more elaborative (Dillon, 1982).

Johnston, Markle, and Haley-Oliphant (1987) made the following suggestions regarding questioning for teachers of early adolescents:

1) To foster a healthy self-concept among middle school students, ask a number of questions during recitations and discussions which provide ample opportunities for students to feel successful. Pose questions with more than one correct answer.

2) In recognition of the social needs of early adolescents, center some questioning activities around small group work. Small problem-solving groups afford students the chance to talk and debate with peers.

3) The design and implementation of questioning activities should take into account students' personal and academic backgrounds, academic levels, and interests. (p. 33)

Within the context of middle school language arts curriculum and with specific instructional strategies that build on interactive and guided thinking practices, teachers can provide opportunities for the wide range of students in transition from the concrete-manipulatory stage to the capacity for abstract thought. An interactive and expectant classroom climate provides a conducive setting; guided discussion around carefully-formulated questions adds challenge to sustain and extend student thinking. These classroom conditions and instructional approaches can be helpful in the healthy intellectual development of the middle grades student.

Summary

Teachers are both facilitators and mediators of students thinking. The classroom climate they instill and the kinds of inquisitive interaction that they promote can help students to exercise their cognitive skills. Costa (1985) stated that "[w]hat a teacher says and does in the classroom greatly

affects student learning" (p. 125). Bernard de Jouvenal, a French philosopher said, "'People do what you expect of them'" (Segal et al., 1985). If a teacher expects students to examine their thoughts, to give their best cognitive performance, students are more apt to do so. They will do so even more readily if the teacher encourages as well as provides the opportunity for active thinking and the open exchange of ideas.

Emerging theories of how the brain functions in the thinking and learning process and more enlightened theories about the thinking and learning capacities of individuals may begin to change teacher expectations for learning potential in the classroom. The research indicates that students learn and think better in an environment free from threat and controlled passivity. Learning is an extremely complex phenomenon, yet research in cognitive and neurological science has given clues as to the most conducive conditions for both. This research also indicates that learning is affected by both internal and external conditions.

Teachers can play a significant role in setting the stage for student thinking and in using specific instructional techniques that challenge students to think at a higher level. Creating classroom conditions where ideas are freely exchange and openly accepted; where interaction is frequent and widespread; and where thinking is not only expected but valued is the first step. The second is to bring into this "safe" classroom a spirit of inquiry fostered by effectively- used questioning strategies. By helping students to process knowledge, by giving the opportunity through wait time for students to elaborate, by probing for more extensive or complex responses, by expecting students to substantiate or give a rationale

for responses, teachers provide students with the opportunity to think more interpretively and to defend ideas more logically. An encouraging and expectant teacher attitude linked with the continued use of questioning and interactive strategies could result in significant gains in level of student cognitive development.

CHAPTER III
METHODOLOGY

Subjects

The subjects in this study were seventh and eighth-grade students in a public school system in a Piedmont North Carolina city. The school system serves approximately 6,500 students enrolled in six elementary school (Grades K-5), two middle schools (Grades 6-8), and two high schools (Grades 9-12). Approximately 83% of graduating seniors enter higher education. With an approximate population of 40,000, the city is primarily a yarn and textiles industrial community. The school system offers instructional programs in adherence to federal and state regulations and guidelines. These programs include a comprehensive curriculum recommended by the State Department of Public Instruction's Basic Education Plan, a vocational education program, compensatory programs, programs for exceptional children and student support services. The system has also served as a pilot system for the North Carolina Career Development Plan and is accredited by the State Department of Public Instruction and the Southern Association of Colleges and Schools.

The racial composition of the Middle School A, located in the eastern section of the city, is minority, 44.64% and white, 55.36%. For the Middle School B, located in the western part of the city, this ratio is minority,

27.97% and white, 72.03%. The mean and range of the IQ by targeted grade level in each middle school are

School A	Grade 7	$\bar{x}$ =97.8	R = 60–139
	Grade 8	$\bar{x}$ =98.0	R = 61–139
School B	Grade 7	$\bar{x}$ =106.7	R = 68–150
	Grade 8	$\bar{x}$ =101.9	R = 56–140

Eight heterogeneous language arts classes, four on each grade level, were represented in the study. These language arts classrooms included students with a range of academic abilities; however, these classes did not include Academically Gifted (AG) and Educable Mentally Handicapped (EMH) students, who were homogeneously grouped at these grade levels, or Chapter I students, who were members of the classes but who received small-group reading instruction with a teacher assistant. Although the identification criteria for AG students consider achievement test scores and classroom performance in addition to IQ, the lower range score generally averages 125. The IQ criteria for EMH students is below 69, and Chapter I students are those who score below the 25th percentile on the California Achievement Test (CAT).

Four students, selected at random from each of the eight classrooms, comprised the sample group (n=32). Sixteen of the 32 students represented the four classrooms of the experimental group, and 16 represented the four classrooms of the control group. Due to the attrition of two students, one in each group, the sample group was reduced to 30, 15 per group. Table 1 compares the students by class and group on composite age standard IQ score on the Cognitive Abilities Test (composite scores) and percentile and

grade equivalent on the total reading battery of the California Achievement Test (CAT). Table 1 also gives descriptive scores for the total group (n=30). A comparison of the scores indicated that reading achievement and intelligence were similar between the two groups.

Design

The study followed the Pretest-Posttest Control Group Design (Campbell & Stanley, 1975). In the spring of 1989 the researcher observed a 20-minute segment of a reading discussion in 12 seventh- and eighth-grade language arts classrooms. The Classroom Climate and Questioning Strategies observation instrument was used. The data from each observation were analyzed for the climate component, as indicated by frequency in response opportunity (section 1), for the questioning strategies component, as indicated by frequency in cognitive level and cognitive processes (sections 2 and 3). Data were also analyzed on the cognitive levels of questions and for the instances of sustained interaction during which the teacher used specific questioning strategies with individual students. A rank order was then established for the 12 teachers. The four teachers ranking in the high one-third were assigned to the experimental group, and the four teachers ranking in the low one-third were designated the control group. This assignment was for the purpose of maximizing the differences between the two groups of teachers in the observed use of the instructional practices. Table 2 shows descriptive data analysis of a representative teacher in each group.

Table 1

Subjects by Class, Group, and Total Sample on Cognitive Abilities Test (IQ) and Percentile and Grade Equivalent on Total Reading Battery of California Achievement Test (CAT)

	Cognitive Abilities Test	California Achievement Test	
	$\bar{x}$ IQ	$\bar{x}$ %tile	$\bar{x}$ Gr. Equ.
Experimental			
Class			
1	93.3	44	5.8
2	102.25	81.75	10.78
3	109.25	71	9.0
4	111	84.5	10.45
Group Mean	104.2	72.07	9.22
SD	11.47	20.96	2.72
Control			
Class			
1	109	79.75	9.63
2	102.25	59	7.73
3	102	72	8.78
4	106	60.67	7.77
Group Mean	104.6	68.33	8.52
SD	12.93	21.57	2.07
Total Sample	104.4	70.2	8.87
SD	12.01	20.98	2.4

Table 2

Descriptive Analyses of Representative Teachers in Experimental and Control Groups Based on Pre-Training Observations

Experimental Group
The teacher asked 14 knowledge level questions, 13 analysis, 1 focusing knowledge in a new direction, and 1 evaluating the new knowledge. On 13 occasions, the teacher sustained interaction with individual students by asking for textual proof (2 times), probing for more extensive responses (4 times), and cognitive sequencing (8 times high-to-low; 1 time low-to-high). On 12 occasions the students were asked to an alternate point of view. The teacher directed probing questions 3 times to the class, lower level follow-up questions 4 times, and higher level follow-up questions 3 times. All students were given a opportunity to respond to questions, and the students were invited to ask questions. The teacher was accepting of student responses and was consistent with wait time.
Control Group
The teacher asked 12 knowledge level questions, 5 analysis, 0 focusing knowledge in a new direction, and 1 evaluating the new knowledge. On no occasion did the teacher sustain interaction with an individual student; however, 5 probing and 5 lower level follow-up questions were directed to the class. On 6 occasions, students were permitted to give an alternate point of view. Eleven of the 26 students were called upon to participate in the discussion. The teacher was accepting of student responses and consistent with wait time; however, on one occasion the teacher did not provide sustaining feedback to an incorrect response and passed the question to another student.

In the summer prior to the beginning of the 1989-90 school year, the researcher conducted the training for the four teachers in the experimental group. The 10-hour staff development, "Are Your Classrooms 'Safe' for Thinking?" was designed by the researcher to acquaint teachers with cognitive instruction, learning theory, positive classroom climate setting practices, and questioning techniques and strategies that challenge higher level thinking. The staff development teacher's manual for "Are Your Classrooms 'Safe' for Thinking?" appears as Appendix A . The four participants spent the remainder of the three- day training period discussing and planning specific instructional and questioning strategies for integration into the specific grade level language arts curriculum.

At the beginning of the 1989-90 school year, a sample group of 32 students, four from each of the eight classrooms, thus 16 from each group, were selected randomly from class rosters. A cognitive pretest was administered individually and under controlled conditions by the researcher to the 32 students during the first month of school. The pretest data were analyzed to determine if significant differences existed between the experimental and control groups. No significant differences were found.

Two follow-up observations, one each semester, were conducted by the researcher in the classrooms of both control and experimental groups. Data from these 20-minute observations of group reading discussions were to record the use of the training practices by the experimental group and to check for the consistency of previously-observed instructional practices by the control group. The data were analyzed for classroom climate (response

opportunity), and questioning strategies (cognitive level of questions and cognitive processes). The data were also analyzed for cognitive levels of questions (knowledge, analysis, synthesis, evaluative) and the number of sustained interactions (use of questioning strategies with individual students). The Chi square statistic was used to analyze the differences between the two teacher groups on classroom climate, questioning strategies, level of questions, and sustained interaction.

A cognitive posttest was administered by the researcher to the 30 students during the ninth month of the school year. (Attrition of one student per group.) Identical pretest procedures were followed. The cognitive pretest and posttest were given to assess the level of student thinking at the beginning and end of the study to determine if the instructional practices used by the experimental group had a significant influence on level of student cognitive development. An analysis of variance was calculated to determine if significant differences existed between the groups on cognitive posttest scores.

Instruments

The researcher-developed Classroom Climate and Questioning Strategies observation instrument was used by the researcher in determining 1) the prevalence of the instructional practices in the 12 language arts classrooms observed prior to the study; 2) the selection of the four teachers for the experimental group and the four for the control group; 3) the extent to which the teachers in the trained (experimental) group increased and/or maintained the use of the instructional practices during

the period of the study; 4) the extent to which teachers in the control group maintained consistency in the use of the practices during the study; and 5) the relationship of the use of the practices to level of student cognitive development. A copy of the Climate and Questioning Strategies instrument and the directions for its administration and scoring appear as Appendix B.

The 20 teacher practices represented on the observation instrument are clustered by the three areas of response opportunity (7), cognitive level of questions (4), and cognitive processes (9). The instrument represents a synthesis of the research on classroom climate, teacher expectations, cognitive instruction, learning theory, and questioning strategies, and it provides a means to document teacher-student and student-student interaction during classroom discussion. The research base for the instrument has suggested that teachers who use many of these practices consistently should create a positive classroom climate and cognitively challenging questioning. These practices reflect the instructional strategies taught during the staff development, "Are Your Classrooms 'Safe' for Thinking?"

Construct validity for the instrument appears as Appendix C. The instrument was pre-tested by the researcher and a second observer during joint observations of discussions in classrooms comparable to those in the study. An inter-rater agreement estimate (83%) was established based on the recorded frequency of the instructional practices during three-second intervals. Because of the complexity and pacing of classroom discussion and as a check for accuracy of question and process classification, a tape recorder was used by the researcher during all classroom observations during the study.

The student cognitive test used as a pre-and post- measure of the level of student cognitive development consists of 30 questions based on the short story "Charles" by Shirley Jackson. The questions reflect an integration of The Taxonomy of Educational Objectives (Bloom, 1956); the Cognitive Preference Questioning Inventory (Gallagher and Aschner, 1963; Cunningham, 1971); and questioning strategies suggested by Brophy (1986), Costa (1984), Jones (1986), Smith (1976), and Shiman (1976). Ten of the 30 questions parallel the four cognitive levels represented on the Classroom Climate and Questioning Strategies observation instrument: 2 on cognitive level 1 (setting up the knowledge base); 5 on level 2 (analyzing the new knowledge); 2 on level 3 (focusing the knowledge in a new direction); and 4 on level 3 (evaluating the new knowledge). Seventeen of the test items are cognitive process questions that probe for more extensive or complex responses, ask for explanation and inferential interpretation based on textual clues and details, and assess metacognition and questioning aptitude. Question items 21–26 are arranged in a specific high-to-low-to-high cognitive sequence. A copy of the story and the test script with directions appear as Appendix D.

"Charles" appears in Junior Great Books, Series 5, (Vol. 1) and in seventh and eighth grade state adopted and supplementary textbooks. Criteria for selection of the story include adaptability to interpretive discussion, interest level, and length (four pages). The story was field-tested by the researcher during inquiry-based discussions with eight classes of students reading on a comparable level to those in the study. Questions for the cognitive test were selected among those used during the

field-testing, and include two that were asked by students. The test questions were also cross-checked with those generated by the teacher participants during the field-testing of the training program.

The student cognitive test was administered individually to students during a time interval of approximately 30 minutes. Students were asked to read the selection prior to the testing session and were permitted to have a copy of the story during the session for reference. Wait time after each question was posed and after a student response was given, as specified in the test directions, allowed for information processing, higher-level thinking, and elaboration.

The student cognitive test was coded by assigning points from one to three based on three levels of responses. The maximum score, therefore, was 90 and the minimum, 30. Definitions and examples for each of the three levels of responses appear in Table 3. A complete test response analysis with prototype level examples appears as Appendix E. The descriptors for each response level were generated by the researcher following the reading of all 32 students' responses on the pretest. To assess the reliability of the descriptors, an independent reader classified 3 of the 32 pretests using the test response analysis (Appendix E). A coefficient of inter-rater agreement using a formula for estimating the degree of agreement was calculated for each response item. The coefficient of agreement (83%) compares equitably with those reported in other studies (Squire, 1964; Strahan, 1982). It was concluded that the classification scheme could be used for categorizing test responses.

The staff development program, "Are Your Classrooms 'Safe' for Thinking?" was developed by the researcher for the purpose of training

Table 3

Definitions for Analyses of Levels of Responses on the Student Cognitive Test

Level 1:	No response; incorrect or partially correct response, indicating confusion of facts; or response is unsubstantiated or fails to provide additional information.
Examples:	"Cause Laurie told her all this stuff about Charles's mom and she wanted to see and meet her..." "Laurie says all these things to get his parents worried." "Like hitting the teacher's friend. I think he would have done that because most boys are mean."
Level 2:	A correct response that is general or fails to draw reference to a specific textual clue; or a correct response without elaboration or explanation.
Examples:	"Because he got in trouble so much that she wondered why it was happening." "He acts kind of strange when he comes home from school."
Level 3:	Response gives specific textual clues that reference the story; response provides a plausible, logical, or insightful explanation that links evidence to inference; or response is accompanied by rich detail or unsolicited elaboration.
Examples:	"He played practical jokes at home...started acting rebellious against his parents as well as Charles against his teacher. He started trying to be a bigger person than he really was like Charles in school. His grammar deteriorated and wasn't that great in school, either." "One thing..they didn't mention anything to Laurie that teacher did call home. If did call home,..may have realized he was telling a lie and paid more attention to his problem."

teachers in the experimental group in climate setting and questioning strategies conducive to higher level thinking. The 10-hour workshop acquainted teachers with current cognitive development theory, with ways to create a thinking and learning-compatible classroom climate, and with techniques for developing questioning strategies that optimize individual students' cognitive growth. The training focused on teacher attitudes and actions that promote student thinking and learning and on inquiry and interaction strategies that stimulate the thinking process. The program was based on the following assumptions:

1. All students can and do think.
2. All students can learn to think better.
3. Teachers can help all students improve their thinking.
4. Teachers can facilitate student thinking and learning by creating a receptive and interactive classroom climate.
5. Teachers can stimulate student thinking through questioning strategies that promote discussion and inquiry.

The program was based on the rationale that many teachers may feel overwhelmed by the vast array of thinking skills programs on the market, that they may have little or no time left in the school day to "add on" the teaching of thinking, and that they may be uncertain how to integrate higher level thinking into regular classroom instruction. Teachers may also be unsure of what classroom conditions and instructional strategies best promote thinking and learning. Climate setting techniques conducive

to student thinking and instructional strategies that challenge the level student thinking were based on:

1. Frequent student-teacher and student-student interactions;
2. Heightened and enlightened teacher expectations;
3. An understanding of how students think and learn; and
4. Knowledge of specific questioning strategies, including cognitive sequencing, and follow-up and feedback techniques.

The goals of the program for student cognitive development were:

1. Increased ability to respond to questions beyond recall and comprehension, including analysis, synthesis, and evaluation;
2. Expanded ability for interpretive and inferential thinking;
3. Increased ability for in-depth responses to questions; and
4. Heightened spirit of critical inquisitiveness.

The program was field-tested by the researcher as a staff development consultant for the Burlington City Schools, Burlington, North Carolina, during the spring, 1989. Thirteen (86.7%) of the 15 teacher participants, ranging from second grade to high school, responded "Strongly Agree" that the workshop was a successful training experience on the North Carolina Staff Development Evaluation; the other 2 (13.3%) participants responded, "Agree Somewhat." Participants were also asked to give evaluative input on the following questions:

1. Which activities/discussions helped you the most about climate setting and questioning strategies?

2. Which activities would you consider the least helpful?

3. What do you consider the most effective aspects of the workshop?

4. What changes would you suggest that might strengthen the workshop?

5. Do you feel more comfortable with the aspects of classroom climate setting and the use of questioning strategies as a result of the workshop?

Comments:

Suggestions, such as to provide time for practicing questioning strategies during simulated discussions and for designing and integrating strategies for specific grade level curriculum, were considered and/or incorporated before the workshop was administered to the four teachers in the study.

Procedure

In late April, 1989, prior to the closing of the school year, the researcher met with the superintendent of the school system to explain the nature and purpose of the dissertation research and to seek permission to conduct the study in the two middle schools in the system. Support was expressed and permission granted by the superintendent, contingent upon the approval of both middle school administrators. A memorandum was sent to each principal from the superintendent, individual meetings were scheduled with each by the researcher for early-May, 1989, and a folder containing copies of pertinent materials was delivered for each to preview

prior to the meeting. During the meetings the researcher gave an overview of the study, explained what would be requested of each participant, and addressed related questions. Permission to conduct the study during the school year of 1989-90 was granted by both administrators.

Also, in May, 1989, permission was granted by the special assistant for staff development for the researcher to conduct the workshop through the school system with one renewal credit per contact hour. Approval was granted for three 6-hour days prior to the opening of the 1990 school year, thus allowing time for the 10-hour training and for supervised curriculum planning. An upstairs classroom in the administrative office building, a frequent setting for system staff development because of its central location, was selected as the site for the workshop.

In mid-May the researcher met briefly with the 12 seventh and eighth-grade language arts teacher during individual planning periods to request permission to observe one 20-minute reading discussion as a preliminary step in preparation for the dissertation study. Each was informed that the dissertation focused on various kinds of discussion strategies to the level of student thinking. These observations were scheduled during regular classroom instruction during the latter two weeks of May. During the observations the researcher sat unobtrusively in an agreed-upon seat, most frequently a back row desk. Prior permission to use a tape recorder for accuracy was obtained; however, as not to bias any discussion, no teacher was given an opportunity to view the observation instrument. Students, accustomed to multiple observations by observer/evaluators and administrators during the year, were given minimum or no prior announcement.

The researcher analyzed the data from the preliminary observations based on response opportunity, (climate component), cognitive level of questions, cognitive processes, and the use of specific questioning strategies through sustained interactions with individual students (questioning component). Individual teachers were ranked on a continuum from high to low frequency of observed practices. The four teachers clustered in the high one-third of the scale were placed in the experimental group; the four teachers clustered in the low one-third were assigned to the control group. All 12 teachers received a thank-you response for assisting the researcher in this part of the study.

During individual planning periods in the late May, 1989, the researcher met with each of the four teachers selected for the experimental group to discuss further involvement in the study. During oral presentation the researcher reiterated that the dissertation focused on the relationship of various kinds of discussion strategies to the level of student thinking. The teachers were told that permission had been granted by the school system to involve four teachers in staff development designed by the researcher and based on instructional practices that support student thinking. They were informed of the nature of the workshop, the opportunity for renewal credit, and the receipt of a stipend commensurate to that offered by the school system for staff development held during vacation days.

The oral presentation explained that two follow-up observations by the researcher would be involved, one per semester, as would a pretest and posttest measure of the level of student thinking. One heterogeneous language arts class would be chosen by each teacher for the study. Within

this class, four students would be randomly selected from the roster, and a letter would be sent home requesting permission for participation in the study. For the student testing, each would be asked to read a short story independently and to respond individually and orally to questions asked by the researcher. The testing would be administered during a period of approximately 30 minutes scheduled at the convenience of the teacher during the language arts block in early September, 1989, and in late May, 1990.

The researcher maintained that all data and analyses would be kept confidential and that no part of the study was linked to teacher performance appraisal. The researcher also pointed out the need for commitment from each teacher to use the instructional practices consistently during reading discussions throughout the school year; however, the teachers were informed that, although the practices were research-based, the study was exploratory in determining the relationship to level of student cognitive development. Each teacher gave consent, and two days in mid-June were agreed upon for the training.

Similarly during individual planning periods in late May, 1989, the researcher met with each of the four teachers designated for the control group and invited each to participate further in the study. During the oral presentation the researcher reiterated that the dissertation focused on the relationship of various kinds of discussion strategies to the level of student thinking. Participation would involve allowing the researcher to observe two reading discussions, one per semester, during the 1989-90 school year. One heterogeneous language arts block would be selected by the teacher, and the observations would be scheduled during regular instruction. The

student involvement, to assist in determining the relationship of the discussion strategies to the level of student thinking, was explained in context parallel to the presentation to the experimental group. The information involving confidentiality and risk was also similarly presented. Each teacher gave consent to participate in the study.

The researcher conducted the staff development on two days in mid-June, 1989 and a third day in late July for the four teachers in the experimental group. One-fourth of the training period was used by the teachers to prepare specific story questions and to plan instructional strategies for the beginning of the school year under the supervision of the researcher. In evaluating the training, each teacher expressed an understanding of what has been taught and a confidence in integrating the climate setting and questioning strategies into the regular language arts curriculum for the 1989-90 school year.

During the first week of September, beyond the first 10 days during which adjustments in class rolls normally take place, the researcher met briefly with each of the eight teachers during individual planning periods to select students for the study. Class rolls for the targeted language arts blocks, one per teacher, were divided into quartiles, the initial student in each section being selected for the sample. The researcher met with each cluster of four students for a scheduled 15-minutes in the conference room for the purpose of inviting each to participate in the study.

The researcher informed the students that she was a doctoral student at the University of North Carolina at Greensboro and explained the purpose of a dissertation. The students were told each had been randomly

selected from the class roll to assist in the researcher's study which focused on the relationship of various kinds of discussion strategies to the level of student thinking in language arts classrooms; however, they understood that the decision to participate rested with them and their parents. The researcher gave each student a copy of the parent letter, read the contents aloud, and asked each who was interested to share the letter with his parents and to return it signed to his language arts teacher by the specified date. A copy of the letter appears as Appendix F.

The researcher further explained that she would script the students' responses, and that a tape recorder would be used to assist in the process and as a check for scripting accuracy. The researcher emphasized that involvement in the study would in no way affect the language arts grade, and that the teacher would assist with missed work during the time of the questioning. The letter assured parents of confidentiality, and a place on the permission slip was provided to request a copy of the student's performance. The phone number of the researcher was also given in the event of questions.

On the agreed upon return date, the researcher collected letters, distributed copies of the story "Charles," and gave instructions to read the story by a date previously designated by the language arts teacher as convenient for the cognitive pre-testing. All students' parents gave consent for participation in the study. Permission was also granted by school administration for use of the conference room during the testing.

During the second and third weeks of September the researcher administered the cognitive pretest individually to each of the 32 students during 30-minute time slots scheduled within language arts blocks. Two

students who were absent were rescheduled within this time frame. The distribution of language arts blocks over the school day matched for the experimental and control groups: one early morning, two mid-morning through lunch, and one following lunch.

The researcher escorted each student from the classroom to the conference room, a walk which allowed an opportunity for informal conversation. After both were seated at a table in the conference room, the researcher read aloud the directions, checked for understanding, turned on the recorder, and began the questioning. Test duration spanned from 15 to 25 minutes. Upon completion, the researcher expressed thanks and walked each student back to the classroom.

The researcher conducted two classroom observations, one each semester, with all teachers in the study to check for the transference of training practices among teachers in the experimental group and for the continuation of previously-observed practices among those in the control group. During January and again in April, 1990, the researcher used the Classroom Climate and Questioning Strategies instrument to observe reading discussions in each of the eight language arts classes. Scheduling, observation procedures, and observation time frame were consistent with that of the spring, 1989.

The procedure for the May, 1990 student cognitive posttesting was consistent with the pretest administration. A copy of the story was distributed to the 30 students to be read prior to the scheduled test day. Using the conference room, the researcher followed the same testing format, ending each session by expressing appreciation and by obtaining an address for follow-up correspondence to the parents. Information on

individual student progress and an expression of appreciation for permitting participation in the study was mailed parents in August, 1990. A letter of appreciation was also mailed to each student at this time.

In May, 1990, the researcher met individually with the four teachers in the control group to express appreciation for participation in the study with a small token and to obtain mailing addresses for correspondence during the summer. In July, 1990, a copy of the general findings and conclusions from the study was mailed to each.

On two occasions during the school year, one preceding the first semester observation, one following it, the researcher met with the four teachers in the experimental group to discuss any problems encountered thus far in the study and to provide feedback from the observation. A common problem ventured among the teachers was that time for discussion during language arts instruction was often limited to approximately three class periods per week. Furthermore, in School A, the limited supply of books forced the teachers to spend class time in oral or silent reading, again limiting discussion time. The feedback from the first observation was upon the request of the teachers, and the meetings were scheduled during individual planning periods. In addition, in July, 1989, the researcher met jointly with the four teachers to share the findings and conclusions from the study.

All data in the study were prepared for computer analysis using Statview SE + Graphics (1988). Data collected from the student cognitive tests were analyzed by computing means and standard deviations for each group and total group. An analysis of variance was computed between

pretest scores and race, sex, IQ, and total reading battery and grade equivalent on the California Achievement Test (CAT) to determine if a significant relationship existed between these variables. An analysis of variance was also calculated to determine if significant differences existed between the experimental and control groups on the cognitive posttest.

Data collected from the student cognitive tests were also analyzed by computing means and standard deviations by group on the frequency of each of the levels of responses. An analysis of variance was calculated for each response level to determine if significant differences existed between the two groups for any of the three response levels on the cognitive pretest and posttest.

The frequency data collected from the teacher observations were analyzed using the Chi square statistic for each variable considered in the study. The Chi square statistic for the climate component was computed using the frequency data for the Response Opportunity section on the Classroom Climate and Questioning Strategies instrument to determine if significant differences existed between the experimental and control groups on classroom climate practices. The Chi square statistic for the questioning strategies component was calculated using the frequency data from the combined Cognitive Level of Questioning and Cognitive Processes sections, with and without the frequency of sustained interactions with individual students, to determine if significant differences existed between the two groups on questioning strategies practices. The Chi square statistic for the level of questions was also computed using the frequency data for the Cognitive Level of Questioning section of the instrument to determine if

significant differences existed between the two groups on total frequency of question levels and between each of the four cognitive levels.

The teacher observation data were analyzed in response to the three major research questions presented in Chapter I. Should statistically significant differences exist between the two groups of students on the cognitive posttest, the question to be considered was whether or not level of student cognitive development was related to the elements of classroom climate, questioning strategies, or of the combination of the two element. The research questions were as follows:

> Do statistically significant differences exist between classroom climate and level of student cognitive development?
>
> Do statistically significant differences exist between teacher questioning strategies and level of student cognitive development?
>
> Do statistically significant differences exist between the combination of classroom climate and teacher questioning strategies and level of student cognitive development?

CHAPTER IV
RESULTS

The data collected from the student cognitive pretests were analyzed to establish if the students in the experimental and control groups showed statistically significant differences in level of cognitive development at the beginning of the study. Table 4 presents the mean and standard deviation scores for individual and total group on the pretest. An analysis of variance between group pretest scores indicated no significant differences (F-Ratio = 0.323, $p < 0.574$, SS = 6.533, df = 1, MS = 6.533) between groups.

As Table 5 indicates, an analysis of variance between student cognitive pretest scores and race, sex, the Cognitive Abilities Test (composite score) and the California Achievement Tests (total reading percentile and grade equivalent) resulted in no statistically significant differences within the total sample. A two-way analysis of variance of the cognitive pretest scores and each of these variables also resulted in no statistically significant differences between the experimental and control groups. These data indicated that level of student cognitive development and the variables of race, sex, IQ, and achievement of the experimental and control groups were not statistically significantly different at the beginning of the study.

Additional data supporting that no statistically significant differences existed in level of student cognitive development between groups was indicated by the analyses of variance between groups on the

Table 4

Descriptive Statistics for the Experimental, Control, and Total Sample Scores on the Student Cognitive Pretest

Group	n	$\bar{x}$	SD
Experimental	15	51.667	5.627
Control	15	50.733	2.963
Total Sample	30	51.200	4.444

Table 5

Analyses of Variance of Student Cognitive Pretest Scores and the Variables of Sex, Race, IQ, and Achievement

Variables	SS	df	MS	F-Ratio	Prob >F
Total Sample					
Race	1.633	1	1.633	0.080	0.799
Sex	33.035	1	33.035	1.174	0.136
IQ Cognitive Abilities Test	221.008	6	36.835	2.408	0.06
Achievement %tile,Total Reading CAT	221.883	8	27.735	1.660	0.168
Gr. Equiv., Total Reading CAT	221.133	7	31.590	1.976	0.105
Between Groups					
Race	5.647	1	5.647	0.301	0.588
Sex	4.728	1	4.728	0.305	0.585
IQ Cognitive Abilities Test	1.2	1	1.2	.008	0 .929
Achievement %tile,Total Reading, CAT	104.533	1	452.295	.231	0.634
Gr. Equiv., Total Reading, CAT	2.7	1	2.7	.439	0.531

three levels of responses as coded on the student cognitive test. Students in the two groups did not show statistically significant differences on any of the three levels of responses on the cognitive pretest (level 1: F-Ratio = 0.171, $p< 0.683$; level 2: F-Ratio = 0.026, $p< 0.874$; level 3: F-Ratio = 0.825, $p< 0.371$).

In conclusion, the student cognitive pretest data indicated no statistically significant differences between the experimental and control groups in level of student cognitive development at the beginning of the study. Furthermore, the analyses of variance indicated that level of student cognitive development did not differ according to the variables of race, sex, IQ, and achievement.

Hypothesis I: Statistically significant differences do not exist between classroom climate and level of student cognitive development.

The first null hypothesis of this study stated that no statistically significant differences existed between classroom climate and level of student cognitive development. To determine if this hypothesis was supported by the data, it needed to be established if students in the experimental and control groups demonstrated significant differences in level of cognitive development as measured by the cognitive posttest. Table 6 presents the mean and standard deviation scores on the student cognitive posttest. The analysis of variance between group cognitive posttest scores showed statistically significant differences (F-Ratio = 9.994, $p < .004$, SS = 529.200, df = 1, MS = 529.200) between the two groups. It was established, then, that students in the experimental group scored higher on level of cognitive development than the students in the control group.

Table 6

Descriptive Statistics for the Experimental, Control, and Total Sample Scores on the Student Cognitive Posttest

Group	n	$\bar{x}$	SD
Experimental	15	65.467	8.774
Control	15	57.067	5.378
Total Sample	30	61.267	8.329

Additional data supporting a statistically significant difference in level of cognitive development between groups at the end of the study were indicated by the analyses of variance between groups on the three levels of responses as coded on the student cognitive test. Significant differences were indicated in the analyses of the first two levels on posttest responses between groups (level 1: F-Ratio = 5.965, $p< 0.021$; level 2: F-Ratio = 5.711, $p< 0.024$). The strongest difference, however, was indicated between group responses on level 3 (F-Ratio = 13.035, $p< 0.001$). Since level 3 reflected a higher level of student thinking on the cognitive test, i.e., elaborative, inferential, logical, and substantiated responses to question items, the analysis of variance of level 3 responses on the posttest further supported differences between the experimental and control groups in level of student cognitive development at the end of the study.

Since the students in the experimental group demonstrated a significant difference in level of cognitive development, it needed to be determined if this difference was related to classroom climate. A Chi square analysis of climate practices between groups, as represented by frequency of Response Opportunity practices on the Classroom Climate and Questioning Strategies observation instrument, showed significant differences between groups ($x^2= 128.918$, $p< .001$). This difference indicated a higher (positive) level of climate practices among the trained teachers whose students showed a higher level of cognitive development at the end of the study. It was accepted, then, that classroom climate had a statistically significant influence on level of student cognitive development. The first null hypothesis was rejected.

Hypothesis II: Statistically significant differences do not exist between teacher questioning strategies and level of student cognitive development.

The second null hypothesis stated that statistically significant differences did not exist between teacher questioning strategies and level of student cognitive development. Since the students in the experimental group showed significant differences in level of cognitive development, it needed to be determined if this difference was related to teacher questioning strategies. A Chi square analysis of questioning strategies between groups, as represented by frequency of Cognitive Level of Questioning, Cognitive Processes, and sustained interactions on the Classroom Climate and Questioning Strategies observation instrument, showed significant differences between groups ($x^2 = 201.589, p < .0001$). This difference indicated a significantly higher use of questioning strategies integrating cognitive level and process among the teachers whose students showed a higher level of cognitive development. This difference also indicated a significantly higher use of specific questioning strategies, i.e., probing for more extensive or complex responses, asking for rationale or substantiation for responses, high and low level question sequencing of questions, and metacognitive questioning strategies, during sustained interactions with individual students. These data indicated that teacher questioning strategies have a statistically significant positive influence on the level of student cognitive development. The second null hypothesis was rejected.

Additional data supporting the rejection of the second null hypothesis was indicated from a Chi square analysis of the frequency of Cognitive Level of Questions. The data in this second section of the Classroom

Climate and Questioning Strategies observation instrument represented the frequency of questions of each cognitive level asked during the observation period, the cognitive levels of follow-up questions when cognitive sequencing (high-to-low or low-to-high) occurred, and the cognitive level of questions offered to students for alternate points of view. The Chi square analyses between groups for total frequency of questions using the four cognitive levels and for total frequencies within individual levels is shown in Table 7. The statistic ($x^2 = 47.046$, $p < .001$) between groups for overall frequency of cognitive level of questions indicated a significant difference between the two groups. As Table 7 indicates, however, group differences between individual cognitive levels of question were not consistent.

The teachers in the control group asked a higher percentage (51.28%) of questions at the knowledge level than the teachers in the experimental group (48.72%). At the analysis (56.83%), synthesis (55.56%), and evaluative levels (87.5%), however, the teachers in the experimental group asked the higher percentages of questions. Although Table 7 does not indicate the purpose for the teachers' use of any particular level, (i.e., cognitive sequencing, review of information), it does reveal that the teachers in the experimental group demonstrated a higher percentage of questions at the cognitive levels above the factual recall and basic comprehension. Since a student's ability to respond to higher cognitive level questions (i.e, analysis, synthesis, and evaluation), was operationally defined as an indicator of level of student cognitive development, the teacher practice of asking students questions at a higher level was recognized as an

Table 7

Percent Totals for Experimental and Control Groups on Cognitive Levels of Questions on Classroom Climate and Questioning Strategies Instrument

	Experimental	Control
Knowledge	48.72%	51.28%
Analysis	56.83%	43.17%
Synthesis	55.56%	44.44%
Evaluative	87.5%	12.5%
Combined Levels	58.4%	41.6%

effective questioning strategy. Viewed from this perspective, the data on the use of individual cognitive levels between groups supported the rejection of the second null hypothesis.

Hypothesis III. Statistically significant differences do not exist between the combination of classroom climate and questioning strategies and level of student cognitive development.

The third null hypothesis stated that statistically significant differences did not exist between the combination of classroom climate and teacher questioning strategies and level of student cognitive development. Because it was established that the classroom climate is significantly related to level of student cognitive development ($x^2 = 128.918$, $p < .0001$), and because it was established that teacher questioning strategies were significantly related to level of student cognitive development ($x^2 = 201.589$, $p < .0001$), the position could be taken that the combination of these two elements was also significantly related to level of student cognitive development. Table 8 presents a summary of the Chi square statistical analyses for climate and the questioning strategies element as documented by observations using the Classroom Climate and Questioning Strategies instrument. The conclusion supported by these data is that the combination of classroom climate and teacher questioning strategies was significantly related to level student cognitive development. The third null hypotheses was rejected.

The data generated by this study supported the rejection of the three null hypotheses presented in Chapter I. Statistical analyses have been

Table 8

Chi Square Analyses on Between Experimental and Control Groups for Elements of Classroom Climate and Teacher Questioning Strategies from Classroom Climate and Questioning Strategies Instrument

	Chi Square	
Classroom Climate		
Response Opportunity	$x^2 = 128.918$	($p < .0001$)
Teacher Questioning Strategies		
Cognitive Level of Questions	$x2 = 47.046$	($p < .0001$)
Cognitive Level and Processes	$x^2 = 201.589$	($p < .0001$)

presented that classroom climate had a statistically significant influence to level of student cognitive development. Statistical analyses have been presented that teacher questioning strategies had a statistically significant influence on level of student cognitive development. Statistical analyses have also been presented that the combination of classroom climate and teacher questioning strategies had a statistically significant influence on level of student cognitive development.

CHAPTER V
DISCUSSION

Summary

The purpose of this study was to determine if the elements of classroom climate and teacher questioning strategies, singularly or collectively, have an influence on level of student cognitive development. The impetus for the study was the desire to develop an instructional approach that would enable teachers to create a positive thinking and learning classroom climate and to integrate specific higher level thinking strategies within the regular curriculum.

A classroom observation instrument, Classroom Climate and Questioning Strategies, was developed and utilized to document the frequency of classroom climate and questioning strategies practices used by teachers during class discussions. Classroom climate practices were represented by the opportunities teachers provide students to participate and interact and by their treatment of students' questions and answers. Questioning strategies practices were represented by the integration of cognitive level and process, and by the use of specific questioning strategies during sustained interactions with individual students.

The Classroom Climate and Questioning Strategies observation instrument was used to cluster eight seventh and eighth grade language arts teachers on the basis of frequency of climate and questioning practices

during a 20-minute reading discussion. The four teachers demonstrating the higher frequency of observed practices formed the experimental group. Prior to the beginning of the school year, these four teachers participated in the staff development program, "Are Your Classrooms 'Safe' for Thinking?" Based on instructional theory and practices in positive climate setting and questioning techniques, this training program was developed to acquaint these teachers with current cognitive theory and to strengthen climate and questioning practices. The four teachers demonstrating the lower frequency of observed practices formed the control group and received no training prior to the schcol year.

Thirty students, randomly selected from the eight language arts classrooms, comprised the sample. A student cognitive test was used as the pretest and posttest measure of level of cognitive development of the 15 students in each group. The cognitive test was designed to elicit higher level thinking by students as demonstrated through oral responses to questions on the short story "Charles," by Shirley Jackson. The student responses were coded on the basis of factual correctness and comprehension, specificity, logic, and plausibility, and elaborative, inferential, and substantiated textual interpretation.

In order to examine the relationship of classroom climate and teacher questioning strategies to level of student cognitive development, student pretest data was analyzed for differences based on race, sex, IQ, and achievement. No significant differences existed within and between groups on these variables. Data collected from the the student cognitive posttests were analyzed using an analysis of variance to determine if

significant differences existed between the experimental and control groups in level of student cognitive development at the end of the school year.

Once each semester of the year of the study, the Classroom Climate and Questioning Strategies observation instrument was used to document the frequency of these teacher practices during scheduled 20-minute reading discussion observations. The Chi square statistic was used to analyze differences between groups on frequency of response opportunity practices, representing the classroom climate element. The Chi square statistic was also used to analyze differences between groups on frequency of question level and cognitive process practices, representing the questioning element. The Chi square statistic was used further to analyze group differences of frequency of questions asked per cognitive level, data which supported the questioning element. These analyses were used to determine if statistically significant differences existed between the experimental and control groups on the climate and questioning practices. The analyses were used to determine if classroom climate and teacher questioning strategies have a statistically significant influence on level of student cognitive development.

Based on the classroom climate, questioning strategies, and student cognitive development data compiled in this study, the following null hypotheses were tested:

H_0 1 Statistically significant differences do not exist between classroom climate and level of student cognitive development.

H_0 2 Statistically significant differences do not exist between teacher questioning strategies and level of student cognitive development.

H_0 3 Statistically significant differences do not exist between the combination of classroom climate and teacher questioning strategies and level of student cognitive development.

Hypothesis I: Classroom Climate and Level of Student Cognitive Development.

The data generated by this study did not support the null hypothesis that no statistically significant differences existed between classroom climate and level of student cognitive development. The Chi square analysis of frequency of teacher classroom climate practices (Response Opportunity) as documented by the Classroom Climate and Questioning Strategies observation instrument indicated a statistically significant difference between the experimental and control groups. An analysis of variance of the posttest scores on the student cognitive test also indicated statistically significant differences between students in the experimental and control groups. Since the analyses of variance of student cognitive pretest scores indicated no significant differences in the variables of race, sex, IQ, and achievement, the significant cognitive posttest difference was attributed to level of student cognitive development. Since the level of student cognitive development in the experimental group was significantly different from the control group, and since the classroom climate teacher practices were also significantly different between groups, a relationship was indicated between classroom climate and level of student cognitive development.

The rejection of the first null hypothesis indicated that a positive classroom climate had an influence on level of student cognitive development. High climate practices used by teachers in the experimental

group included distributing questions equitably among students, accepting valid student responses in a nonjudgmental manner, using sustaining feedback to help student to arrive a successful answers, and providing students with the opportunity to express alternate points of view, ask questions, and respond to each others' questions. These positive climate practices were significantly related to level of student cognitive development as demonstrated by an increased ability among students to use higher level thinking skills.

The level of student cognitive development was indicated by the quality of students' oral responses to questions that integrate cognitive level and process. These questions were formed to elicit the higher cognitive thinking skills of analysis, synthesis, evaluation, interpretation, inference, logic, elaboration, and questioning aptitude. The ability to respond to questions that check for comprehension and assess skills of analysis, synthesis, and evaluation reflected the level of student cognitive development. The ability to respond to questions that require inferential thinking; that probe for more extensive, complex or elaborative answers; that ask for rationale and substantiation; and that require metacognitive or reflective thinking were other indicators of level of student cognitive development. Responses that were logical, reflective, and elaborative, and that were factually, interpretively, hypothetically, and evaluatively substantiated with textual proof indicated a high level of student cognitive development. Student-initiated higher cognitive level questions were also indicators of this higher level thinking development.

Hypothesis II: Teacher Questioning Strategies and Level of Student Cognitive Development.

The data generated by this study did not support the null hypothesis that no statistically significant differences existed between teacher questioning strategies and level of student cognitive development. The Chi square analysis of the frequency of teacher practices on the questioning strategies component (Cognitive Level of Questions and Cognitive Processes) as documented by the Classroom Climate and Questioning Strategies observation instrument indicated that the statistical difference between experimental and control groups was significant. Since the analysis of variance of the student posttest scores on the cognitive test indicated a statistically significant difference between groups; and since a pretest comparison indicated no statistically significant differences on the variables of race, sex, IQ, and achievement, the significant cognitive posttest difference were attributed to level of student cognitive development. Because level of student cognitive development between the experimental and control groups was significantly different, and because the questioning strategy teacher practices was significantly different between groups, a relationship was indicated between questioning strategies and level of student cognitive development.

This finding also indicated that the teachers in the experimental groups interacted more frequently with individual students by probing for more extensive or complex answers, by asking for rationale or textual proof, by using sequencing strategies to help students recall knowledge or to think on a higher level, and by using metacognitive strategies that

encourage students to think about how they arrived at a particular answer. These questioning practices of teachers in the experimental group supported the finding that teacher questioning strategies have a positive influence on level of student cognitive development.

The relationship between questioning strategies and level of student cognitive development was further supported by the frequency data on the Cognitive Level of Questions section of the Classroom Climate and Questioning Strategies instrument. The Chi square analysis between groups indicated a statistically significant difference in combined cognitive levels. The percentage of questions per cognitive level used by each group, however, varied. The teachers in the experimental group asked a higher percentage of questions at each level (analysis, synthesis, and evaluative) above the knowledge level, with the most noticeable difference at the evaluative level. The teachers in the control group asked a higher percentage of questions at the knowledge level, yet a lower percentage of analysis, synthesis, and evaluative questions.

These data indicated that teachers in the experimental group used higher cognitive levels of questioning more frequently during discussion either in initiating verbal interaction with students, sequencing questions (high-to low, low-to-high), or offering questions for alternate points of view. This analysis of the questioning practices of the experimental group supported the conclusion that teacher questioning strategies have a positive influence on level of student cognitive development.

The rejection of the second null hypothesis indicated that teacher questioning strategies have a positive influence on level of student cognitive development. These questioning practices included providing post-question

and post-response wait time, of probing for more extensive or complex responses, of asking students to give rationale, provide proof, or reflect upon thought processes, of sequencing follow-up questions, and of eliciting higher cognitive questions from students. These questioning practices also included use of a higher percentage of questions above the knowledge level. These teacher questioning strategies were statistically significantly related to the development of higher level thinking among students.

Hypothesis III: Combination of Classroom Climate and Teacher Questioning Strategies and Level of Student Cognitive Development.

The data generated by this study did not support the null hypothesis that no statistically significant differences existed between combination of classroom climate and teacher questioning strategies and level of student cognitive development. The Chi square analyses of the individual elements of classroom climate and teacher questioning strategies, as documented by the Classroom Climate and Questioning Strategies observation instrument, indicated that the statistical difference between experimental and control groups was significant on each element. Since the analysis of variance of the student posttest scores on the cognitive test also indicated a statistically significant difference between groups, it was concluded that a relationship existed between the combination of classroom climate and teacher questioning strategies and level of student cognitive development.

These findings indicated that the positive climate practices of providing opportunities for classroom interactions used in combination with questioning strategies that integrate cognitive level and process had a

positive influence on level of student thinking. High climate teacher practices included giving students the opportunity to answer and to initiate questions, accepting valid student answers in a nonjudgmental manner, allowing for alternate viewpoints, and helping students arrive at successful answers through sustaining feedback. Teacher questioning strategies included providing wait time, asking more questions at a higher level, and asking follow-up questions for extension, elaboration, substantiation, rationale, and reflection. These climate and questioning practices had a positive influence on students' abilities to respond more elaboratively, interpretively, substantially, logically, and inquisitively to oral questions asked on a variety of cognitive levels. The combination of classroom climate and teacher questioning strategies had a statistically significant positive influence on level of student cognitive development.

Implications

The theoretical implications of the findings that classroom climate and teacher questioning strategies have a positive influence on student cognitive development can be discussed with respect to the supporting research. As indicated in Chapter I, emerging cognitive development theory has placed an emphasis on how an individual thinks and learns, on the external and internal factors that influence thinking and learning, and on the possibility of expanding or accelerating one's thinking and learning (Clark, 1983; Detterman & Sternberg, 1982; Gardner, 1985; Hart, 1975, 1981, 1983a, 1983b, 1986; Kirby & Biggs, 1980; Sternberg, 1984). This focus on the dynamics of the individual's capacity to think and learn and on the

conditions that enhance this learning accentuates the teacher's strategic role in setting a positive classroom climate and in providing cognitive instruction. The statistically significant gains in higher level thinking ability by students in the experimental group are influenced by a positive, expectant, and interactive classroom climate and to the cognitive challenge of inquiry-oriented and process-based teacher questioning strategies.

Beyer (1987) noted that proficiency in students' thinking abilities was developed in supportive settings where teachers communicate that ideas and inquiry are accepted and valued; he also noted that effective thinking was the result of deliberate, sustained and conscious effort on the part of the teacher. The research of Good and Brophy (1984, 1990) and Good and Weinstein (1986a, 1986b) confirmed that frequent and equitable interaction through response and questioning opportunities conveyed to students that their involvement was meaningful. Students' perceptions of the nature of classroom interactions and of the expectations communicated by teachers are linked to their beliefs about their own thinking and learning abilities.

Fostering attitudes of respect for and desire to give and seek reasons, to consider various points of view, to suspend judgment, and to judge and evaluate alternatives undergirds the thinking process (Beyer, 1987). Barell (1985b) concurred that the teacher's ability to generate trust, open communication, and willingness to tolerate and encourage differences within a warm and supportive environment was an imperative for higher level thinking. Furthermore, this supportive classroom environment creates the nonthreatening, brain-compatible conditions in which higher and more complex learning takes place (Hart, 1975, 1981, 1983a, 1983b, 1986).

Marzano et al. (1990) have suggested that students' attitudes and perceptions about self and environment, self and others, including teachers and peers, and self and task, including personal competence were relevant to the learning climate. The students in the experimental classrooms benefitted intellectually from a climate in which ideas were exchanged and accepted in a nonjudgmental manner, in which various points of view were invited and the fear of "one right answer" minimized, where sustaining feedback was provided to help them achieve success, and where interaction through response and questioning opportunity was expected, frequent, and equitable. Within these supportive classrooms, the students felt "safe" to express ideas without recrimination, to give opinions within a tolerant setting, to initiate questions and to answer each others' questions, and to take a risk with higher level thinking.

The cognitive growth in the students in the experimental group was also related to consistent efforts by the teachers to challenge their thinking through cognitive questioning strategies. Several theorists have proposed that effective questioning techniques incorporate both sequencing and process strategies (Barell, 1985b; Brophy, 1986; Gall, 1984; Hunkins, 1987, 1989; Sanders, 1979; Shiman, 1976; Strother, 1990; Smith, 1976). Thoughtful integration of cognitive levels helps students to focus on specific information, to extend their thinking to a higher cognitive level, and to develop new thoughts based on previous knowledge. An appropriate sequence strategy may begin with a teacher's higher level question and follow with lower level questions that call for textual support and substantiation. A different strategy may begin with lower level questions to help students integrate facts and proceed to higher level questions that call

for higher order thought. Other process strategies may call for more complex or metacognitive thinking.

The use of these cognitive questioning techniques, particularly during sustained interaction with individual students, distinguished the teachers who made the greater impact on student higher level thinking. Proponents of the thinking skills movement (Beyer, 1987, 1990; Ennis, 1987; Paul, 1987) have suggested that dialogue-based sustained efforts to explain one's point of view, to give reasons or evidence for what one is saying, to give alternate ways of looking at a position stimulate critical thinking. Skillful thinkers are those who can respond to probing and can justify assertions. The students in the experimental group were given more sustained opportunity to develop these higher level thought processes through inquiry-oriented instruction.

This exercising of the cognitive levels through process and sequencing strategies directly parallels the cognitive development theory (Barell, 1985b; Hart, 1975, 1981, 1983a, 1983b, 1986; Jones, 1986; Jones et al., 1987; Marzano, Pickering & Brandt, 1990; Nummela & Rosengren, 1986; Resnick, 1984; Shulman, 1984). Helping students to form new patterns of thinking by relating new information to what is familiar, to organize it through association with existing knowledge, and to create new knowledge structures are practices supportive of brain-compatible learning and cognitive instruction. Costa (1985) and Wilen (1987) concurred that to facilitate answers, teachers needed to perceive students' informational needs and provide what was needed to help them respond. The practice of cognitive sequencing and processing strategies by teachers in the

experimental group reflected the practice of learning theory and cognitive development principles. Furthermore, this purposeful integration of various cognitive levels has support in the research that questions asked on higher cognitive levels elicit higher levels of student thinking, though not to the exclusion of questions that require a recall of information (Brophy, 1986; Gall, 1984; Norris, 1985).

The theoretical implications of the study are also supported in the literature on the adolescent. As discussed in Chapter I, the Carnegie Council Task report (1989) recognized the need to help the adolescent acquire inquiring habits of mind by providing them with opportunities to think about and communicate ideas, to participate actively in their learning, and to discuss, analyze, and express opinions. The adolescent years are intellectually formative; the middle grades teacher can actively help students develop the discipline of mind needed for critical, analytical, and evaluative thinking.

The teachers in the experimental group exhibited an understanding of the learning process from a psychological perspective by creating a classroom climate low in anxiety and fear, yet high in meaningful and appropriate challenge. Within a supportive, accepting, and inviting setting, students were actively involved through varied and reflective questioning that encouraged them to express ideas, give alternate points of view, and think on a higher level. The teacher's use of guided instruction and skillful manipulation of questions can help students in the middle grades begin to generate abstractions, build on learning concepts, exercise reasoning abilities (Strahan, 1987), and generate new patterns of thinking (Hart, 1983b).

Cognitive instruction at the middle school level places the teacher in an active instructional role. The adolescent who is "experimenting" with higher level and more abstract thought needs both both time and assistance to process information and to think with more complexity (Jones, 1986; Jones et al., 1987; Schurr, 1989). The teachers in the experimental group sequenced follow-up questions to help students set a knowledge base for higher thought processing, and they allowed wait time for the anticipated cognitive level. These teachers also provided students with opportunities to answer questions successfully, to initiate questions, and to give alternate viewpoints, suggested practices for teachers of the middles grades student (Johnston, Markle, & Haley-Oliphant, 1987; Rogers; 1988; Dillon, 1982). In turn, the students in their classrooms indicated significant growth in higher level thinking abilities.

The practical implications of the study can be discussed with respect to the need for an integrative instructional approach to the teaching of thinking. Heeding the caution by Brophy (1986) of oversimplifying the educational task of teaching thinking, yet recognizing the dilemma of teachers when faced with the challenge; and acknowledging the complexity of the learning situation, yet noting the critical role of the teacher as classroom decision-maker (Arredondo & Block, 1990; Marzano et al., 1989, 1990; Weiss, 1988), the researcher sees value in instructional techniques that give the teacher active responsibility in creating a learning and thinking-compatible setting. A curricular approach that integrates learning and cognitive instructional theory, that supports a positive climate for learning and thinking, and that offers a range of questioning strategies designed to meet students on individual cognitive levels offers teachers a

theoretical base and the practical skills to "customize" instruction to specific student needs. Viewed from this perspective, an instructional framework integrating cognitive development, classroom climate, and questioning techniques offers teachers a repertoire of strategies and the flexibility with which to make instructional choices applicable to their learning situations.

The researcher recognizes the limitations in attempting to generalize research conducted with a small group of teachers in one subject area on two grade levels, and the next section addresses the need for extended research on other grade levels and with other disciplines. The researcher also, however, recognizes that classroom climate, which is affected by teacher expectations, classroom interaction, and principles of learning, questioning, and student thinking are elements generic to classrooms where students are actively involved in the learning process. To establish a positive learning climate where interaction is frequent and students feel comfortable yet challenged to discuss ideas, ask questions, and share opinions, and to incorporate specific questioning strategies that help students understand knowledge and think more complexly about learning could provide the conditions for higher level thinking development in other classroom situations. Viewed generically and with respect for the need for additional study, this research could have implications for staff development for teachers to help students increase their thinking abilities.

If a goal of teaching is to help each student learn to his/her capacity, then an awareness by teachers and administrators of conducive classroom conditions and specific instructional strategies needs to be gained.

Certainly high expectations that all students can think and learn, the awareness that some basic principles of learning are widely applicable, and the knowledge that instructional strategies can be differentiated to meet students' individual cognitive needs are steps toward realizing this goal. This research has established that an interactive, expectant, and positive climate combined with cognitive questioning strategies are significant to the level of cognitive development of the middle grade student in the language arts classrooms involved this study. Perhaps the implications of these findings can provide the impetus for further exploration of instructional practices by which educators can realize the goal of helping students become better thinkers.

Another practical implication of this study can be discussed with reference to the researcher-developed Classroom Climate and Questioning Strategies observation instrument. The instrument represents a synthesis of the research on classroom climate, teacher expectations, cognitive instruction, learning theory, and questioning strategies. It provides a means to observe and document teacher-student and student-student classroom interaction, and the data collected provides the observer and teacher with an analysis of the cognitive and affective climate of the classroom and of the teacher's use of specific questioning strategies related to higher level thinking. This observation instrument, which may be refined through future research, could provide useful feedback to initially-certified teachers and experienced teachers on the nature of their classroom climate and on the quality of discussion and questioning techniques. Useful for teachers and administrators, the instrument provides documentation for instructional practices influential on student cognitive development.

Suggestions for Further Research

This data compiled in this study support the relationship between classroom climate and teacher questioning strategies and level of student cognitive development. Since the study was limited to the students in eight language arts classrooms at the middle school level, it is recommended that the research be extended to larger samples of adolescents in language arts and other subject areas. Since the staff development incorporated new and emerging cognitive instructional theory, similar studies would contribute to the instructional problem of developing a comprehensive and integrative curricular approach to the teaching of thinking. Furthermore, since the adolescent literature indicates the need for instructional strategies responsive to the developmental needs for the middle grade student, other studies focusing on student cognitive development at this level would be contributive.

Continued research at the middle grade level might also involve a comparable follow-up study with teachers who exhibit a low frequency of classroom climate and questioning strategies practices such as the teachers of the control group. The teachers of the experimental group indicated a more positive use of these practices during the pre-study observations, and the training was designed to maximize the observed high climate and questioning techniques as well as acquaint these teachers with current cognitive instruction. A complementary study would involve the training of teachers who rank lower on the classroom climate continuum and who use fewer questioning strategies. This research could reveal if limitations exist in the transfer of training into practice when the training

involves more extensive changes in instructional practices. This research would also provide data on the effectiveness of the staff development program to train teachers who are initially less inclined to instruct in an interactive and engaging manner.

A third area of extended research might involve a similar study with populations of students above the eighth grade level. Research with high school students at the tenth and eleventh grade, for example, might establish the significance of classroom climate and questioning strategies with a different and older age group. In response to Goodlad's (1983) findings that rarely did instruction go beyond the mere possession of information to the level of implication and application, that teachers used few questioning strategies that called for open response involving reasoning or opinion, that meaningful and supportive feedback was infrequent, and that "teacher talk" was prevalent and discussion minimal, research on classroom climate and teacher questioning strategies at this school level is needed.

The study of student cognitive development in light of current cognitive development theory is a relatively new line of research. Though supported by a growing theoretical base, the relationship of teaching practices incorporating cognitive strategies is recent to the educational practice. This study has contributed data supporting the relationship of classroom climate and teacher questioning strategies and student cognitive development in language arts classrooms at the middle grade level. With the educational obligation to develop instructional approaches to help students improve their thinking ability and with the discrepancy between

this recognized goal and instructional practice, continued and concentrated research efforts in the area of student cognitive development are needed.

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APPENDIX A

Are Your Classrooms "Safe" for Thinking?

Staff Development Manual

Glenda W. Beamon

1989

INTRODUCTION

Overview

A classroom climate where ideas are freely exchanged and openly accepted; where interaction is frequent and widespread; and where thinking is not only expected but valued and supported is a "safe" thinking climate. Within this supportive setting, the teacher's ability to direct questions to students' individual cognitive levels; to ask clarifying and follow-up questions that probe and challenge; and to foster a questioning aptitude is important in stimulating and sustaining student thinking. This training program is designed to help teachers create a classroom that supports student thinking and to help them develop questioning strategies that challenge and extend student thinking abilities.

The staff development focuses on teacher attitudes and actions that promote student thinking and learning, and on inquiry and interaction strategies that stimulate the thinking process. Although the program is specific to middle school language arts teachers, the approach can be adapted across grade levels and content areas. The program is based on the following assumptions:

1. All students can and do think.
2. All students can learn to think better.
3. Teachers can help all students improve their thinking.
4. Teachers can facilitate student thinking and learning by creating a receptive and interactive classroom climate.

5. Teachers can stimulate student thinking through questioning strategies that promote discussion and inquiry.

Rationale

Most teachers agree about the need to prepare students for the challenge of the 21st century. Trends in technology in the workplace and major shifts to an informational and global economy indicate the need to teach students to become better thinkers. A responsible, productive and self-fulfilled citizen of tomorrow's world needs to be equipped with skills to process vast amounts of information; to interpret, analyze, synthesize and evaluate this information; and to make intelligent, thoughtful decisions. Many national reports sponsored by government, business and educational groups, however, have voiced concerns that today's students lack the skills to be proficient thinkers.

Teachers, however, may feel overwhelmed by the vast array of thinking skills programs on the market; they may have little or no time left in the school day to "add on" the teaching of thinking; or they may be uncertain just how to integrate higher level thinking into regular classroom instruction. They also may be unsure what classroom conditions and which teaching strategies best promote thinking and learning. How do students think and learn? Do all students possess a "thinking potential," or can we expect more of some than others? What can a teacher do to stimulate thoughtful classroom discussions; to challenge students to respond with more reflective answers; or to ask critical

questions of us and of other students? What kind of opportunities help students extend their thinking abilities?

Teachers can create a thinking climate in their classrooms. By expecting better thinking from all students and by facilitating classroom interactions that give all students an opportunity to participate, teachers can encourage students to exercise their thinking abilities. With strategic questioning techniques such as asking questions at various cognitive levels, sequencing questions to integrate higher and lower order thought processes, and asking clarifying and follow-up questions that probe and challenge, teachers can challenge students to think and to ask questions themselves. Across any curriculum, within any grade or ability level and in any teachers can make it "safe" for students to think.

PROGRAM OBJECTIVES

The goal of the staff development is to promote student thinking by training teachers in positive climate classroom practices designed to foster and sustain thinking based on

1. Frequent student-teacher and student-student interactions;
2. Heightened and enlightened teacher expectations;
3. An understanding of how students think and learn; and
4. Knowledge of specific questioning strategies, including cognitive sequencing, and follow-up and feedback techniques.

The goals of the program for student cognitive development are:

1. Increased ability to respond to questions beyond recall and comprehension, including analysis, synthesis, and evaluation;
2. Expanded ability for interpretive and inferential thinking;
3. Increased ability for in-depth responses to questions; and
4. Heightened spirit of critical inquisitiveness.

(Use as Handout)

Session 1. How Do We Make Our Classrooms "Safe" for Thinking?

Objectives

1. Participants will share conceptions of what conditions make a classroom "safe" for thinking.
2. Participants will discuss the purpose of education and write a personal "vision" for their individual classrooms.
3. Participants will become familiar with the basic assumptions and purpose of the workshop.

Introductory Activity: SETTING THE STAGE

Let's Reminisce! Everyone had at least one teacher they liked the best. Close eyes and visualize your "very favorite." Do you remember this teacher's classroom? Pretend you are sitting in this classroom. What do you see around the room? What are some sounds you hear? Can you remember some of the things you studied or learned in this classroom? How did this teacher make you feel? Do you remember anything in particular about this teacher? Why do you think this teacher is your all-time favorite?

As a group, share some of these memories. Why were these teacher special and why did you enjoy being in their classrooms? What are some of the feelings you associated with that teacher or room.

As a group, make a list that reflects the conditions of a "favorite classroom." Try to come up with a composite picture of a "good" learning atmosphere.

Is this a "safe" classroom? Discuss.

Activity 2: HOW IS TEACHING DIFFERENT TODAY?

Has that "favorite" teacher influenced the way you teach today? Has the purpose of education changed any since you were in school? What is the same and what is different? What do we want to accomplish as teachers today as we prepare students for the 21st century?

What do you want to accomplish with your students? On a piece of paper write down your personal vision as a teacher today.

Activity 3: HOW DO WE MEET THE CHALLENGE?

Teachers today are faced with the challenge of preparing students to live in a world very different from what we have known and about which we can only speculate. We do know that advances in technology will give students access to an increasing amount information about which they must make thoughtful and rational decisions. The emphasis on teaching students to think is no longer "reserved" for the gifted classrooms; proficient thinking is being emphasized as a survival skill for all students. A tall order!

How do we begin? How do we make "good" thinkers out of our students? How do we encourage them to express ideas, to elaborate on their answers, and to put some real thought into their decision making? Before we can expect these changes in students, we, as teachers, have to set the stage.

Overview: MAKING CLASSROOMS "SAFE"

This staff development focuses on what we can do as teachers to make our classrooms "safe" for thinking. Good thinking does not "just happen." We can't simply transform students into quality thinkers by telling them to "put on their thinking caps!" We need to create in our classrooms an environment where thinking is valued, expected and supportive. To create a thinking climate, we may need to examine some of our perceptions about the thinking potential of certain students; we may need to take a look at the kinds of interactions that go on in our classrooms; and, if we expect students to give more intelligent answers, we may need to examine the kinds of questions we ask.

In creating a safe climate for thinking, it would also be helpful to know more about how students actually learn. What happens in the brain when learning takes place? How can we optimize this learning process? Are there factors in the classroom setting that actually inhibit learning and higher level thinking? What can teachers do to help students internalize what they learn and apply the knowledge to new situations. How do we get that carry-over that is so important to ready them for the "real world"?

This program is based on the following assumptions:

BASIC ASSUMPTIONS

1. All students can and do think.

2. All students can learn to think better.

3. Teachers can help all students improve their thinking.

4. Teachers can facilitate student thinking and learning by creating a receptive and interactive classroom climate.

5. Teachers can stimulate student thinking through questioning strategies that promote discussion and inquiry. (1-1)

Session 2. How Do Students Learn?

Objectives

1. Participants will gain a basic understanding of selected current learning theories.
2. Participants will become familiar with the external and internal conditions that facilitate the thinking/learning process.
3. Participants will gain an understanding of the implications of learning theory on educational practices.

Activity 1: WHAT DO WE KNOW ABOUT THE HUMAN BRAIN?

Most of us know that:

*Of the more than one million species in the animal kingdom, man alone has the largest (a little over 3 pounds) and most complex brain.

*Our brains give us the capacity to speak, to reason, and to learn.

*Our emotions arise in the brain–and they are controlled and expressed by the process we call "thinking."

*Our dreams, hopes, goals and attitudes; how we relate to people and feel about ourselves, purely "brain matters," are formed by adulthood.

What are some of the implications of these facts for education?

But Did You Know That..

1. The human brain consists of three brains that reflect millions of years of evolution?

2. The human brain is about 600 times as large as a rat's, and millions of times more complex?

3. Learning is believed to take place when the brain "calls up" stored knowledge to pattern with the new?

4. Under stress the cerebrum, where thinking takes place and language originates, "shuts down" most of its processing?

5. The brain is continually active, in one way or other?

6. Brain processes present at birth will degenerate if environmental stimulation is withheld?

Discussion: ELABORATION ON BRAIN FACTS

1. **The human brain consists of three brains that reflect millions of years of evolution.** (Show transparency of Triune Brain Concept, 2–2.) The Reptilian brain is 250 millions years old and controls our instincts. The The Paleomammalian or Old Mammalian brain is about 60 million years old and is linked to our emotions. The Neomammalian or New Mammalian brain is called the cerebrum and is the seat of all thinking and learning. Is is only a few million years old; covers 85% or 5/6 of the entire brain area; and is divided into two hemispheres.

The human brain is staggeringly complex. It links 30 billion intricate nerve cells, called neurons, that interface or connect with trillions of nerve endings, called dendrites, in an elaborate information-processing system. (Neuron Transparency, 2–3) We've all heard the expression, "I could hear the wheels turning." This is not so unlike what is believed to happen when thinking is taking place. (Demonstrate synapse activity with hands.)

No two neurons are exactly alike, nor are any brains alike. We are as different from one another as snowflakes. The long nerve fiber that extends from the cell body and serves as a transmitter, sending signals that are picked up by neighboring dendrites. The end of the axon does not actually touch the dendrites of another cell but transmits the information chemically across a region where the cells are particularly close. This junction is called a synapse, and it the most likely site for learning and memory.

If a nerve pathway is used often, the threshold of the synapse falls, so that pathway operates more readily. It is by increasing the strength and the speed of synaptic activity that we can affect the process of learning. By

the environment we provide in classrooms, we can affect the growth of dendritic branching and increase the network of connections among neurons.

2. **The human brain is about 600 times as large as a rat's, and millions of times more complex.** What does this tell us about the behavioral sciences? What does this tell you about the need to give rewards to students for good behavior? Is the reward itself more important, or is it the intrinsic implication of feeling recognized, paid attention to and valued that is really important to the student?

3. **Learning is believed to take place when the brain "calls up" stored knowledge to pattern with the new.** The brain takes in new information, and, with a very high rate of speed, tries to match or compare what it perceives to be similar information stored in its memory. When a match is found, linking the new input to what is stored, new or expanded learning takes place. Children learn by building on what they already know. They form what one writer calls new program structures. By the time we are adults, we have collected countless numbers of interrelated program structures. The number and the quality of these programs have much to do with the quality of the conditions at the time the learning took place. (Show transparency, "How We Learn, 2–4.") In fact, the brain will actually "resist" instruction to which it cannot relate or to which it can find no trace of a match. Even though this brain research is relatively new, the concern that teachers expect students' mind to act as "ink blot paper," continually absorbing facts, was voiced by John Dewey in 1933. (Transparency 2–5.)

Think of what you're doing now in trying to make sense out of what I'm telling you. You're trying to find some kind of match it to something you know or to somehow categorize it in your brain. I'm trying to help you make sense of this by giving you examples to which you can relate. What does this tell us about new information we are trying to teach?

Another reason for making new learning relevant to what is known is that the brain also replaces new information with old. If there is no "linkage" provided, the students fails to conceptualize. He just tries to amass large amounts of facts, which he stores in his short term memory –just long enough to be tested on it.

4. **Under stress the cerebrum, where thinking takes place and language originates, "shuts down" most of its processing.** (Go back to Triune Brain Concept transparency.) The huge cerebrum, which is divided into the left and right hemisphere, is the seat of language and the part of the brain that does elaborate "intellectual" processing. Under stress, brought about by a dominating or overly-aggressive teacher or by the fear that one might not get "the right answer," the skittish cerebrum will "downshift." The Old Mammalian section, which controls the emotions, takes over. In sudden fright, for example, we become literally speechless. In a classroom, a student becomes unable to "think" or to express his ideas. He begins to stab at answers, to guess haphazardly. A teacher might perceive this display to indicate poor intellectual ability, lack of preparation, or lazy thinking. How might this interaction become a self-perpetuating cycle? How might it harm a child's esteem or thwart his thinking potential?

Higher and more complex learning takes place best in a nonthreatening setting. The cerebrum, which controls higher level

thought processes, responds in classrooms where students feel comfortable about sharing ideas. Students do not experiment with ideas or take risks unless they feel relaxed or secure. When they do not feel "safe" to express ideas or to ask questions, their capacity to think and learn is minimized. Students do not instinctively "resist" learning; often a classroom setting dampens the inquisitive spirit.

What are some "stressful" classroom conditions? Nonthreatening?

5. **The brain is continually active, in one way or other.** If a student is not challenged or in classroom talk, "actively engaged in his own learning," his mind tends to wander. He begins to daydream or fantasize. He may become a behavioral problem: Having to tell Johnny to stop looking out the window and to pay attention may have started when his brain gave the signal, BORING!!

The brain is an enormously powerful instrument that just will not be passive. It resists direct instruction unless it is able to make sense of what is presented. Children who are made to sit still day after day, passively doing work sheets and rarely given the opportunity to discuss ideas or to ask questions will soon "turn off" to learning, and, unfortunately, to school altogether. What does this say about the need for stimulation in classrooms?

6. **Brain processes present at birth will degenerate if environmental stimulation is withheld?** We've heard the "horror" stories of the extreme cases when children have not been nurtured, whether in the home or in the school setting (neglected or abused children; in orphanages; children "mislabeled" by the school system). Our school systems have a more enlightened conception about student potentiality. Mainstreaming and

heterogeneous groupings are more prevalent as is the belief that all students can improve their thinking if given the opportunity.

Emerging cognitive development theory places an increasing emphasis on how an individual thinks and learns; on the external and internal factors that influence thinking and learning; and on the possibilities for expanding and accelerating one's thinking and learning–even intelligence. The focus of this theory is on the dynamics between a student's capacity to think and learn and on the conditions that enhance this learning.

The exciting part of this new thinking is that students' abilities are no longer viewed as barriers to thinking; rather, teachers can create learning experiences to enhance and challenge abilities. A lesson that poses too little challenge, too little complexity, too few connections, or too much threat, however, will fail to invite or stimulate learning and thinking. With higher expectations for all students, teachers can set the stage for better thinking.

It is hardly an exaggeration to say that too often the pupil is treated as if he were a phonographic record on which is impressed a set of words that are to be literally reproduced...[T]he mind is treated as if it were a cistern into which information is conducted by one set of pipes that mechanically pour it in...

How We Think, p. 260
John Dewey (1933)

(2–5)

HOW WE LEARN: IMPLICATIONS FOR EDUCATION

1. Students learn by building on what they already know. The brain takes new information and, very rapidly, tries to match or compare it to what is perceived to be similar information stored in its memory. When a match is made, new or expanded learning takes place.

2. The brain actually "resists" instruction to which it cannot relate or to which it can find no trace of a match. We can help students make matches, and thus conceptualize, by trying to make information more meaningful. Otherwise, they just try to amass a large amount of facts– which are stored in the short-term memory just long enough for the test.

3. Under stressful or threatening conditions, such as fear of failure or high anxiety, the cerebrum will actually starts to "shut down" its thought-processing ability. While rote learning can still take place, higher and more complex learning and thinking is limited.

4. A lesson that poses too much threat, too little complexity, too little challenge, or too few connections will fail to invite, stimulate or sustain learning and thinking. When students feel "safe" to express ideas or ask questions and are "actively engaged," thinking and learning is maximized.

Session 3: Creating Classroom Climate

Objectives

1. Participants will become familiar with the components of a "good" classroom climate

2. Participants will assess the climate of their individual classrooms.

3. Participants will become familiar with classroom conditions that both foster and inhibit student thinking.

Activity 1: CONSIDERING CLASSROOM CLIMATE

Have each participant fill out the "Considering Classroom Climate" Inventory. Discuss questions that might arise with each item on the checklist. Have participants share what they feel are strong aspects in their classrooms and how they maintain this climate.

Which are some of the more challenging areas of classroom climate?

In small groups, brainstorm characteristics that would describe a "high climate" classroom teacher or "low climate" classroom teacher.

Compare ideas.

CONSIDERING CLASSROOM CLIMATE

Directions: Put a check by any descriptor you would like to discuss. Put a star by any descriptor that indicates your classroom climate.

____ Openness: Respecting, accepting and inviting students to share unusual ideas and to ask unique questions.

____ Freedom for Supposing: Creating situations that allow students to guess, pose possibilities, and predict outcomes with or without evidence.

____ Idea Testing: Offering opportunities for comparing, evaluating, and examining, and critiquing of divergent possibilities.

____ Thinking Time: Allowing time for experimenting with and expressing ideas without the pressure to "get the right answer."

____ Stimulating Inquiry: Asking open-ended questions; asking students to test and challenge answers; and presenting questions which have no answers. Also allowing students to ask questions.

____ Elaboration: Asking follow-up questions that probe and challenge students to expand upon their ideas.

____ Reinforcement: Rewarding creative and divergent thinking with encouragement. Assigning value and prestige to unusual thoughts without formal evaluation.

____ Listening: Listening carefully to students' answers, which helps to know what follow-up questions to formulate.

____ Stimulating Materials: Providing a variety of enriching and exciting resources for stimulating inquiry.

____ Wait time: I pause after posing questions and after student answers.

Discussion: WHAT DO WE MEAN BY CLASSROOM CLIMATE?

Classroom climate is affected by the nature and extent of teacher-student and student-student interactions, and by the level of teacher expectancy. A sense of security prevails in a classroom where students are encouraged to make decisions and share ideas, and where their ideas are encouraged and respected. This classroom climate is expectant of student involvement, not passive compliance. Open interaction, active listening, appreciation of individuality, and an encouragement and acceptance of diversity are nurturing to student confidence and conducive to successful experiences with thinking. A classroom climate that is relaxed and intellectually permissive is "safe" for inquiry and higher level thinking.

You see, really and truly, apart from the things anyone can pick up (the dressing and the proper way of speaking, and so on), the difference between a lady and a flower girl is not how she behaves, but how she's treated. I shall always be a flower girl to Professor Higgins, because he always treats me like a flower girl, and always will; but I can be a lady to you, because you always treat me as a lady, and always will.

Eliza Doolittle to
Colonel Pickering
George Bernard Shaw,
Pygmalion
(3-1)

Discussion: HOW IMPORTANT ARE TEACHER EXPECTATIONS?

Teacher expectations are inferences that teachers make about the abilities and future academic success of students. Even indirectly displayed, these expectations, or lack of, play a significant role in how well and how much students learn; they may also determine success or failure in the classroom. Studies in the 1960s have referred to the consequences of teacher expectations, high or low, as the "pygmalion effect." Students that are expected to achieve, will achieve. A teacher who fails to see potential in a student, and hence does not respond; or a teacher who responds negatively can create a self-fulfilling prophecy that can affect the students behavior as well as their self-concept. Frequently students form perceptions of their own ability in response to expectations communicated by these interactions.

Students pick up on these classroom interaction patterns. Students are aware that teachers treat them differently. This teacher behavior can effect students directly, in that they have reduced opportunity to interact; and indirectly, in that they form lowered perceptions of their own ability, and hence do not try any harder. Teachers tend to vary in their interaction with high- and low-achieving students. They often:

(Transparency 3–2)

1) call on low achieving students less frequently;

2) wait less time for them to answer;

3) call on another without giving sustaining feedback;

4) give them little informative feedback;

5) ask them fewer higher level questions; and

6) criticize them more often for failure (while praising highs for success).

Discussion: HOW DOES CLIMATE RELATE TO LEARNING?

New learning takes place primarily in the cerebrum, which works best in the absence of threat. The teacher who can generate trust among students sends a powerful invitation for learning. When a teacher creates a supportive classroom environment, one in which students do not fear what might happen if a wrong answer is given or if an answer is difficult for the student to arrive at, this teacher can avoid the tendency of the brain to "downshift." Hart (1986) calls these conditions "brain-antagonistic." When students feel threatened, their capacity to learn is reduced because the part of the brain that sends out feelings of anxiety appears to "take over" the student's capacity to think clearly and productively.

Classroom climate and instruction need to be compatible with the nature of the brain, and not work against its natural capacity to learn. When students fear the teacher, these feelings "short circuit" thinking and inhibit learning. When the teacher is always in tight control and students are never given an opportunity to express their ideas; or if they do and find that their ideas are continually unacceptable, students become hesitant to express ideas or to ask questions, and they fail to do the quality thinking.

The nature of the teacher-student interactions in the classroom has been ranked as a primary reason to students' dropping out of school. Consider these statements gathered in interviews with students:

Transparency 3–3

1. "Good" teachers are accessible and willing to provide help.

2. "Good" teachers go out of their way to follow up on students who had fallen behind; to reach out to those in trouble; and to give all students opportunities to ask questions and receive help in class.

3. Teachers who embarrass students are disliked and their classes avoided.

4. Students can be affected for a long time by classroom situations in which they feel undermined, degraded or humiliated.

5. Students feel anger and resentment toward teachers who show favoritism to certain students.

6. Students respond to teachers who have demanding but clear-cut expectations.

Session 4. Why Teach Thinking?

Objectives

1. Participants will be better acquainted with the rationale behind teaching students to think.
2. Participants will be better informed of the the widespread need to teach thinking.
3. Participants will be have a better understanding of their role in teaching students to become better thinkers.

Introductory Activity:

As a large group, brainstorm reasons why teachers need to help students become better thinkers. Discuss reasons why it's difficult to teach thinking? What are the barriers? Do you think that thinking can be taught? Why or why not?

Activity: WHY TEACH THINKING?

As teachers today, we have the tremendous task of preparing students for a world that differs vastly from that of previous generations. Technological changes in the job market and major economical shifts have thrust us into high-paced, informational society where one's survival depends on the ability to process information, to make rational decisions and to think critically about important issues. We need only consider these facts:

(Transparency 4-1)

1. The Sunday edition of The New York Times contains more information than the average 16th century citizen processed in a lifetime.

2. By the year 2000, 80% of jobs that will exist have not even been created.

3. By the year 2000 most people will have had at least five career changes.

4. High school dropouts are functionally illiterate, unprepared for the demands of the job market, and lacking in skills for responsible, productive citizenry.

5. The amount of knowledge in the world roughly doubles every twenty years.

In a recent study by the National Assessment of Educational Progress, it was found that virtually all students ages 9 through 17 can read simple text, perform basic addition and know everyday facts; however, relatively few older students can use algebra, compute how much change they are owed after ordering two items from a menu, understand a newspaper essay, write an adequate persuasive letter or apply their scientific knowledge to solve a simple problem. This study, which involved 1.4 million students aged 9 to 14, cited the following findings:

(Transparency 4–2)

This study concluded that in recent years, standard techniques of instruction that rely on teacher lectures, textbooks and work sheets have successfully raised the level of basic skills of most students; but that these same methods could be blamed for the failure of students to master more complicated thinking skills. It recommended that teachers allow more active participation and cooperative work by students; that students be required to apply the knowledge they gain and that tests be written so that students are encouraged to think about and use this knowledge rather than just repeat facts and rules they have learned.

1. In reading, 61 percent of 17-year-olds cannot understand complicated written passages, including topics they study in school, high school textbooks or simple newspaper essays.

2. In science, 59 percent of 17-year-olds cannot apply their knowledge to interpret text and graphs or evaluate whether the design of an experiment is appropriate.

3. In mathematics, 49 percent of 17-year-olds cannot solve problems using decimals, fractions, percents, basic geometry or algebra such as:

Which of the following is true about 87% of 12?

Choices: Greater than 10; Equal to 10; Less than 10; Can't tell; Don't know.

Other studies reflect a similar concern that widespread instructional practice does not include the opportunity for higher order thinking. Goodlad (1984), in his comprehensive study of 1,016 classrooms across the United States, found little evidence that teachers providing classrooms conditions conducive to student thinking. Consider these findings:

(Transparency 4–3)

Consistent throughout the school reform and thinking skills literature is an emphasis on the role of the classroom teacher in the thinking-learning process. We can help students to improve their thinking in these ways:

(Transparency 4–4)

1. On the average, about 75% of class time was spent on instruction and 70% of this was "talk"–usually by teacher to students.

2. Barely 5% of this instructional time was spent initiating student response to questions.

3. Not even 1% of teacher questions invited open responses which involved a higher level of thinking by students, such as reasoning or giving an opinion. Most questions were designed for factual recall.

4. Rarely did teachers respond to students with supportive language, corrective feedback...

5. For the most part, teachers failed to establish a classroom climate that invited or promoted thinking.

1. Have a clear purpose and plan instructional activities to accomplish it.

2. Help students relate new information with what they already know.

3. Ask divergent, open-ended questions in addition to recall questions.

4. Wait before calling on students.

5. Follow up student responses by asking for: clarification, elaboration, textual proof, and thinking process.

6. Make students conscious of their own thinking processes.

7. Encourage students to ask questions of their own.

Culminating Activity: MAKING THE THINKING CONNECTION

Have participants share some ways they know will increase the level of student thinking in their own classrooms.

Ask: Why is lower level thinking important in the classroom?

Why would it be inappropriate to merely increase the number of higher level questions?

What might be some of the barriers to overcome if

(1) the level of questioning is increased in the classroom?

(2) more higher level questions are included in discussion?

What are some questions you have about helping students become better thinkers?

Compile a list of descriptors that indicate a "good" and "safe" thinking climate.

Session 5. Questioning: Kinds and Levels

Objectives

1. Participants will gain an understanding of the value of questioning to stimulate student thinking.
2. Participants will become familiar with various kinds of questions (guiding v. controlled; open v. closed; divergent v. convergent).
3. Participants will gain experience in formulating and identifying questions according to kind, difficulty and cognitive levels.

Introductory Activity: QUESTIONING

Questioning has been called teacher's chief verbal tool for shaping and molding interaction in the classroom. Over 2,000 years ago, Socrates demonstrated the power of questioning to stimulate thinking. Today we know that the way a teacher structures a question influences the nature of the student response. By manipulating the syntactical structure of questions, we can invite students to accept information, to process or compare the information with what they already know, to draw meaningful relationships, and to apply or transfer those relationships to hypothetical or novel situations. Question-and-answer discussion has been called the most effective strategy for student learning.

Handout: QUESTIONING TECHNIQUES: A CHECKLIST. Discuss.

QUESTIONING TECHNIQUES: A CHECKLIST

1. Do I ask a few broad, pivotal thought-provoking questions rather than many inconsequential ones?

2. Is there an openness in the questions I ask that guides students without controlling their thinking and leading them to a set answer?

3. On what level are my questions?

   a. Are my questions designed to help students use many levels of thinking?
   b. Do my questions draw on the life experiences of my students?
   c. Are my questions relevant to contemporary issues?

4. How do I ask my questions?

   a. Do I ask the entire class before I invite one student to answer?
   b. Do I distribute my questions among the entire class? Do I ask them of volunteers and nonvolunteers?
   c. Do I avoid repeating questions and answers?
   d. Are my questions succinct, simple and direct?
   e. Do I vary the phrasing of my questions?
   f. Do I avoid leading questions? (e.g., "Don't you really think there was nothing else for the United States to do?"

5. How do I treat my answers?

   a. Do I follow up incorrect answers and take advantage of them?
   b. Do I refer pupils' questions or answers to other students to promote interaction?
   c. Do I use correct answers as stepping stones to the next question?

6. What are the outcomes of my questions?

   a. Do my questions stimulate thought and reason?
   b. Do my questions elicit concepts and generalizations as well as facts?
   c. Do my questions stimulate creative thought?
   d. Are my questions interesting enough to sustain attention?
   e. Do my questions arouse cross-discussion?
   f. Do my questions stimulate further discussion?
   g. Do my questions achieve the aim(s) of the lesson?

Kinds of Questions

Closed: Limited number of acceptable answers, most of which are anticipated by teacher. Students usually arrive at one correct answer.

- What is the definition of an adjective? (simple)
- What are the stages of cell division? (more complex)

Convergent: Students might be asked to compare, interpret or analyze information, yet one answer is usually anticipated.

- Given the results of the experiment, would you say that water moves from an area of high salt density to low, or low to high?
- What main conclusion can you draw based on the results of the experiment?

Open: Many acceptable answers, most of which are not anticipated by teacher. Students are asked to generate many different responses.

- What is an example of an adjective? (low level)
- What are some ways we might solve the energy crisis? (higher)

Divergent: More creative responses may be accepted; often associated with inventive/productive thinking.

- If the world was suddenly covered by a dense fog and all you could see were people's feet, what might be some of the consequences?

Cognitive Levels of Questions

	Can Students.....
Setting up the Knowledge Base	Remember the facts? Understand the meaning? Make relevant connections?
Analyzing the New Knowledge	See relationships of events? Make inferences based on facts? Compare with old knowledge? Interpret or explain reasons? Categorize? Classify? Distinguish fact and fiction?
Focusing the New Knowledge in a Different Direction	Make predictions about? Think of another way to? Adapt to a new situation? Make a hypothesis about?
Evaluating the New Knowledge	Give an opinion or a a critique? Judge? Debate? Generalize? Appraise against a criteria? Give value to?

Activity: FORMULATING QUESTIONS

Divide participants into small groups. Have each group:

(1) Select a story from the list below.
(2) Select a grade level (primary, intermediate, or secondary); and
(3) Write a question for each of the four cognitive levels.

Have each group share their questions aloud and ask volunteers to adapt any to a different age group. Have groups identify whether the questions are open or closed; divergent or convergent; and guided or controlled.

THE UGLY DUCKLING
THE EMPEROR'S NEW CLOTHES
THE PIED PIPER OF HAMELIN
THE NIGHTINGALE
JACK AND THE BEANSTALK

Session 6. Questioning Strategies

Objectives

1. Participants will learn the importance of integrating higher and lower cognitive level questions.
2. Participants will become aware of the various sequencing strategies.
3. Participants will practice writing questions using sequencing strategies.

Overview: THE STRATEGY OF SEQUENCING

Assuming that higher level questions, or those that call for analysis, synthesis, and evaluation of information, are categorically better than lower level questions that call for knowledge and basic understanding is a simplistic notion. Teachers need to recognize the value of lower level questions, in their own right, and in their use to set the stage for higher level questions. Teachers need to concentrate on the sequencing of lower and higher level questions, depending on the purpose of the discussion. Since higher level thinking cannot take place in a vacuum, it requires individuals to apply what they know about the subject matter as well as their common sense and experience. The teacher's role would be, then, through the cognitive level of questioning, to bring to mind previous knowledge and provide students with the opportunity to think about in in more depth or to expand upon it.

An appropriate questioning strategy in the classroom would be to integrate literal-factual with analysis, synthesis or evaluative, higher-order questions. For example, a teacher might sequence questions beginning with a higher level question and proceed with a few lower level follow-up

questions, such as asking students to interpret information, then probing for details to support the student's answer. A different strategy would be to ask a series of lower level questions, to help students recall relevant facts, and following with a higher level question to stimulate them to integrate the facts and draw conclusions.

Many students may be unaccustomed to inquiry-oriented questions and become frustrated and anxious as to how to respond. They may be hesitant to give up the security of the one right answer. An appropriate strategy would be to acquaint students with the expected response requirement of the particular level of question. An additional strategy would be to have students verbalize how they arrived at responses; this strategy is not only useful to the student responding but should be helpful to others in the classroom who are attempting to become familiar with their own thought processes.

Practice Exercise on JACK AND THE BEANSTALK.

EXERCISE ON "JACK AND THE BEANSTALK"

For the following questions, write (S) if the question deals with setting the knowledge base; (A) if deals with the analysis of information; (F) if focuses the information into a new direction; and (E) if evaluative.

1. What time of day does the ogre return home on each of Jack's visits?

2. Would you have exchanged the cow for the beans with the old man?

3. Did Jack plan to steal from the ogre when he climbed the beanstalk the first time?

4. Is the author sarcastic when he calls Jack's reply to the old man "sharp as a needle"?

5. Why did the ogre's wife want to keep Jack from being eaten on the first trip?

6. Does the author want you to believe the funny-looking man is trying to help Jack or to take advantage of him?

7. Why does the author use the word "ogre" more often than the word "giant"?

8. Why did the ogre become suspicious that a stranger was present?

9. Does your mother's approval of what you do become less important as you get older?

10. Why does Jack go up the beanstalk a third time?

11. How might the story have changed had Jack not gone up the beanstalk a third time?

12. Hypothesize about the sort of life Jack might have had if he had not sold his mother's cow for the beans?

Culminating Activity: PRACTICE AT SEQUENCING

Directions: In small groups, using the preceding questions and adding others you formulated as you read the story, cluster the questions together according to a specific sequence.

(1) High to low: helping students to recall facts to arrive at the proposed higher level question; or

(2) Low to high: helping students to establish a knowledge base in preparation for a higher level question.

Share question clusters with other groups. Discuss situations and typical students with which each strategy might be appropriate.

Additional Discussion:

What are some of the questions that came to your mind?

Which words did you wonder about? events?

Did you not any discrepancies in the story? What were they?

Session 7. A Closer Look at Feedback and Follow up

Objectives

1. Participants will become familiar with responses that promote and inhibit student thinking.
2. Participants will practice formulating follow-up questions for elaboration and clarification.
3. Participants will discuss the concept of wait time.

Briefly discuss the frustrations of giving feedback to reluctant students.

Overview: THE IMPORTANCE OF GOOD FEEDBACK

Teachers need to use judgment in providing feedback to students. Active acceptance of students' responses involves rephrasing, paraphrasing, translating, recasting or summarizing, not merely repeating an answer or passively accepting without any clue as to the value of an idea. Criticism, or other negative value judgments, inhibits cognitive learning. Teachers need to use praise sparingly and judiciously; its excessive use builds conformity and dependency rather than diversity and independent thinking. Probing or follow-up questions that ask for clarification help student to elaborate or reflect upon their answers.

Teachers need to take into consideration the students' previously conditioned impression of the importance of the "right" answer and of their lack of experience in thought-provoking answering questions . These students may need encouragement and practice to feel more secure about taking a risk with reflective or divergent thinking.

Handout: "Teacher Responses That Promote and Inhibit Thinking"

Teacher Responses That Promote and Inhibit Thinking

I. Responses that inhibit thinking: do not require students to think or undermine students' confidence in his thinking.

Teacher
- ...agrees with student (includes judging or rewarding)
- ...disagrees with student (includes judging, rewarding)
- ...tells student what s/he thinks or explains his/her way
- ...does the thinking by telling/showing student what to do
- ...talks too much
- ...repeats the students' statement for other to hear
- ...puts down students' ideas
- ...promotes fear; student becomes afraid to express ideas
- ...cuts student off by asking another student to do thinking

II. Responses that stimulate low level thought: require recall of information; channel or direct student's thinking; leads students to one right answer.

Teacher
- ...looks for one single answer.
- ...leads student to one single, correct procedure.
- ...injects voice inflection– leads student to right answer.
- ...leads student to a particular line of thought.
- ...gives student answers to informational questions.

III. Responses that sustain or extend students' thinking: clarify what student is saying; promote inquiry; require student to accept responsibility for his ideas; require many different answers.

Teacher
- ...clarifies/reflects back central idea of student's answer.
- ...asks student to tell point of view, express opinion.
- ...ask student to elaborate on his idea.
- ...invites additional responses or other contributions.
- ...asks for an analysis of the idea.
- ...asks student to extend an idea/create new framework.
- ...asks student to raise new idea/open new line of inquiry.
- ...accepts student's idea.
- ...invites student to ask questions.

Application Activities:

1. Handout: "Questioning for Clarification" Briefly go over.
2. Reading: "Charles" by Shirley Jackson.
   Distribute copies and have each participant read the story silently, writing questions or reactions in the margin as they occur. Share reactions and a few of the questions.

Small group activity: Have small groups write two questions for each of the four cognitive levels. Share these question.
Have each group choose one question at one of the cognitive levels (or assign a cognitive level to each group) and write a script showing the dialogue between teacher and student
(1) if the student is hesitant or gives an inappropriate answer; or
(2) if the student responds with an appropriate response and the teacher wants to student to expand upon or to clarify his ideas.
(This activity requires participants to anticipate typical students' responses.)
Share or demonstrate scripts. Discuss
(1) how the follow-up questions would help the student to arrive at an answer;
(2) if the feedback responses would lead to higher level thinking; and
(3) what kind of questioning sequence each dialogue reflects.

Follow-up Questions for Clarification

Tell me how you arrived at that idea.

Give me more examples of your idea?

What do you mean by...?

Are you saying...? (rephrase answer)

What would the benefits be of this...?

Are there other possibilities?

What makes your idea workable?

Where will this idea lead?

What other ideas did you consider? Why did you eject the other ideas?

Is there anything else that can be done?

What other uses are there?

What other changes are possible?

Can it be modified? In what ways?

What change will this idea effect? Are you satisfied with the changes?

What might keep your idea from working well?

What would happen if you combined your idea with ___'s idea?

What hesitations or questions do you have about your idea?

Were there any things that happened along the way that might have taken your idea in a different direction?

DO YOU HURRY STUDENTS' RESPONSES?: PAYOFF OF PAUSING

Mary Budd Rowe, a leading researcher on the concept of wait time, has written that teachers often go at such a rapid pace in their questioning that no substantial thinking could take place. After ten years of research, she found the following facts to be true:

1. When teachers ask a question, they generally wait one second or less for students to begin an answer. If the reply does not start in one second, the teacher repeats or rephrases the question, or calls upon someone else.
2. After a student replies, teachers typically react or go on with more questioning in less than one second. There is little chance for second thoughts by the students.
3. Teachers give the more able students more time to answer than they give the less able students.

Questioning at the "one-second rate" can make a shambles out of the teacher's plans for a good discussion. It can inhibit language and logic development and limit productive inquiry by students. The remedy is simple–try to get an average wait-time up to a minimum of three seconds. If you can, this will happen: (7–1)

1. The length of relevant students responses or statements increases markedly. Among advantaged groups, the increase of explanations is about 500 percent. Among less advantaged groups, it is about 700 percent.
2. The number of unsolicited but appropriate comments increases. The wait-time seems to provide students with a chance to hear each other. They tend to add or offer counter opinions under the longer wait-time.
3. Failures to respond decrease. These failures are as high as 30 percent in some classrooms. Under the three-second wait-time, minimum failures to respond drop to less than five percent, and more students who typically avoid participation take part.
4. More student-student comparisons of results, and arguments over alternative interpretations take place.
5. Evidence and inference get hooked together more often. Under the one second regiment, students may respond with a three or four word phrase that neither states and inference or a piece of evidence; but rarely are the evidence and inference properly tied together.
6. Contributions by so-called slow learners increase.
7. The number of questions asked by students and the relevant solutions proposed by them increases. Students ask very few questions–longer wait-time increases the probability of productive inquiry by students.
8. The number of disciplinary moves that teachers make actually decrease

Research indicates that only "knowledge level" questions can be entertained in the length of time offered by the average teacher. Students must have time to think. More recent research indicates students need 8-10 seconds as quality "think time" after a question is asked and at least 5 seconds after a response is given.

Wait time should vary with the complexity or cognitive level of the question. A factual question may be answered quickly and the teacher can move on to the next question, whereas a higher level question requires an extended period of thought. Wait time will also help the teacher reduce the number of questions asked during a lesson, which in itself is a deterrent to higher level thought processes.

Payoffs From Pausing

1. The length of relevant students responses or statements increases markedly.
2. The number of unsolicited but appropriate comments increases.
3. Failures to respond decrease.
4. More student-student comparisons of results, and arguments over alternative interpretations take place.
5. Evidence and inference get hooked together more often.
6. Contributions by so-called slow learners increase.
7. The number of questions asked by students and the relevant solutions proposed by them increases.
8. The number of disciplinary moves that teachers make actually decrease.

Session 8. Cognitive Processing

Objectives

1. Participants will become more familiar with the emerging field of cognitive instruction.
2. Participants will practice formulating process questions that help student become aware of their own thinking processes.
3. Participants will better understand the concept of metacognition.

Overview: WHAT IS COGNITIVE INSTRUCTION?

The implications of modern cognitive development theory on education and the role of the teacher has given rise to a new model of learning called cognitive instruction (Transparency, 8–1). A student's capacity to learn can be significantly improved by instruction that seeks to build on existing knowledge base and strengthen or change the student's repertoire of thinking and learning strategies. The teacher helps students to link new information to prior knowledge. In this theory, students' cognitive abilities are not seen as barriers; rather, teachers have to assess at what level students are thinking and design learning experiences to match and slightly exceed the current level of complexity. With high expectations of all students, emphasis on interaction and an open exchange of ideas through discussion and inquiry, the teacher sets the basis for increasingly complex thinking.

Cognitive instruction...refers to any effort on the part of the teacher or instructional materials to help students process information in meaningful ways and become independent learners... [It] has the potential to alter substantially the capability of the learner, especially the low-achieving learner, in much the same way that microchips radically altered the capability of the computer.

(Jones, 1986, p. 7)

(8–1)

Discussion: A CLOSER LOOK AT CLARIFICATION

Probably the most challenging part of questioning lies in meeting the student on his/her individual cognitive level and in extending that cognitive level into higher realms of thinking. The teacher must be an active participant in classroom dialogue–and an extremely careful listener. An answer of "I don't know" could indicate that the student hasn't done the assignment; in many cases, however, that answer could signal:

1) the question is on a cognitive level beyond the student's immediate response capability;
2) the student needs some help understanding the basic knowledge;
3) the student needs help in connecting the information base to personal experience; or
4) the student needs some practice in answering questions of that particular level.

Thoughtful follow-up questions help students to clarify their thoughts or to answer more elaborately. Clarification also contributes to the development of students' metacognitive abilities. Students become more aware of their own problem-solving abilities by understanding better how they and other students think about and arrive at answers.

SAMPLE PROCESS QUESTIONS

1. How did you arrive at that idea?

2. Are there any other possibilities?

3. Show me any proof for your answer in the story.

4. Tell me a detail in the story that supports your answer.

5. Give me some examples for your idea.

6. Why do you think that?

7. What makes you think of that?

8. Explain to me why you gave that answer.

9. Try to add something to your answer.

10. Tell me another way to look at the situation.

Sample Script: Processes and Strategies

1. Why does Laurie invent Charles? (Analyzing Knowledge)

   (Response): "I Don't Know."

   Is there a boy in kindergarten named Charles? (Knowledge Base)

   *How do you know that Laurie "made up" Charles?

2. Why does Laurie invent Charles? (Repeating of question.)

   (Response): To cover up for the bad things he was doing at school.

3. Why does Laurie invent Charles? (Redirect question)

   (Response): He was having trouble adjusting to kindergarten.

   *What clues in the story make you think Laurie might be having trouble adjusting to kindergarten?

Group Activity: ADD ON!

Why do you think Laurie's parents were more interested in Charles' behavior that the behavior of their own son? (Analyzing)

Session 9. The "Safe" Attitude for Inquiry

Objectives

1. Participants will become aware of teacher and students dispositions or attitudes that affect the thinking level of inquiry-based discussions.
2. Participants will discuss ways to set the stage for classroom inquiry.
3. Participants will be familiar with strategies that facilitate discussion.

Opening Activity: VIDEOTAPE (Student Seminar)

Critique as a group the videotape in terms of:

1. Facilitation of discussion by leader.
2. Use of feedback to promote thinking by teacher.
3. Use of follow-up questions for probing or elaboration by teacher.
4. Questioning strategies used by teacher.
5. Acceptance of students' ideas by teacher.
6. Student questioning aptitude.
7. Use of process questions by teacher.
8. Cognitive response levels of students
9. Wait time after questions and after student responses.
10. Distribution of questions among group.

Introduction: FOSTERING "SAFE" INQUIRY

Classrooms that are "safe" for thinking continuously invite–almost beg–students to think. Seating arrangements that facilitate grouping and face-to-face interaction are more conducive to an exchange of ideas. More student-student than student-teacher interaction can be seen. Students are expected to consider the ideas, contributions and arguments of peers and to value the quality of their reasoning. These classrooms call out: "It's okay to think! It's useful to think! Come on, let's think to learn." A number of similar attitudes or dispositions are said to from a base for effective thinking.

(Transparency 9–1).

Effective student thinking is not likely to develop without this attention to the affective dimension. To foster the development of these attitudes, teachers can:

(Transparency 9–2)

1) a respect for and a desire to seek and give reasons;

2) a willingness to suspend judgments;

3) a desire to consider other points of view on a topic;

4) a desire to identify and judge a number of alternatives before making a choice; and

5) a willingness to revise one's opinion in light of new evidence.

(Beyer, 1986)

(9–1)

1) model the desired disposition by seeking a variety of views or a number of alternative answers or solutions;

2) require that students display similar dispositions by giving reasons for their decisions or by exploring a variety of viewpoints;

3) engage students, consistently and continuously, in learning opportunities to practice the behaviors; and

4) reinforce the appropriate dispositions by valuing and rewarding the behavior, not the student.

(Beyer, 1986)

(9–2)

LEADING A GOOD DISCUSSION!

Effective discussion leaders:

1. Ask a series of questions that give directions to the discussion;
2. Are sure the questions are understood or rephrase them until they are;
3. Raise issues that lead to further discussion;
4. Allow for discussion of conflict or differences;
5. Ask questions which allow for a range of answers deserving consideration and demanding judgment;
6. Examine the answers and draw out implications;
7. Insist that answers are clear or rephrased until they are;
8. Request that reasons by given;
9. Do not entertain answers for argument's sake alone;
10. Are open to questions and issues raised by answers;
11. Do not insist on common agreement to one answer;
12. Are active listeners;
    a. by giving appropriate wait-tim
    b. accepting students' answers
    c. redirecting questions, i.e., "What does...mean?"; "Why do you say...?"; How does...differ from...?"; "Suppose...happened....?"; "In what way would ... change if...were different?"; What does...affect?"

Session 10. Integrating Process with Strategy

Objectives

1. Participants will practice integrating process questions into various questioning strategies.
2. Participants will practice using questioning strategies during seminar discussion.
3. Participants will conceptualize the conditions that make a classroom "safe" for thinking.

Opening Activity: INTEGRATING THE PROCESS

Directions: The following questions have been written for the story "Charles" and categorized according to cognitive levels. Individually, or with a partner, choose a question from one category. Write three follow-up questions to form a questioning strategy. Be sure to integrate process questions with cognitive levels.
(This exercise requires participants to anticipate at least two student responses.)

Group Practice Activity:

As a group, participate in a discussion about the story "Charles." Each person can assume an active role either by answering or asking questions. Participants are encouraged to use their written follow-up questions to probe others or to ask others to examine how they arrived at answers.

Share reactions.

COGNITIVE LEVELS OF QUESTIONS FOR "CHARLES"

Setting Up Knowledge Base

1. What grade is Laurie in at school?
2. Does Laurie have any brothers and sisters?
3. Name two "bad" things that Charles did at school, so Laurie says.
4. Who was Laurie's mother curious about at the P.T.A. meeting?
5. Is there a boy in kindergarten named "Charles"?
6. Do you know someone who is about Laurie's age? Is this person imaginative?

Analyzing the Knowledge Base

1. Why does Laurie invent Charles?
2. How would you compare Laurie's behavior at home with Charles' behavior at school?
3. Why do you think Laurie might have trouble adjusting to kindergarten?
4. Why do you think Laurie might become the teacher's helper in the third week of school?
5. Why don't Laurie's parents guess that Charles doesn't exist?
6. Why do you think Laurie's parents were more interested in Charles' behavior than that of their own son?
7. Why do you think Laurie has a relapse just before the P. T. A. meeting?

Focusing the New Knowledge in a New Direction

1. What do you think would have happened if Laurie's mother had not gone to the P. T. A. meeting?
2. How would the story have changed if there really was a"Charles"?
3. Can you think of a person you know, have read about, or have seen on television who is like Charles? Explain why.

Evaluating the New Knowledge

1. Would you consider Laurie a behavioral problem? Charles?
2. Do you think Laurie did all the things that he described about Charles?
3. Do you think Laurie's teacher should have called his parents?
4. Why do you think the author had the story told by Laurie's mother rather than his father?

Culminating Discussion: PUTTING IT ALL TOGETHER

Teachers can help students become better thinkers. Classroom conditions where ideas are freely exchange and openly accepted; where interaction is frequent and widespread; and where thinking is not only expected but valued is the first step. The second is to bring into this "safe" classroom a spirit of inquiry fostered by effectively used questioning strategies. Classroom discussions around carefully-formulated thought questions; more equitable distribution of higher-level questions; and more frequent use of probing instructional feedback, can provide students with the opportunity to think more interpretively and to defend ideas more logically. Linked with an encouraging teacher attitude, continued use of these questioning and interactive strategies could improve the level of student thinking.

Sequencing of Questions
Attitude of Teacher and Students
Feedback and Follow-up Techniques
Emphasis on Cognitive Processes

(Transparency 10–1)

SAFE FOR THINKING

Sequencing of Questions

Attitude of Teacher and Students

Feedback and Follow-up Techniques

Emphasis on Cognitive Processes

"It is better to know some of questions than all of the answers."

James Thurber

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EVALUATION OF WORKSHOP

1. Which activities/discussions helped you the most in learning about climate setting and questioning strategies?

2. Which activities/discussions would you consider the least helpful?

3. What do you consider the most effective aspects of the workshop?

4. What changes would you suggest that might strengthen the workshop?

5. Do you feel more comfortable with the aspects of classroom climate setting and the use of questioning strategies as a result of the workshop?

Comments:

APPENDIX B

CLASSROOM CLIMATE AND QUESTIONING STRATEGIES
Classroom Observation Instrument
Glenda W. Beamon
1989

Practice _____ Time _____ Code _____

1. RESPONSE OPPORTUNITY

1.1 Teacher offers questions to class before specific students_____

1.2 Teacher accepts all valid students responses (nonjudgmental) _____

1.3 Teacher gives sustaining feedback to incorrect answers _____

1.4 Teacher queries/allows for more than one student's point of view _____

1.5 Teacher elicits students' questions_____

1.6 Teacher permits students to answer other students' questions _____

1.7 Teacher distributes questions equitably_____

---

2. COGNITIVE LEVEL OF QUESTIONS

2.1 Teacher asks questions that help students set up the knowledge base (remember facts, make connections)_____

2.2 Teacher asks questions that help students analyze new knowledge (interpret, infer, compare, explain)_____

2.3 Teacher ask questions that help students focus knowledge in new direction (synthesize, hypothesize)_____

2.4 Teacher asks questions that help students evaluate new knowledge (judge, evaluate, opine, appraise) _____

---

3. COGNITIVE PROCESSES

3.1 Teacher gives adequate wait time for cognitive level of questions_____

3.2 Teacher's cognitive level of questions elicits expected cognitive response level_____

3.3 Teacher pauses after students' responses (at least 3 seconds)_____

3.4 Teacher asks probing questions for more extensive or complex responses_____

3.5 Teacher asks students to explain why or give proof for answers (details, examples) _____

3.6 Teacher asks follow-up questions at same or lower cognitive level_____

3.7 Teacher asks follow-up questions at a higher cognitive level_____

3.8 Teacher asks students to tell how they arrived at answer (i. e., metacognition)_____

3.9 Teacher elicits higher level questions from students_____

DIRECTIONS FOR USE

Using the Climate Observation Instrument requires training and practice. A tape recorder should be used to check for accuracy, particularly in classifying the the cognitive level of each question and interaction. To document equitable response opportunity, a numbered seating chart should be made in the space at the top of the form before the observation begins.

Recording of practices is by frequency marks in a vertical pattern down a column. Each column indicates an individual teacher-student or student-student interaction, with the exception of when the teacher allows for choral responses. When the interaction moves to involve a new student, the recording crosses into the next column. In this way, the movement of the class discussion and the level of each individual interaction are recorded. These steps describe the recording process:

1. Recording begins with a mark where the interaction is initiated. (For example, 1.1. Teacher offers questions to class before specific students or 1.5. Teacher allows students to ask questions).

2. A number representing the student called upon or initiating the interaction is recorded beside practice 1.7. (If more than one student responds simultaneously, a "ch" is marked for choral.)

3. The cognitive level of question is recorded in Section 2. Wait time and level of student response are documented in 3.1 and 3.2. The teacher's treatment of the response is recorded in 1.2 or 1.3.

4. After the student(s) has responded, the teacher has several cognitive process options: (3.3) gives additional wait time; (3.4) probes for a more extensive response; (3.5) asks for explanation or proof; (3.6, 3.7) asks follow-up question at same, lower, or higher level; or (3.8) asks how s/he arrived at answer.

5. When the teacher sustains an interaction with a student using one (or more) of these options, frequency marks are recorded in the same column.

6. If the teacher directs a cognitive process option to this student, then calls on another student, the recorder marks the option, extends a horizontal line into the next column, and makes a second mark to show the beginning of the interaction with the new student. If the process question is offered to the class before the new student, however, a 'C' is marked in the new column at this beginning point. If a process question is directed to the class instead of the original student, a 'C' is also recorded in the new column, but no horizontal line is drawn.

7. Once a new interaction is begun, the marking continues in the described manner.

8. Instead of using a cognitive process option, the teacher may begin a new interaction by: (1.4) offering the original question to another student for point of view; or (1.1) beginning a new line of questioning with the entire class (1.1). These marks are also recorded in the next vertical column.

9. In the event that a student begins an interaction with a question, practice 1.5 is marked. If the question is higher level, practice 3.9 is marked, and if another student is permitted to respond, practice 1.6 is marked.

10. To document the cognitive level of the follow-up process questions (practices 3.6 and 3.7), thus distinguishing these from the level of the initial question, this frequency mark in Section 2 is slashed.

DIRECTIONS FOR SCORING

To score the Classroom Climate and Questioning Strategies observation instrument, mean frequencies are calculated during a timed period.

Data for the Climate component is obtained by counting the number of marks in the Response Opportunity section, practices 1.1–1.6. The frequency for practice 1.7 is indicated by the number of different students called upon during the discussion.

Data for the Cognitive Level of Questions category is obtained by counting the frequency marks in practices 2.1-2.4, Section 2. A cognitive level frequency mark was given during the observation to each new teacher question and to each follow-up question. During the analysis, marks are added to indicate the continuing level of interaction when the same question is offered to another student for an alternate point of view.

Data for the Questioning component is obtained by counting the number of marks in the Cognitive Level of Questions and Cognitive Process sections, practices 2.1–2.4 and 3.1–3.9.

Additional data is available by counting the frequency of Sustained Interactions per individual student as indicated by use of cognitive processes practices 3.3–3.8 in Section 3.

APPENDIX C

Construct Validity for CLASSROOM CLIMATE AND QUESTIONING STRATEGIES Observation Instrument

1. RESPONSE OPPORTUNITY

1.1 Teacher offers questions to class before specific students (1, 5, 6)

The teacher communicates to all students the expectancy of being called upon to answer the question. All students begin thinking about a possible response, thus encouraging autonomy of thought.

1.2. Teacher accepts all valid student responses (nonjudgmental) (1,2, 3, 6, 10, 13)

The teacher accepts students' contributions nonjudgmentally, thus communicating an attitude of acceptance that encourages risk taking.

1.3. Teacher gives sustaining feedback to incorrect responses (3, 6, 10, 11, 12, 13)

The teacher gives students who respond incorrectly an opportunity for a success by offering clues or by rephrasing the question. Thus, teachers are more likely to sustain interaction rather than terminating it through providing the answer or calling on another student.

1.4. Teacher queries/allows for more than one student's point of view (1, 2, 6, 13)

The teacher allows for alternate viewpoints, conveying the message that it is acceptable to take a risk with a new idea or to offer a different approach. Thus, the thinking become student-oriented rather than teacher-directed. This behavior also communicates a willingness to tolerate and encourage differences.

1.5. Teacher elicits students' questions (1, 2, 5, 11, 12, 13)

The teacher is open to student-oriented interaction, thus encouraging inquisitiveness. A thinking-centered classroom is one in which students wonder, speculate and ask questions, not just answer them.

1.6 Teacher permits students to answer other students' questions

(1, 5, 7, 13)

The teacher facilitates student-student exchanges, thus promoting active listening and an exchange of ideas among students. Students rely less on the teacher for the "right" answers and learn to value their own thinking.

1.7 Teacher distributes questions equitably (3, 6, 7, 10, 11)

The teacher communicates the expectation that all students participate in the discussion and conveys the message that each student's ideas are valued.

2. COGNITIVE LEVEL

2.1 Teacher asks questions that help students set up the knowledge base (remember facts, make connections) (1, 2, 3, 4, 6, 10, 11, 12, 13)

The teacher asks questions that elicit substantive information. Students may be asked to recall facts, define, recount, identify, or repeat. Thus, the teacher sets the stage for higher level thinking by helping students recall previous knowledge or information basic to understanding and comprehension.

2.2. Teacher asks questions that help students analyze knowledge (interpret, infer, compare, explain) (1, 2, 3, 4, 6, 10, 11, 12, 13)

The teacher asks questions that cause students to interpret, infer, combine, compare, explain, conclude, or relate information. Students' answers are less literal and more conceptual as they analyze the knowledge base.

2.2 Teacher asks questions that help students focus knowledge in a new direction (synthesize, hypothesize) (1, 2, 3, 4, 6, 10, 11, 12, 13)

The teacher asks questions that encourage students to hypothesize, predict, or synthesize. These questions ask students to expand their thinking by developing new thoughts about the knowledge base.

2.4. Teacher asks questions that help students evaluate new knowledge (judge, evaluate, opine, appraise). (1, 2, 3, 4, 6, 10, 11, 12, 13)

The teacher asks questions that encourage students to judge, rate, value,evaluate, opine, or appraise. These questions are contextual and elicit responses based on students' personal values or judged against an established criteria.

3. COGNITIVE PROCESSES

3.1. Teacher gives adequate wait time for cognitive level of question (1, 2, 3, 5, 6, 10, 11, 12, 13)

The teacher varies wait time with the complexity or cognitive level of the question. Generally a teacher should wait 3-5 seconds for a lower level question, but may need to wait 8-10 seconds for higher cognitive levels.

3.2. Teacher's cognitive level of questions elicits cognitive response level (2, 3, 7, 8, 9)

The cognitive level of the teachers' questions evoke the desired cognitive response level in students. An indirect measure of the students' ability to generate a covert response based on appropriate cognitive processing is the degree of congruence between the cognitive level of the teacher's question and the cognitive level of the students' responses.

3.3 Teacher pauses after students' responses (at least 3 seconds) (1, 2, 3, 5, 6, 10, 11, 12, 13)

The teacher allows wait time of at least three seconds following students' responses. This pause permits for students' additional cognitive processing, gives students an opportunity to elaborate on their own without the teachers' probing, and allows teacher time to listen and think about students' responses. This pausing also discourages impulsiveness and encourages reflection.

3.4 Teacher asks probing questions for more extensive or complex responses (1, 2, 3, 7, 8, 9, 10, 11, 12, 13)

The teacher asks probing questions that cause students to elaborate upon their answers. This process strategy encourages students to think in more depth about knowledge and to expand upon responses.

3.5 Teacher asks students to explain why or give proof for answers (1, 3, 7, 8, 9, 10, 11, 12, 13)

The teacher asks questions that cause students to explain the reasoning behind their answers and to provide the contextual proof upon which answers are based. This process strategy encourages students to base responses upon reasoning and evidence.

3.6 Teacher asks follow-up questions at same or lower cognitive level

(6, 7, 8, 9)

When the student has difficulty responding to a question or answers "I don't know," an appropriate strategy may be to ask a lower level question. To facilitate response at a higher cognitive level, teachers need to be aware of students' informational needs. This strategy can put students in touch with the knowledge base and make a contribution to the discussion.

3.7 Teacher asks follow-up questions at a higher cognitive level (6, 7, 8, 9)

The teacher asks a follow-up question that causes students to think at a higher cognitive level in order to respond. This strategy "exercises" students' cognitive ability by stretching and challenging the level of thinking.

3.8 Teacher asks students about thinking process (metacognition) (1, 3, 7, 8, 9, 12)

The teacher asks students, "How did you arrive at that answer?" or to explain the thought process leading up to a particular response. In this way, the teacher the higher level thinking skill of metacognition, or the thinking about one's thinking. This ability reflects the highest level of intellectual functioning

3.9 Teacher elicits higher level questions from students (1, 3, 8, 11, 12)

Student-oriented questions are posed at a level higher than informational. The inquiry-oriented classroom is one in which students take a risk with questions that reflect higher cognitive or indepth thinking. This practice may also reflect a modeling by students of teacher questioning behavior.

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APPENDIX D

Charles
by
Shirley Jackson

The day my son Laurie started kindergarten he renounced corduroy overalls with bibs and began wearing blue jeans with a belt. I watched him go off the first morning with the older girl next door, seeing clearly that an era of my life was ended, my sweet-voiced nursery-school tot replaced by a long-trousered, swaggering character who forgot to stop at the corner and wave good-bye to me.

He came home the same way, the front door slamming open, his hat on the floor, and the voice suddenly become raucous shouting, "Isn't anybody *here*?"

At lunch he spoke insolently to his father, spilled his baby sister's milk, and remarked that his teacher said we were not to take the name of the Lord in vain.

"How was school today?" I asked, elaborately casual.

"All right," he said.

"Did you learn anything?" his father asked.

Laurie regarded his father coldly. "I didn't learn nothing," he said.

"Anything," I said. "Didn't learn anything."

"The teacher spanked a boy, though," Laurie said, addressing his bread and butter. "For being fresh," he added, with his mouth full.

"What did he do?" I asked. "Who was it?"

Laurie thought. "It was Charles," he said. "He was fresh. The teacher spanked him and made him stand in a corner. He was awfully fresh."

"What did he do?" I asked again, but Laurie slid off his chair, took a cookie, and left, while his father was still saying, "See here, young man."

The next day Laurie remarked at lunch, as soon as he sat down, "Well, Charles was bad again today." He grinned enormously and said, "Today Charles hit the teacher."

"Good heavens," I said, mindful of the Lord's name. "I suppose he got spanked again?"

"He sure did," Laurie said, "Look up," he said to his father.

"What?" his father said, looking up.

"Look down," Laurie said. "Look at my thumb. Gee, you're dumb." He began to laugh insanely.

"Why did Charles hit the teacher?" I asked quickly.

"Because she tried to make him color with red crayons," Laurie said.

"Charles wanted to color with green crayons so he hit the teacher and she spanked him and said nobody play with Charles, but everybody did."

The third day–it was Wednesday of the first week–Charles bounced a see-saw on the head of a little girl and made her bleed, and the teacher made him stay inside all during recess. Thursday Charles had to stand in a corner during story-time because he kept pounding his feet on the floor. Friday Charles was deprived of blackboard privileges because he threw chalk.

On Saturday I remarked to my husband, "Do you think kindergarten is getting too unsettling for Laurie? All this toughness and bad grammar, and this Charles boy sounds like such a bad influence."

"It'll be all right," my husband said reassuringly. "Bound to be people like Charles in the world. Might as well meet them now as later."

On Monday Laurie came home late, full on news. "Charles," he shouted as he came up the hill; I was waiting anxiously on the front steps. "Charles," Laurie yelled all the way up the hill, "Charles was bad again."

"Come right in," I said, as soon as he came close enough. "Lunch is waiting."

"You know what Charles did?" he demanded, following me through the door. "Charles yelled so in school they sent a boy in from first grade to tell the teacher she had to make Charles keep quiet, and so Charles had to stay after school. And so all the children stayed to watch him."

"What did he do?" I asked.

"He just sat there," Laurie said, climbing into his chair at the table. "Hi, Pop, y'old dust mop."

"Charles had to stay after school today," I told my husband. "Everybody stayed with him."

"What does this Charles look like?" my husband asked Laurie. "What's his other name?"

"He's bigger than me," Laurie said. "And he doesn't have any rubbers and he doesn't ever wear a jacket."

Monday night was the first Parent-Teachers meeting, and only the fact that the baby had a cold kept me from going. On Tuesday Laurie remarked suddenly, "Our teacher had a friend come to see her in school today."

"Charles's mother?" my husband and I asked simultaneously.

"Naaah," Laurie said scornfully. "It was a man who came and made us do exercises, we had to touch our toes. Look." He climbed down from his chair and squatted down and touched his toes. "Like this," he said. He got solemnly back into his chair and said, picking up his fork, "Charles didn't even *do* exercises."

"Fresh again," I said.

"He kicked the teacher's friend," Laurie said. "The teacher's friend told Charles to touch his toes like I just did and Charles kicked him."

"What are they going to do about Charles, do you suppose?" Laurie's father asked him.

Laurie shrugged elaborately. "Throw him out of school, I guess," he said.

Wednesday and Thursday were routine; Charles yelled during story hour and hit a boy in the stomach and made him cry. On Friday Charles stayed after school again and so did all the other children.

With the third week of kindergarten Charles was an institution in our family; the baby was being a Charles when she cried all afternoon; Laurie did a Charles when he filled his wagon full of mud and pulled it through the kitchen; even my husband, when he caught his elbow in the telephone cord and pulled telephone, ashtray, and a bowl of flowers off the table, said, after the first minute, "Looks like Charles."

During the third and fourth weeks it looked like a reformation in Charles; Laurie reported firmly at lunch on Thursday of the third week, "Charles was so good today the teacher gave him an apple."

"What?" I said, and my husband added warily, "You mean Charles?"

"Charles," Laurie said. "He gave the crayons around and he picked up the books afterward and the teacher said he was her helper."

"What happened?" I asked incredulously.

"He was her helper, that's all." Laurie said, and shrugged.

"Can this be true about Charles?" I asked my husband that night. "Can something like this happen?"

Wait and see," my husband said cynically. "When you've got a Charles to deal with, this may mean he's only plotting."

He seemed to be wrong. For over a week Charles was the teacher's helper; each day he handed things out and he picked things up; no one had to stay after school.

"The PTA meeting's next week again," I told my husband one evening. "I'm going to find Charles's mother there."

"Ask her what happened to Charles," my husband said. "I'd like to know."

"I'd like to know myself," I said.

On Friday of that week things were back to normal. "You know what Charles did today?" Laurie demanded at the lunch table, in a voice slightly awed. "He told a little girl to say a word and she said it and the teacher washed her mouth our with soap and Charles laughed."

"What word?" his father asked unwisely, and Laurie said, "I'll have to whisper it to you, it's so bad." He got off his chair and went around to his father. His father bent his head down and Laurie whispered joyfully. He father's eyes widened.

"Did Charles tell the little girl to say *that*?" he asked respectfully.

"She said it *twice*," Laurie said. "Charles told her to say it *twice*.

"What happened to Charles?" my husband asked.

"Nothing," Laurie said. "He was passing out the crayons."

Monday morning Charles abandoned the little girl and said the evil word himself three or four times, getting his mouth washed out with soap each time. He also threw chalk.

My husband came to the door with me that evening as I set out for the PTA meeting. "Invite her over for a cup of tea after the meeting," he said. "I want to get a good look at her."

"If only she's there," I said prayerfully.

"She'll be there," my husband said. "I don't see how they could hold a PTA meeting without Charles's mother."

At the meeting I sat restlessly, scanning each comfortable matronly face, trying to determine which one hid the secret of Charles. None of them looked to me quite haggard enough. No one stood up in the meeting and apologized for the way her son had been acting. No one mentioned Charles.

After the meeting I identified and sought out Laurie's kindergarten teacher. She had a plate with a cup of tea and a piece of chocolate cake; I had a plate with a cup of tea and a piece of marshmallow cake. We maneuvered up to one another cautiously, and smiled.

"I've been so anxious to meet you," I said. "I'm Laurie's mother.

"We're all so interested in Laurie," she said.

"Well, he certainly likes kindergarten," I said. "He talks about it all the time."

"We had a little trouble adjusting, the first week or so," she said primly, "but now he's a fine little helper. With occasional lapses, of course."

"Laurie usually adjusts very quickly," I said. "I suppose this time it's Charles's influence."

"Charles?"

"Yes," I said, laughing, "you must have your hands full in that kindergarten, with Charles."

"Charles?" she said. "We don't have any Charles in the kindergarten."

STUDENT COGNITIVE TEST
for
"Charles"
Glenda W. Beamon
1989

DIRECTIONS: Administer individually and orally in a quiet place. Student may have a copy of the story for reference. Allow wait time of at least 5-8 seconds after asking a question and after the student has responded, unless student indicates that he has completed his answer. Inform that the student may refer to the text and ask that any question be repeated. Explain that the tape recorder is used to ensure accuracy.

1. Is there a boy in kindergarten named Charles? (Setting Knowledge Base, 2.1)

   (If incorrect response given, have student read last paragraph, then repeat question #1.)

2. *How do you know that Laurie "made up" Charles? (Process, 3.5)

3. Who was Laurie's mother curious about at the P. T. A. meeting? (Setting Knowledge Base, 2.1)

   (For correct response)

4. *What makes you think that she was curious about Charles's mother? (Process, 3.5)

   (For incorrect response, have student locate and read aloud the part in the story that describes Laurie's mother's thoughts during the P.T.A. meeting. Repeat original question. If student give correct answer, ask question #4. If student fails to pick up clue from text, continue to #5.)

5. What do you think might have happened if Laurie's mother had not gone to the P. T. A. meeting? (Focusing Knowledge in New Direction, 2.3)

6. *What makes you think that? (Process, 3.9)

7. *Is there something else that could have happened? (Process, 3.4)

8. Why does Laurie invent Charles? (Analyzing New Knowledge, 2.3)

9. *What clues in the story make you think that? (Process, 3.5)

10. *Is there any evidence in Laurie's behavior at home that tells you he was having some adjustment problems with kindergarten? Explain. (Process, 3.5)

11. Compare Laurie's behavior at home with Charles's behavior at school? (Analyzing New Knowledge, 2.2)

12. Do you think Laurie did all the things he described about Charles? (Evaluating New Knowledge, 2.4)

13. *What details in the story give you a base for your answer? (Process, 3.5)

14. Would you consider Laurie a behavioral problem? (Evaluating New Knowledge, 2.4)

    *Why? (Process, 3.5)

15. Why do you think Laurie's parents were more interested in Charles' behavior that the behavior of their own son? (Analyzing New Knowledge, 2.2)

16. *Is there another reason why they seem more interested in Charles? (Process, 2.4)

17. Do you think Laurie's parents suspected that Laurie had invented Charles? (Evaluating New Knowledge, 2.4)

    *What makes you think that? (Process, 3.9)

18. Why don't Laurie's parents guess that Charles doesn't exist? (Analyzing New Knowledge, 2.2)

19. Do you think Laurie's teacher should have notified his parents? (Evaluating New Knowledge, 2.4)

20. *What in the story indicates that the teacher did <u>not</u> call home. (Process, 2.5)

21. Why do you think Laurie had a relapse just before the P. T. A. meeting? (Analyzing New Knowledge, 2.2)

22. Was Laurie having trouble adjusting to kindergarten? (Process, 3.6)

23. *How do you know that? (Process, 3.5)

24. *Is there a time that he seems to have adjusted? (Process, 3.6)

25. *What indicates that to you? (Process, 3.5)

26. *Why would he have a setback just before the P. T. A. meeting? (Process, 3.7)

27. How would the story have changed if there really had been a "Charles"? (Focusing Knowledge in New Direction, 2.3)

28. *Why do you think that? (Process, 3.5)

29. *Think of another way to look at the ending, if there really had been a Charles. (Process, 3.4)

30. Do you have any questions about the story? (Process, 3.8)

APPENDIX E

STUDENT COGNITIVE TEST: RESPONSE ANALYSIS
for
"Charles" by Shirley Jackson

Directions for Scoring: Assign points from 1-3 according to the level of each response as classified according to the following example responses and descriptors.

1. Is there a boy in kindergarten named Charles? (Setting the Knowledge Base)

   A: 1–"Yes." (incorrect answer)

   2–"No." (correct answer)

   3–"No, his real name is Laurie. He's just making up the name so parents won't find out he's causing all the trouble." (correct answer with elaboration)

   (Give no additional points if correct answer was obtained after re-reading text aloud.)

2. *How do you know that Laurie "made up" Charles? (Process)

   A: 1–"I don't know." (no response) or "Laurie says all these things to get his parents worried." (unsubstantiated response)

   2–"Cause at the end of the story his teacher said no one in class named Charles." (correct response)

   3–" Because he was doing all the tricks his parents thought Charles was doing and when she asked the kindergarten teacher if she had a Charles in kindergarten, she said no and said that Laurie was helping out and it had taken a couple of weeks but was settling down and helping out." (correct answer with added detail).

3. Who was Laurie's mother curious about at the P. T. A. meeting? (Setting Knowledge Base)

   A: 1–"Charles." (incorrect response)

   2–"Charles's parents." (not specific)

3–"Charles's mother." (correct)

(Assign no additional points for corrected answer. If student fails to pick up clue from reading, assign a 1 to question #4 and continue to question #5.)

4. *What makes you think that she was curious about Charles's mother? (Process)

A: 1–"Cause Laurie told her all this stuff about Charles's mom and she wanted to see and meet her and hadn't at any PTAs." (incorrect)

2–"Well, Charles was a bad influence on Laurie. Maybe she wanted to speak to her about Charles's behavior." or "She wanted to find out what his mother was like and if she's anything like Charles." (general clue)

3–"Because she wanted to find her and invite her for a cup of tea and see what she looked like and why Charles was acting that way." (more specific to context)

5. What do you think might have happened if Laurie's mother had not gone to the P. T. A. meeting? (Focusing Knowledge in New Direction)

A: 1–"She might not have wanted to know if Charles would be there at meeting with Mom." (incorrect, doesn't answer question) or "She wouldn't have known there was no Charles going to that school or her son wasn't going to that school." (confusion of facts)

2–"She wouldn't have found out there was no Charles in that class." or "Laurie would have kept on telling his mom stories." (correct response, one clue/reason given)

3–"Laurie's mother wouldn't have gone asking about Charles and Laurie would have probably kept on acting the same, going on telling his parents about what's happening at school about boy named Charles." (correct response with elaboration or combination of reasons)

6. *What makes you think that? (Process)

A: 1–"I don't know." or "Just the way in the reading..how it's said." (can give no reason or repeats previous response)

2–"Because he got in trouble so much that she wondered why it was happening." or "Laurie is the one who has problems–an imaginary boy." (response not specific to detail)

3–"Because L told her there was a Charles and if she didn't go to find out herself, she would have kept on thinking it." or " Because she didn't know that there wasn't a Charles til she asked the teacher if a Charles in class and she said no." (logical response based on detail)

7. *Is there something else that could have happened? (Process)

A: 1–"I don't know." (no response or repetition of #5 response)

2–"Maybe L would have started acting like Charles or really believing there might have been one." or "Maybe Laurie would have told her that there was no Charles once he got fed up with his little game." (general with no connection to clues)

3– "He could have gotten a phone call from the teacher." or "She could have kept thinking that Charles's mother wasn't doing anything about it." (plausible responses based on clues)

8. Why does Laurie invent Charles? (Analyzing New Knowledge)

A: 1–"I don't know." (fails to respond) or "Because he wanted to give an example of what it's like." or "Just to have something to say..to have some fun.' (unsubstantiated guess)

2– "To cover up for the bad things he was doing at school;" "Adjustment problems with kindergarten;" or "To get attention." (plausible reasons)

3–"He could have tried to tell his mother things that he might have been doing at school." (offers some insight into problem)

9. *What clues in the story make you think that? (details, support)

A: 1–"I didn't see any." (no response)

2–"I guess he likes getting attention..wasn't getting as much as he liked to..all I can really say." or "He started acting the same way Charles did in the story." (general)

3– "Kicking people, hitting the teacher, being bad at recess and having to stay after school, would throw chalk, and would use bad grammar, probably cussing. (richer detail)

10. *Is there any evidence in Laurie's behavior at home that tells you he was having some adjustment problems with kindergarten? Explain. (Process)

    A: 1–"No." or "I didn't really see any." (failure to make Inferences or to address question).

    2– "Well, he'll say something to his parents and just walk off and not say anything." or "He acts kind of strange when he comes home from school." (affirms and gives general clue

    3–"When he pulled the wagon in the kitchen full of mud. I guess he tried to give his mother a hint he wasn't doing all that well in kindergarten."or "He was telling the stories about Charles doing all these things to other people. He came home shouting..slammed the door..spilled baby sister's milk." (affirms with richer detail or attempts explanation)

11. Compare Laurie's behavior at home with Charles's behavior at school? (Analyzing New Knowledge)

    A: 1–"Laurie is sort of a nice kid..never does that much–and Charles is like beating up all these kids and saying bad words to the teacher." (draws no parallel) or "They're the same person." or "It was like he was Charles instead of there was a Charles in class. (sees parallel, doesn't detail comparison)

    2–"Behavior at school was a whole lot more tense acting and behavior at school like he wanted to get some attention." or "Well, Charles acted worse because he hit teacher and hit girl in head with see-saw and made her nose bleed and Charles hit teacher and Laurie didn't act that bad." (draws a general comparison/details only one side)

    3–"He played practical jokes at home. He started acting rebellious against his parents as well as Charles against his teacher. He started trying to be a bigger person than he really was like Charles in school. His grammar deteriorated and wasn't that great in school either." (substantiated comparison, details on each side)

12. Do you think Laurie did all the things he described about Charles? (Evaluating New Knowledge)

    A: 1–"I don't know." (no response)

    2–"Yes." or "No." (gives no qualification for answer)

3–"Not really, because he if he did, then the teacher would have sent a note home or called a parent-teacher conference." or "Yes,..." (qualifies answer or presents a rationale)

13. *What details in the story give you a base for your answer? (Process)

A: 1–"I don't know..can't remember." (no response) or "Like hitting the teacher's friend. I think he would have done that because most boys are mean." (unsubstantiated)

2–"The way he was acting when came home from school.. would tell his parents about things Charles did and stuff." or "I think he talked too much for a little kid to do. They would have already thrown him out of school or called his mother." (general clue)

3– "I believe Laurie acted up considerably, but I don't believe he kicked or did some of the extremely bad things or the teacher would have said something at PTA meeting." (logical, specific support)

14. Would you consider Laurie a behavioral problem? (Evaluative) *Why? (Process)

A: 1–"Yes–because he's doing things..hits people and teacher and doesn't do what they say." (judges specific behavior at school, fails to qualify)

2–Yes. Well, I'm not saying he's not normal..some act like that in kindergarten..but he's going along with what Charles does..trying to be like his imaginary friend..(tries to qualify answer by attempting a cause of behavior) or "Yes, if he did all that at school." (distinguishes between exaggeration/ fact)

3–"Well, yes and no..Yes, because he was acting up a lot..tricks he played were real bad..and no because he just wanted to get attention and didn't get it at home.not many friends at school..didn't get attention." (elaborates on cause behind behavior, draws parallels).

15. Why do you think Laurie's parents were more interested in Charles' behavior that the behavior of their own son? (Analyzing New Knowledge)

A: 1–"I don't know." (no response or confusion of facts)

2–"I guess because he comes home every day telling stories..tells what Charles did and did not tell what he was doing at school." (general reason or one clue)

3– Because that's all they talked about...he didn't mention himself. Probably a bad influence on him..starting to do some of the same things. (links clues) or "They don't know their son really, not have taken a look at own son. They are worried about Charles being a bad influence on others in class..Too close to problem to see it. At PTA meeting ready to go to Charles's mother to tell her. She is a little upset at home..feels Charles who is making their precious son change by his bad influence..when it is really Laurie who does all this." (more detail, attempts to explain problem)

16. *Is there another reason why they seem more interested in Charles? (Process)

A: 1–"No." or "Not really." (no response; repeats answer to # 15)

2– "I guess cause he's a bigger behavior problem than anyone else..they hadn't heard of such a person that acted that bad." (general answer)

3– "Wanted to find out at PTA meeting about his mom and see what was going on and see why he had changed." (supplies another substantiated reason)

17. Do you think Laurie's parents suspected that Laurie had invented Charles? (Evaluating New Knowledge)
*What makes you think that? (Process)

A: 1–"I don't know." (no response) or "No, well the way he said it. It seemed like there was somebody that was Charles." (yes or no, but no specific link to clues in story)

2–"No. Because she still wanted to hear about who Charles was when she went to PTA meeting...didn't show any indication Laurie was Charles." (gives specific clue)

3– "No, not really, because they thought her son was perf..well, not perfect, but believed their son..had enough faith in son to think he wouldn't lie like that and the mother..the parents would probably at end when mom was told her son was doing better in kindergarten and that goes along with the story as to how Charles got into trouble and helped out a lot and mother probably suspected that.. was doing all the things and would have gotten into trouble." (offers more than one specific

clue or elaborates)

18. Why don't Laurie's parents guess that Charles doesn't exist? Analyzing New Knowledge)

    A: 1–"I don't know." or "I don't think it is really something you would guess really." (no response) or "I guess they can't believe all that stuff like principal kicked him out of school..got suspended." (confusion of facts or repetition of previous response)

    2–"Cause Laurie just keeps going on about Charles." or "I guess they believed their son and didn't want to think he would tell them that." (general response)

    3–"Well, when he said he had to stay after school, parents might have gotten a call from the teacher." (plausible reason based on specific detail)

19. Do you think Laurie's teacher should have notified his parents? (Evaluating New Knowledge)

    A: 1–"Yes." or "No." (no attempt to qualify)

    2–"Well, yes I do, cause if he did all these things, no reason why not. Any good teacher would have." or "I don't think the teacher knew about it..that he was making it up." (qualifies)

    3–"Maybe, if he didn't continue to be extremely bad, she thought she could deal with him and not bring parents into it." (qualifies answer with insight into Laurie's problem)

20. *What in the story indicates that the teacher did <u>not</u> call home? (Process)

    A: 1–"His parents didn't know anything about it cause they thought it was a little boy..didn't think it was a girl..cause he was coming home telling about this guy named Charles. (confusion of facts) or "He might have been making up the whole story to get attention." (no inference attempted)

    2– "Wasn't said anything about the fact." or "Because Laurie's mother never got mad at home for talking about Charles or making up what he did." (general clue, reason)

    3–"Because Laurie kept coming home telling about Charles and parents were never doing anything about it and if teacher

would have called, they most likely would have spoke to Laurie about Charles. Most likely would have stopped the lying." or "One thing..they didn't mention anything to Laurie that teacher had called home. If did call home, may have realized or thought that Laurie was telling a lie and paid more attention to Laurie's problem." (gives more than one reason or offers explanation with reason, insight)

21. Why do you think Laurie had a relapse just before the P. T.A. meeting? (Analyzing New Knowledge)

    A: 1– "Cause maybe he didn't want the teacher to remember how he'd been acting and tell parents about it since he knows parents would be coming."(incorrect response – fails to recognize relapse or no response)

    2–"I don't really know. I guess he wanted to tell his parents how bad Charles was..to tell about him and make at first being good, then he all of a sudden started acting bad again. I'm not sure..doesn't make any sense." or " Cause might have had some friends..might have wanted to show off." (comprehends relapse–has difficulty explaining or guesses)

    3–"Probably cause wants parents to come..to get attention.. more willing to come..more curious so would want to come." (plausible explanation)

22. *Was Laurie having trouble adjusting to kindergarten? (Process)

    A: 1–"I don't think so." or "I believe he just got wrapped up in fun he was having and new friends ..things he was hearing good and bad." (negative response, doesn't see clues in story)

    2– "Yes." or "I think so." (affirmative)

    3– "For the first few weeks." (qualifies affirmative answer with textual proof)

23. *How do you know that? (Process)

    A: 1–"Because, let's see...I don't know that one." or "Well, I think his mom would have found out..he probably would have done all right..but would not have got into trouble anymore cause parents would have punished him.." (no response or does not support)

    2–"Cause it seems like he didn't want to do anything and always causing trouble." or "Because he made up

Charles..maybe wanted to get some attention...to help him in school." (general–fails to spot specific clue)

3–"It says he had a little trouble adjusting the first week or so." (specific textual clue)

24. *Is there a time that he seems to have adjusted? (Process)

A: 1–"Not really." or "I think after the PTA meeting." (sees no adjustment, guesses)

2–"Yes" or "Probably" (affirmative) or "Right there close to PTA meeting." (general response)

3–"Yes, when he becomes the teacher's helper." or "About near the end cause he starts getting used to not being very special and not getting lots of attention." (adds specific clue or explains)

25. *What indicates that to you? (Process)

A: 1–"I can't remember." (sees no connection or repeats)

2–"Tells about Charles and how good he's been doing." (general reason or clue)

3– "He was a fine little helper." or "In third or fourth week a reformation..." (specific textual clue)

26. *Why would he have a setback just before the P. T. A. meeting? (Process)

A: 1–"I have no idea." or "So that she would have something good to say before she told about bad things he did." (no connection)

2–"Because he would think teacher would ask mother why an attitude change?" or "He started to get out of control again." (makes connection, general response)

3–"Maybe he wanted his mom to actually go there and find out about him. Maybe they wanted Laurie himself to be a little confusing so they couldn't figure him out. Good one day and bad the next. I guess he did it to confuse them." (attempts an explanation, understands relapse)

27. How would the story have changed if there really had been a "Charles"? (Focusing Knowledge in New Direction)

    A: 1–"Maybe Laurie..they would have found out there was no Charles and Laurie would have bragged about trouble after school." (no extension of information, guessing)

    2–"Well, his mom would have gone to PTA meeting and talked to Charles's mom and his mom would not have been satisfied until she talked with Charles's mom about his behavior." (hypothesizes with information)

    3–"For one, it would have solve the enigma about who Charles is. Laurie might have gotten worse..no I change my mind..Laurie might not have been doing that at home cause would see what kind of trouble Charles would get into." (elaborates and adds clues, reasons)

28. *Why do you think that? (Process)

    A: 1–"She would find out Laurie was just a person and she was getting into trouble." (no more information given, no support)

    2–"Cause she never did think there was going to be a Charles..thought another boy..surprised her. If really a Charles, she would meet parents..would make story longer." (general)

    3–"Because in story it told at end Laurie's mother wanted to talk to Charles's mother about how he'd been acting in class. (reference to clue)

29. *Think of another way to look at the ending, if there really had been a Charles. (Process)

    A: 1–"I can't see anything." (none or repeats same reason)

    2–"His mom would just sit down and talk about Charles maybe about his behavior." (general)

    3–"Before PTA Laurie probably wouldn't have started helping teacher because he wouldn't have been Charles and Charles's mother might have apologized to teacher and other mothers on how her son had been treating the other children." (references story)

30. *Do you have any questions about the story? (Process)

A: 1–"No."

2–"I guess ..wonder why Laurie would tell his mother stories about what he did and tell a boy named Charles did it." (comprehension, knowledge level)

3– How come it doesn't say whether Laurie got in trouble or not (above knowledge level)

APPENDIX F

SAMPLE PERMISSION LETTER

Dear Mr./Mrs._____:

As a doctoral student at UNC-Greensboro and a former teacher in the Burlington City Schools, I am interested in helping students become better thinkers. My dissertation focuses on the relationship of various kinds of discussion strategies to the level of student thinking in language arts classes. Your child has been randomly selected from his/her language arts class to be, with your permission, a part of this study. What is requested is that the student read a short story, which I will furnish, and answer a few questions orally, which I will ask him/her. A minimal amount of class time, not to exceed 30 minutes, will be used during the language arts block. The cooperating language teacher will assist in helping with any missed classroom work.

For the purpose of the study, it will be necessary to schedule this time early in the month of September and again during the late spring of the school year. I will schedule the time at the convenience of your child's language arts teacher and preferably during a period in which no new instructional material is being presented. Your child's principal is aware of and supports this arrangement.

I request that you give permission for your son/daughter to participate by signing below. Names of students, teachers, and schools will be held in confidence. You may receive a copy of your child's performance upon request. I sincerely appreciate your support in this project. If you have any questions, please call me.

Sincerely yours,

I give my permission for my son/daughter _____
to participate in the student thinking/language arts program.
Parent signature_____
I would like a copy of my child's performance. _____ (please check)