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The effect of control strategies on sixth graders' metacognitive awareness

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THE EFFECT OF CONTROL STRATEGIES
ON SIXTH GRADERS'
METACOGNITIVE AWARENESS

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THESIS ACCEPTANCE

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Abstract

This experimental action research study provided sixth grade students five lessons about metacognitive control skills, with pre- and post-instruction measurements of the students' observable behaviors and notation of the students' think-alouds regarding their metacognitive activity. The purpose of the study was twofold: 1. to test whether students' metacognitive awareness can be increased, and 2. to compare the performance of students who initially demonstrate higher metacognitive awareness by scoring above the median on a Metacognitive Awareness Inventory with students who scored below the median on the inventory. Because research has shown metacognitive ability to operate independently of academic ability and to enhance academic performance, studies are needed to test various methods of teaching metacognitive skills. A Metacognitive Awareness Inventory consisting of 20 items was administered, with results used to match the control and experimental groups. Each group then participated in a pre-instruction problem-solving activity while observers tallied students' specific observable behaviors and listened to their think-alouds. Instruction during the study consisted of 5 30-minute lessons: for the control group, questioning strategies, and for the experimental group, metacognitive control skills relating to task variables, personal attitude, organization of work area, and selection of strategies. Post-treatment measures were taken while the students participated in a computer problem-solving experience. Results of the study showed increases in awareness of the skills for the experimental group, and although the data was not statistically significant, positive trends

were apparent, especially for the students initially identified as low-metacognitive ability.

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TABLE OF CONTENTS

LIST OF TABLES

Chapter I
Introduction

Introduction

Although metacognition is readily accepted as one piece of the "thinking skills" pie, (Costa, 1985; Marzano, Brandt, Hughes, Jones, Presseisen, Rankin, & Suhor, 1988), the definition has varied widely. Metacognition in its most general sense means "thinking about thinking," of being aware of one's own thought processes (Royer, Cisero, and Carlo, 1993). John Flavell (1970), who is often credited with drawing attention to the concept of metacognition, focused his earliest work on metamemory. Later, Flavell and Wellman (1977) characterized children's metamemory as the knowledge about how person variables, task variables, and strategy variables can influence memory. In 1979, Flavell expanded his concept of metacognition to include the individual's realization that metacognition is to be used, the affective reactions, and ways in which people use metacognition to differently organize their thinking. He also foreshadowed today's work by suggesting that at some point the definition of metacognition might even be stretched to include wise and thoughtful life decisions.

In the late 1970s, Ellen Markman (1977) began investigating metacognition in terms of comprehension monitoring. She studied young children's reactions to unclear instructions and found that younger children (first grade) would reiterate an instruction or even try to execute it before realizing anything was wrong. Although her research indicated clearly that a lack of awareness about a misunderstanding is necessary before a learner will request clarification, her conclusions about first graders' lack of understanding may have failed to take into account the fact that first graders rarely question adult authority figures, a fact she noted in a later study regarding the under-reporting of comprehension difficulties (1985).

Ann Brown (1978) expanded the early definition of metacognition to include five areas: checking, planning, monitoring, revising, and evaluating. These executive strategies were generally considered by Brown to be "cold" in contrast to Flavell's suggestion that metacognition can be laden with affect (Jacobs and Paris, 1987). Researchers then began to explore the concept of self-regulatory training during strategy instruction, theorizing that children could and should be taught the *how, when,* and *why* of strategy use to assure more generalization and transfer of the strategies taught (Yussen, 1985).

More recently, researchers have incorporated the idea of self-governing behavior as used to reflect on and control one's own mental states (Gaskins & Elliot, 1991; Royer et al., 1993, Sternberg, 1996). Howard Gardner (1991) calls for schools to forego the teaching of surface knowledge and strive instead for real understanding. Enhanced understandings, he believes, may occur if students are taught to engage in reflection and self-assessment to better control their own learning. Irene Gaskins (1994) illustrates the success of metacognitive training at the Benchmark School. "Our objective was to produce goal-directed, planful, self-assessing, strategic students who were motivated to understand and apply what they were learning" (p. 131). Gaskins & Elliot (1991) produced a series of lessons for their Benchmark School students that appear well-grounded in best practices. The content encourages students to take control of the variables that affect learning: task, strategy, personal attitude, work environment, and so on.

This "executive control" appears to be an area deserving of further research: the teaching of strategies by which one can more effectively monitor one's own mental states could lead to more effective learners.

As more information is gathered about how learners use metacognitive skills, a core of knowledge is growing about metacognitive ability. Long assumed to be connected with IQ, research is indicating instead that metacognitive ability acts independently of both IQ and academic ability (Pressley & Ghatala, 1990; Schraw & Dennison, 1994; Swanson, 1990.) Researchers are now striving to develop assessment tools (such as Schraw & Dennisons's Metacognitive Awareness Inventory) with which to measure metacognitive aptitude and awareness. Teachers interested in enhancing their students' metacognitive abilities may one day be able to administer individual assessments to check for use of specific metacognitive skills.

<u>Problem Statement</u>

Based on current research, educators are striving to find ways to incorporate the affective metacognitive domain and its executive control into daily instruction. Research about metacognition is moving beyond theoretical definition and is beginning to search for methods to assess, instruct and develop this important skill in learners. More empirical investigation is needed. Thus, this study investigated the effects of teaching students metacognitive control skills (strategies for managing their mental states) through a series of five "Intelligence Formula" lessons.

<u>Hypotheses</u>

In order to investigate the potential effects of teaching students metacogntive control skills, the following hypotheses were developed:

1. Students receiving 5 Intelligence Formula lessons about metacognitive control will demonstrate a significant increase in awareness of the skills as measured by observable behaviors and student think-alouds.

2. Students identified as high metacognitive ability by scoring above the median on the Metacognitive Awareness Inventory will show evidence through observable behaviors and student think-alouds of having applied the metacognitive control skills at a higher rate than those students scoring below the median on the MAI.

Significance of the Problem

Current definitions of intelligence have broadened in recent years (Gardner, 1983; Sternberg and Wagner, 1986; Sternberg, 1996). Traditionally, intelligence has been inextricably linked with notions of how well one performed in school, or to a static IQ score. Intelligence, it seemed, was innate and unchanging (Sternberg, 1988). More recently, an individual's success in life and on the job has been proposed as a more valid measure of intelligence (Baker, 1989; Sternberg, 1988; Sternberg, 1996). In fact, many of today's most successful individuals do not have high IQ scores (Sternberg, 1996). Instead, they appear to possess skills in the realm classified as metacognitive control. Their key traits consist of habits such as goal-setting and planning, manipulating their working environment to best match their personal learning and working styles, and the ability to reflect on work and progress, evaluating, monitoring, and adjusting as necessary (Abbot, 1997; Covey, 1989; Baker, 1989; Gardner, 1991; Gaskins, 1994; Sternberg, 1996). Additionally, they have strong "lifeskills" (Kovalik, 1994) and "megaskills"

(Rich, 1992) such as perseverance, motivation, effort, initiative, problem solving, and responsibility.

It might appear that these practical skills of intelligence are more necessary for adults than for students. Indeed, much of school consists of strictly academic tasks, required at a certain time to be completed in a specific way. Children who are able to handle the school tasks successfully have been the ones regarded as intelligent. An analysis of these students, however, shows clearly that success in school depends as much on the ability to understand the demands made by the school environment and to adjust to those demands as it does on academic competencies (Gardner, Krechevsky, Sternberg, & Okagaki, 1994). Research has consistently demonstrated that differences between good and poor students of similar aptitude result more from their ability and disposition to learn than on their content-area knowledge (Gaskins, 1994). Campione and Brown (1990) concluded that the lack of self-regulatory metacognitive skills such as planning and monitoring progress accounted for the poor performance of academically weak students.

These metacognitive control skills, while sometimes mentioned to children in schools ("Put forth more effort, please"), are rarely taught directly. Students who possess these skills are thought to be innately smart, when in fact it seems that all students could benefit from instruction about the acquisition and use of the control skills (Gaskins & Elliot, 1991; Gardner et al., 1994; Kovalik, 1994; Marzano et al., 1988; Rich, 1992). The face validity of metacognitive skills is very compelling, state Nickerson, Perkins, and Smith (1985). "Who can argue against the desirability of carefully managing one's time and resources, or of monitoring the effectiveness of an approach to a demanding task? If such things can be taught, and in such a way that they generalize across tasks, one would be surprised if intellectual performance were not enhanced as a consequence." (p. 109).

Operational Definitions

Awareness - the use or discussion of a new concept or skill

Intelligence Formula Lessons - a set of 5 researcher-designed lessons based on the formula "Intelligence = Knowledge + Control" (Gaskins & Elliot, 1991).

Metacognition - A reportable, conscious awareness about cognition that can be demonstrated, communicated, examined, and discussed (Jacobs and Paris, 1987).

Metacognitive Awareness Inventory (MAI) - a 20-item, 4 point Likert Scale survey (adapted for sixth grade from Schraw & Dennison, 1994).

Metacognitive Control Skills - Skills which provide the ability to monitor and adjust (to *control*) variables surrounding the learning. Variables include personal (attitude, motivation, effort, and so on), task (assignment choice, activity choice), environmental (noise level, lighting, organization of work space), and strategy (choosing the appropriate strategy from a field of many) (Gaskins and Elliot, 1991).

Think-aloud - a verbal reporting strategy in which the students are asked to explain their thought processes aloud to an observer. Also used to describe a teaching technique whereby the teacher thinks-aloud while modeling a behavior or strategy.

Chapter II
Review of Related Literature

The Teacher's Role in Encouraging Thinking

The need to change the American educational system from the factory model has been raised repeatedly by educators and others concerned with the future of American education (Caine & Caine, 1994; Gardner, 1991; Hart, 1983; Reich, 1991; and many others). A heartfelt call for authentic learning and real understanding is being heard. Howard Gardner (1991) gives many examples of students of all ages showing disjunctions in their learning processes: in math they rigidly apply algorithms, in science they bring misconceptions to their studies, and in the arts and humanities they stereotype and simplify (p. 151). Gardner asserts that traditional educational practices fail to correct these disjunctions. In addition, most school tasks do not require the kinds of knowledge access demands that everyday, real-life tasks do (Bereiter & Scardamalia, 1985).

Teaching for understanding has become a major concern for cognitive scientists and educators. Recommendations for teachers include creating a low-threat, high-challenge atmosphere (Caine & Caine, 1994), fostering the attitude that learning is for understanding (Gardner, 1991), modeling critical and creative thinking and metacognitive goals and skills (Bereiter & Scardamalia, 1989; Marzano et al, 1988), and redefining the teacher's role to become more a *learning coach* and less a *knowledge teller* (Gaskins, 1994; Marzano, et al).

A Learning Coach

Just as a coach must understand the nuances of the game, so must a teacher understand and be able to apply cognitive theory to instruction. In order to provide students with a repertoire of cognitive and metacognitive skills and strategies, teachers must understand cognition, be aware of a variety of strategies, and be able to analyze the strategies before teaching them (Gaskins, 1994; Marzano et al, 1988; Joyce, 1985). When teachers can "(a) identify conditions that students can learn to recognize, and (b) specify actions that students can learn to carry out when those conditions are met" (Bereiter and Bird, 1985, p. 154), effective strategy instruction can begin.

Because teacher-student dialogue is essential for helping students construct understandings (Zahorik, 1997), instruction should take the form of coaching, with active intervention by the instructor as students work on problems (Schoenfeld, 1989). The teaching should involve high levels of social interaction, with the "coach" encouraging the student to verbalize and reflect on new knowledge and pose and solve their own problems (Rowan, 1995). This model stimulates students to explore new strategies, while being guided to discover their effectiveness (Borokowski, 1992).

This type of *guided discovery* model of teaching will come easier for a constructivist teacher than for a traditional classroom teacher. In conflicting studies, teachers were found to (a) have a difficult time changing teaching models (Joyce & Showers, 1984), and (b) be able to quickly learn how to model metacognitive behavior and emphasize the mental processing in lessons (Duffy et al., 1986). Joyce and Showers found that in order to change to a new model, teachers need to study its theory, see it demonstrated, and repertoire. Additionally, Borokowski (1992) found that the practice must include guidance in modifying the instructional techniques and adapting the model's characteristics to the individual demands of their classroom. Just as recommended for students, teachers too must be allowed to construct their own meanings rather than having a model externally imposed.

Metacognitive Awareness

Much of the earliest work on metacognition was applied to the field of reading. Research in the 1970's and 1980's in this domain concentrated on metacognitive deficits and interventions in the form of reading strategies (see Ward & Traweek, 1993). In many of the studies, positive treatment effects after strategy instruction were demonstrated on cloze tasks, with no corresponding improvement on standardized reading tests. Further, "many of the studies did not measure students' metacognition either before or after training. Thus, little information was provided about initial levels of metacognition or increased understandings about specific strategies as a result of training" (Ward & Traweek, 1993, p. 471.) Clearly, additional assessments were needed. As researchers have developed assessment procedures for obtaining data about metacognition, a number of unexpected findings have occurred (Shraw & Dennison, 1994). One finding of particular importance is that metacognitive awareness appears to operate independently of academic achievement (Pressley & Ghatala, 1990) and intellectual ability (Swanson, 1990). Swanson's study compared metacognitive awareness in 4th and 5th graders with high- and low-academic aptitudes (as determined by their scores on the Cognitive Abilities Test and the Comprehensive Test of Basic Skills.) Determinations of metacognitive awareness were made using a

17-item individual interview. Although Swanson's sample was small (N=56), it seems apparent that metacognitive awareness is a factor independent of academic aptitude. Swanson's sample divided as follows: high-aptitude/high metacognition, N=15; high-aptitude/low metacognition, N=16; low-aptitude/high metacognition, N=16; and low-aptitude/low metacognition, N=9.

While Swanson's study should be replicated using a larger sample, preliminary results indicate that a high metacognitive awareness can compensate for low academic ability. In light of this and other findings (see Schraw & Dennison, 1994), the quick and reliable identification of a student's metacognitive awareness becomes at once more important and more difficult.

Schraw & Dennison (1994), realizing that individual interviews are prohibitive in most settings due to time constraints, set out to generate and test an easily administered, written metacognitive inventory that would be suitable for adolescents and adults. Their Metacognitive Awareness Inventory (MAI) is composed of 52 items that reliably assess two types of metacognitive knowledge: *Knowledge of cognition* includes what students know about their own strengths and weaknesses, strategies, and conditional usefulness of strategies, while *regulation of cognition* includes students' understandings of planning, implementing, monitoring, correcting comprehension errors, and evaluating their learning (Brown, 1987; Jacobs & Paris, 1987).

The MAI was validated using college undergraduates, who responded to each statement on a 100-mm, bi-polar scale. The left end of the scale indicated that the statement was true about the individual; the right end that the statement was false (p. 463). Not only was the MAI found to provide a reliable test of metacognitive awareness, it was also useful as a predictor of subsequent performance (although the authors caution that the reading test administered may not have been a sufficiently difficult task for the subject population. They suggest further studies comparing the MAI to performance on reasoning or thinking tasks.) Further, the usefulness of the MAI for younger adolescents has not been tested.

Assessment

In addition to measuring metacognitive awareness before and after treatment, researchers have devised various means of assessing metacognitive activity during thinking exercises. Assessment in cognitive and metacognitive instructional systems takes different forms than in behavioral systems. Rather than focusing on declarative knowledge, cognitive assessment frequently focuses on both the qualitative and quantitative. Cognitive assessment must provide indexes of change in knowledge structures and organization (Royer et al., 1993). Researchers should "look for examples of introspection, retrospection, and *futurespection*" according to Baron (1985, p. 229). Examples of assessments that have been utilized include post-performance interviews, post-performance questionnaires, inferring metacognitive activity from observable behaviors, and self-reports in the form of tally sheets, written comments, or think-alouds (Jacobs & Paris, 1987; Ward & Traweek, 1993).

The use of self-reports has been questioned and criticized (see Jacobs & Paris, 1987), with concerns ranging from social acceptability of the answers to lack of verbal facility to discuss mental events. Despite these concerns, there is frequently enough correspondence between self-reports and actual behaviors to give us reason to continue including verbal self-reporting as a valid research measure (Baker, 1989). Thinking aloud has value both for demonstrating strategies to students and for practice in recognizing and using the strategies. Thinking aloud also provides a way to assess deficits in the learning of specific strategies (Bereiter & Bird, 1985; Baker). An additional benefit of the think-aloud, as reported by participants in several studies, is that the approach itself gives participants more insight into their own comprehension processes (Baker). This has been found to be especially helpful when processing difficult items - as task difficulty increases, so does the helpfulness of the think-aloud (Ward & Traweek, 1993).

Initial use of the think-aloud was somewhat unwieldy, as students were asked to tell "everything they thought about." Subsequent researchers have modified the technique to help students focus on actual thinking (metacognitive) behaviors, difficulties, successes, and so on. A modified think-aloud often includes questions being asked by the researcher (Baron, 1985; Jacobs & Paris, 1987; Lesgold, et al., 1990; and Schoenfeld, 1989; see Table 1).

Table 1

Think-aloud Prompts
Why would you do this?
How would you do it?
What does it tell you?
Is this what you think you would do in a different situation?
What do you think the problem is?
What do you plan to do next?
How would you use that?
How does it help you?
How could you have prevented that problem?
How would you approach a similar problem in the future?

Metacognitive Lesson Design

Whether discussing thinking skills in general or metacognition in particular, one of the first issues in lesson design is the model: stand-alone, with skills taught independently as a special subject, or imbedded, with skills taught during other content-area instruction (Gaskins, 1994). Metacognition has been found to be useful across the curriculum, in math (Schoenfeld, 1989), reading (Baker & Brown, 1984), and writing (Bereiter & Scardamalia, 1985). Because of the wide variety of applications, metacognitive skills seem plausible candidates for transfer and generalization across many subject areas (Larkin, 1989). Thus, either stand-alone or imbedded lessons would seem to be appropriate. After a year's pilot of a stand-alone course designed to teach practical intelligence skills (Sternberg, Okagaki, & Jackson, 1990) to middle school students, a valid concern surfaced (Gardner et al., 1994). "It would be possible to succeed on the Practical Intelligence For Schools (PIFS) measures without significant improvement in class performance, papers, homework, tests, and the like. Hence, one emerging goal was to tie the PIFS curriculum more closely to the kinds of performances that students ought to be exhibiting in their daily and yearly schoolwork" (p. 123).

Nickerson (1988) takes a position for utilizing both techniques to assure maximum transfer across subject areas. He suggests beginning instruction with stand-alone lessons and then mentioning the skills often during content-area lessons. It is this combination model that the lessons written for this study will use.

Whether the lessons are stand-alone or imbedded, researchers have reached a consensus regarding key components of effective metacognitive lessons. These components, which are being grounded in recent cognitive theories of learning (Rowan, 1995), include: 1. explicit, elaborated instruction, 2. cyclical lesson design, and 3. teacher modeling.

Explicit, Elaborated Instruction

Metacognitive lessons that are most effective are those that are the most explicit (Yussen, 1985). Gerald Duffy and his colleagues (1986) found that teachers who provide explicit descriptions of strategies to be learned for use in reading promoted student understanding of lesson content. Their studies also showed that teachers could easily learn to model metacognitive approaches to reading so that students received elaborate verbal instructions about strategy use. Twenty-two fifth grade teachers quickly learned to emphasize the mental processing inherent in basal text reading skills. Students in these teachers' classrooms showed significant metacognitive gains as evidenced by answers to interview questions such as "When would you use what was taught in the lesson?" Unfortunately, the one reading test administered during the study failed to show a change in student reading scores (Jacobs & Paris, 1987). Bereiter and Bird (1985) also found strong evidence for using direct, explicit instruction in strategies. Their study compared instructional techniques based on modeling only (similar to what Ann Brown and colleagues called *blind training,* 1981), modeling plus instruction (direct, explicit identification of strategies and their use), oral and written exercises, and a control group. Unlike Duffy's students, the 7th and 8th graders in Bereiter's and Bird's modeling plus instruction group showed increases not only in metacognitive awareness, but also in reading comprehension.

In a study by Pressley and Dennis-Rounds (1980), elaborated lessons were shown to significantly increase transfer over a more typical instruction condition. Children and adults were taught a keyword strategy for learning pairs of vocabulary words. Elaborated instruction simply included a discussion or set of examples of how this strategy is useful and how it might be useful in other areas. (See also Pressley, Borokowski, & O'Sullivan, 1985). When presented with a new variation of the memory task, the groups receiving elaborated instruction used the strategy significantly more often, and could give reasons why.

Cyclical Lessons

A second key component in effective metacognitive lessons is the development of cyclical lessons which provide opportunities for student to practice and receive feedback on their use of the strategies. Weinstein and Underwood (1985) conducted a series of studies which found that students need opportunities to create their own elaborations via practice with the strategy and feedback from the instructor. A strategy lesson introduced by the instructor, with an explanation of the characteristics of the strategy and examples of how the strategy will be useful in one or two situations, followed by a practice period during which the students devise their own applications for the strategy, appear to be the most beneficial. Indeed, more and more, "Cognitive instructional researchers are developing a new body of instructional theory based on constructivist, self-regulated assumptions about the nature of learning" (Resnick & Klopfer, 1989, p. 4).

Teacher Modeling

"Since students learn best by imitating the adults around them, the teacher who publicly demonstrates metacognition will probably produce students who metacogitate" (Costa, 1984, p. 62). All of the studies calling for explicit, elaborate instruction and cyclical, practice lessons also emphasized the importance of the teacher taking the time to model the strategies (Bereiter & Bird, 1985; Brown, Campione, & Day, 1981; Costa, 1984; Pressley & Dennis-Rounds, 1980; Sternberg, Okagaki, & Jackson, 1990; and Weinstein & Underwood, 1985). Some ways teachers can model include sharing their planning, monitoring, revising, and evaluating for lessons (Marzano et al, 1988), making errors and describing ways to get back on track, admitting they don't know the answer but designing ways to find out, and describing their goals and objectives (Costa).

Chapter III
Methodology

Research Design

This was a quasi-naturalistic study, combining aspects of both experimental and naturalistic methods to investigate the effects of teaching metacognitive control skills to sixth graders. Measurements of students' awareness or use of metacognitive control skills were taken pre- and post-treatment using a researcher-designed rubric (Table 3) on which observers tallied specific student behaviors and think-alouds.

Subjects

The subjects for this study were members of a sixth-grade public school classroom in a Midwestern urban school district. The students were randomly assigned to the classroom by the building principal at the end of the 1995-96 school year. The class consisted of 12 boys and 12 girls of varying levels of ability and achievement. Formal permission was obtained from the University's Institutional Review Board, the school district Division of Research, and the building principal. In addition, parental permission slips were returned for 23 of the 24 students (the 24th student was excused from the study and one student missed three of the five lessons, for a final N of 22).

Instrumentation

The proposed study measured 6th graders' metacognitive aptitude and awareness as measured by a Metacognitive Awareness Inventory (MAI), observable metacognitive behaviors, and think-alouds. Three measurement instruments were developed for this study. First, the researcher utilized a 20-item Metacognitive Awareness Inventory (adapted from Schraw & Dennison, 1994). Adaptations to the inventory included the use of a 4-point

Likert scale, with the rationale that an *always, sometimes, never, don't know* response would be easier for a sixth-grader to comprehend than a percentage on a 100-point scale, and the omission of 32 items for purposes of brevity. Schraw and Dennison's MAI was found to be valid across two general areas: Knowledge of Cognition and Regulation of Cognition. The 20-item adaptation maintained the same ratio of categories as the original. In addition, several items were reworded to compensate for a more appropriate elementary reading level (Table 2). This instrument is a non-standard form of the original. No testing of the validity of the instrument was done (other than the validation done during the development of the MAI by Schraw and Dennison.) The adapted MAI was previewed by six elementary teachers, two of whom are currently teaching sixth grade, for suggestions to enhance readability of the MAI.

The classroom teacher administered the MAI two weeks before the study began, instructing students to think about their answers and give their most honest response. The administration of the MAI was repeated after the study, three weeks after the initial exposure.

Table 2: Metacognitive Awareness Inventory

	Choose always, sometimes, never, or don't know for each statement.				
1.	I have control over how well I learn.	A	S	N	DK
2.	I set learning goals before I begin a task.	A	S	N	DK
3.	I slow down when I read important information.	A	S	N	DK
4.	I learn best when I know something about the subject.	A	S	N	DK
5.	I ask myself every so often if I am meeting my learning goals.	A	S	N	DK
6.	I understand my brain's strengths and weaknesses.	A	S	N	DK
7.	I try to connect what I'm learning to something I already know.	A	S	N	DK
8.	I think of several ways to solve a problem and choose the best one.	A	S	N	DK
9.	I ask others for help when I don't understand something.	A	S	N	DK
10.	I can motivate myself to learn when I need to.	A	S	N	DK
11.	I know that certain ways to study work best for me.	A	S	N	DK
12.	I know how well I understand something.	A	S	N	DK
13.	I stop every once in a while to check my understanding.	A	S	N	DK
14.	I ask myself how well I met my goals once I'm finished.	A	S	N	DK
15.	I draw pictures or diagrams to help me understand my learning.	A	S	N	DK
16.	I organize my time to help me meet my goals.	A	S	N	DK
17.	I learn more when I am interested in a subject.	A	S	N	DK
18.	I stop and go back over new information that is not clear.	A	S	N	DK
19.	I stop and reread when I get confused.	A	S	N	DK
20.	I read instructions carefully before I begin.	A	S	N	DK

The second instrument developed was a rubric designed to measure students' observable behaviors and think-alouds (Table 3). This rubric was designed to allow one rater to observe and tally behaviors and think-alouds for four students at one time. Five undergraduate Elementary Education majors and two post-doctoral instructors met to review the instrument prior to the first field observation. Their suggestions included a change of format from a table to a chart for easier transcription and a request for room on which to make notations other than tallies. In addition, the behaviors were categorized according to the areas of control that were included in the lesson design. Examples were discussed for each type of behavior, and observers were requested to utilize the think-aloud prompts (Table 1) that were provided.

Table 3: Student Observation Rubric

	cat.	Behavior	A	B	C	D
1	env.	organizes work space				
2	task	checks understanding (reviews, asks)				
3	task	uses/gets appropriate materials				
4	task	plans work/sets learning goals/allots time				
5	task	makes connections to prior knowledge				
6	strat.	predicts				
7	strat.	relates new to old/old to new				
8	strat.	takes notes				
9	strat.	self-talk: with questioning				
10		self-talk: with gestures				
11		self-talk: with elaboration				
12	self	motivation				
13	self	perseverance				
14	self	attitude (+ or correction)				

Observer:

Procedures

The students were divided into a control and an experimental group, matched for strong and weak metacognitive aptitudes as determined by their answers on a metacognitive awareness inventory (MAI, Table 2). Those students scoring above the median were classified as having a high metacognitive aptitude, while those scoring below the median were classified as having a low metacognitive aptitude. The classroom teacher reviewed the groups to determine that the groups evenly represented academic achievement and gender.

Baseline Data Collection

After dividing the class into control and experimental groups, a baseline assessment was taken. The groups participated in a placebo problem-solving activity designed by the classroom teacher, while raters used the rubric to observe the students. The observers prompted thinking aloud several times during the activity, using the prompts from Table 1. The verbal responses and observable behaviors were tallied on the rubric (Table 3).

Procedures for Instruction

Each day's format was similar. One group remained in the classroom for the first thirty minutes, while the other group met in the school library. The order of the groups was changed for each lesson. After the thirty-minute lesson, the groups were switched and lessons repeated, with the experimental group receiving lessons on metacognitive control skills and the control group receiving placebo lessons. Both groups were taught by the researcher in a similar format. During the thirty minutes that the groups were not with the researcher, the classroom teacher was asked to provide activities and supervision. This served somewhat to lessen the impact on his daily schedule.

The "Intelligence Formula" Lessons - Experimental Group

Portions of five school days were required to teach the set of lessons. Each lesson was approximately 30 minutes in length and was designed to be self-contained (no homework or outside tasks). Students in the experimental group received a folder of handouts. The lessons, called collectively "A Formula For Intelligence: Metacognitive Control Skills" (Appendix A), were based largely on the work of Gaskins and Elliot (1991), while incorporating suggested content and educational practices as described in Chapters I and II. Each lesson began with a global overview and mental warm-up (similar to a general review and anticipatory set), which encouraged the making of connections to the students' past experience. Lesson One served as an introduction to the Intelligence Formula and to the idea of intelligence and metacognition as something a person can control. Lesson Two taught control over the student's learning environment, specifically addressing organization of work space, and also provided the children with a rationale for thinking aloud. Lesson Three encouraged control over task variables such as use of materials, the setting of learning and quality goals, checking prior knowledge, and reviewing understanding of the task. In Lesson Four, students were taught briefly about control over strategy choice, and during Lesson Five the variables within oneself such as attitude, motivation, effort, and perseverance were discussed. The lessons utilized a variety of techniques, including discussion, role-playing, active participation, reciprocal teaching, and reflective journaling. The researcher modeled the use of think-aloud questions (see Table 1) during each of the Intelligence Formula lessons.

Placebo Lessons: Control Group

The control group was taught in a similar active-learning format, with their lessons centering on questioning skills. Five-minute mysteries, twenty questions, and generating questions were used as the focus of the lessons. These lessons were chosen to be worthwhile educationally without contaminating the treatment and measurement.

Post-treatment Data Collection

After the completion of the five lessons, the groups each visited the school's computer lab for a session of exploring programming with LogoWriter (Logo Computer Systems, Incorporated, 1986). The students were instructed to use the think-aloud technique as they made their way through several drawing and programming problems (Appendix B) which required the hands-on use of LogoWriter.

Before beginning, the researcher explained that this is was to be a fun problem-solving challenge and each group was asked to explore the workings of Logo as best they could while working in pairs. Raters monitored the students' use of observable strategies and think-alouds by tallying individual rubrics for each student (four or fewer students per rater.) Raters also asked each student at least two think-aloud questions. Each group spent 40 minutes in the computer lab, and participated in an alternate activity designed by the classroom teacher during their time out of the lab.

The next day, the classroom teacher again administered the MAI.

Data Analysis

A descriptive analysis was conducted on the data from the MAI and the rubrics. Data were analysed by hypothesis, with additional descriptive analyses utilized from the qualitative data.

Chapter IV
Analysis of Data

Results

Two types of data were collected on students who participated in the study: individual scores on the Metacognitive Awareness Inventory and individual scores of observable behaviors and think-alouds. Each measure was completed twice, once before the treatment and once after. This chapter outlines the results by hypotheses. Supporting descriptive data as well as some qualitative excerpts are used to strengthen the discussion in Chapter V.

Descriptive Data

Data were collected at four different times, two prior to treatment and two post-treatment. Students self-assessed metacognitive awareness using the Metacognitive Awareness Inventory, a 4-point Likert scale. Scoring was completed by assigning point values as follows: Always = 4, Sometimes = 3, Never = 2, and Don't Know = 1. Raw scores, which fell within a normal distribution, were used to match the groups (Table 4) and to rank the students for statistical analysis of Hypothesis 3, using a median of 64.

Table 4
Pre-Treatment Metacognitive Awareness Inventory Score Analysis

	N=	Mean MAI Score	SD
Control Group	11	63.09	4.78
Experimental Group	11	63.00	6.63

Post-treatment MAI scores were analyzed in this study only to ascertain group improvement in metacognitive awareness. These scores did not show significant gains, with means of 63.36 for the control group and 63.44 for the experimental group, although the higher standard deviations (6.10 and 7.91, respectively) show a greater tendency to answer toward the extreme end of the scale, indicating students may have been more comfortable with the survey items after treatment. Three weeks separated the two administrations of the MAI.

Students' observable behaviors and think-alouds were measured pre- and post-treatment by trained observers. To standardize scores, the observers' tallies were converted to a percentage, using each observer's highest number of tallies given as 100%. These percentages were then used to calculate Spearman Rank Order Correlation Coefficients and to compute *t*-tests in order to analyze Hypotheses 1 and 2.

Hypothesis 1

Students receiving 5 Intelligence Formula lessons about metacognitive control will demonstrate a significant increase in awareness of the skills as measured by observable behaviors and student think-alouds.

Null Hypothesis: Students receiving 5 Intelligence Formula lessons about metacognitive control will demonstrate no significant increases in awareness of the skills.

After calculating a percentage score for each observation, *t*-tests were run to determine the significance of difference between the pre- and post-treatment means of observable behaviors and think-alouds. Both the control and experimental groups showed some improvement in their mean scores (control group 73.78 to 76.44, experimental group 66.78 to 75.11) (Table 5). Although these scores were not significant at $p < .05$ (matched

t-values of .23 and .73, respectively), the standard deviation in all cases was smaller, which also indicates improvement.

Table 5
Comparison of Mean Scores from Observations

	Pre-treatment	SD	Post-treatment	SD	t-value
Control	73.78	25.84	76.44	23.75	0.23
Experimental	66.78	26.83	75.11	21.10	0.73

Thus, although a general trend toward improvement was detected, the Null Hypothesis 1 was not rejected based on a lack of significance.

Hypothesis 2

Students identified as high metacognitive ability by scoring above the median on the Metacognitive Awareness Inventory will show evidence through observable behaviors and student think-alouds of having applied the metacognitive control skills at a higher rate than those students achieving below the median on the MAI.

Null Hypothesis: Students identified as high metacognitive ability will not show application of metacognitive skills.

A Spearman Rank Order Correlation Coefficient was performed to compare the initial scores on the MAI with initial scores on the observation. While metacognitive awareness (a self-perception measure) and metacognitive use appear to have a relationship, the correlations failed to achieve significance at $p < .05$ (control group rho=.19; experimental group rho=.31).

Finally, a comparison of observation scores of each group's high metacognitive aptitude students with low metacognitive aptitude students was performed, with results reported in Tables 6 and 7.

Table 6
Observation Scores and Analysis: Control Group

	Pre-treatment		Post-treatment	
	High Aptitude	Low Aptitude	High Aptitude	Low Aptitude
Number	N=5	N=4	N=5	N=5
Scores	100	100	100	89
	90	100	100	84
	61	64	94	78
	50	72	61	57
	27		49	33
Mean	65.6	84	80.8	68.2
SD	29.72	18.76	24.06	23.15
t-value	-1.13		0.85	

Table 7
Observation Scores and Analysis: Experimental Group

	Pre-treatment		Post-treatment	
	High Aptitude	Low Aptitude	High Aptitude	Low Aptitude
Number	N=5	N=5	N=4	N=5
Scores	100	84	100	84
	100	66	100	83
	72	56	78	78
	66	44	50	66
	63	16		37
Mean	80.2	60	82	69.6
SD	18.36	33.11	23.72	19.58
t-value	1.2		0.86	

Note to Tables 6 and 7: Differences in N occur due to student absences during either pre- or post-treatment measures.

The *t*-test values of -1.13, .85, 1.2, and .86 indicated that there were not significant differences between students' self-perception (metacognitive awareness) and actual use of metacognitive skills, either with or without training. Again, however, the trend showed the metacognitive training having a slight positive effect, especially for the children identified as being low-aptitude in regards to metacognitive awareness. Those low-aptitude learners receiving treatment raised their mean scores on observable behaviors (60 to 69.6) and also decreased the amount of deviation (SD = 33.11, SD = 19.58.) Thus, although the null hypothesis was not statistically rejected, it appears further study is validated.

Qualitative Data

Notations about behaviors and think-alouds from the observers provided additional data, as did anecdotal evidence from the classroom teacher. For example, the teacher reported that one student from the experimental group chose to write about the researcher in her year-end memory book. When asked to elaborate, the student stated, "She taught us to think." This student did, in fact, improve her scores on both the MAI and observable behaviors.

The initial observation took place during a problem-solving activity designed by the classroom teacher. The students were working in groups of 3 or 4 to complete several new and difficult activities. The observers noted a great deal of off-task behavior, which was often commented upon by certain group members. "...wants to get her work done, tries to keep the group on task, takes over because he knows the answer" were some of the items coded as think-alouds during the pre-treatment observation. The post-treatment observation took place in the computer lab, where the students were told they would have the *opportunity* to complete a challenging problem-solving activity. The observers noted some frustrations with the activity, but no mention was made by any of the observers about off-task behavior. Subsequently, fewer think-alouds of that type were recorded during the post-treatment measure. Interestingly, more verbal predictions were coded during the LogoWriter computer activity (pre-treatment predictions = 23; post-treatment predictions = 36) even though the total number of self-talk tallies was far less (pre-treatment=61, post-treatment=40.) A possible reason that less thinking-aloud was seen during the post measure might be the nature of group dynamics: two students at one computer may have different types of oral communication than three students involved in a classroom activity (i.e., pointing at the computer screen, grabbing the keyboard without communicating why, and so on would all be non-coded behaviors).

Conclusions

Hypothesis 1: There was no significant difference between metacognitive control skills instruction and the use of observable metacognitive skills. Therefore, Null Hypothesis 1 failed to reject.

Hypothesis 2: *T*-test scores showed no significant differences between metacognitive awareness and use of metacognitive skills, regardless of application of skills training, and statistically insignificant correlations were found, therefore, Null Hypothesis 2 failed to reject.

Although no statistically significant differences were found between instruction and use of metacognitive skills (Hypothesis 1) or metacognitive ability and use of metacognitive skills (Hypothesis 2), certain trends were apparent. In every case, the low-aptitude experimental group improved their means and lowered their standard deviations, indicating a possible causal relationship.

Chapter V
Conclusions

Study Summary

The teaching of metacognitive skills appears to have considerable potential. These skills enhance student learning and achievement and occur in all ability levels. More empirical studies about teaching metacognitive skills are needed. The purpose of this study was to determine the effect of five lessons directly teaching metacognitive control skills. Measurement consisted of tallying students' observable behaviors (organizing work space, using appropriate materials, note-taking, gesturing) and think alouds (regarding such metacognitive skills as checking understanding, setting learning goals, making connections to prior knowledge, predicting, self-talk, keeping oneself motivated and correcting attitude as necessary, and exhibiting perseverance). A secondary purpose of the study was to utilize an adapted Metacognitive Awareness Inventory to study high- and low-metacognitive ability behaviors.

Conclusions

The Metacognitive Awareness Inventory utilized for this study indicated that metacognitive ability operates independently of academic ability. After the initial MAI data was collected, two groups were established by matching for high and low metacognitive ability. The classroom teacher was asked to review the groups for academic ability. Each group had an even number of high and low academic performers, and the teacher noted with surprise that several of his lowest students had high metacognitive abilities.

Hypothesis 1 investigated the question: Will sixth graders participating in five Intelligence Formula lessons show a significant increase in awareness of the skills? As measured by the study, neither the

Metacognitive Awareness Inventory (MAI) nor the observers' rubrics showed statistically significant increases in awareness or use of the metacognitive control skills in the experimental group.

Two observations of the students during problem-solving activities yielded observational tallies regarding observed behaviors and think-alouds. Although the raters met, discussed the rubric, and agreed to certain key concepts, the lack of a pilot observation for these observers brings serious questions regarding their data. In order to run *t*-tests on the observation data, the observers' scores, which varied widely, needed to be adjusted to provide similarity of scores. Each observer posted a high and a low number of tally marks. The student receiving each observer's highest number of tallies was accorded the 100% position. Other scores were figured based on that percentage. These percentages served to compensate for the discrepancies between raters (one rater's high was 51 tallies, several others tallied 6 behaviors as their high mark), but the scores of 100 provided for large standard deviations in every instance. Additionally, each rater was provided with a copy of Table 1 (Think-Aloud Prompts) and was asked to utilize these prompts several times for each student observed. Video tapes of the observations would, perhaps, yield more reliable data.

Although the *t*-test scores did not show significant differences between instruction and subsequent awareness of the skills, several questions remain. First, was the observation rubric a legitimate measure of awareness, or was it measuring the *use* of the skills? Perhaps the students were aware of the concepts presented in the lessons, without necessarily using them during the problem-solving activity. Second, how accurate were the observers' tallied rubrics? The extreme variance of scores from one observer to another leads to questions about the validity of the inter-rater reliability. Overall, the experimental group's mean scores did improve and their standard deviations were smaller, which indicates some improvement. These scores, however promising, were not statistically significant.

Metacognitive aptitude appears to vary from person to person, and appears to operate independently of IQ or academic achievement. Hypothesis 2 postulated that students already possessing a higher level of metacognitive awareness would be seen applying metacognitive skills at a higher rate than other students. Data to support this hypothesis was derived from contrasting students' answers to the MAI with data from the observations. Again, the data failed to indicate significant relationships. The same concerns noted above about the reliability of the raters' observational data occur here as well. Interestingly, the data in this case also show slight, if insignificant, improvements in the scores. It would appear from the data that children with low metacognitive aptitude can be expected to benefit from metacognitive skills training. This is certainly an area for future study.

Limitations

Lesson Scheduling: A researcher entering a sixth grade classroom late in May faces the obvious disadvantage of having to cope with inappropriate student behavior perhaps more than at any other time of the year. Future action researchers may want to schedule their research projects more carefully, utilize one-on-one meetings with the students, or at the very least work with the class while the classroom teacher is present. In this study, minimizing disruptions became a constant focus of the lessons, with content becoming almost a secondary issue.

The Intelligence Formula lessons require a “let’s find out” attitude, a desire to become a more effective learner, a belief that increasing one’s effectiveness is possible, and a trust in the teacher that the content will meet these expectations. Adults across America are learning these same types of effectiveness skills at workshops, seminars, and through self-help books. This sixth grade class, however, did not exhibit these desires and attitudes. A class taught by a teacher who has modeled and valued these attitudes during the year would probably fare better. Research suggests that the teacher should act as a “coach” when instructing metacognitive skills; an action researcher new to the classroom has a limited amount of time to develop students’ trust, which is essential to coaching.

In addition, the experimental group discovered after the first day that the control group was receiving a different set of lessons. The perception was immediately formed that the control group was having more fun. This perception added to the misbehaviors and off-task comments. Interestingly, the students’ attitudes changed remarkably the day the “control over self” lesson was taught. Students in the experimental group truly analyzed their own behavior and even apologized to the researcher and to their classmates for being disruptive. Being asked to tally their own positive and negative behaviors gave them the opportunity to immediately practice the skill, with remarkable results. This lesson and its handouts could certainly be used by teachers at almost any grade level to help their students focus on positive behaviors prior to beginning *any* learning activity.

Lesson Reinforcement: Metacognitive skills, whether taught in direct lessons or imbedded in the curriculum, are best taught over a long period of time, with many opportunities to practice and be reminded to use the skills. The design of this study did not permit either the long-term teaching or the opportunity to practice and remind students of the skills (both the control and experimental groups were in the same classroom, so any mention of the instruction would taint the study.) Given a classroom where the proper attitude was developed and an extended period of time to practice the concepts, a teacher using the Intelligence Formula lessons should see significant improvement in students' work and study habits and increases in intelligent behavior.

Measurement Instrument: This study utilized a rubric on which raters tallied specific behaviors (Table 3). The lack of a pilot of this instrument decreased its effectiveness. Inter-rater reliability is also suspect. Had more observers been available, each group of subjects could have been observed by two raters, whose scores could then have been compared. It would also have been desirable to have raters observe the same children for each observation. Again, due to difficulties with scheduling, different raters were used.

Further, measuring metacognitive behaviors poses many difficulties for researchers. Individual interviews are terrifically time-consuming, video- and audio-taped situations can be expensive and difficult to set up, and observable behaviors may not provide the whole metacognitive picture. Think-alouds have been used extensively with good success rates, however, it appears that specific training in the think-aloud protocol is required before research subjects will feel comfortable utilizing the technique.

Sample Size: The study was limited to one sixth grade classroom in one school district. Results may not be generalizable to different student populations.

Summary: These concerns do not necessarily invalidate the entire study. An examination of case study data indicates that some students did find the instruction effective, and the data analysis indicated a general trend toward improvement. Given revamped data collection procedures, statistically significant results could have been possible. The most promising trend was that of the low metacognitive ability students. It appears that these students do benefit from training in metacognitive skills, become more effective, and are more willing to take risks in their learning.

In addition, this study has value for future researchers designing studies on metacognition. The difficulties with the observation tool and the observers should be noted by other researchers and may provide a starting point for their research.

Recommendations for Further Research

1. While the Metacognitive Awareness Inventory operated as expected for this study, further analysis of its questions and results is desirable. Specifically, case study data indicate that students with high metacognitive ability take their skills for granted, assuming that everyone thinks that way. Lower-ability students, however, appear to need direct, specific, repetitive instruction of the metacognitive skills before comprehension and use occurs. Teachers, then, have need of an assessment tool that would provide a list of metacognitive outcomes for each student. Perhaps the MAI could be adapted to provide such a list.

2. A long-term study should be undertaken to more effectively utilize the Intelligence Formula lessons. Several classrooms in which the lessons were used as an integral part of the thinking environment during much of the school year should be compared with similar classrooms not using the lessons.

3. Further research regarding more effective measurement of metacognitive skills should continue.

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APPENDIX A

INTELLIGENCE FORMULA LESSONS

A Formula For Intelligence: Metacognitive Control Skills

Lesson Plans and Related Materials For Sixth Grade

Course Overview:

Intelligent thinking means more in the 1990's than possessing an innately high I.Q. score. Teachers and employers alike are becoming aware of the value of practical intelligence skills such as self-evaluation, the ability to set achievable, important goals and monitor progress towards those goals, and an attitude of perseverance. The five Intelligence Formula lessons provide a brief introduction to these types of skills, using the formula "Intelligence = Knowledge + Control" as a central theme.

Course Objective:

The students will increase their awareness of metacognitive control skills, and will begin to apply those skills in their schoolwork.

Course Content:

1. **Control over Environment**

   A. Choose appropriate work space

   B. Organize work space to best suit learning needs

2. **Control over Task**

   A. Set learning and quality goals

   B. Review understanding of task; check with others

   C. Check prior knowledge; make connections

   D. Choose appropriate materials

3. **Control over Self**

   A. Attitude

   B. Motivation

   C. Perseverance

   D. Examples:
   -brainstorm beliefs about the value of the task
   -find something good about the task
   -plan a reward for yourself upon task completion
   -pose questions and make predictions to focus your interest
   -select one personal characteristic over which you will take charge
   -keep track of the positive and negative behaviors you exhibit
   -talk to yourself as a coach would

4. **Control over Strategy**

   A. Relate new to old; old to new (making connections - what have I done before that is similar to this?)

   B. Predict (if-then)

   C. Take notes

   D. Self-talk with elaboration (how, what, why, when), questions, and gestures

Lesson One
Introduction and Overview

Materials:

Folder for each student.
Folder title page and clip art handouts.
Banner: 'Intelligence = Knowledge + Control' rolled and ready to hang.
Overhead transparencies and handouts.
Tea Party cards.

T: Do you remember back in your younger days when someone, usually a teacher, would say, "Let's put on our thinking caps before we begin"? What do you think that means?

Discuss/elicit the following ideas:
you can influence how hard your brain works, and you can tell yourself to pay better attention when you know something will be difficult

T: Over the next few days, we are going to learn some things about your brain and how you can use it best. Scientists and psychologists have been studying the brain and how it works, and have found out some things that you and I can use to help ourselves be smarter. During these lessons, we will learn about ways of being intelligent and ways to use control to maximize your intelligent behaviors. We'll learn about control over your environment, your tasks, your strategies, and yourself. You'll learn that often, when you decide to be the boss of your learning, the learning becomes easier.

T: (Handout: Intelligence Formula, show on overhead). I'm going to model a strategy (point to overhead) called the 'think-aloud' to review what we've learned so far. I'll pretend that I am also a student in class, listening to this same lesson. Please listen carefully. Hmmm. The teacher said I could make my learning easier. Here's this paper - it looks just like the overhead. This must be something she wants us to remember. She says we can learn to take control - and there are four areas listed. Control over my work space and over myself I guess I kind of understand. But control over task and strategy? I wonder what those are? I guess on the days she tells us about those I better listen carefully.

T: Okay, class, what did you hear me saying? (Elicit the idea of telling yourself to pay better attention.) It is probably time for a get up and move around break. I have an activity called a tea party that we'll do for a few minutes. This activity gives you a chance to use your dramatic talents. Each of you will get a card with a sentence or phrase written on it. Your jobs at the tea party are to read your card to many people, using many different vocal styles and facial expressions, and to listen carefully as others read their cards to you. (Model example, hand out cards, discuss silent signal or bell, and begin the tea party.) After each student has read his/her card at least five times, call for their attention and ask them to switch cards with the person they are standing next to. Repeat activity several times.

T: Did any of you have cards that had statements that we have already discussed? (Allow brief discussion). We'll have another tea party later in the course of these lessons, and you will find that all the statements will make sense eventually. Let's move on.

(Unroll first part of banner to show the word 'intelligence'). What is intelligence? (Allow discussion. Depending on the students, the following ideas may be elicited or taught directly: Some psychologists think intelligence is knowledge. Some think of intelligence as ability, and many more believe that intelligence is the application of ability). A professor at Harvard University named Howard Gardner has been working on an idea, a theory, about types of intelligence. (Show overhead and handout.) He believes we have seven or more ways of being intelligent. Another psychologist at Yale believes these are talents, and that we have three ways of being intelligent (overhead and handout.) So you can see, there are differing theories about how to measure intelligence. I found a definition that is like a math equation or formula that was written by a team of middle school teachers. Can anyone guess what that formula is? (Unroll rest of banner).

During our next lesson we'll learn more about knowledge and control. To finish up today, I'd like you to put your handouts in your new folder. Complete your title page and use the clip art to decorate the front of the folder. While you are putting your folder in order, I'd like you to practice the think-aloud strategy I modeled earlier. You can tell some of your thoughts to a friend if that seems easier. I'll be listening to your comments and perhaps asking some questions. Use this time to think ahead about what new information we might learn and which areas you might find difficult. (Teacher circulates and asks questions such as "Were you interested in the lesson?" "Will you be interested to learn more?" "What do you think you may find difficult?" and so on.)

Intelligence = Knowledge + Control

A Formula for Intelligence

Intelligence = Knowledge + Control

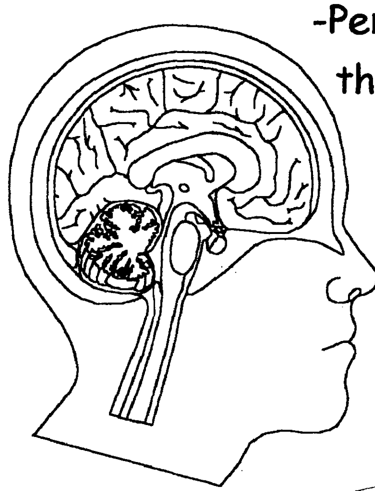
Monitor these areas often; make adjustments when necessary.

Control Over Environment

-work space organization

Control over Self

-Attitude
-Motivation
-Perseverance (sticking to the job until it's done)

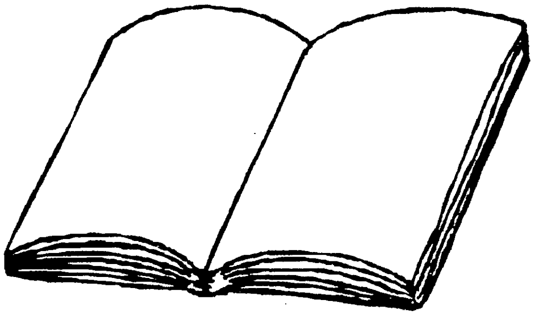


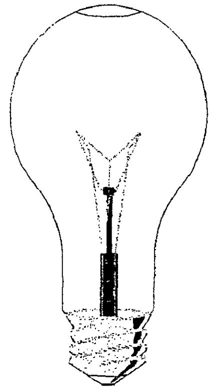
Control over Task

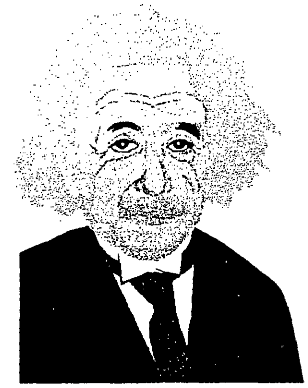
-Review your understanding of the task, check with others
-Set learning and quality goals
-Check prior knowledge, make connections

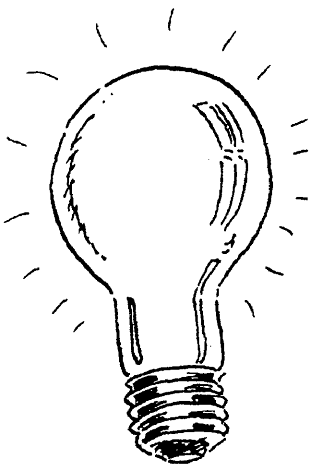
Control over Strategy

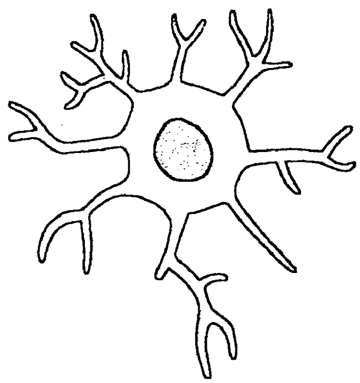
-Take notes
-Relate new to old; old to new
-Predict
-Self-talk with elaboration, questioning, and/or gestures

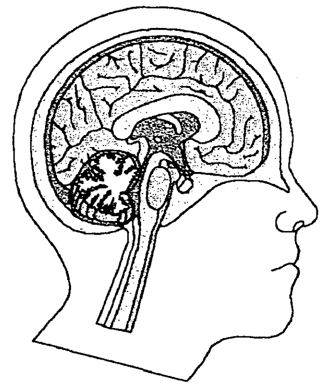


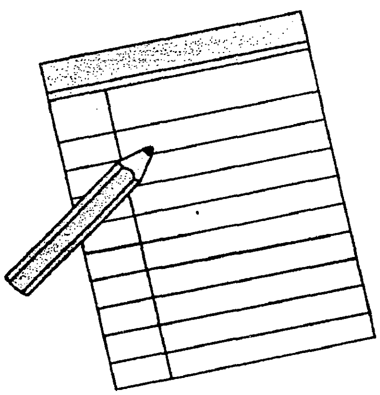


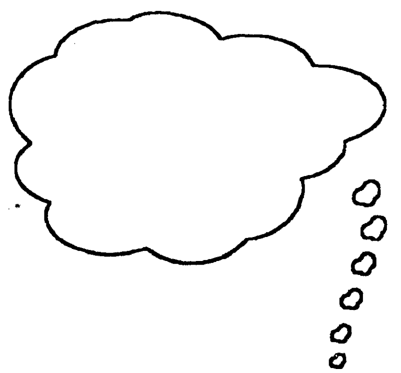


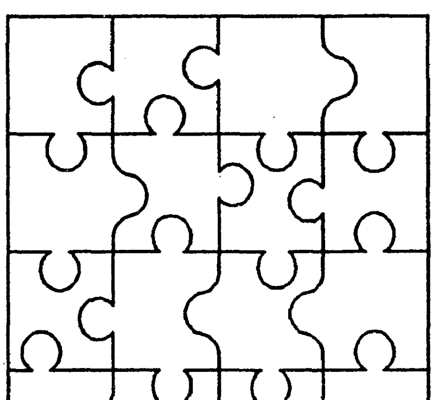


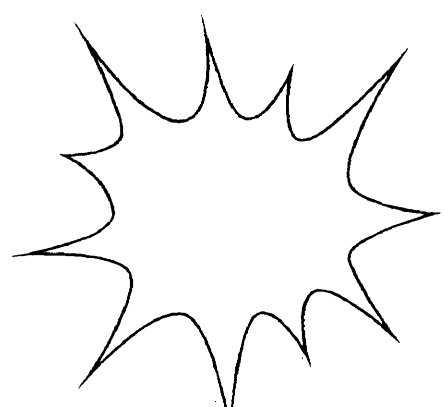






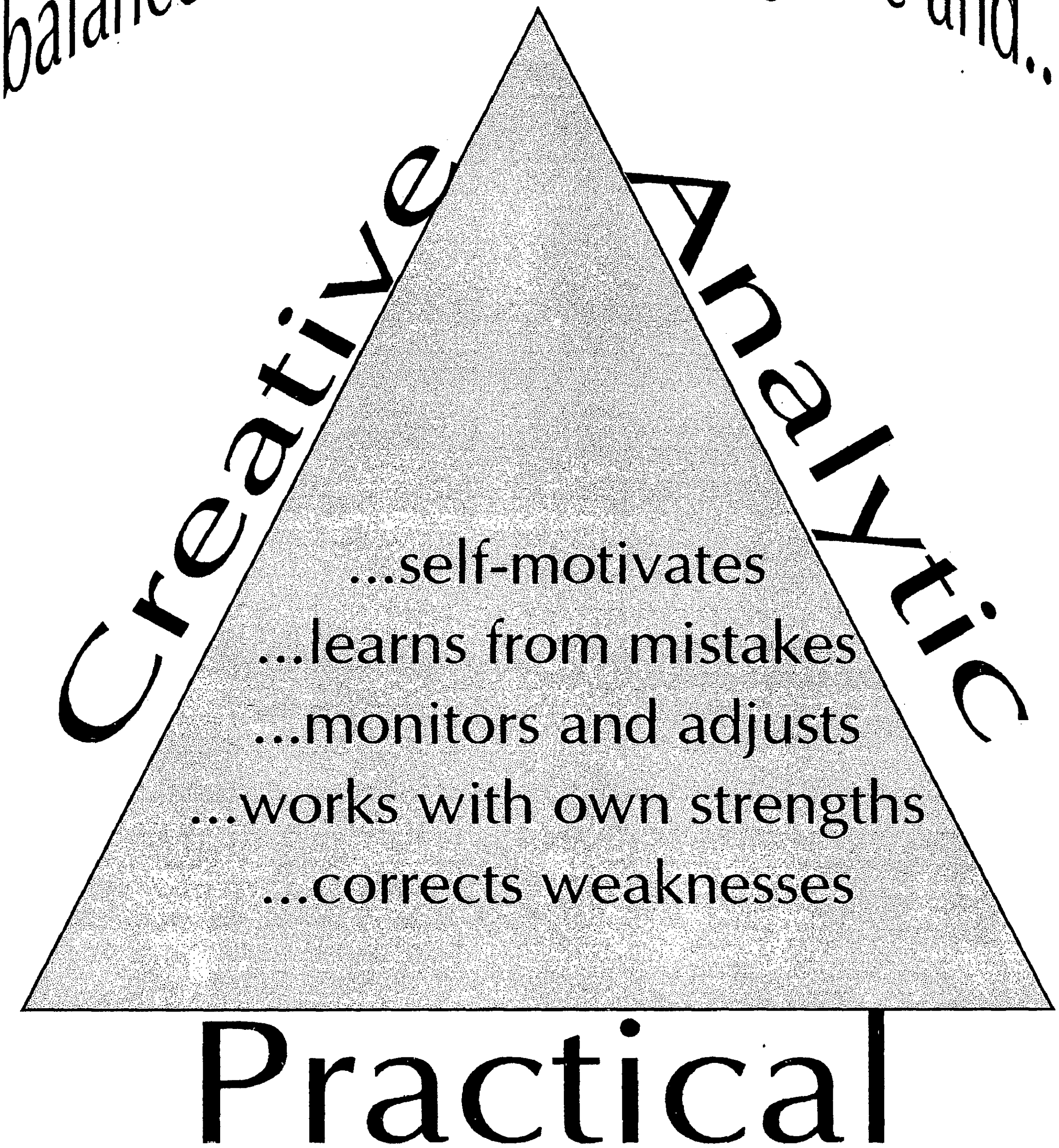




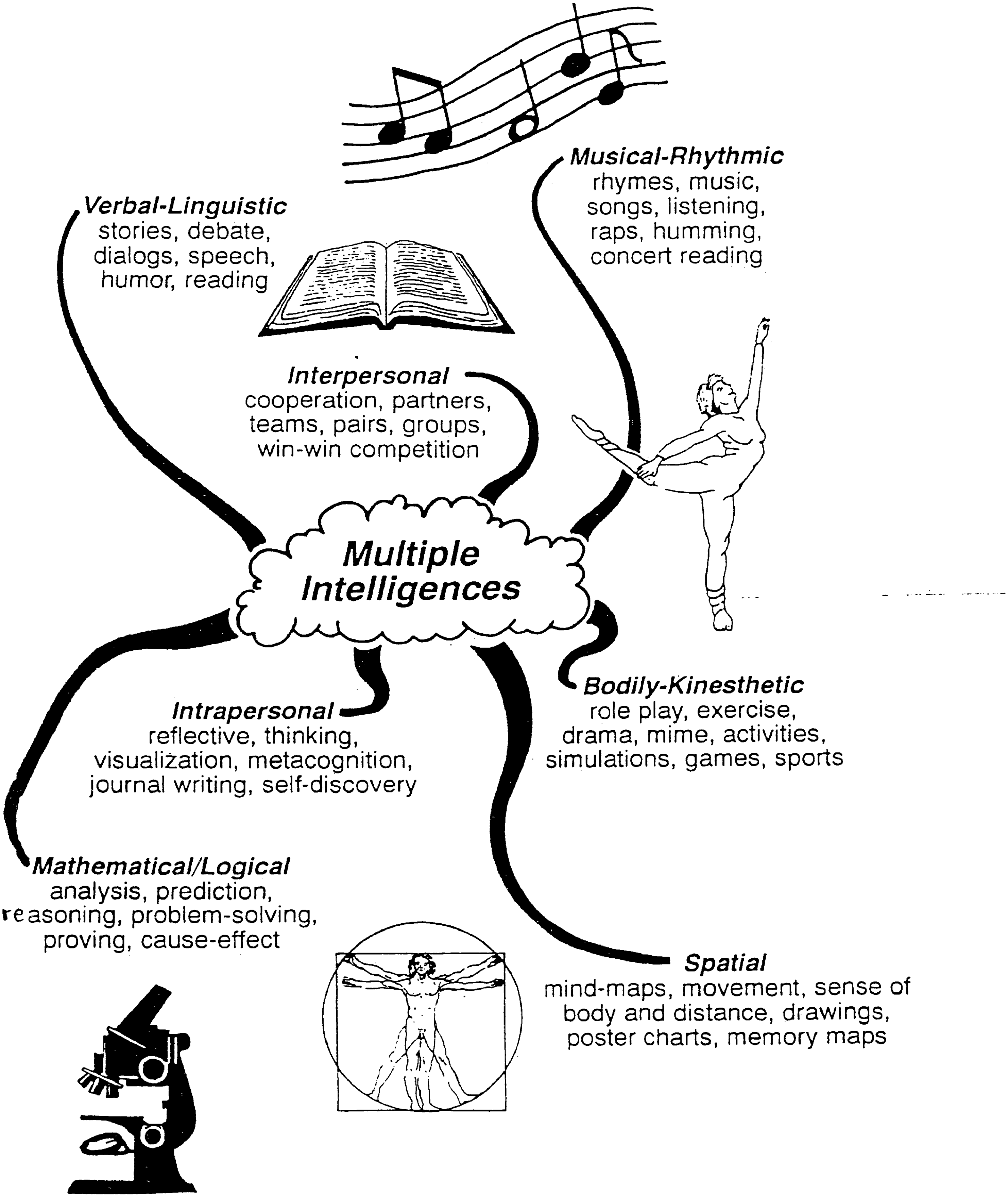


The Successfully Intelligent Person

balances three types of intelligence and...



from Successful Intelligence by Robert Sternberg, 1996, Simon & Schuster



From Frames of Mind by Howard Gardner, 1983: Basic Books
Adapted by Eric Jensen in Brain Based Learning and Teaching, 1995: Turner Point

A good learner knows how to stick with a job until it is done.

Predicting (asking "What If?") is a useful strategy.

Taking notes is a helpful learning tool.

When I am given an assignment, I should check my understanding of the task first.

An effective learner monitors and adjusts certain areas often.

I can take control of my environment, my self, the task, and strategy use to be a better learner.

Sometimes I can use hand and body movements to help my brain understand.

Learning often begins with choosing the correct materials to do the job.

Some people believe there are seven ways of being intelligent.

I can learn new things easier if I connect them with something I already know.

Ways of defining intelligence can be very different.

Talking to myself may help my brain learn better.

I can learn ways to organize and work that will help my brain work better.

Intelligence equals Knowledge plus Control.

I can choose to be motivated and have a positive attitude.

I can set goals for my learning and decide how much effort I will put forth.

Lesson Two
Control over Environment; Thinking Aloud

Materials: Quiz, Thinking Aloud handout

Review: Quiz and discussion

Give class the Thinking Aloud handout. Ask them to find one of these questions that they have asked themselves at one time or another. Then ask them to find one they think they could use in the future. Discuss the idea of thinking aloud as another trick we can use to become a more effective learner. Discuss specific examples of utilizing these questions ("When your teacher assigned the vocabulary lesson, you might have said,...").

Write "Control over Environment" on the board. Ask class to look at the handout in their folder titled "Intelligence = Knowledge + Control." Remind them that they are going to learn ways to control each of the four areas.

Discuss times when we do not have control - the drivers around our car, certain times in school. Then discuss times that control can be taken. Talk about the classroom environment and the times they can and cannot take control. Discuss ways people make their study environments more personal - pictures of family and friends, personalized screen savers on computers, in/out boxes, and so on.

Ask students to open their desks. Are they in control of their environment? If time allows, let them clean their desks in order to feel more in control of the environment.

Suggested Extensions for Lesson Two

1. Encourage children to find examples of people taking control of their environment. Keep a list in the classroom or in the students' folders.

2. Journal prompt: Reflect for a moment about today's lesson. We learned that control is possible over parts of one's environment. We can often take control over things like where we choose to work (or with whom) and we can almost always take control over the organization of our own work space. Write your understanding of today's lesson, and explain how you organized your desk. Look at your list of think aloud questions and answer at least one of them as you write this entry.

Review Quiz

Name:______________________________

Matching: Write the letter from Column B that correctly completes the sentence in Column A.

Column A	Column B
1. I can choose to have a ______________ about learning.	A. sticking with a job
2. Effective learners__________ their learning.	B. boss
3. I can decide to be in charge of my learning - I can be the _______.	C. thinking out loud
4. ____________ is a strategy that may help me learn.	D. monitor and adjust
5. Intelligent behavior can be_____.	E. positive attitude
6. Perseverance means __________.	F. learned

7. Name one area you could take control over to help you learn better.

____

8. Write the "Intelligence Formula".

____

9. "I wouldn't mind learning some tricks to help me be smarter." True or False? Why?

____

Thinking Aloud

Some questions to help jump-start your brain

How can I use this?

What would I do in a different situation?

What does this tell me?

Do I know what the problem is?

How could I have prevented that problem?

How would I approach a similar problem in the future?

What do I plan to do next?

Lesson Three
Control over Task

Materials: Handouts: Control over Task

Divide into two or four groups. Give each group one or two of the task variable descriptions.

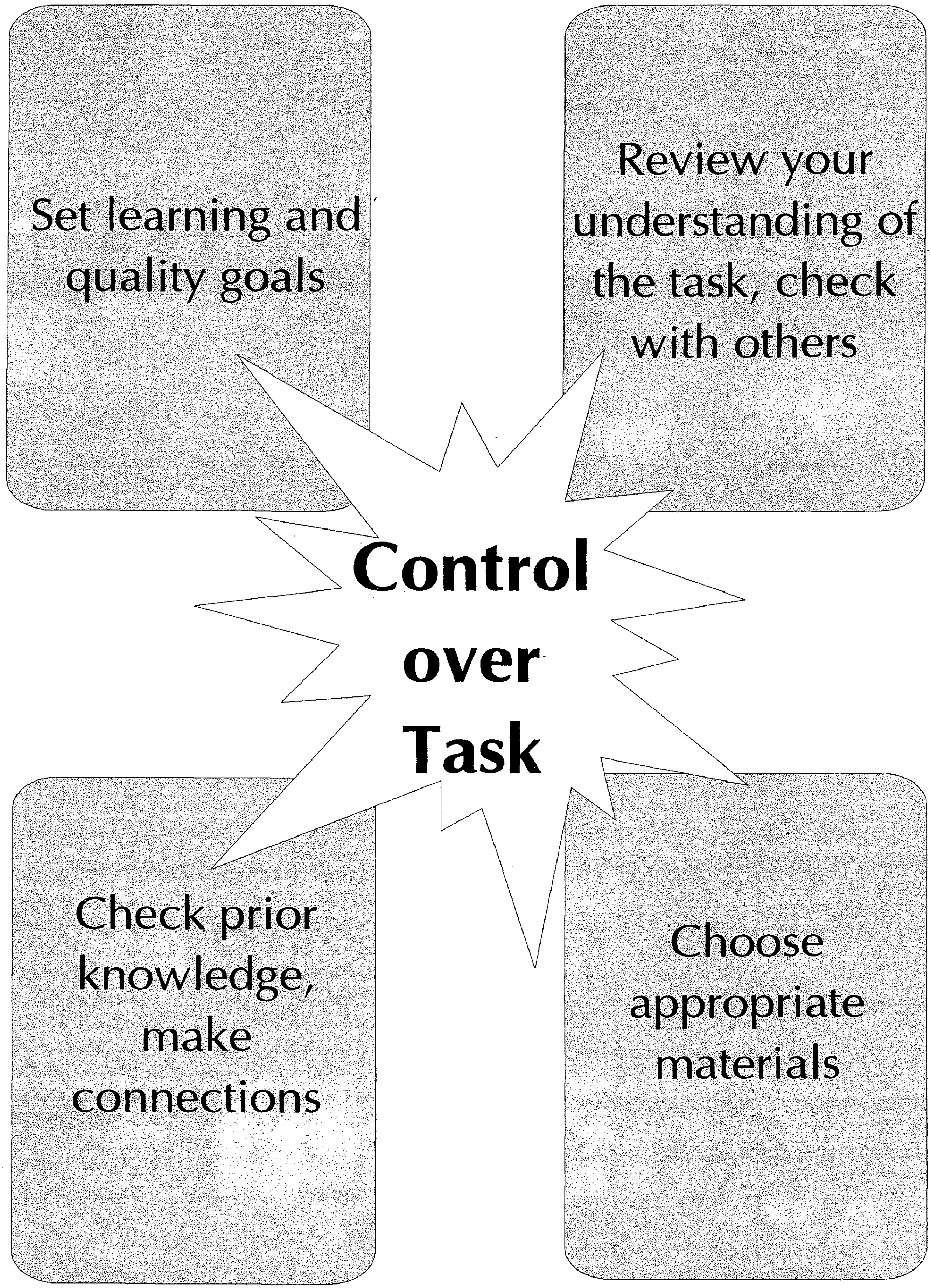
T: Your group's job is to invent a role-play that will explain to the other groups what your task variable is about. You may want to use think-alouds to help get your message across.

(Teacher can provide students with a scenario such as "Your job is to find as many things as possible that could be made with a brick" or "Find as many items as you can that could be categorized as 'things you put together,'" or students can be allowed to invent their own scenario. Work with each group to make sure they are concentrating on the task variable first.)

During the role plays, discuss the idea that it is wise to stop before beginning a task and try to control for these variables. This pre-planning will make them more effective learners.

Suggested Extension for Lesson Three

1. Allow students the opportunity to create graphic representations for each of the four task variables. Remind them of the icons on a computer (scissors for 'cut', disk for 'save', and so on) and the highway road sign symbols. Ask them to graphically represent the four task variables on the Control over Task handout. Allow students time to share their graphics with others.


Set learning and quality goals
Review your understanding of the task, check with others
Control over Task
Check prior knowledge, make connections
Choose appropriate materials

Control over Task

An effective learner will take control
of these variables before beginning a task.

Review your understanding of the task, check with others.

Ask yourself questions to make sure you know what your job is.
Ask other people questions to check your understanding.
A smart learner understands his/her job.

Set learning and quality goals.

Decide how much time and effort you need to do the job.
Make a commitment to yourself - "I am going to do a good job."
Think through your goals - say them aloud, ask yourself questions, write them down, or tell a friend. Sometimes it is wise to set sub-goals - smaller pieces to work towards.
Remember that these are your goals. The teacher can give you assignments, but you control how much effort you put into the task.
An example of goal-setting might be a person who is trying to get to the next level on a video game.

Check prior knowledge, make connections.

The brain needs to know which compartment to put new information in. Help your brain by thinking of things that are similar to the new task that you have done in the past.
During learning tasks, always look for those connections to what you already know.
An example of checking prior knowledge is the book a professional pitcher keeps on all the batters he faces. He knows before he throws each pitch how that batter might react to the pitch.

Choose appropriate materials.

Similar to controlling your environment, you can choose the best materials for a job.
Think ahead of time about what you might need to complete a task.
Make a plan to get unusual materials if they might be needed.

Lesson Four
Control over Strategy

Materials: Strategy description handout

T: Would you like to learn some tricks to help you become a better learner? Would you like to be more intelligent? A strategy is a trick you can use to help you with learning tasks. If you take the time to think about strategies and choose one, your learning could go much more smoothly.

Options for teacher: Students can be divided into groups and can either role play the strategies (similar to Lesson Three) or each student in the group can be given the responsibility for reading about one strategy and explaining it to the rest of the group.

Afterwards, discuss each strategy together.

RELATE NEW INFORMATION TO OLD; OLD TO NEW

Just like checking prior knowledge, making connections to old information makes it easier to recall information in the future. You could use this strategy when learning rules to a new game, or when listening to the teacher explain a new assignment. You could say, "I remember when we..." or "What have I done that is similar to this?" (Did you have prior knowledge of wheels and axles before building your cars?)

SELF-TALK WITH ELABORATION

Self-talk is thinking aloud - the things you say to yourself to monitor and adjust your learning behaviors. Elaboration is adding to your self-talk by asking and answering the questions What, Why, How, and When, or by restating what you already know. "How can I take control of my attitude?" or "So far I've figured out that..." or "What is the main idea?" are some examples.

SELF-TALK WITH QUESTIONS AND/OR MOVEMENTS

Self-talk is thinking aloud - the things you say to yourself to monitor and adjust your learning behaviors. Movements of your hands or using real objects can help you solve a learning problem. Imagine you're at the zoo, looking at the map. You probably will trace the routes with your finger, then point to the direction you want to go.

PREDICTING

In science, we call predicting "making a hypothesis." This can be a good way to discover "If--Then" relationships (IF I do this, THEN this will happen..., IF I do my schoolwork well, THEN I'll get good grades.) Predicting is useful even outside of science because it can help you to understand relationships between two items (If I clean my room, I can go roller skating tonight.)

TAKING NOTES

Note-taking can be an effective way to remember things from one moment to the next. It can help you organize your work, and it can help you plan ahead. Just because others around you aren't taking notes doesn't mean you shouldn't! As an example, if you found a really cool Internet site, you might write down its address.

Lesson Five
Control over Self

Materials: Take Control of Your Learning Behaviors handout
Speech Bubble handout
small reward for each student (mini candy bars)

Write on board: ATTITUDE IS EVERYTHING.
T: Today I'm going to begin by reading to you a very famous story from a very famous book. As I read, please try to decide why I've chosen this chapter, and how it relates to the phrase I just wrote on the board. (Teacher then reads excerpts from Chapter 2, "The Glorious Whitewasher" from Mark Twain's The Adventures of Tom Sawyer.) Discuss Tom's change of attitude about the whitewashing, and how he was able to convince others that it was no chore, but a desirable activity. Discuss positive attitudes briefly.

Hand out one "Take Control of your Learning Behaviors" sheet to each student. Ask them to look first at #6 to see if they have exhibited any of the negative learning behaviors recently. They may want to circle any they agree that they have found themselves doing. Have them each choose one to work on and write it down. Then have them look at #8. Discuss the idea of self-monitoring behavior, and ask them to do so during the lesson.

T: Now please look back at #1. Today, the task is to learn how to use this sheet to take control of your learning. Please write: to finish this sheet.

T: Sometimes we need to plan rewards for ourselves to help keep us motivated. Today your reward will be a small candy bar. Please write that in.

T: When faced with a difficult situation or job, it helps to think of reasons the job is important. What traits did Tom think up to make his job seem more desirable? Please list several things you can think of about the value of today's task. (Teacher then makes three columns on the chalkboard, labeled Attitude, Motivation, and Perseverance.) As we discuss your ideas, let's see if they can be categorized.

T: Number 4 asks us to find something good about the task. This may be something from your list above, or it may relate to the reward, or it may be a feeling of accomplishment. Please write your idea. (Discuss again with categories.)

T: Another way to increase motivation and encourage yourself to stick to a project is to focus your interest using questioning and predicting. Please think of at least one prediction about today's lesson, and one question. Write them. (Discuss.)

T: This paper outlines things you can do to become a more intelligent learner. Can you think of any people who exhibit these three traits? (Tiger Woods - attitude, Cal Ripken, Jr. - perseverance, etc.) Please turn your paper over and list any others you can think of.

T: Now look at number seven on your paper - talk to yourself as a coach would. (Hand out speech balloon paper.) Please fill each balloon with a positive comment you can make to yourself to increase your motivation, perseverance, and attitude. (Discuss individually as they work.)

Suggested Extensions for Lesson Five

1. Put up three large sheets of paper labeled either Motivation, Attitude, or Perseverance. Ask students to think of people who exhibit those traits and list them. Leave the lists up for several days and encourage additions.

2. Utilize the Lesson Five worksheet again for other tasks. Scaffold instruction so that the children will eventually work through it independently.

3. Start a bulletin board or other display of a coach. Collect the best speech balloons and put them up near the coach.

Take Control of Your Learning Behaviors

Name:____________________

1. The taskis:____________________
2. Plan a reward for yourself upon task completion:

____

3. Brainstorm beliefs about the value of the task:

____

4. Find something good about the task:

____

5. Pose questions and/or make predictions to focus your interest:____________________

____

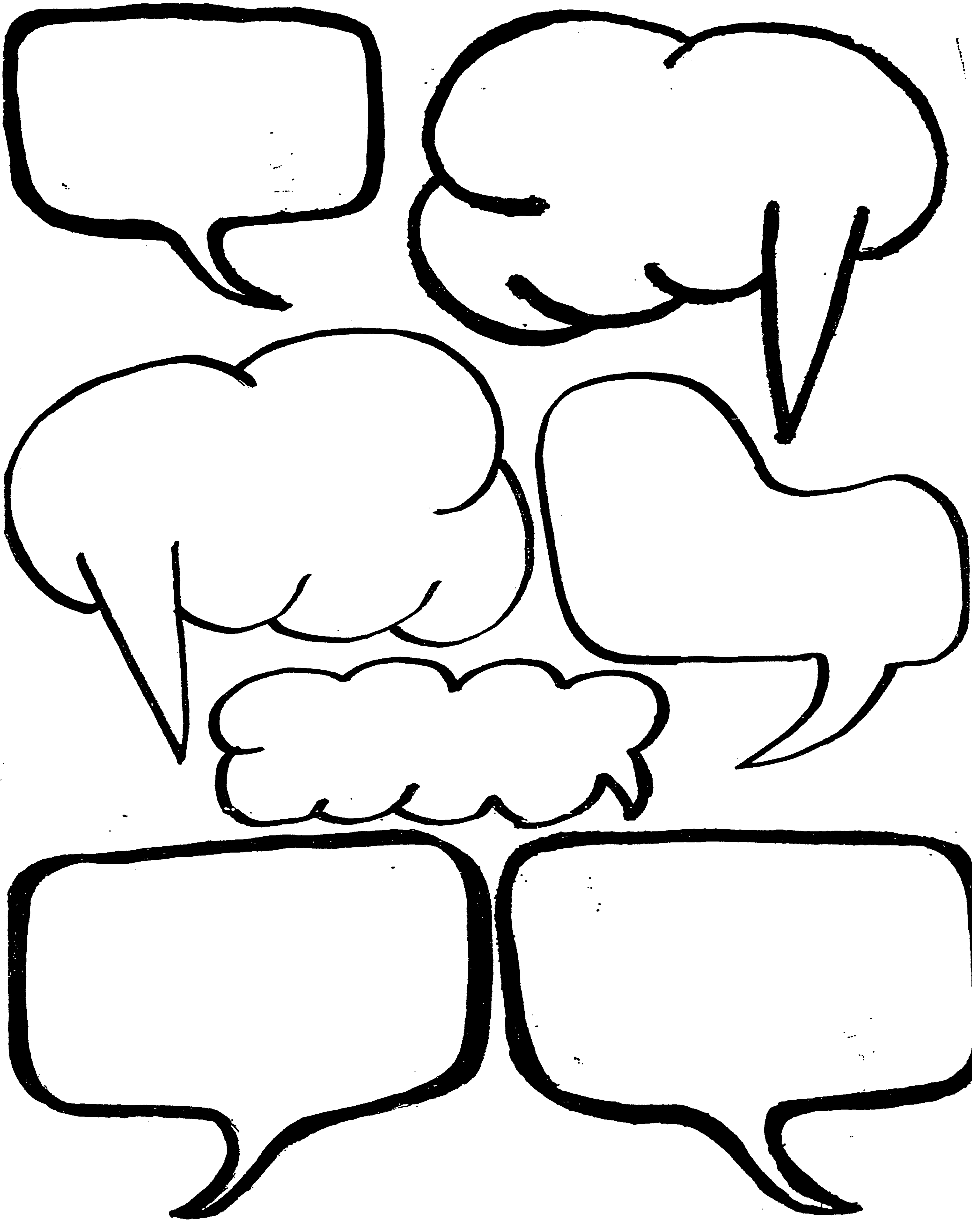
6. Select one personal characteristic over which you will take control: (talking out of turn, lack of focus, bad attitude, arguing, too little participation, interrupting others, etc.)

____

7. Talk to yourself as a coach would.

8. Keep track of the positive and negative behaviors you exhibit.

Positive (+)	Negative (-)

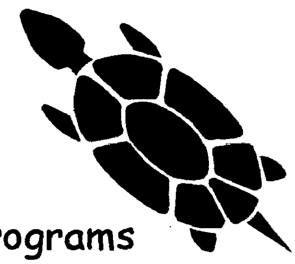


APPENDIX B

LOGOWRITER INSTRUCTION

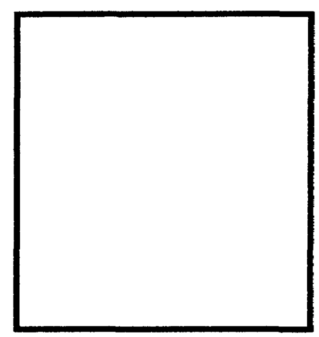
LogoWriter Computer Programming

Basic Commands:



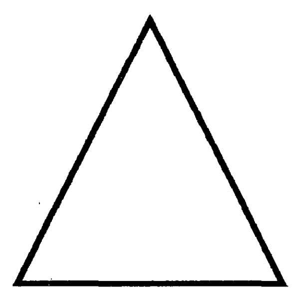
RT = right turn
LT = left turn
FD = forward, needs a number input for length
BK = back, needs a number input for length
OF = moves you to the "flip side" to construct programs
PU = pen up, can move cursor without a line being drawn
PD = pen down, now the cursor will draw a line
CG = clear graphics, clears your screen

To program a square:



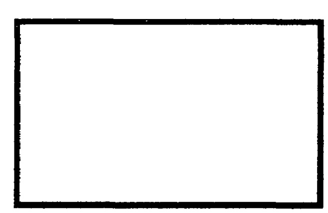
1. go to flip side
2. type TO SQ , enter
3. type REPEAT 4[FD50 RT90] , enter
4. type END , enter
5. flip back to cursor side
6. type *CG* , enter
7. type SQ , enter

To program a triangle:



1. go to flip side
2. type TO TRI , enter
3. type REPEAT 3[FD100 RT120] , enter
4. type END , enter
5. flip back to cursor side
6. try it out! Type *CG*, enter
7. type TRI , enter

A program for a rectangle would look like this:



```
TO REC
REPEAT 2[FD 50 RT 90 FD 100 RT 90]
END
```

APPENDIX C

THESIS APPROVAL DOCUMENTS

University of Nebraska at Omaha

Teacher Education
College of Education
Omaha, Nebraska 68182-0163
(402) 554-3666

April 11, 1997

Dr. Ernest Prentice
Institutional Review Board
Eppley Science Hall 3018
University of Nebraska Medical Center
Omaha, NE 68198-6810

Dear Dr. Prentice,

I am a graduate student in the Department of Teacher Education at the University of Nebraska at Omaha, and will be conducting a research study involving human subjects as part of my graduate program. Enclosed is my request for IRB review, my related research prospectus, and the parent or guardian informed consent letter. I have also included your standard exemption form since I believe that the study qualifies for your "exempt" status in accordance with the 45 CFR 46:101(b) categories and guidelines.

I can be contacted days and evenings at 292-0819. I am working with Dr. Elliott Ostler (554-3486) and Dr. Neal Grandgenett (554-2690) from the University of Nebraska at Omaha, who also would be happy to answer any questions.

Thank you for your consideration of my request. I look forward to hearing from you.

Sincerely,

Pamela Haag Clower
11715 South 31st Street
Bellevue, NE 68123

University of Nebraska
Institutional Review Board
For the Protection of
Human Subjects

University of Nebraska Medical Center
Eppley Science Hall 3018
600 South 42nd Street
Omaha, NE 68198-6810
(402) 559-6463
Fax (402) 559-7845

EXEMPTION FORM

SECTION I: APPLICATION DATA

TITLE OF RESEARCH PROPOSAL: The Effects of Control Strategies on Sixth Graders' Metacognitive Awareness

STARTING DATE: May 13, 1997

PRINCIPAL INVESTIGATOR: Pamela M. Clower

SECONDARY INVESTIGATOR(S): Dr. Elliott Ostler

DEPARTMENT/COLLEGE: Teacher Education/College of Education

ADDRESS: 11715 South 31st Street Bellevue, NE ZIP CODE: 68123

TELEPHONE: (402) 292-0819

SECTION 2: CERTIFICATION

CERTIFICATION OF PRINCIPAL INVESTIGATOR: Signature certifies that the research project as described will be conducted in full compliance with University of Nebraska Regulations governing human subject research as stated in the IRB Guidelines for the Protection of Human Subjects. It is understood that the IRB will be notified of any proposed changes which may affect the exempt status of the research.

Pamela M. Clower — Signature of Principal Investigator

4-28-97 — Date

Graduate Student/Masters Degree Candidate
Position

ADVISOR APPROVAL: Student investigators are required to obtain approval from their advisor. Signature of approval certifies the research proposal has been approved and recommended for submission to the IRB.

Elliott Ostler — Signature of Advisor

4-28-97 4/28/97 — Date

Dr. Elliott Ostler
Printed Name of Advisor

The IRB requires submission of an original and one (1) copy of the Exemption Form.

Institutional Review Board
EXEMPTION FORM

Section 3: Review Information

I. Purpose of the Study

The purpose of this study is to determine the effect of metacognitive control strategies on the metacognitive awareness of sixth grade students.

II. Characteristics of the Subject Population

A. Age Range: The participants will be 11 and 12 years old.
B. Sex: Both the male and female students in the class will be asked to participate inthe study.
C. Number: 24 students are anticipated for this study.
D. Selection Criteria: All students enrolled in Mr. Bob Nylin's sixth grade at Dodge Elementary School (OPS) will be asked to voluntarily participate in the study.

III. Method of Subject Selection

Selection of subjects is, of necessity, based on enrollment in a specific sixth grade class. Mr. Nylin and his principal, Rosemary Moore, have agreed to allow the class to participate in the study. A letter will be sent home with each of Mr. Nylin's students. The letter (attached) will outline the purpose of the study and ask for voluntary participation.

IV. Study Site

All instruction and measurement will take place at Dodge Elementary School, 3520 Maplewood Blvd., Omaha, 68134.

V. Description of Procedures

A. A Metacognitive Awareness Inventory will be administered to the class. Scores will be used to match the control group and the experimental group.
B. A baseline observation of both groups will be conducted during a placebo activity.
C. Treatment will consist of five lessons of approximately 30 minutes each. The lessons will be taught over a five day period. Five placebo lessons consisting of logic and problem-solving activities of 30 minutes each will be provided for the control group.

D. A post-treatment measurement of each group will be taken during a computer lab activity. Observers will utilize a rubric to notate observable behaviors and student think-alouds.

E. The Metacognitive Awareness Inventory will be administered post treatment.

VI. Confidentiality

Individual names and schools will not be used to report results. Only group scores will be analyzed and reported. All testing material will be kept stictly confidential by the investigator.

VII. Informed Consent

Because this study is being conducted with minor children, an informed consent letter will be sent home prior to the study. Participants in this study will be limited to those students whose parents or guardians return the signed consent form (attached.)

VIII. Justification of Exemption

The parameters of this study match the exemption categories 1(a) through 1(g) as follows:

a. all of the research will be conducted in a public school;
b. normal educational practices will be utilized as instruction, assessment, and content follow OPS curriculum guidelines;
c. the study will not adversely impact the classroom teacher's or students' instructional time because all study lessons are related to curriculum guidelines already in place, and lessons will take place during regular class hours;
d. instruction during the study will be non-threatening and similar to that presented every day, which will limit student discomfort;
e. the subject of the study is thinking skills, which is a part of the regular OPS curriculum;
f. all due respect will be accorded students who choose not to participate, as indicated in the parental informed consent letter;
g. the school has granted written permission for the research to be conducted, as indicated by the attached letter from Principal Rosemary Moore.

University of Nebraska at Omaha

Teacher Education
College of Education
Omaha, Nebraska 68182-0163
(402) 554-3666

April 30, 1997

Dear Parent or Guardian,

Your child has the opportunity to participate in a study about thinking skills. Your sixth-grader's teacher, Mr. Nylin, has agreed to allow his class to participate in a research study that I will be conducting as a partial requirement for my Master's of Arts degree at the University of Nebraska at Omaha. I will be the principal investigator in the study and will work will Dr. Elliott Ostler, Assistant Professor in the Department of Teacher Education at UNO. The study has the approval of your child's principal, Rosemary Moore. The following information is provided in order to help you make an informed decision whether or not to allow your child to participate in the study.

The study is designed to investigate the effects of teaching students thinking and organization skills such as planning, predicting, and note-taking through a series of five thirty minute lessons. All instructional and measurement techniques used in the study are well accepted and respected in the educational community. The study will take place in the classroom during a two-week period in May.

As a result of participation in this research, it is possible that your child could learn strategies that may be helpful during future school assignments. In addition, your child's participation in this study will not only help me as I work towards the completion of my degree, but will assist other teachers struggling for effective teaching methods.

While the results of the study may be published in scientific journals or at educational conferences, any information which could identify your child will be kept strictly confidential.

Participation is limited to those students whose parents sign the attached consent form. Participants can withdraw at any time without reprisal. Won't you please seriously consider allowing your child to participate? If you should have any questions or need any additional information, please do not hesitate to call me at 292-0819. Dr. Ostler is also available to answer questions at 554-3486. We look forward to hearing from you.

Sincerely,

Pamela Haag Clower
Department of Teacher Education, UNO

University of Nebraska
Nebraska's Health Science Center

Institutional Review Board
For the Protection of
Human Subjects

University of Nebraska Medical Center
Eppley Science Hall 3018
600 South 42nd Street
Box 986810
Omaha, NE 68198-6810
(402) 559-6463
Fax (402) 559-7845

May 22, 1997

Pamela Clower
11715 South 31st Street
Bellevue, NE 68123

IRB#: 131-97-EX

TITLE OF APPLICATION/PROTOCOL: The Effects of Control Strategies on Sixth Graders' Metacognitive Awareness

Dear Ms. Clower:

The IRB has reviewed your Exemption Form for the above-titled research project. According to the information provided, this project is exempt under 45 CFR 46:101b, category 1. You are therefore authorized to begin the research.

It is understood this project will be conducted in full accordance with all applicable sections of the IRB Guidelines. It is also understood that the IRB will be immediately notified of any proposed changes that may affect the exempt status of your research project.

Please be advised that the IRB has a maximum protocol approval period of five years from the original date of approval and release. If this study continues beyond the five year approval period, the project must be resubmitted in order to maintain an active approval status.

Sincerely,

Ernest Prentice/jlg

Ernest D. Prentice, PhD
Vice Chair, IRB

EDP:jlg

University of Nebraska at Omaha

April 30, 1997

Teacher Education
College of Education
Omaha, Nebraska 68182-0163
(402) 554-3666

Dr. John Jorgensen
Coordinator of Research
Omaha Public Schools
Omaha, NE

Dear Dr. Jorgensen,

I am a graduate student in the Department of Teacher Education at the University of Nebraska at Omaha, pursuing my Master's of Arts degree in Elementary Education. As part of my graduate program, I have planned a research study I hope to complete in an OPS sixth grade. Although I am not an OPS teacher, my study will benefit the teachers and students involved, and when published, will provide valuable insights for all teachers. Included with this letter of application is my research proposal abstract and a sample of the Parental Informed Consent Form for the study. I would appreciate your looking over the enclosed materials for possible approval.

The study will require less than seven non-consecutive hours with the class, scheduled at the discretion of the classroom teacher. The study will provide stand-alone lessons regarding thinking skills for one-half of the class, and logic/problem-solving lessons for the other half. These lessons will complement the students' scholastic knowledge and are a perfect supplement for the last few days or weeks of school. Pending district approval, Mr. Bob Nylin and Dr. Howard Faber at Dodge Elementary have agreed to allow me access to their sixth grade classroom. Principal Rosemary Moore has also agreed to allow the study.

The Instructional Review Board at the University of Nebraska is reviewing this proposal and full permission for the study is expected to be granted on or about May 2, 1997. I will contact you as soon as I hear from them. Should you have any questions, I can be contacted at 292-0819 (days and evenings). I am working closely with Dr. Elliott Ostler of the University of Nebraska at Omaha (554-3486), who would also be happy to discuss the study.

Thank you for your consideration of my request. I look forward to hearing from you.

Sincerely,

Pamela Haag Clower
11715 South 31st Street
Bellevue, NE 68123

You are invited to permit your child to participate in this research study. Please fill out the form below and return it to your child's teacher as soon as possible. Thank you for your time.

PARENTAL INFORMED CONSENT FORM

IRB # ________________

I agree to allow my child to participate in the study "The Effects of Control Strategies on Metacognitive Awareness" during May in Mr. Nylin's classroom. I understand that at no time will my child's identity be revealed and that the study utilizes accepted educational procedures.

_________________________________ ____Child's Name

_____________________________________Signature of Parent or Guardian

OMAHA PUBLIC SCHOOLS
Omaha, Nebraska

EXTERNAL RESEARCH REQUESTS

Any request to conduct a study involving either staff or students of the School District of Omaha, must make formal application to the Research Division. A study may include, but not be limited to, surveys, questionnaires, personal or group interviews, testing, or any other type of interaction which requires student and/or staff time. The impact of studies on students/staff time will be carefully scrutinized as well as the appropriateness of the study. Priority will be given to: (1) Federal and State requests, (2) requests of professional educational organizations, (3) Omaha Public Schools staff writing theses or dissertations toward advanced degrees, (4) staff pursuing advanced degrees with class projects, and (5) persons not associated with the Omaha Public Schools but who are pursuing educational research.

The following conditions apply to research requests:

I. A formal letter of application directed to the Research Office.

II. A proposal of the study including a description, statement of scope of the project, staff and/or students to be involved and the length, time and repetition of the study.

III. If students are involved, a sample copy of the Parental Informed Consent Form must be filed with Research Division.

IV. All persons pursuing degrees in or representing colleges/universities having Institutional Review Board requirements for theses, dissertations and other research, must have the permission of the IRB to conduct research in the Omaha Public Schools.

V. All involvement with OPS staff by the researcher must be communicated to staff and agreed to by that staff before the study begins. Building principals must be aware of, and in concurrence with, any study conducted within their school.

When all conditions have been met and when in the judgment of Research Division, the study has merit and has the potential to make a positive contribution to the improvement of instruction in the district, a formal letter of approval will be forwarded to the researcher. The Omaha Public Schools reserves the right to limit numbers of studies.

Prepared by:
John Jorgensen
Coordinator of Research

Approved by:
Norbert J. Schuerman
Superintendent of Schools

06/22/95

Please see reverse side for Omaha Public Schools' policy governing survey of students.

SURVEY OF STUDENTS

Section 11.05 - Policy and Regulations of the School District of Omaha
Adopted June 19, 1995

External requests to conduct research/studies involving students of the Omaha Public Schools must be submitted in writing to and be approved by the Research Division. Research studies include, but are not limited to, surveys, questionnaires, opinionnaires, personal or group interviews or testing. Prior written consent of a parent (legal guardian) will be required for surveys if they include questions which reveal information concerning:

(1) political affiliation;
(2) mental and psychological problems potentially embarrassing to the student or his or her family;
(3) sex behavior and attitudes;
(4) illegal, anti-social, self-incriminating and demeaning behavior;
(5) critical appraisals of other individuals with whom the student has close family relationships;
(6) legally recognized privileged or analogous relationships, such as those of lawyers, physicians, and ministers; or,
(7) income (other than that required by law to determine eligibility for participation in a program or for receiving financial assistance under such program).

All external and internal research study instruments such as questionnaires and opinionnaires may be reviewed by parents/guardians at any time, including in advance of their child's participation in the study.

OMAHA PUBLIC SCHOOLS
DIVISION OF RESEARCH
3215 CUMING STREET OMAHA, NE 68131-2024 (402) 557-2080 FAX: (402) 557-2049

May 1, 1997

Pamela Haag Clower
11715 South 31st Street
Bellevue, Nebraska 68123

Dear Ms. Clower:

We have received your formal letter of request and proposal of study entitled "The Effects of Control Strategies on Sixth Graders' Metacognitive Awareness." You indicate this study will involve one 6th grade classroom and will require seven non-consecutive hours with the class. The study will provide stand-alone lessons regarding thinking skills for one-half of the class, and logic/problem-solving lessons for the other half.

You also indicate you have visited with Mr. Bob Nylin and Dr. Howard Faber at Dodge Elementary School and they have agreed for you to utilize their class in this project. You have also included a supportive letter from Rose Mary Moore, Principal of Dodge School.

We believe your study has merit and permission is granted for you to proceed under the following conditions:

Parent consent forms will be required for all student participants.

Staff identified above continue to support your study.

In the reporting of your results, students will not be personally identifiable.

You will be willing to share results of your study with OPS.

Best wishes.

Sincerely,

John C. Jorgensen
Coordinator of Research

cc: Rose Mary Moore
Bob Nylin
Dr. Howard Faber

Go Wildcats!
Go Dodge!

Laura Dodge Elementary

3520 Maplewood Blvd., Omaha, NE 68134

April 28, 1997

Dr. Elliott Ostler
University of Nebraska at Omaha
314 Kaiser Hall
Omaha, NE 68182

Dear Dr. Ostler,

This letter is to confirm our conversation last week regarding Pamela Clower's Thesis Project on The Effect of Metacognative Skills Training on Sixth Graders Problem Aptitude.

We welcome the opportunity to assist Ms. Clower with this project at Dodge School. If we can be of further assistance, please do not hesitate to call.

Sincerely,

Rose Mary Moore

Rose Mary Moore, Principal
Laura Dodge Elementary School