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# The effects of an adolescent self-instructional model versus an adult self-instructional model on adolescent's accuracy, self-efficacy and generalization on an arithmetic task

Mendola, Leonard Richard, Ph.D.

City University of New York, 1989



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# THE EFFECTS OF AN ADOLESCENT SELF-INSTRUCTIONAL MODEL VERSUS AN ADULT SELF-INSTRUCTIONAL MODEL ON ADOLESCENT'S ACCURACY, SELF-EFFICACY AND GENERALIZATION ON AN ARITHMETIC TASK

by

LEONARD R. MENDOLA

A dissertation submitted to the Graduate Faculty in Educational Psychology in partial fulfillment of the requirements for the degree of Doctor of Philosophy, the City University of New York.

1989

This manuscript has been read and accepted for the Graduate Faculty in Educational Psychology in satisfaction of the dissertation requirement for the degree of Doctor of Philosophy.

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## Abstract

THE EFFECTS OF AN ADOLESCENT SELF-INSTRUCTIONAL MODEL VERSUS AN ADULT SELF-INSTRUCTIONAL MODEL ON ADOLESCENT'S ACCURACY, SELF-EFFICACY AND GENERALIZATION ON AN ARITHMETIC TASK

by

LEONARD R. MENDOLA

Advisor: Professor Shirley Feldmann

125 students were trained in the addition of fraction problems and then tested to ascertain changes in Self-Efficacy, Accuracy of performance and Generalization of acquired rules to novel problems. The effects of 2 major factors were examined: 1) Tutoring condition, i.e., adult tutor, and adolescent tutor. 2) Type of training, i.e., direct, vicarious, and control. Hypotheses for investigation were developed in light of the work of Bandura (1977a, 1977b, 1981, 1982) and Schunk (1981, 1982a, 1982b, 1983a, 1983b, 1983c, 1984, 1985) in Self-Efficacy; the work of Meichenbaum (1977)

in Self-Instruction; and the work of Allen (1976), Apolloni & Cooke (1975) and Rubenstein & Howes (1976) in Peer Tutoring. It was hypothesized that subjects trained by adolescents under direct training conditions would perform at higher levels than subjects trained under other conditions in the design. The findings generally failed to support these major hypotheses. The outcomes were interpreted in light of the work of Zimmerman & Martinez-Pons (1986) on self-regulation. It is possible that subjects with low readiness level, such as those employed in this study, may require greater structure and external regulation of learning behavior than subjects with higher levels of readiness. It is conjectured that the adult tutors used in the study provided this external structuring with greater effectiveness than peer tutors. Recommendations were made for further study controlling for readiness level to test the validity of this conclusion.

## Acknowledgments

Among the many brilliant psychologists and educators with whom I have been privileged to study throughout my professional training, the following individuals have made a special contribution to the development and completion of my doctoral project.

It is a particular pleasure to have this opportunity to express my gratitude and appreciation to Dr. Shirley Feldmann who made fine editorial suggestions with rare discernment and provided unfailing guidance and direction when I most needed help. I would also like to thank the other members of my dissertation committee, Dr. Marian C. Fish and Dr. Philip A. Saigh, who have been tremendously giving of their time, advice, and counsel. They offered constructive and insightful comments, which were a great help in the development of this manuscript. For this, I am continually grateful.

I dedicate this dissertation to my wife, Faith. Her unfailing support, encouragement, patience, and love have been ever present during the years I put into making my dream a reality.

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# CHAPTER I

## INTRODUCTION

Children's peer experiences are no longer considered only as a source of social skills but have increasingly been viewed as a potential source of cognitive growth as well. Recent work on cognitive growth has examined both collaborative interactions (Cooper, 1980) in which children who have comparable skills work together, and didactic interactions (Ellis & Rogoff, 1982) in which one child guides a lesser skilled child. In studies involving academic tasks children have benefited from both of these peer interaction experiences.

The literature on peer interaction or peer tutoring suggests that children can be effective teachers of other children (Allen, 1976; Cicielli, 1976; Frager & Stern, 1970; Harris & Sherman, 1973; Johnson & Barley, 1974; Oakland & Williams, 1975). Peer-tutoring has been used with preschoolers (Stokes & Baer, 1976), developmentally delayed toddlers (Apolloni, 1977), mentally retarded children (Barry & Overman, 1977; Wagner, 1974; Wagner & Steinlicht, 1975), profoundly retarded adolescents (Snell, 1979), learning-disabled children (Epstein, 1978; Jenkins, Mayhall, Peshka, & Jenkins, 1974), speech-impaired students (Evans & Potter, 1974), and emotionally or behaviorally

disordered children (McCarty, Griffin, Apolloni, & Shore, 1977; Slavin, 1977; Strain, Cooke, & Apolloni, 1976). However, peer-tutoring has not received attention in the cognitive-behavioral literature; in particular, it has not been applied to self-instructional training. No analyses of possible interactive effects between model (self-instructional trainer) and subject (self-instructional trainee) variables have been examined.

Stokes and Baer (1977, p.364) have strongly supported the use of peer tutors, not only because of their effectiveness but also because peers "are likely to be found in generalization settings," for example, classrooms and neighborhoods, and not just in the training settings. Other researchers, for example, Kendall (1977) and Meichenbaum (1977) argue similarly concerning the use of peers as natural change agents and models in cognitive behavioral interventions. Kendall (1977) suggests that having children interact with one another during self-instructional training could promote generalization to other interpersonal settings and be beneficial for children who have difficulty in controlling verbal or physical aggression.

A central concern for researchers at this time is whether procedures developed within an academic context would enhance both long-term maintenance of behavior

change and generalization from specific training tasks to a wider class of behaviors. As several authors suggested (Meichenbaum & Asarnow, 1979; Roberts & Dick, 1982), evidence is lacking in both these important areas. Meichenbaum and Asarnow (1979) have stated that "evidence for treatment generalization . . . especially across response modes and settings is less convincing than evidence for treatment efficacy and often equivocal" (p. 15).

An area in which cognitive behavioral programs have been used with increasing frequency is that of academic remediation. Many academic tasks lend themselves to the systematic step-by-step problem solving characteristics of self-instructional training. The self-instructional research that has been reviewed indicates that complex cognitive skills can be taught through the combination of observational learning or cognitive modeling and self-instructional rehearsal. Both a variety of theoretical positions (Luria, 1961; Vygotsky, 1962) and the research findings of different investigators (Camp, Blom, Herbert, & Van Doorninck, 1977; Douglas, Parry, Maston, & Garson, 1976; Kendall & Finch, 1978) provide support for the use of self-instructional procedures. However, a critical review of the literature dealing with self-instructional training reveals that very little attention has been given to model and subject

variables and whether those variables affect a subject's learning to self-instruct or affect treatment outcome. An exploration of model, subject and training variables appears potentially fruitful.

If children can be taught, through cognitive training, to view themselves as causal agents of change rather than seeing themselves as being controlled by their environment than perhaps such a perception might lead to an increase in a child's sense of self-efficacy, along with a rise in performance on an academic task. Changes in self-efficacy have been held as the common underlying cognitive process that accounts for changes in behavior (Bandura, 1977). While self-efficacy assessments have begun to appear in the adult cognitive-behavioral literature (Bandura & Adams, 1977; Kazdin, 1979), Bandura & Schunk (1981), Mednick (1986), Salomen (1984), and Schunk (1981, 1982a, 1982b, 1983a, 1983b, 1983c) have assessed self-efficacy with children. However, adolescents have yet to receive much attention in intervention research.

## GENERAL PURPOSE OF THE STUDY

The purpose of this study is to explore how variations in tutoring plans, i.e., adult-led self-instructional training versus adolescent-led self-instructional training, can influence accuracy, self-efficacy, and generalization on an arithmetic task. It

asks whether an adolescent's perceptions of self-efficacy are enhanced following self-instruction training. If so, then with whom as the model?

## BRIEF OVERVIEW OF LITERATURE REVIEW

A brief overview of the structure and organization of this study's literature review may be helpful at this time. Included are five major sections: Peer Tutoring, Modeling, Self-Instruction, Modeling with Self-Instruction, Social Learning Theory and The Acquisition of Efficacy Information. Each major section stresses the importance of peers as behavior change agents and the instructional role that they can be taught to assume.

The first major section (Peer Tutoring) reports that the benefits usually ascribed to the tutored child include academic competencies and enhanced motivation to learn. Tutoring offers a way for children to engage in constructive social interaction from which useful psychological consequences can result. Tutoring can play an important role in the socialization process, in addition to any academic or cognitive benefits that may be realized.

The remaining four sections present several theoretical approaches that are relevant to tutoring and interaction between children. The second major section, Modeling, consists of research that reports the use of

modeling or peer imitation as a behavior change procedure which has direct effects on affective and cognitive skills as well as on children's social relations (Bandura, 1968).

The third major section, Self-Instruction, discusses studies which add a cognitive component to training. The model demonstrates overt coping behaviors enhanced by verbalization of a strategy or rationale. Meichenbaum (1971) has shown that models who provide a narrative of their self-verbalizations are superior to non-verbalizing models.

The fourth major section focuses on Modeling with Self-Instruction as a specific technique which teaches children a verbal strategy to self-guide their own behavior. The prototype for these studies was conducted by Meichenbaum and Goodman (1971).

The fifth major section contains two parts: Social Learning Theory and the Acquisition of Self-Efficacy (Bandura, 1977a, 1977b). Bandura (1977b) views development as resulting from a reciprocal relationship among individual characteristics, behavior, and environmental influences. Neither covert mediational nor overt behavioral processes are considered in isolation. Rather, cognitions, behavior, and environment are considered interdependent when explaining cognitive development. Social learning

theory stresses the significant role of observational learning. New behaviors can be acquired by observation of the behaviors and the consequences of those behaviors. Research of this kind may be useful in specifying the conditions that determine interpersonal influence and many of the factors that may generalize to other forms of learning.

In part two, The Acquisition of Self-Efficacy, Bandura (1977a) has proposed that an important cognitive factor mediating the effectiveness of behavior training procedures is the extent to which individuals acquire the expectancy that they will be able to perform the new behavior or goal which they desire. Bandura (1977a, 1982) has argued that self-efficacy expectancies are crucial to effective behavior change because they mediate the likelihood that a person will attempt a new behavior or goal.

# CHAPTER II

# REVIEW OF THE LITERATURE

## Peer Tutoring

Many peer tutoring programs have been implemented but few empirical investigations have been undertaken to evaluate them (Allen, 1976; Allen & Feldman, 1976; Cloward, 1967; Devin-Sheehan, Feldman, & Allen, 1976; Gartner, Kohler, & Riessman, 1971; Stainback, & Lichtward, 1975; Wagner, 1974).

Only recently, with the widespread use of applied behavior-analysis techniques, have the variables controlling the behavioral interaction during peer tutoring been investigated empirically (Apolloni, 1977; Buckholdt & Wodarski, 1978; Dineen, Clark, & Risley, 1977).

For example, Jenkins, Mayhall, Peschka, & Jenkins (1974) conducted a series of short experiments using an applied -behavior analysis methodology comparing various outcomes of teacher instructed small groups to structured tutoring among elementary special education students. One of the skills taught in these experiments was word recognition. The number of correctly recognized words per minute was greater in the tutorial group than in the teacher - instructed group. The same result was replicated in other schools with different students and teachers. In another comparison study,

Oakland and Williams (1975) used a randomized group design to compare gain scores in word recognition and comprehension achieved by third and fourth grade students who were assigned to one of the three learning groups: (a) tutoring only (i.e., no teacher), (b) supplementary tutoring and (c) teaching only (i.e., no tutoring). They found that the supplementary -tutoring group made greater gains than the teaching only group, followed by the tutoring only group.

A similar finding emerged from a study by Stainback and Stainback (1972) which compared the performances of elementary students assigned to either a tutorial or independent study condition on measures of arithmetic skills. No statistical differences were found between experimental and control groups. Since the experimental group received tutoring as a supplement to regular teaching, the authors concluded that peer tutoring plus teaching was shown to be no worse than teacher led instruction and independent study.

Duff and Swick (1974) did find that students in lower elementary grades who were randomly assigned as tutees showed significantly greater gains in reading achievement than students in a teacher led contrast group. It is important to note that Duff and Swick and Stainback and Stainback used significantly different criteria in creating their tutor and tutee subject

pools.

Pre-post testing designs have also been used in evaluating cross-age tutorial projects. Cloward (1967) found that fourth and fifth graders tutored in reading by high school students for five months showed an average gain of six months in reading achievement, in contrast to a control group that showed only 3.5 months gain during the same period. Frager and Stern (1970) used a similar design and found that kindergarten children tutored by sixth graders made significant gains on a language readiness test over a control group that received no tutoring. In other experiments the rate of learning to read has been accelerated by using more able students who are succeeding at reading to help those who are achieving poorly (Hamblin, Buckholdt, Ferritor, Kozloff, & Blackwell, 1971; Meyers, Travers, & Sanford, 1965; Riessman, 1965).

In addition to direct cognitive benefits, the literature suggests that the tutors experience positive emotional, psychological, and social effects (Coyne, 1978; McCarty, Griffin, Apolloni, & Shores, 1977; Dineen, Clark, & Risley, 1977; Frankosky, & Sulzer-Azaroff, 1978; Cobb, & Hops, 1973; Greenwood, Hops, & Walker, 1977; Hops, & Cobb, 1974). However, despite an accumulating body of empirical research, several questions concerning the implementation of peer tutoring

in school settings have not yet been satisfactorily answered. For example, is there sufficient evidence to permit specification of a behavioral technology of peer tutoring?; What guidelines derived from empirical research can assist decision makers in selecting, training, and supervising tutors or choosing tutees?

Since the implementation of a behavioral technology of peer tutoring will utilize behavioral training techniques in this study and these training techniques can be greatly enhanced by addressing the cognitive processing associated with the behaviors being taught, a cognitive component to the training will be added. Prime examples emerge from the modeling literature, presented below.

## Modeling

The influence of a model is a second factor that will be studied in this proposal. The use of tutor as a role model for the tutee has been demonstrated to have a facilitative effect on learning with young children (Apolloni & Cooke, 1975; Rubenstein & Howes, 1976) as well as with older individuals (Bandura & Walters, 1963). Researchers have described some of the factors (sex, race, socioeconomic status and age differential) influencing peer modeling which have relevance to its development as an instructional resource. Even though peer tutoring was investigated researchers demonstrated

the value of involving peers as models to assist in behavior modification efforts to train classmates' social and academic behavior. For example, Cicirelli (1972) found significant differences on sex parings in a one session tutoring study that investigated concept attainment in first graders taught by third grade siblings and nonsiblings. Research conducted by Hamblin & Hamblin (1972) and Snapp, Oakland, & Williams (1972) on racial and socioeconomic factors associated with tutoring reported that lower class or disadvantaged children tutored by other lower class persons improve as a result of tutoring. Tutoring programs have varied widely in the age difference between tutor and tutee. Thomas (1972) found that college students were better than sixth graders in promoting vocabulary acquisition in second grade tutees, but no difference was found as a function of age of tutor in reading comprehension and oral reading of tutees.

Subjects are assigned to a treatment condition where they observe a model perform a task or to a condition where they actively participate in the modeled task. The specific way in which the model demonstrates behavior can vary. Some forms of modeling include graduated modeling, symbolic modeling, filmed modeling, and participant modeling. An important distinction is whether the model displays a mastery or coping behavior.

A mastery model demonstrates ideal behavior. The coping model demonstrates coping strategies for dealing with difficulties or failures. In terms of effectiveness, a coping model has been found to be superior to a mastery model (Kazdin, 1974; Meichenbaum, 1971). Modeling, also referred to as observational learning, vicarious learning or imitation, has been used with snake phobics (Bandura, Adams & Beyer, 1977), teaching self-imposed delay of reward (Bandura & Mischel, 1965), adoption of self-evaluative standards (Allen & Liebert, 1969), patterns of self-reinforcement (Bandura & Krupers, 1964), moral reasoning (Bandura & MacDonald, 1963), reflective thinking behaviors (Debus, 1970), test anxiety (Mann, 1972), classroom participation inhibitions (O'Connor, 1969), and social behavior (Csapo, 1972).

Evidence suggests that students are influenced when they see their peers receive rewarding or punishing consequences for their performance. Behavior changes that results from seeing others receive consequences are referred to as vicarious processes. These processes are referred to as vicarious reinforcement and/or punishment. The term is used here to convey that contingency effects occasionally spread beyond those who receive direct consequences for performance.

Christy (1975) examined the vicarious effects of

reinforcement with preschool children receiving remediation in two classrooms. In-seat behavior in selected target subjects in each group was reinforced with food rewards. In separate instances, different children served as the target subject. In general, when one child received reinforcing consequences in the classroom, peers who did not receive these consequences tended to show similar increases in behavior.

Drabman and Lahey (1974) studied the effects of reinforcement given to a disruptive child on the behaviors of her peers in a fourth grade classroom. Periodically, the teacher rated the child from 1 to 10 on how she performed the appropriate classroom behavior. The ratings provided feedback for the child's performance and could not be exchanged for other reinforcers. Feedback not only changed the behavior of the target subject but also the behavior of her classmates as well.

Several other classroom studies have been conducted confirming the presence of vicarious reinforcement effects (Bolstad & Johnson, 1972; Kazdin, 1977; Kazdin, Silverman, & Sittler, 1974; Patterson, 1974; Strain & Pierce, 1977). The effects have been demonstrated among a wide range of ages and levels of intelligence. However, the comparison of children who were intentionally not included in the contingency but who

were able to observe targeted children receive direct consequences by means of self-instructional training has received limited attention.

Examination of vicarious processes is important for several reasons. First, vicarious processes are a potentially important source of influence on a child in the classroom or other situation. Second, vicarious processes are often neglected and uncontrolled in the classroom, which can enhance existing problems. Third, investigation of vicarious processes is important because the vicarious effects can interfere with evaluating the effects of direct reinforcement. For example, in some reinforcement programs in the classroom, comparisons may be made between the behaviors of students who receive reinforcement and of those who do not. The comparison appears to test reinforcement against no-treatment control children who do not receive direct consequences. However, the operation of vicarious reinforcement has been reported in a few studies showing that children may improve without receiving treatment (Bolstad & Johnson, 1972; Patterson, 1974). Therefore, while the direct effects of reinforcement and/or punishment has been reported in the literature, it now appears necessary to study what the effects will be of not including children in the contingency, i.e., children who can observe other

targeted children receive direct consequences.

Investigation of vicarious processes has important implications for understanding peer influences and for developing techniques that may improve performance.

## Self-Instruction

The things that people say to themselves have been considered important in controlling their own behavior (Zivin, 1979). A major premise of self-instructional training (SIT) is that what we say to ourselves, i.e., the content of our "internal dialogues," shapes and maintains our overt behavior. The Soviet psychologists Vygotsky (1962) and Luria (1961) suggest that the relationship between language, thought and behavior, develops in three stages. In early childhood, behavior is controlled by the speech of others (for example, parents). During the next stage, the child begins to use speech as a way to regulate behavior. For example, children self-administer verbal praise and criticism which they observe in the behavior of adult models. Also, children verbally administer self-instructional statements to guide their actions. In the last stage, speech "goes inside," i.e., much of the child's behavior comes under the control of covert self-speech.

Self-instruction training has been used directly to develop self-control. Children are taught how to use verbalizations to direct their own behavior. Once

learned, these verbalizations become mediating directions between environmental stimuli and behavior. Children use this covert speech to guide their overt behavior. The training sequence that Meichenbaum (1975; 1977) and Meichenbaum and Goodman (1971) use involves five stages of self-instructions: In the first stage, an adult model performs a task while talking to himself aloud (cognitive modeling). In the second stage, the child then performs the same task under the directions of the model's instructions (overt external guidance). In the third stage, the child performs the task while giving himself/herself instructions aloud (overt self-guidance). In the fourth stage, the child whispers the instructions to himself/herself while going through the task (faded overt self-guidance) and finally, the child carries out the task by using covert self-instructions.

In one of the first investigations in this area, SIT was applied to impulsive and hyperactive children (Meichenbaum & Goodman, 1971). The children (kindergarten and first graders) in the study tended to make errors that resulted from performing tasks quickly and without giving them much thought. The children were assigned to either a cognitive SIT condition, a modeling condition or to a control group. The results demonstrated that cognitive modeling alone was effective in slowing down children's behavior on the

Matching Familiar Figures Test, however, errors were not reduced. Slowing down and error reduction were associated with cognitive modeling and rehearsal.

Self-instruction has several advantages over other training procedures in that the intervention can be tailored to the needs of individual children and to the goals of specific tasks. It keeps the child in control, incorporates teaching methods and goals, and focuses on the process as well as the product of the problem-solving procedure. Early research on the efficacy of SIT focused on global behavioral problems, recent efforts have been directed at applying self-instruction to specific academic deficits within a school environment. SIT has been used to reduce off-task behavior (Bornstein & Quevillon, 1976; Burgio, Whitman, & Johnson, 1980; Friedling, & O'leary, 1979) and to remediate deficits in handwriting (Robin, Armel, & O'leary, 1975), and math performance (Johnston, Whitman, & Johnson, 1980). However, one issue which has not been addressed in the studies cited above, nor in the cognitive-behavioral literature on SIT, is whether adults or peers make better models for adolescents in learning SIT.

Another research issue of concern is whether generalization of behavior will be generated by peer modeling via SIT. Reviews of child cognitive behavior

therapy have consistently concluded that, while findings to date have been encouraging, evidence for generalization is considerably weaker (Abikoff, 1979; Karoly, 1977; Meichenbaum & Asarnow, 1979). Not only do gains fail to transfer but they also tend to disappear over time. Adolescents and/or children have not been utilized as the trainers in the training of self-instruction. If generalization was enhanced by increasing the similarity between the training task and setting and the situation in which the behavior change was desired, as Bryant and Budd (1982) and Burgio, Whitman, & Johnson (1980) have done, then perhaps generalization across tasks may be enhanced by increasing the similarity between the trainer and trainee.

## Modeling with self-instruction

Within the self-instruction literature, modeling alone has been compared to modeling with self-instruction. This cognitive-behavioral approach involves teaching by modeling with a limited amount of instructions. For example, Meichenbaum and Goodman (1971) used cognitive modeling to develop self-control in young, impulsive children. The children saw a person model a set of verbalizations and behaviors that characterized a strategy they could use in performing a task. The children exposed to this cognitive model were

compared to a group that received cognitive modeling plus self-instructional training (Meichenbaum & Goodman, 1971). In the latter group, in addition to watching the model, the children were trained to repeat the self-instructions the model demonstrated while performing the task. The children performed the task while instructing themselves as the model had done. Gradually the children's self-statements were faded from overt to a covert level. This group not only decreased decision time but also significantly reduced performance errors.

Kendall and Braswell (1982) found that problem children between 8 -12 years of age who received cognitive modeling with cognitive self-instructional training improved on teachers' ratings of self-control. Copeland (1981) recommended that subject variables such as age, IQ, cognitive style, and internal versus external attributions be considered when designing self-instructional programs for impulsive children.

Cognitive self-instruction used in combination with rehearsal and homework practice was found to be effective in developing assertive skills (Kazdin & Mascitelli, 1982a). Written symbolic models of self-instructional statements were made to "help the person adopt a set to facilitate the assertive response, to identify the situation as one requiring actions, and to prompt a specific response" (Kazdin & Mascitelli, 1982a,

p. 350).

Cognitive modeling plus self-instructional training was also used effectively to train hospitalized schizophrenics to alter their thinking, attention and self-talk while performing tasks (Meichenbaum & Cameron, 1973b).

In addition, a number of investigators have successfully taught retarded children to imitate nonretarded children with attendant increases in imitative and social behaviors (Apolloni, Cooke, & Cooke, 1977; Cooke, Apolloni, & Cooke, 1978; Devaney, Guralnick, & Rubin, 1974; Guralnick, 1976).

This surge of interest in the application of modeling with self-instructional procedures (Bender, 1976; Bornstein and Quevillon, 1976; Bryant and Budd, 1982; Fish & Mendola, 1986; Kendall, 1977; Kendall & Finch, 1978; Kendall & Wilcox, 1980; Meichenbaum, 1975, 1977; Robin, Arnel and O'Leary, 1975;) has generated much momentum among researchers; however, the actual body of cognitive behavioral studies involving parents, teachers and/or peer-student teachers is small but encouraging. Glenwick and Barocas (1979) compared five groups of impulsive fifth and sixth graders. In the first group, the parents and teachers of impulsive children were trained in verbal self-instruction by the experimenters. In the second group, just the teachers

of impulsive children were trained by the experimenters. In the third group, just the parents of impulsive children were taught. In the fourth group, the experimenters trained a group of impulsive children themselves and the fifth group acted as a control. In the groups involving parents and/or teachers, the adults were trained in prompting, monitoring and reinforcing their children's use of verbal self-statements and problem-solving at home and at school. Training took place in eight one hour long sessions that went on for four weeks. The group of children who had two sets of natural change agents, parents and teachers, showed superior gains on a number of cognitive, achievement and behavior measures compared to the other four groups.

Parents and/or teachers have also have been involved in research directed at children's nighttime fears (Graziano & Mooney, 1980), "acting out" behaviors (Thoresen, Thoresen, Klein, Wilbur, Becker-Haven, Haven, 1979), hyperactivity (Douglas, Parry, Marton & Garson, 1976), aggressiveness (Camp, Blom, Herbert & Van Doorninck, 1977), interpersonal cognitive problem-solving skills (Spivack & Shure, 1974), and self-management abilities (Hartman, 1979). These studies have demonstrated that the cognitive behavioral approach is one that nonprofessionals can learn and carry out

with children of different ages and developmental levels. This use of natural change agents represents a means of significantly affecting a child's life and could come to be seen as a valuable way of fostering a sense of self-efficacy (Bandura, 1977a).

Although several studies (Barry & Overman, 1977; Duff & Swick, 1974; Epstein, 1978; Jenkins, Mayhall, Peschka, & Jenkins, 1974; Oakland & Williams, 1975; Stainback & Stainback, 1972) compared the effectiveness of various peer-tutoring plans to either teacher-led instruction or some form of self-instruction, several factors have not received sufficient attention to date but are of interest: How do model variables (adult vs. peer) interact with self-instruction treatments?; How does verbalizing self-instruction compare to listening to one's partner overtly self-instruct on an arithmetic task?; Will adolescent's working with a peer model and directly engaged in self-instruction training do better than adolescents working with a peer model and vicariously observing?; Will adolescents working with a peer model and directly engaged in self-instruction training do better than adolescents working with an adult model and vicariously observing?; Will adolescents working with a peer model and directly engaged in self-instruction training do better than adolescents working with an adult model and directly

engaged?

Also of research interest is whether generalization of behavior will be generated by peer modeling via SIT. Although children have increasingly been chosen to modify their peer's behavior, i.e., they have assumed active intervention roles, acting as model agents of behavior change (Baily, Timbers, Phillips, & Wolf, 1971; Greenwood, Sloane, & Baskin, 1974; Harris & Sherman, 1973) limited generalization has been reported (Apolloni, Cooke, & Cooke, 1977; Peck, Apolloni, Cooke, & Raver, 1978). It seems necessary then to further investigate the significance of generalization gains in peer modeling behavior. Such efforts would be two fold: (a) to increase generalization, and (b) to examine whether peer modeling via SIT is making a worthwhile contribution to an adolescent's achievement.

## Social Learning Theory

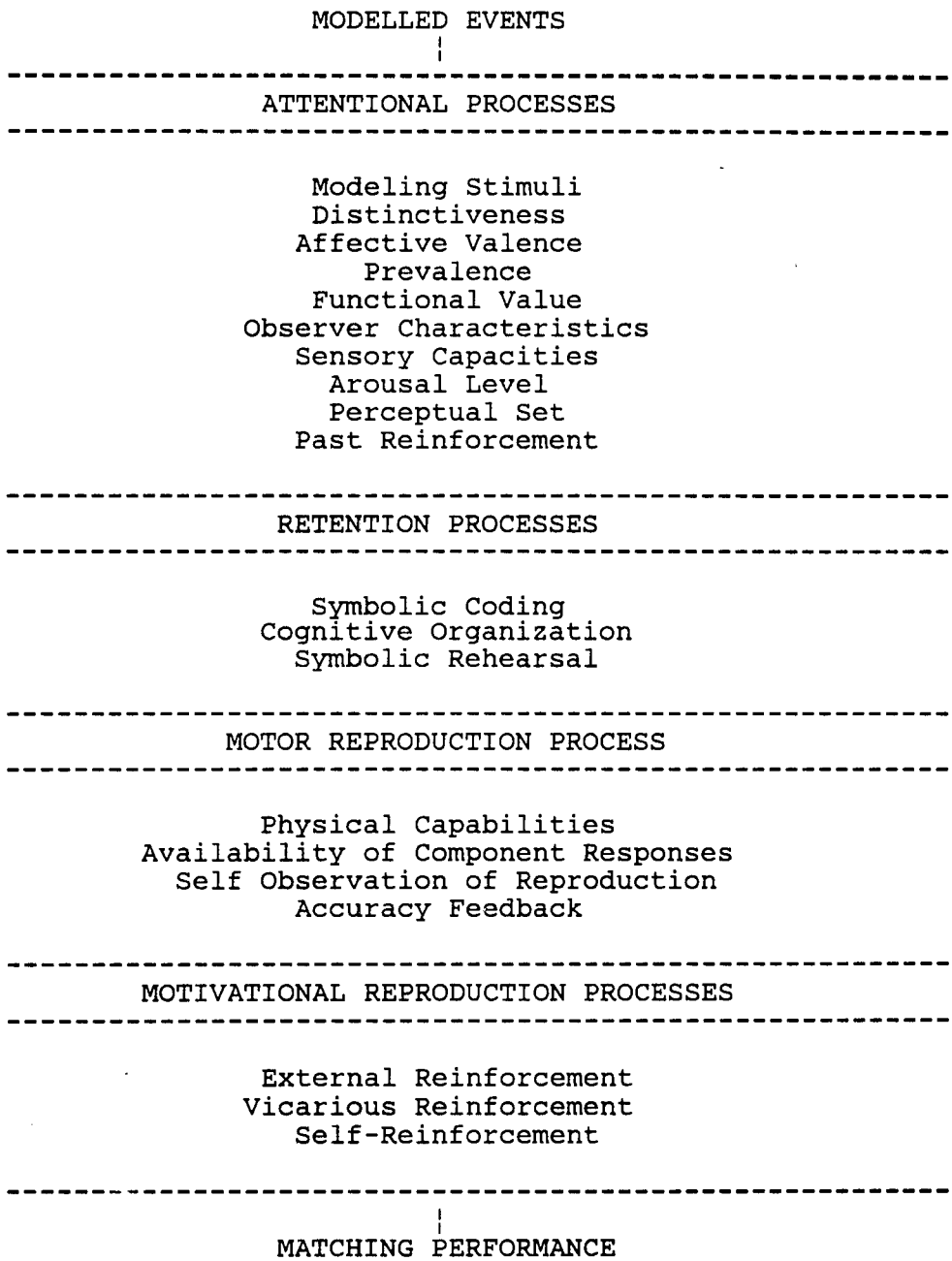
Bandura's Social Learning Theory (1969; 1977b) is a synthesis of radical behaviorism and cognitive theory, specifically information-processing theory. The distinguishing feature of Bandura's social learning theory revolves around his analysis of how people learn by observing others. This type of learning has been referred to as observational learning, vicarious learning, imitation or modeling. For Bandura (1977b) observation of the behavior of others is the means by

which new responses are acquired, reinforced or extinguished. Bandura recognized that both classical and operant conditioning procedures play a part in getting people to attend to and reproduce for themselves the behavior of others. But neither one of these processes could fully account for this kind of learning. He reasoned that internal reasoning processes must be included in a model of psychological functioning because it allows one to re-enact symbolically the performances one has selected from the behavior of others and what is anticipated as being useful.

Figure 1 presents Bandura's (1977b) component processes underlying observational learning. The first section (Attentional Processes) is associated with the characteristics of the modeled stimulus and what it is about that modeled stimulus that is selectively perceived and attended to. The second section (Retention Processes) relates to the coding, organization and storage of a "mental picture" of the performance. Both attention and retention processes are stressed by information-processing theory. The two remaining component processes, motor reproduction and motivation, refer to the performance of behaviors once they are learned by observation. The third section (Motor Reproduction) is concerned with the rehearsal of modeled performances and the fourth section

Figure 1

Component Factors Governing Observational Learning in the Social Learning Process




Source: Bandura (1977).

(Motivational Processes) with how often the behavior is likely to be performed. Emphasis is placed on the cognitive activity of the learner. The learner is seen as an active processor of information and not a passive receiver of reinforcement.

Bandura (1977b, 1978) also included the concept of a self-system in his theory. The self-system "is not a psychic agent that controls behavior. Rather, it refers to cognitive structures that provide reference mechanisms and to a set of subfunctions for the perception, evaluation, and regulation of behavior" (Bandura, 1978, p. 348). The self-system and its relationships to the environment is referred to as reciprocal determinism, i.e., the self and the environment are interdependent, each influence and regulate the other. Reciprocal determinism implies that a person is not bound to the environment for reinforcement. Rather, one can determine one's own reward and/or punishment.

The idea that one can self-reinforce indicates that one can motivate oneself as well. Behavior can be regulated or managed by the individual. The self-regulation processes are made up of three components: self-observation, judgemental processes and self-response. However, the self-reinforcement concept does not provide a reason for why these processes are

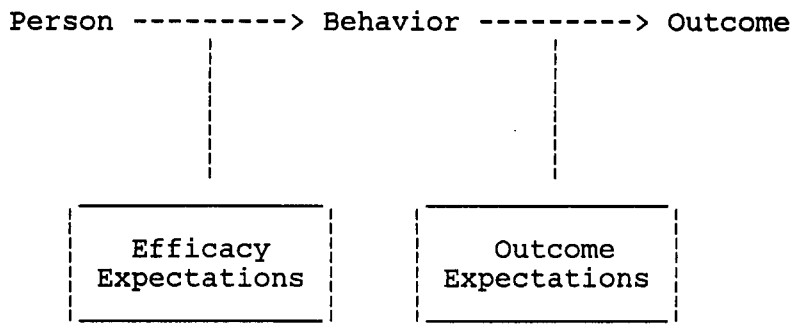
important. Bandura's (1977b) concept of self-efficacy was developed to deal with this problem.

## The Acquisition of Efficacy Information

Bandura (1977b) describes two classes of expectations: outcome expectations and efficacy expectations. Outcome expectations are defined as a person's estimate that a given behavior will lead to a certain outcome. Efficacy expectations represent the belief that one can successfully carry out the behavior required to produce a specific outcome. These two classes of expectations are differentiated because a person can believe that a particular course of action will lead to certain outcomes but may have serious doubts about whether he/she will be able to perform the necessary behavior(s). Outcome expectations is a knowledge of what to do, while efficacy expectations is a judgement of whether it can be done. Efficacy expectations then are a person's belief about his/her mastery, competence and ability in any given situation. The person's expectation of self-efficacy determines the level of motivation for performing a specific task. According to Bandura (1977b) all psychological change procedures, whatever they might be, are mediated through this system of beliefs about the end result of an action and the level of skill required to perform it adequately. Figure 2 presents a diagram of how efficacy

Figure 2

Efficacy and Outcome Expectations




Source: Adapted from Bandura (1977).

and outcome expectations are distinguished.

Bandura (1977b) lists the following four sources of self-efficacy expectations: (A) Performance accomplishments are based on personal mastery experiences. Successes raise mastery expectations while failures lower them. (B) Vicarious experiences affect expectations by watching similar others perform (model) tasks successfully.(C) Verbal persuasion involves suggesting, prompting, coaxing someone into believing that they can succeed and overcome their difficulties. And (D) Emotional arousal can be influential in determining expectations of self-efficacy, especially in threatening situations in which fear and anxiety decrease the efficacy expectations. Figure 3 presents the sources of efficacy expectations and the modes of influence that operate through each of them.

Self-efficacy expectations vary on three dimensions that have important performance implications (Bandura, 1977a): (1) They differ in level of difficulty, i.e., when tasks are compared to other tasks in a hierarchy. (2) Self-efficacy expectations also vary in strength by how easily a person rejects these expectations in the face of disconfirming experiences. (3) Self-efficacy expectations differ in generality. Some experiences foster limited mastery expectations while others are more generalized.

Figure 3

Major Sources of Efficacy Information and the Principle Sources Through which Different Modes of Treatment Operate.

| Source | | Mode of Induction |
|---|---|---|
| Performance Accomplishments | * | * Participant Modeling<br>* Performance Desensitization |
| | | * Performance Exposure<br>* Self-Instructed Performance |
| Vicarious Experience | * | * Live Modeling |
| | | * Symbolic Modeling |
| Verbal Persuasion | * | * Suggestion<br>* Exhortation |
| | | * Self-Instruction<br>* Interpretive Treatments |
| Emotional Arousal | * | * Attribution<br>* Relaxation, Biofeedback |
| | | * Symbolic desensitization<br>* Symbolic Exposure |

Source: Bandura, 1977a, p. 195.

Information obtained from these different major sources does not automatically effect self-efficacy. Rather, the effect of information on self-efficacy expectations depends on how it is cognitively assessed (Bandura, 1977a). Efficacy evaluation is an inferential process in which a person synthesizes many personal and situational factors (Bandura, 1981). In developing one's self-perception of how well one can function in a given situation a person considers many variables: ability, task difficulty, how much effort expended, how much help one receives, situational circumstances and one's past history of successes and/or failures (Bandura, 1981).

Even after students obtain efficacy information from their experiences, later efficacy opinions are not simply reflections of those experiences (Bandura, 1982; Schunk, 1981). Bandura and Schunk (1981) found that judgements of self-efficacy were enhanced when children set attainable subgoals as compared to distant goals or no goals. Schunk (1983a) reported that judgements of self-efficacy were enhanced when children were given "ability feedback" as compared to those given "effort feedback" or to the no feedback condition. In another study, Schunk (1983b) found children who were given social comparative information about the number of problems solved by other children on the same task along

with being given specific proximal goals had enhanced self-efficacy to children receiving only specific proximal goals. Schunk (1983c) studied the relationship between tangible, extrinsic rewards and percepts of self-efficacy. He found that rewards offered for performance attainments increased percepts of self-efficacy whereas offering rewards for task participation did not increase self-efficacy. In applying these ideas to an academic setting Schunk (1984) argued that educational practices differ in how they influence students' efficacy judgements. For example, "in the context of competency development students should begin to develop a sense of efficacy as they work at a task and experience some success. Some educational practices may validate this sense of efficacy by clearly conveying that students are becoming more capable, which should sustain task motivation and lead to further increase in self-efficacy and skills. Other practices may offer ambiguous information about students' capabilities, or even convey information to the effect that students are not particularly skillful and skills should be lower than those resulting from efficacy-validating practices" (Schunk, 1984, p. 49).

Along a similar vein, Dweck (1975) has demonstrated that it is possible to change students' attributions for failure and, as a result, improve students' persistence

on difficult tasks. She chose as her subjects children who exhibited chronic responses to failure. All of the children were given math problems for a number of treatment sessions. Half the children received only success feedback, which they were encouraged to attribute to internal factors. The other half received both success and failure experiences. These children were encouraged to attribute their failures to low effort, a controllable, internal and unstable factor. In a follow-up session, when both groups of children were exposed to failure, only the children who had been taught to attribute failure to lack of effort improved or maintained their performances. In contrast, the performance of children who had received only success experiences in the training session worsened.

Schunk (1981) studied the change in self-efficacy brought about by the combined social influence of observing a model and of receiving attributional feedback. He looked at the relationship between self-efficacy and achievement within the context of an arithmetic task. Low-achieving children participated in a division competency development program and received either cognitive modeling or didactic instruction. In the modeling treatment, children observed an adult model verbalize division operations while at the same time applying them to problems. The didactic treatment

was made up of children reviewing instructional pages that showed the solution of division problems step-by-step. Modeling was expected to be more effective because of evidence that linking explanatory principles with exemplary modeling promotes skills better than principles alone (Rosenthal & Zimmerman, 1978).

The results indicated that both cognitive modeling and didactic instruction led to significant increases in self-efficacy, skill and task persistence but that modeling resulted in significantly higher skill. Effort feedback had no significant effect on any measure. Failure of the attributional feedback was related to task.

Self-efficacy theory predicts that active engagement in activities can result in enhanced self-efficacy more than other kinds of intervention (Bandura, 1982). Depending on the instructional procedure, self-efficacy can be raised or lowered to varying degrees.

While self-efficacy assessments appear in the adult cognitive-behavioral literature (Bandura & Adams, 1977; Kazdin, 1979) they have only begun to receive attention in child intervention research (Bandura & Schunk, 1981; Schunk, 1981; 1982a; 1982b; 1983a; 1983b; 1983c). Schunk (1985) found that higher self-efficacy brought about by observing peer models was substantiated by children's actual performances during training and led to higher

posttest skill. This study also shows that having very capable perceptions of oneself is closely related to subsequent achievement. Personal expectations for success are viewed as important influences on behavior (Bandura, 1982; Schunk, 1984). However, research is needed to examine the peer modeling process in greater detail to determine how children's self-efficacy is influenced by model characteristics and children's perceptions of models. Students are exposed to many peer models each day. By examining what characteristics of peer models children attend to and use in forming self-efficacy judgements, important theoretical and teaching implications may be explored.

## Summary

Several key ideas reported above are especially relevant to this study. First, structured training programs have been shown to be a viable and efficacious means to attain successful outcomes with student-assisted instruction. Second, peer tutoring interventions have been found to produce positive results in academic performance. Third, a child may acquire new patterns of behavior by watching the performance of others. Fourth, research to date has indicated that enhanced self-efficacy heightens performance. Fifth, according to self-efficacy theory, direct engagement in a task enhances self-efficacy more

than any other psychological procedure. Sixth, SIT requires active engagement with a task and therefore may be particularly helpful in influencing self-percepts of efficacy. Seventh, the effectiveness of SIT is influenced by its interaction with subject variables. Eighth, generalization following SIT has been found when the training situation is made similar to the classroom.

# CHAPTER III

# THE PROPOSED STUDY

## Statement of the Problem

The present study seeks to find out whether adolescent males' and females' percepts of self-efficacy are enhanced through peer-mediated SIT. It asks whether enhanced self-efficacy results in increased task accuracy and generalizes across academic tasks. It hypothesizes that percepts of self-efficacy predict accuracy on an arithmetic task.

Bandura (1977a, 1982) argues that perceived self-efficacy is most influenced by performance accomplishments. These accomplishments are influenced by cognitive appraisal of a number of factors. The present study examines the trainer's characteristics (adult vs. adolescent) involved in the self-instruction technique. The influence of direct vs. vicarious experience in creating efficacy expectations will be tested as well as the hypothesized relationship between self-efficacy and performance.

This study asks if there is a typical type of interpersonal "teaching" which peer-tutoring strategies may make use of in the classroom? Is there sufficient evidence to permit specification of a behavioral technology of peer tutoring? What guidelines can be derived from this research that can assist decision

makers in selecting, training, and supervising tutors or choosing tutees?

Research Questions and Experimental Hypotheses

The following research questions and experimental hypotheses are posed for investigation:

Research Question I asks: Is there a difference between direct self-instructional training (SIT) experience and vicarious SIT experience in terms of their effects on accuracy of performance? The hypothesis for this research question states that direct SIT experience is more effective in this sense than vicarious SIT experience.

Research Question II asks: Is there a difference between direct SIT experience and vicarious SIT experience in terms of their effects on self-efficacy regarding performance? The hypothesis for this research question states that direct SIT experience is more effective in this sense than vicarious SIT experience.

Research Question III asks: Is there a difference between direct SIT experience and vicarious SIT experience in their effects on generalization to a wider class of computational problems? The hypothesis for this research question states that direct SIT experience will generalize to a significantly wider class of computational problems than vicarious SIT experience.

Research Question IV asks: Is there a difference

in accuracy of performance between subject's tutored by adults and subjects tutored by peers? The hypothesis for this research question predicts that adolescents tutored by peers will exhibit greater performance accuracy than adolescents tutored by adults.

Research Question V asks: Is there a difference between subjects tutored by adults and subjects tutored by peers in terms of self-efficacy of performance? The hypothesis for this research question states that adolescents tutored by peers will exhibit a higher degree of self-efficacy than adolescents tutored by adults.

Research Question VI asks: Is there a difference between subjects tutored by adults and subjects tutored by peers in terms of generalization of performance to a wider class of computational problems? The hypothesis for this research question states that adolescents tutored by peers will generalize their gained arithmetic skills to a wider class of computational problems than adolescents tutored by adults.

Research Question VII asks: Is there an interaction between method of instruction (direct, vicarious or control) and tutor condition (adult versus peer) in terms of their effect on accuracy of responses? The hypothesis for this research question states that adolescents given SIT with direct modeling by a peer

will exhibit greater accuracy of response than adolescents given SIT with direct modeling by an adult. It is also hypothesized that adolescents given SIT with direct modeling by a peer will exhibit greater response accuracy than adolescents given SIT with vicarious modeling by a peer.

Research Question VIII asks: Is there an interaction between method of instruction (direct, vicarious or control) and tutor condition (adult versus peer) in terms of their effect on self-efficacy concerning responses? The hypothesis for this research question states that adolescents given SIT with direct modeling by a peer will exhibit greater self-efficacy than adolescents given SIT with direct modeling by an adult. It is also hypothesized that adolescents given SIT with direct modeling by a peer will display greater self-efficacy than adolescents given SIT with vicarious modeling by a peer.

Research Question IX asks: Is there an interaction between method of instruction (direct, vicarious or control) and tutor condition (adult versus peer) in terms of their effect on generalization concerning responses? The hypothesis for this research question states that adolescents given SIT with direct modeling by a peer will generalize their arithmetic skills to a wider class of computational problems than adolescents

given SIT with direct modeling by an adult. It is also hypothesized that adolescents given SIT with direct modeling by a peer will generalize their arithmetic skills to a wider class of computational problems than adolescents receiving SIT with vicarious modeling by a peer.

Adjunct Research Question asks: Do students taught under direct self-instructional conditions exhibit higher self-evaluation than students taught under vicarious conditions?

# CHAPTER IV

## METHOD

The present study was conducted during the academic school year of 1987-1988. Adolescents were assigned to one of four training groups or to a control. There were three phases to the experiment: pretesting, training, and posttesting. Figure 4 outlines the phases of the experiment.

### Subjects

The sample consisted of 125 male and female adolescents drawn randomly from four ninth grade and four tenth grade classes. The adolescents in the sample were selected from a suburban high school in Long Island. Their ages ranged from 14 to 15 years. The subjects were Black, Hispanic and White and came from a mixed socioeconomic status group. The tutees (subjects in the experimental and control groups) consisted of all subjects who obtained an arithmetic achievement score on the Otis Lennon School Ability Test (OLSAT) (Otis & Lennon, 1979) in the bottom one-third of their class. The subjects were matched according to group IQ test scores as measured by the OLSAT (Otis & Lennon, 1979) and then randomly assigned to groups. Pretesting and posttesting took place in the adolescents' own homeroom classroom. Training was done in a separate room. Adolescents were trained in pairs with Group I and II

**Figure 4**

**Phases of the Experiment**

| **Pretests** | **Training** | **Posttests** |
|---|---|---|
| Fraction Problem #1<br>Self-efficacy Measure #1 | For groups I - IV | Self-efficacy Measure #1<br>Fraction Problem #1 |
| Fraction Problem #2<br>Self-efficacy Measure #2<br>etc. | | Self-efficacy Measure #2<br>Fraction Problem #2<br>etc. |
| Fraction Problem # 28<br>Self-efficacy Measure # 28 | | Self-efficacy Measure # 28<br>Fraction Problem # 28 |
| Generalization Measure | | Generalization Measure |

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Other Measures: Social Comparability Questionnaire

working together, and Group III and IV working together. Adolescents in Group V and Group VI were paired with each other. Initially 144 adolescents had gone through pretesting and training, however, nineteen adolescents dropped out of the study. This resulted in unequal cell sizes in what were initially equal samples within each cell. Adolescents were chosen as the targeted subject population because the majority of studies cited above used children below 9 years of age. Thus, little is known about the functional significance of adolescents acting as self-instructional trainers with their peers.

## Pretest Measures and Instrumentation

Accuracy measure. This task consisted of 28 addition of fraction problems. Each problem was presented on a single page and problems were increasingly more difficult. Each subject was asked to look at each sheet and where a problem was presented, without a self-efficacy measure, solve it. Then, when the problem was completed the subject was asked to turn the page and check the line on the self-efficacy measure that best reflected his/her belief about how he/she answered the fraction problem. One point was given for each fraction problem correctly answered. The highest score a subject could obtain was 14 while the lowest score a subject could obtain was zero. No partial credit was given. All answers had to be reduced to

lowest terms in order to earn credit. All work was done in the fraction booklet.

Self-Efficacy measure. A pretest level of efficacy was administered immediately after each fraction problem. The subject was presented with a fraction problem which was similar to the one he/she had just completed. The subject did not work this problem but instead checked one of the five lines which best expressed the subject's self-efficacy. The subjects were asked to judge privately their ability to solve the problem and to put an "X" on the line which best showed how sure they were that they could solve the problem. They were asked to be honest in their appraisals and to put the "X" on the line which best showed how they felt right then and there. There were five lines to choose from and each line had a verbal descriptor. These sheets followed each of the fraction problems that the subjects solved.

Generalization measure. This task consisted of 7 levels of hierarchically categorized addition of fraction problems. The seven categories were: (1) simple addition of fractions with like denominators; (2) one digit addition of fractions with denominators needing a least common denominator (LCD); (3) one digit addition of fractions with denominators that have more complicated LCD; (4) two digit addition of fractions

that have more complex LCD; (5) addition of fractions with mixed numbers; (6) addition of algebraic numerators with same or like denominators; and (7) addition of algebraic numerators with different denominators.

Each category is made up of 2 addition of fraction problems. Subjects were actually required to solve two addition of fraction problems in each category, while the other two addition of fraction problems in each category were part of the self-efficacy measure which subjects did not solve; instead they checked one of the five lines which best expressed the subject's self-efficacy. For a category to be considered mastered 100% of the answers given to a specific category had to be correct. The lowest possible generalization score is zero while the highest possible generalization score is seven. No partial credit was given. All answers had to be reduced to lowest terms in order to earn credit.

The Otis Lennon School Ability Test (OLSAT) (Otis & Lennon, 1979). The OLSAT was designed "to provide an accurate and efficient measure of the abilities needed to acquire the desired cognitive outcomes of formal education" (Otis & Lennon, 1979). The authors identify this complex of abilities as "school ability." The test measures this set of abilities by assessing student's skills in detecting similarities and differences, defining words, following directions, classifying,

sequencing, solving arithmetic problems, and completing analogies. Both internal-consistency and test-retest reliability are reported in the test manual by both grade and age. All internal-consistency coefficients exceed .90. Test-retest reliability was ascertained by studying the test performance of students in grades 1, 2, 4, 7, and 10 over a 6 month interval. Test-retest reliabilities ranged from .84 to .92.

## Training Conditions

In the present study, adolescents were either assigned to one of four training groups or to one of two control groups. Figure 5 presents the paradigm.

Self-Instructional Training with Direct Modeling: (Group I Adult Model and Group III Adolescent Model). Subjects participate in arithmetic task while verbalizing instructions.

Self-Instructional Training with Vicarious Modeling: (Group II Adult Model and Group IV Adolescent Model). Subjects watch the task being performed and listen to the instructions.

Didactic Training or Attention Control Groups: (Group V Adult Model and Group VI Adolescent Model). Subjects were told to pay close attention and follow along as the model, adult or peer, read them the directions aloud from the sample problems. Then, when the model was finished, the subjects were told to

Figure 5

Research Analysis Paradigm

| | TRIAD I | TRIAD II |
|---|---|---|
| | TYPE of MODEL | |
| TYPE OF TRAINING | ADULT MODEL | PEER MODEL |
| SI with DIRECT TRAINING | I | III |
| SI with VICARIOUS TRAINING | II | IV |
| DIDACTIC TRAINING (Control) | V | VI |

continue answering the remaining problems in the fraction packet.

## Experimental Assignments

After the administration of the pretest measure the subjects were called out of the classroom two at a time. Subjects in group I and group II were called together, subjects in group III and group IV were called together and subjects in group V and group VI were called together.

## Instructional Material

Three mathematic specialists, each with a masters degree in math and currently teaching in their specialty, were individually consulted to determine whether the training directions provide a student with sufficient information to answer the hierarchically categorized addition of fraction problems. Each mathematic specialist believed that the training directions were sufficient.

All subjects received the same fraction packet. The packet included 15 fraction problems. The first five problems were samples which gave solutions with all work shown. With these are step-by-step explanations on how to solve the problems. The following ten problems were practice exercises.

## Tutors

Two adolescents, one white male the other a white

female, served as the peer tutors or adolescent models for the study. Both adolescent models obtained an arithmetic achievement score on the OLSAT in the top one-third of their class. Another criteria for the adolescent tutors to meet was a recommendation by their teachers on the basis of the following: (1) conscientiousness and dependability as determined by teacher judgement and (2) desire to be a tutor. The adolescent tutors were trained by the experimenter to demonstrate the tasks.

The adult tutors, both white females, were graduate students in their mid 20's who were also trained by the experimenter to demonstrate the tasks.

Three 30 minute sessions on consecutive days were conducted by the experimenter to train the tutors. The first training session was primarily introductory, with emphasis on describing the tutoring program and modeling appropriate teaching behaviors for the trainees to imitate (e.g., speaking clearly, ignoring inappropriate social behavior, correcting an incorrect response, and repeating a stimulus after correcting an incorrect response). During the second session, appropriate teaching behaviors were reviewed and the tutoring materials were introduced. A role-playing procedure was used. Each trainee was given an opportunity to practice. The third training session was entirely

devoted to the role-playing procedure. Throughout the modeling and role-playing sessions, the experimenter gave social approval to the trainees, contingent upon appropriate tutoring behavior. Mastery of tutoring materials was required and obtained by all tutors before training with subjects began.

## Procedures for Training

The training phase of the experiment was conducted on the day following pretesting. The self-instructional procedures included five steps for those in Groups I, II, III, and IV. The didactic training or control procedures included one step for those subjects in groups V and VI. Figure 6 outlines the procedures for each group.

For Groups I & III the following steps include:

Step 1. The adult or peer model works and verbalizes each problem.

Step 2. Subject works while the adult or peer model verbalizes.

Step 3. Subject works and verbalizes.

Step 4. Subject works and whispers.

Step 5. Subject works without verbalizing.

For Groups II & IV the following steps include:

Step 1. The adult or peer model works and verbalizes each problem.

Step 2. Subject observes an adult or peer model

Figure 6

**Procedure for Self-Instructional Training**

| Triad I | | | Triad II | | |
|---|---|---|---|---|---|
| Adult Model | Adult Model | Adult Model | Peer Model | Peer Model | Peer Model |
| Group I | Group II | Group V | Group III | Group IV | Group VI |
| Direct SIT | Vicarious SIT | Control | Direct SIT | Vicarious SIT | Control |

verbalizing.

Step 3. Subject observes and listens.

Step 4. Subject observes and listens.

Step 5. Subject observes.

For Groups V & VI the following steps include:

Step 1. Subjects are told to pay close attention and follow along as the model (adult or peer) reads them the directions aloud from the sample problems. Then, when the model is finished, the subjects are told to continue answering the remaining problems in the fraction packet.

**Triad I and Triad II.** During step 1 both subjects were asked to follow along in the booklet as the adult or peer model worked sample problems 1 & 2 while talking through each step of the problem. In step 2 the subjects from Group I & III were asked to work problems 3 & 4 as the adult or peer model verbalized the steps. The subjects from Group II & IV were asked to watch his or her partner and to listen to the adult or peer model. In step 3 the Group I & III subjects were asked to work problems 5 & 6 and to say the steps as the adult or peer model did for the last four problems. The group II & IV subjects were asked to watch and listen. In step 4 the subjects from group I & III were asked to work problems 7 & 8 and to whisper the steps of the problem. The subjects from Group II & IV were asked to watch and to listen. In step 5 the subjects from Group I & III were

asked to work problems 9 & 10 without saying the steps aloud. The subjects from Group II & IV were asked to watch.

## Dependent Measures

Accuracy measure. This task consisted of 28 addition of fraction problems. Each problem was presented on a single page and problems were increasingly more difficult. Each subject was asked to look at each sheet and where a problem was presented, without a self-efficacy measure, solve it. Then, when the problem was completed the subject was asked to turn the page and check the line on the self-efficacy measure that best reflected his/her belief about how he/she answered the fraction problem. One point was given for each fraction problem correctly answered. The highest score a subject could obtain was 14 while the lowest score a subject could obtain was zero. No partial credit was given. All answers had to be reduced to lowest terms in order to earn credit. All work was done in the fraction booklet.

Self-Efficacy measure. A pretest level of efficacy was administered immediately after each fraction problem. The subject was presented with a fraction problem which was similar to the one he/she had just completed. The subject did not work this problem but instead checked one of the five lines which best

expressed the subject's self-efficacy. The subjects were asked to judge privately their ability to solve the problem and to put an "X" on the line which best shows how sure they were that they could solve the problem. They were asked to be honest in their appraisals and to put the "X" on the line which best showed how they felt right then and there. There were five lines to choose from and each line had a verbal descriptor. These sheets followed each of the fraction problems that the subjects solved.

Generalization measure. This task consisted of 7 levels of hierarchically categorized addition of fraction problems.

Each category is made up of 2 addition of fraction problems. Subjects were actually required to solve two addition of fraction problems in each category, while the other two addition of fraction problems in each category were part of the self-efficacy measure which subjects did not solve; instead they checked one of the five lines which best expressed the subject's self-efficacy. For a category to be considered mastered 100% of the answers given to a specific category had to be correct. The lowest possible generalization score is zero while the highest possible generalization score is seven. No partial credit was given. All answers had to be reduced to lowest terms in order to earn credit.

## Posttest Measures

The posttests were administered to the entire subject population after training. The posttests were given in the same way as the pretests were given. However, this time, the self-efficacy judgement scale preceded each fraction task in order to determine the predictive value of the information obtained. The problems shown corresponded to but were not the same as those on the pretest.

Following the posttests subjects were presented with a rating sheet on which they were asked to check the line which best matched how they felt about their abilities as compared to the ability of their paired partner. Three sentences were listed with a line after each one. Subjects were asked to check the box which best matched how they felt.

"I think I did better than my partner."

"I think I did about the same as my partner."

"I think I did not do as well as my partner."

## Method of Data Analysis

The data was analyzed using a 2 X 3 analysis of covariance model. For each dependent measure an equivalent pretest score was used as a covariate. The column factor was type of tutor (adult / adolescent) and the row factor was type of instruction (direct, vicarious, and control). The tables displaying the

analysis of covariance appear on pages 64 through 67. This analysis was carried out for each of the three dependent variables: Accuracy, Self-Efficacy, and Generalization. This design was adequate for testing the hypotheses posed for investigation.

For the Social Comparability measure a 2 X 2 analysis of covariance was calculated. The column factor was type of tutor (adult / adolescent) and the row factor was type of instruction (direct, and vicarious). Subject's pretest accuracy and pretest generalization scores were used as the two covariates.

# CHAPTER V

## RESULTS OF THE INVESTIGATION

The results of the analysis of the data will be presented in this section. First, the research questions and hypotheses for investigation will be restated, and then each hypothesis will be examined in light of the data analysis outcomes.

The means and standard deviations for Accuracy (pre and post test scores) for the three study groups are presented in Table 1. The means and standard deviations for Self-efficacy (pre and post test scores) for the three study groups are presented in Table 2. Table 3 presents these data for the measure of Generalization, and Table 4 contains the descriptive statistics for the 3 study groups for the measure of IQ.

The results of the Analysis of Covariance (ANCOVA) for the measure of Accuracy appear in Table 5; Table 6 displays the ANCOVA outcomes for Self-efficacy; and Table 7 displays the ANCOVA outcomes for Generalization. Finally, Table 8 displays the ANCOVA outcomes for Social Comparability.

An examination of Tables 5 through 7 reveals that while IQ did not play a statistically significant role as a covariate, pre-test scores on Accuracy, Self-efficacy and Generalization did serve this function for their corresponding measures. Based on these findings,

Table 1

Means and Standard Deviations of Accuracy; Pre and Post Test Scores

| | | Pretest | | Posttest | |
|---|---|---|---|---|---|
| Group | N | Mean | SD | Mean | SD |
| Tutor Condition | | | | | |
| A. Adult | 63 | 2.94 | 3.18 | 4.10 | 3.17 |
| B. Adolescent | 62 | 2.2 | 2.97 | 3.37 | 2.97 |
| Type of Training | | | | | |
| C. Direct | 39 | 2.02 | 2.49 | 3.99 | 3.16 |
| D. Vicarious | 43 | 3.15 | 3.37 | 3.80 | 3.22 |
| E. Control | 43 | 2.54 | 3.25 | 3.43 | 3.01 |
| Interactions | | | | | |
| A X C | 18 | 2.67 | 2.81 | 4.44 | 2.68 |
| A X D | 22 | 2.68 | 2.84 | 4.66 | 3.07 |
| A X E | 23 | 3.48 | 3.79 | 3.22 | 3.66 |
| B X C | 21 | 1.38 | 2.06 | 3.54 | 3.34 |
| B X D | 21 | 3.62 | 3.87 | 2.93 | 3.36 |
| B X E | 20 | 1.6 | 2.16 | 3.64 | 1.99 |

Table 2

Means and Standard Deviations of Self-Efficacy; Pre and Post Test Scores

| | | Pretest | | Posttest | |
|---|---|---|---|---|---|
| Group | N | Mean | SD | Mean | SD |
| Tutor Condition | | | | | |
| A. Adult | 63 | 53.59 | 12.16 | 58.83 | 9.12 |
| B. Adolescent | 62 | 55.64 | 12.07 | 59.33 | 8.44 |
| Type of Training | | | | | |
| C. Direct | 39 | 54.60 | 12.08 | 58.52 | 7.68 |
| D. Vicarious | 43 | 53.25 | 13.75 | 59.34 | 9.67 |
| E. Control | 43 | 55.98 | 10.32 | 59.38 | 8.91 |
| Interactions | | | | | |
| A X C | 18 | 50.39 | 13.71 | 60.06 | 8.74 |
| A X D | 22 | 52.41 | 14.08 | 58.14 | 10.35 |
| A X E | 23 | 57.96 | 7.23 | 58.29 | 8.30 |
| B X C | 21 | 58.81 | 9.11 | 56.97 | 6.76 |
| B X D | 21 | 54.10 | 13.69 | 60.53 | 8.95 |
| B X E | 20 | 53.99 | 12.89 | 60.47 | 9.79 |

Table 3

Means and Standard Deviations of Generalization; Pre and Posttest Scores

| | | Pretest | | Posttest | |
|---|---|---|---|---|---|
| Group | N | Mean | SD | Mean | SD |
| Tutor Condition | | | | | |
| A. Adult | 63 | 1.05 | 1.23 | 1.65 | 1.34 |
| B. Adolescent | 62 | .92 | 1.26 | 1.25 | 1.29 |
| Type of Training | | | | | |
| C. Direct | 39 | .77 | .93 | 1.55 | 1.31 |
| D. Vicarious | 43 | 1.19 | 1.41 | 1.54 | 1.46 |
| E. Control | 43 | .98 | 1.31 | 1.25 | 1.22 |
| Interactions | | | | | |
| A X C | 18 | .88 | .96 | 1.80 | 1.18 |
| A X D | 22 | .96 | 1.09 | 1.89 | 1.39 |
| A X E | 23 | 1.30 | 1.52 | 1.26 | 1.44 |
| B X C | 21 | .66 | .91 | 1.30 | 1.36 |
| B X D | 21 | 1.43 | 1.69 | 1.19 | 1.54 |
| B X E | 20 | .65 | .93 | 1.25 | .86 |

Table 4

Means and Standard Deviations of IQ for Training Groups Collapsing Across Tutor Condition

| Instruction Group | N | Mean | SD |
|---|---|---|---|
| Direct | 39 | 92.29 | 10.11 |
| Vicarious | 43 | 92.77 | 11.71 |
| Control | 43 | 92.88 | 12.44 |

Table 5

Analysis of Covariance for Accuracy

| Source | DF | SS | MS | F | p |
|---|---|---|---|---|---|
| Covariates | | | | | |
| Accuracy | 1 | 599.85 | 599.85 | 136.13 | .00 |
| IQ | 1 | .49 | .49 | .11 | .74 |
| Main Effects | | | | | |
| A. Tutor | 1 | 16.36 | 16.36 | 3.71 | .05 |
| B. Instruction | 2 | 6.75 | 3.37 | .77 | .47 |
| Interaction | | | | | |
| A X B | 2 | 23.98 | 11.99 | 2.72 | .07 |
| Error | 117 | 515.54 | 4.41 | | |
| Total (Adj) | 124 | 1213.2 | | | |

Table 6

Analysis of Covariance for Self-Efficacy

| Source | DF | SS | MS | F | p |
|---|---|---|---|---|---|
| Covariates | | | | | |
| Self-Efficacy | 1 | 5852.59 | 5852.59 | 189.31 | .00 |
| IQ | 1 | 20.06 | 20.06 | .65 | .42 |
| Main Effects | | | | | |
| A. Tutor | 1 | 7.41 | 7.41 | .24 | .63 |
| B. Instruction | 2 | 18.98 | 9.49 | .31 | .74 |
| Interaction | | | | | |
| A X B | 2 | 185.02 | 92.51 | 2.99 | .05 |
| Error | 117 | 3617.15 | 30.92 | | |
| Total (Adj) | 124 | 9740.93 | | | |

Table 7

Analysis of Covariance for Generalization

| Source | DF | SS | MS | F | p |
|---|---|---|---|---|---|
| Covariates | | | | | |
| Generalization | 1 | 97.54 | 97.54 | 106.41 | .00 |
| IQ | 1 | .24 | .24 | .26 | .61 |
| Main Effects | | | | | |
| A. Tutor | 1 | 5.00 | 5.00 | 5.46 | .02 |
| B. Instruction | 2 | 2.41 | 1.21 | 1.32 | .27 |
| Interaction | | | | | |
| A X B | 2 | 2.55 | 1.28 | 1.39 | .25 |
| Error | 117 | 107.25 | .92 | | |
| Total (Adj) | 124 | 220.8 | | | |

Table 8

Analysis of Covariance for Social Comparability

| Source | DF | SS | MS | F | p |
|---|---|---|---|---|---|
| Covariates | | | | | |
| Accuracy | 1 | .73 | .73 | 3.91 | .05 |
| Generalization | 1 | .34 | .34 | 1.82 | .18 |
| Main Effects | | | | | |
| A. Instruction | 2 | .45 | .23 | 1.21 | .30 |
| Error | 79 | 14.72 | .19 | | |
| Total (Adj) | 83 | 16.24 | | | |

the research questions posed for investigation will be examined in light of these analyses referring only to the pre-test scores as covariates.

Results Related to Research Questions I Through III

Research Question I.

Research question I asked: "Is there a difference between direct experience and vicarious experience in terms of their effects on accuracy of performance?" The hypothesis for this research question stated that direct self-instructional training (SIT) experience would be more effective in this sense than vicarious SIT experience.

An examination of Table 5 revealed no statistically significant main effect of instruction on Accuracy of performance, indicating that subjects in vicarious and direct learning conditions do not differ in this respect; and that subjects in these two groups do not differ from subjects in a control group in terms of this measure. While the hypothesis for this research question predicted a statistically significant difference between the two major learning conditions, the results of the analysis showed the case to be otherwise, and thus, this research question is not supported.

Research Question II.

Research question II asked: "Is there a difference

between direct SIT experience and vicarious SIT experience in terms of their effect on self-efficacy regarding performance.?" The hypothesis for this research question stated that direct SIT experience would be more effective in this sense than vicarious SIT experience.

An examination of Table 6 revealed no statistically significant main effect of instruction on Self-Efficacy, indicating that subjects in direct and vicarious learning conditions do not differ in this respect; and that subjects in these two groups do not differ from subjects in a control group in terms of this measure. While the hypothesis for this research question predicted a statistically significant difference between the two major learning conditions, the results of the analysis showed the case to be otherwise, and thus, this research question is not supported.

Research Question III.

Research question III asked: "Is there a difference between direct SIT experience and vicarious SIT experience in their effects on generalization to a wider class of computational problems?" The hypothesis for this research question stated that direct SIT experience would generalize to a significantly wider class of computational problems than vicarious SIT experience.

An examination of Table 7 revealed no statistically

significant main effect of instruction on Generalization of performance, indicating that subjects in direct and vicarious learning conditions did not differ in this respect; and that subjects in these two groups did not differ significantly from subjects in a control group in terms of this measure. While the hypothesis for this research question predicted a statistically significant difference between the two major learning conditions, the results of the analysis showed the case to be otherwise, and thus, this research question is not supported.

Results Related to Research Questions IV Through VI

Research Question IV.

Research question IV asked: "Is there a difference in accuracy of performance between subjects tutored by adults and subjects tutored by peers?" The hypothesis for this research question predicted that adolescents tutored by peers would exhibit greater performance accuracy than adolescents tutored by adults.

An examination of Table 5 revealed a main effect on accuracy by tutor condition (Adult versus Adolescent). Moreover, an examination of Table 1 disclosed that subjects tutored by adults scored higher on accuracy (M = 4.10) than subjects taught by peers (M = 3.37). This finding, while statistically significant, showed the difference to be in the opposite direction from that

stipulated in the hypothesis. Thus, research question IV is not supported.

Research Question V.

Research question V asked: "Is there a difference between subjects tutored by adults and subjects tutored by peers in terms of Self-Efficacy of performance?" The hypothesis for this research question stated that adolescents tutored by peers would exhibit a higher degree of self-efficacy than adolescents tutored by adults.

An examination of Table 6 revealed no statistically significant difference between tutor conditions on self-efficacy of performance. Moreover, perusal of this table revealed no statistically significant difference on self-efficacy between subjects in either of these two groups and subjects in a control group. While the hypothesis for this research question predicted a statistically significant difference between the two major learning conditions, the results of the analysis showed the case to be otherwise, and thus, this research question is not supported.

Research Question VI.

Research question VI asked: "Is there a difference between subjects tutored by adults and subjects tutored by peers in terms of Generalization of performance to a wider class of computational problems?" The hypothesis

for this research question stated that adolescents tutored by peers would generalize their gained arithmetic skills to a wider class of computational problems than adolescents tutored by adults.

An examination of Table 7 reveals a statistically significant main effect for the tutor condition. Moreover, an inspection of table 3 reveals that the post-test mean for generalization for subjects in the adult tutor group was 1.65 versus 1.25 for subjects in the adolescent group. Since, a) the difference between these means proved significant and b) the difference was in the opposite direction as that stipulated in the hypothesis, research question VI is not supported. It is worth noting the diametrically opposite finding for this hypothesis; this unexpected outcome will be discussed in the following section.

Results Related to Research Questions VII Through IX

Research Question VII.

Research question VII asked: "Is there an interaction between method of instruction (Direct, Vicarious or Control) and tutor condition (Adult versus Peer) in terms of their effect on accuracy of responses?" The hypothesis for this research question stated that adolescents given SIT with direct modeling by a peer would exhibit greater accuracy of response than adolescents given SIT with direct modeling by an

adult. Moreover, it was hypothesized that adolescents given SIT with direct modeling by a peer would exhibit greater response accuracy than adolescents given SIT with vicarious modeling by a peer.

Inspection of Table 5 revealed near significance ($p = .07$) for the interaction between tutor and instruction conditions in the case of accuracy. While this effect did not prove significant, it was decided to perform post hoc comparisons to further corroborate the findings for this hypothesis. Neuman-Keuls post hoc comparisons revealed no significant differences between any pair of cells in the interaction matrix. Thus, while the present hypothesis stipulated differences between subjects taught by peers through direct instruction and subjects taught by peers under other conditions the outcomes proved otherwise and research question 7 is not supported.

Research Question VIII.

Research question VIII asked: "Is there an interaction between method of instruction (Direct, Vicarious or Control) and tutor condition (Adult versus Peer) in terms of their effect on Self-Efficacy concerning responses?" The hypothesis for this research question stated that adolescents given SIT with direct modeling by a peer would exhibit greater self-efficacy than adolescents given SIT with direct modeling by an

adult. Moreover, it was hypothesized that adolescents given SIT with direct modeling by a peer would display greater self-efficacy than adolescents given SIT with vicarious modeling by a peer.

Inspection of Table 6 revealed a significant ($p = .05$) interaction effect between tutor and instruction conditions in the case of Self-Efficacy. However, Neuman-Keuls post hoc comparisons revealed no significant differences between any pair of cells in the interaction matrix. Thus, while the present hypothesis stipulated differences between subjects taught by peers through direct instruction and subjects taught by peers under other conditions the outcomes proved otherwise and research question 8 is not supported.

Research Question IX.

Research question IX asked: "Is there an interaction between method of instruction (Direct, Vicarious or Control) and tutor condition (Adult versus Peer) in terms of their effect on Generalization concerning responses?". The hypothesis for this research question stated that adolescents given SIT with direct modeling by a peer would generalize their arithmetic skills to a wider class of computational problems than adolescents given SIT with direct modeling by an adult. Moreover, it was hypothesized that adolescents given SIT with direct modeling by a peer

would generalize their arithmetic skills to a wider class of computational problems than adolescents receiving SIT with vicarious modeling by a peer.

An examination of Table 7 revealed no statistically significant interaction effects between instruction and model variables, and thus this hypothesis is contradicted and research question IX is not supported.

## Adjunct Research Question

As an adjunct issue social comparisons of subjects in the direct SIT groups and subjects in the vicarious SIT groups were explored.

### Adjunct Research Question.

The following adjunct research question was posed for investigation: Do students taught under direct instructional conditions exhibit a higher degree of self-evaluation than students taught under vicarious conditions? The purpose of this research question was to test an important component of Bandura's Social Learning Theory: Bandura (1977b) proposed that Self-Efficacy develops through four major processes: Performance accomplishments, Vicarious experiences, Verbal persuasion and Emotional arousal. Further, he stipulated that the effect is stronger for the earlier processes then for the latter ones. Thus, performance accomplishments should prove more powerful in

determining subsequent self-efficacy than vicarious experiences. To test this hypothesis, subjects taught under direct instructional conditions were compared with subjects taught under vicarious instructional conditions in terms of their social comparability responses. It is important to note that such a test of the hypothesis would be valid only if the level of achievement under each of these conditions is uniform. Since no uniformity of achievement was insured for these two instructional modes in the present study an analysis of covariance model was used controlling for accuracy, and generalization. The dependent variable was the social comparability score and the independent variable was instructional mode (Direct and Vicarious).

Table 8 displays the analysis of covariance results for this analysis. An examination of this table disclosed no main effect for instructional method, rejecting the hypothesis posed for this research question. In view of this finding the adjunct research question posed for investigation is not supported.

# CHAPTER VI

# DISCUSSION OF RESEARCH FINDINGS

The following chapter includes a discussion of the results of the investigation. The limitations of the study will be examined and suggestions for further research in the area of academic achievement among adolescent students will be offered.

## Interpretation of Results

The present study had three related goals: 1) To determine whether modeling conditions (Adult versus Peer) interacts with self-instructional training to affect either accuracy, self-efficacy or generalization. 2) To determine whether a difference exists between direct experience and vicarious experience in terms of their effect on accuracy, self-efficacy or generalization; and 3) to determine whether an enhancement of self-efficacy is followed by an enhancement in accuracy and/or generalization. These objectives were based on hypotheses derived from Bandura's Social Learning Theory (1969; 1977b). Thus, the major goals of the study involved theory testing, and more specifically, ascertaining group differences in areas of practical interest in the education of adolescents.

In the following sections, there will be a discussion of the extent to which the theoretical model

examined was supported by the findings. In addition, certain issues covered in the review of the literature will be reconsidered in light of the present findings. These issues involve prior research outcomes regarding peer tutoring, modeling, self-instruction, and self-efficacy.

Finally, implications of the present findings for the education of adolescent students will be discussed.

## Extent to Which the Theoretical Model was Supported by the Findings

While prior research has tended to support Bandura's Social Learning Model as it applies to learning in the educational setting, the present findings failed to support this general formulation. In retrospect, one salient characteristic of the students in this study may help to account for this lack of consistency with prior findings: The target population involved students who have failed the Regents Competency Examination (RCT) in arithmetic and scored in the lower one third on the Otis-Lennon School Ability Test (OLSAT). These low scores on prior tests reflect a history of underachievement, and likely, a lowered readiness to benefit from the interventions of the present study. By contrast, it is interesting to note that a pilot study involving average students did yield outcomes consistent with previous research that supports

the theoretical model. It is possible that either more intensive training conditions or a longer training period of time would be necessary to produce comparable measurable results on the present subjects. It is therefore recommended that further studies be conducted with the same type of students, employing extended training or more intensive training interventions. It is also suggested that task analysis techniques be employed to ascertain the entry level at which low achieving students such as those in the present sample can be effectively instructed. This step will insure that the readiness level of the students is matched with the entry level of instruction.

## Outcomes Related to Group Differences

A more specific goal of the study was to ascertain whether low achieving students working with peer tutors would score significantly higher on outcome measures than low achieving students working with adult tutors. The outcomes regarding this goal were contrary to expectations, and, as in the findings relative to the general testing of the theoretical model, they may have been confounded by the low achievement level of the students in the study. In this case, matters involving the self-regulation of the students may have played an important role. It has been shown by Zimmerman and Martinez-Pons (1986) that low-achieving students tend to

be less self-regulated in their learning strategies than high-achieving students, and thus, need greater degrees of external regulation than their high achieving counterparts.

This previous finding may help to explain why students in the present study who were tutored by adults performed at a higher level than students who were tutored by peers. It may well be that the adult tutors were able to exert greater control on their tutees than the peer tutors, and were thus able to more effectively provide the degree and type of regulation needed for the desired performance. Evidence for this condition was provided by complaints by peer tutors regarding their difficulties in getting their students involved in the training sessions. Further credence for this hypothesis is provided by perceptions of subjects trained by peer tutors. These subjects expressed low levels of confidence in their trainers with such comments as " our [peer] tutors are still in school but the tutors for the other group are college graduates so you should expect that students in the other group will do better than us."; " The [peer] tutors still have to go to college and take more advanced courses, so they don't know as much as the adult tutors for the other group"; and " The teacher teaches that's their job so they really know it [material]."

These comments indicate perceptions of relative lowered peer tutor competence which, in turn, may have negatively affected the tutee's responses to the peers training efforts. By contrast, the adult tutors had little difficulty in controlling the behavior of their charges, and thus, were likely better able to more effectively regulate their learning behavior. To test this conjecture it is recommended that further studies be conducted comparing the performance of high and low achieving students working under conditions of peer tutoring and adult tutoring.

Finally, no differences were found on the measures of interest between students taught using a direct method, students taught using a vicarious method and students in a control group. These findings, contrary to expectations, may be due to the same factors discussed earlier. The low readiness level of the participants may have obviated any gain from the interventions. The recommendations presented relative to the comments regarding theory testing are reiterated: Further studies should be conducted with the same type of students, employing extended training and/or more intensive training interventions. This recommendation is particularly important for examining the relationship between Self-Efficacy and Achievement under different learning conditions for students in a low achieving

category. Increased intensity or training time may enable researchers to better examine the extent to which changes in Self-Efficacy engender changes in performance.

## Comparison of Present Outcomes and Prior Research Findings Regarding Peer Tutoring, Modeling, Self-Instruction and Self-Efficacy

### Peer Tutoring

The age difference between tutor and tutee has varied widely among tutoring programs. Conditions have varied greatly between adults tutoring kindergarteners to same-age and same-grade pairings, but there is little systematic evidence available concerning the optimum age difference between tutor and tutee. Linton (1973) studied the effects of grade displacement between eighth, tenth, and twelfth grade mathematics tutors and eighth grade low-achieving tutees. Tutees taught by twelfth graders performed significantly better than tutees taught by either tenth or eighth graders. Thus, the larger grade displacement resulted in better performance by the tutees. Thomas (1972) found that college students were better than sixth graders in promoting vocabulary acquisition in second grade tutees, but no difference was found as a function of age of tutor in reading comprehension and oral reading of tutees. On the other hand, the nature of the interaction may be more pleasant when the age range

between tutor and tutee is closer.

Therefore, any generalization must be guided by the recognition that an inherent confounding exists between grade displacement and age of tutor. It may not be age difference, per se, that leads to differential tutee performance; rather, as stated above and reiterated, perhaps older tutors are more self-regulated than younger tutors. The results of this investigation support this argument. However, further research is needed in which the age or grade difference is manipulated by varying the grade of tutors, the grade of the tutees and the level of self-regulation of participating subjects. Without this information, it is difficult to determine the effect of grade (or age) on tutee performance.

Modeling

Skills can be learned through observation alone (Rosenthal & Bandura, 1978; Rosenthal & Zimmerman, 1978). When a person observes another perform a task, that individual is more likely to believe that he or she can perform the task as well (Bandura, 1981). Few studies have investigated modeling's effect on children's self-efficacy. Among these, adults have been traditionally used as the models (Schunk, 1981). The modeling literature reveals that similarity to models can increase observational learning (Bandura, 1971,

1981) and enhance self-efficacy (Bandura, 1981; Schunk, 1984). In a recent study, Schunk & Hanson (1985) found subjects exposed to a peer model displayed higher levels of self-efficacy and achievement then subjects exposed to a teacher model. The results from this investigation failed to support the above formulations. This lack of consistency with prior findings was attributed to the low achievement level of the students in the study and the diverse ethnic and socioeconomic status groups to which they belonged.

However, little systematic research has been conducted on racial and socioeconomic factors associated with tutoring. Although the literature on tutoring uses white, middle-class children as subjects predominantly, as in the research reported by Schunk (1981; 1982a; 1982b; 1983a; 1983b; 1983c), it has been reported from a number of studies that other racial and social-class groups produce significant academic improvement when tutoring children of the same race and status. In several studies Blacks tutored by Blacks showed significant improvement (Brown, 1972; Coker, 1969; Liette, 1972). Lower-class or disadvantaged children tutored by other lower-class persons also appear to improve as a result of tutoring (Hamblin & Hamblin, 1972; Snapp, Oakland & Williams, 1972). However, only a few studies have directly manipulated racial and status

variables. Manipulated racial and status variables may enable researchers to more effectively examine the extent to which changes in Self-Efficacy engender changes in performance. More research is needed in this area.

Self-Instruction

Subjects whose training was modeled after Meichenbaum's and Goodman's (1971) format, i.e., direct self-instructional training, did not significantly outperform their counterparts, who vicariously experienced the verbal self-instructions on all three dependent measures. This finding, contrary to expectations, may have been due to the same factors discussed earlier. The low readiness level of the participants may have obviated any gain from the interventions.

Self-Efficacy

Efficacy evaluation is an inferential process in which a person synthesizes perceptions of many personal and situational factors (Bandura, 1981). In developing one's estimation of how well one can function in a given situation, a person considers many variables: ability, task difficulty, how much effort expended, how much help one receives, situational circumstances and one's past history of successes and/or failures (Bandura, 1981).

Social Learning Theory predicts that active

engagement in a learning activity will engender greater self-efficacy than other types of learning experiences (Bandura, 1982). In this respect, self-instructional training requires active engagement with a task and therefore may be particularly useful in increasing self-perceptions of efficacy.

The results of this study failed to support Bandura's (1977a, 1982) prediction. Active participation in the task failed to produce significantly greater self-efficacy than either vicarious involvement or a control group.

As in the case of the findings concerning modeling and self-instruction, this unexpected outcome may have been due to the low readiness level of the participants. It is possible that the subject's in the experimental group were not academically prepared to gain significantly from the interventions.

### Adolescence as a Developmental Period

Many fundamental physical changes occur during adolescence in terms of endocrinological, biochemical, and physiological processes (Stone & Church, 1957a). Adolescence has been defined in terms of changes in cognitive processes (Piaget, 1969). The work of Piaget offered an approach for understanding these cognitive changes in relation to age, physiological development, and environment. Many psychological and emotional tasks

including the processes of individualization and the formation of ego identity are accomplished during adolescence (Blos, 1967; Erikson, 1956). Although these forces are theorized to impact on the development of the adolescent, studies reporting their detrimental effects to the adolescent in the role of tutor and/or tutee were not found. However, research evidence suggests that adolescents benefit from acting as tutors and/or being tutored (Bean & Luke, 1972; Landrum & Martin, 1970; Lane, Pollack, & Sher, 1972). The literature on tutor characteristics suggests that a very broad range of students may benefit from acting as a tutor. Whether or not the tutee will improve more from being tutored by a particular type of tutor is open for future research.

## Final Recommendations

In summary, the performance of low achieving students under conditions of adult versus adolescent tutoring and under conditions of Direct and Vicarious instruction need to be further investigated; it is possible that factors addressed by Social Learning Theory may be manipulated to the benefit of such students. In this respect, outcomes of the present study suggest that it may be necessary to control for level of self-regulation to fully examine these issues.

# Appendix A

NAME _____

GRADE _____

AGE _____

DATE OF BIRTH _____

MALE _____ FEMALE _____

$$\frac{4}{5} + \frac{3}{5} + \frac{1}{5} + \frac{2}{5}$$

$$\frac{1}{9} + \frac{8}{9} + \frac{5}{9} + \frac{2}{9} =$$

CHECK ONE:

| _____ | _____ | _____ | _____ | _____ |
|---|---|---|---|---|
| NO WAY ! | WELL, MAYBE NOT | MAYBE I CAN | I THINK I CAN | I KNOW I CAN! |

$$\frac{11}{16} + \frac{1}{16} + \frac{15}{16} + \frac{5}{16} =$$

$$\frac{79}{81} + \frac{68}{81} + \frac{19}{81} + \frac{54}{81} =$$

CHECK ONE:

| _____ | _____ | _____ | _____ | _____ |
|---|---|---|---|---|
| NO WAY ! | WELL, MAYBE NOT | MAYBE I CAN | I THINK I CAN | I KNOW I CAN! |

$$\frac{3}{4} + \frac{7}{12} =$$

$$\frac{1}{3} + \frac{5}{6} =$$

| CHECK ONE: | _____ | _____ | _____ | _____ | _____ |
|---|---|---|---|---|---|
| | NO WAY ! | WELL, MAYBE NOT | MAYBE I CAN | I THINK I CAN | I KNOW I CAN! |

$$\frac{1}{3} + \frac{1}{6} + \frac{1}{12} =$$

$$\frac{1}{12} + \frac{1}{6} + \frac{3}{4} =$$

CHECK ONE:

| _____ | _____ | _____ | _____ | _____ |
|---|---|---|---|---|
| NO WAY ! | WELL, MAYBE NOT | MAYBE I CAN | I THINK I CAN | I KNOW I CAN! |

$$\frac{1}{2} + \frac{5}{7} =$$

$$\frac{1}{3} + \frac{1}{5} =$$

| CHECK ONE: | _____ | _____ | _____ | _____ | _____ |
|---|---|---|---|---|---|
| | NO | WELL, | MAYBE | I THINK | I KNOW |
| | WAY ! | MAYBE NOT | I CAN | I CAN | I CAN! |

$$\frac{5}{7} + \frac{3}{4} + \frac{1}{2} =$$

$$\frac{5}{7} + \frac{1}{5} + \frac{3}{10} =$$

CHECK ONE:

| _____ | _____ | _____ | _____ | _____ |
|---|---|---|---|---|
| NO WAY ! | WELL, MAYBE NOT | MAYBE I CAN | I THINK I CAN | I KNOW I CAN! |

$$\frac{6}{13} + \frac{5}{11} =$$

$$\frac{11}{17} + \frac{43}{85} =$$

| CHECK ONE: | _____ | _____ | _____ | _____ | _____ |
|---|---|---|---|---|---|
| | NO WAY ! | WELL, MAYBE NOT | MAYBE I CAN | I THINK I CAN | I KNOW I CAN! |

$$\frac{1}{78} + \frac{2}{156} + \frac{5}{234} =$$

$$\frac{19}{54} + \frac{7}{108} + \frac{11}{162} =$$

| CHECK ONE: | _____ | _____ | _____ | _____ | _____ |
|---|---|---|---|---|---|
| | NO | WELL, | MAYBE | I THINK | I KNOW |
| | WAY ! | MAYBE NOT | I CAN | I CAN | I CAN! |

$$21\ \frac{7}{9} \quad + \quad 13\ \frac{3}{27} \quad + \quad 26\ \frac{40}{45} \quad =$$

$$27\ \frac{2}{3} + 21\ \frac{11}{12} + 45\ \frac{23}{24} =$$

CHECK ONE:

| NO WAY ! | WELL, MAYBE NOT | MAYBE I CAN | I THINK I CAN | I KNOW I CAN! |
|---|---|---|---|---|

$$14\ \frac{11}{16} + 9\ \frac{3}{4} + 15\ \frac{25}{64} =$$

$$16\ \frac{11}{16} + 7\ \frac{1}{4} + 17\ \frac{63}{64} =$$

CHECK ONE:

| _____ | _____ | _____ | _____ | _____ |
|---|---|---|---|---|
| NO WAY ! | WELL, MAYBE NOT | MAYBE I CAN | I THINK I CAN | I KNOW I CAN! |

$$\frac{4T}{5} + \frac{3T}{5} =$$

$$\frac{R}{9} + \frac{2R}{9} =$$

| CHECK ONE: | _____ | _____ | _____ | _____ | _____ |
|---|---|---|---|---|---|
| | NO WAY ! | WELL, MAYBE NOT | MAYBE I CAN | I THINK I CAN | I KNOW I CAN! |

$$\frac{6C}{7} + \frac{2C}{7} =$$

$$\frac{D}{16} + \frac{4D}{16} =$$

CHECK ONE:

| _____ | _____ | _____ | _____ | _____ |
|---|---|---|---|---|
| NO WAY ! | WELL, MAYBE NOT | MAYBE I CAN | I THINK I CAN | I <u>KNOW</u> I CAN! |

$$\frac{6X}{9} + \frac{2X}{3} =$$

$$\frac{8X}{5} + \frac{14X}{15} =$$

| CHECK ONE: | _____ | _____ | _____ | _____ | _____ |
|---|---|---|---|---|---|
| | NO WAY ! | WELL, MAYBE NOT | MAYBE I CAN | I THINK I CAN | I KNOW I CAN! |

$$\frac{3C}{8} + \frac{4C}{12} =$$

$$\frac{3C}{8} + \frac{4C}{12} =$$

CHECK ONE:

| _____ | _____ | _____ | _____ | _____ |
|---|---|---|---|---|
| NO WAY ! | WELL, MAYBE NOT | MAYBE I CAN | I THINK I CAN | I <u>KNOW</u> I CAN! |

## Appendix B

Self-Instructional Training Booklet (Cormier & Cormier, 1985, p. 380). Training was conducted in pairs. Triad I included a subject from Group I and a subject from Group II. In Triad II a subject from Group III was paired with a subject from Group IV. The adult or peer model read the following to the subjects:

I. Training Rationale:

> You are going to learn a new way to solve arithmetic problems. It has been found that some people have difficulty in performing certain kinds of tasks. Often the difficulty is not because they don't have the ability to do it but because of what they say or think to themselves while doing it. In other words, a person's 'self-talk' can get in the way or interfere with performance. For example, if you get up to give a speech and you're thinking 'what a flop I'll be!' this sort of thought may affect how you deliver your talk.
>
> This procedure can help you perform something the way you want to by examining and coming up with some helpful planning or self-talk to use while performing.
>
> I'll show you what I am saying to myself while performing the task. Then I'll ask you to do the task while I guide or direct you through it. Next, you will do the task again and guide yourself aloud while doing it. The end result should be your performing the task while thinking and planning about the task to yourself. Ok?

After the rationale was presented questions were clarified. The adult or peer model began by presenting the self-instructional statements. Each subject had their own training booklet.

II. Model of Task and Self-Instructions

1. The adult or peer instructs the subject in what to listen and look for during modeling.

"While I do this, I'm going to tell you my plans for doing it. Just listen closely to what I say as I go through this."

2. The adult or peer begins modeling the task, verbalizing the self-instructions aloud.

"Ok, I'm going to prepare myself to do these math problems."

3. Self-instruction is demonstrated by the adult or peer model and it includes FIVE COMPONENTS:

A. QUESTION the demands of the task.

"What exactly do I have to do?"

B. Answer the above question with a PLAN of what to do.

"I need to find the answers to these math problems. I must be sure to follow the directions in the samples given."

C. FOCUS your attention on the task and talk to yourself.

"Ok, remember to concentrate on the directions given in the sample problems."

D. CHECK YOUR WORK and evaluate your progress

"Ok, how am I doing? If I have trouble with a problem or problems I'll think back to the sample problems. If I still can't get it, I'll go on. I can always come back to it or it's better to continue than waste <u>all</u> my time on one problem."

E. PRAISE YOURSELF for dealing with the task.

"That's it! Very good! I'm doing my best.

III. Overt External Self-Instruction

4. The Adult or peer model instructs subject to perform the task while the adult or peer model coaches.

> "This time you go through the FIVE COMPONENTS yourself. I'll be coaching you on what to do on your planning."

5. The subject performs the task while the adult or peer model coaches by verbalizing the self-instructions changing I to you. The adult or peer model verbalizations include the FIVE COMPONENTS of self-instruction:

A. QUESTION the demands of the task.

"What exactly do YOU have to do?"

B. Answer the above question with a PLAN of what to do.

"YOU need to find the answers to these math problems. YOU must be sure to follow the directions in the samples given."

C. FOCUS your attention on the task and talk to yourself.

"Ok, remember to concentrate on the directions given in the sample problems."

D. CHECK YOUR WORK and evaluate your progress after each problem.

"Ok, how are YOU doing? If YOU have trouble with a problem or problems then YOU should think back to the sample problems. If YOU still can't get it, the YOU should go on. YOU can always come back to it or it's better to continue than waste <u>all</u> YOUR time on one problem."

E. PRAISE YOURSELF for dealing with the task.

"That's it! Very good! YOU'RE doing YOUR best.

IV. Overt Self-Instruction

6. The adult or peer model instructs the subject to perform the task and instruct him/her self aloud.

> "This time I'd like you to do both things, perform the task and talk to yourself, as you go through the problems in the same way that we've done before. Remember, there are FIVE COMPONENT parts to your planning. If you get stuck, I'll help you."

7. The subject performs the task while simultaneously verbalizing aloud the self-instruction process. The subject's verbalizations include the FIVE COMPONENTS of self-instruction.

A. QUESTION the demands of the task.

"What exactly do I have to do?"

B. Answer the above question with a PLAN of what to do.

"I need to find the answers to these math problems. I must be sure to follow the directions in the samples given."

C. FOCUS your attention on the task and talk to yourself.

"Ok, remember to concentrate on the directions given in the sample problems."

D. CHECK YOUR WORK and evaluate your progress

"Ok, how am I doing? If I have trouble with a problem or problems I'll think back to the sample problems. If I still can't get it, I'll go on. I can always come back to it or it's better to continue than waste <u>all</u> my time on one problem."

E. PRAISE YOURSELF for dealing with the task.

"That's it! Very good! I'm doing my best.

V. Faded Overt Self-Instruction

8. The adult or peer model instructs the subject on how to perform the task while whispering.

> "This time I'd like you to go through this and whisper the instructions to yourself as you go along. The whispering may be a new thing for you, but I think it will help you learn to do this.

9. The subject performs the task and whispers simultaneously.

10. The adult or peer model checks to determine how well the subject performed.

A. If the subject stumbles or leaves out any part of the five components, then the subject engages in the faded overt practice again.

"You had some difficulty with _____. Let's try this type of practice again."

B. If the subject performed the practice smoothly, than the adult or peer model moves on to next step.

"You seemed to do this easily and comfortably. The next thing is....."

VI. Covert Self-Instruction

11. The adult or peer model instructs the subject to perform the task while covertly (thinking only) instructing him/her self.

> "This time while you practice, just think about these instructions. In other words, instruct your self mentally or in your head as you go along."

12. The subject performs the task while covertly instructing. Only the subjects actions are visible at this point.

Appendix C

## Directions for Addition of Fraction Problems

Understanding fractions

A fraction is a "part of something". A fraction consists of two separate numbers. The top number is called the NUMERATOR. The bottom number is called the DENOMINATOR.

NUMERATOR-----> 1
-
DENOMINATOR---> 2

The numerator and the denominator of a fraction are called the terms of the fraction. The fractions 2/4 and 1/2 have the same VALUE, but they are written with different terms. Expressing 2/4 of a pound as 1/2 of a pound is REDUCING the 2/4 to its LOWEST TERMS of 1/2. In general, when you change fractions to simplest forms, you REDUCE FRACTIONS to LOWEST TERMS. There are different types of fractions:

A fraction is called a PROPER FRACTION when its top number is smaller than its bottom number. Examples:

$$\frac{1}{2} \quad \frac{3}{4} \quad \frac{7}{8} \quad \frac{5}{16}$$

A fraction is called an IMPROPER FRACTION when its top number is larger than or equal to its bottom number. Examples:

$$\frac{4}{3} \quad \frac{17}{12} \quad \frac{8}{8} \quad \frac{54}{19}$$

A MIXED FRACTION or MIXED NUMBER is a number that has a whole number part and a fraction part. Examples:

$$14\ \frac{1}{2} \qquad 17\ \frac{3}{4} \qquad 157\ \frac{7}{8} \qquad 5\ \frac{2}{3}$$

## Directions for Adding Fractions and Mixed Fractions

A. To add fractions that have the same denominator

Add: $\frac{3}{16} + \frac{5}{16} + \frac{7}{16}$

Solution: To add these fractions, you are really finding how many 16th there are in all the fractions to be added.

Add the numerators (top numbers):

$3 + 5 + 7 = 15$

Rewrite the same denominator (bottom number) with this sum over it. Answer:

$\frac{3}{16} + \frac{5}{16} + \frac{7}{16} = \frac{15}{16}$

Example #2.

Add: $\frac{5}{8} + \frac{7}{8} + \frac{3}{8} + \frac{5}{8}$

Solution: Add the numerators: $5 + 7 + 3 + 5 = 20$. Rewrite the same denominator, 8, with this sum over it: $\frac{20}{8}$. Since the answer is an improper fraction, change it to a mixed number:

$$\frac{20}{8} \quad 8\overline{)\,20}$$

$$\frac{16}{4}$$

$$\frac{4}{8} = \frac{1}{2}$$

Answer: $\frac{5}{8} + \frac{7}{8} + \frac{3}{8} + \frac{5}{8} = 2\frac{1}{2}$

B. To add fractions that have unlike denominators

Add: $\frac{3}{4} + \frac{5}{8} + \frac{5}{16}$

Solution: Arrange the given fractions, one under the other, as shown. Then, to the right, draw the fraction bars for the equivalent fractions and for the sum.

$$\frac{3}{4} = \text{-----}$$

$$\frac{5}{8} = \text{-----}$$

$$\frac{5}{16} = \text{-----}$$

---

Notice that the denominator of 5/16 is the largest denominator in the problem. Therefore, you will raise 3/4 and 5/8 to equivalent fractions that have a denominator of 16. You can do this because the denominator of 3/4 divides evenly into 16 (without a remainder) and the denominator of 5/8 divides evenly into 16. Write 16 as the common denominator for all the fractions, including the fraction that will be your answer.

$$\frac{3}{4} = \text{-----}$$

$$\frac{5}{8} = \text{-----}$$

$$\frac{5}{16} = \text{-----}$$

---

$$\text{-----}$$

$$16$$

Next, divide each given denominator into the common denominator and then multiply the quotient by each numerator. The final product is the new numerator of each equivalent fraction.

```
 3     4  =  12          Think: 4 into 16 = 4, and
 - x       --                  3 x 4 = 12. Write the
 4 --------->16   4            12.
```

```
 5     1  =  10          Think: 8 into 16 = 2, and
 - x       --                  5 x 2 = 10. Write the
 8 --------->16   2            10.
```

```
 5     1  =   5          Think: 16 into 16 = 1, and
 - x       -                   5 x 1 = 5. Write the
16 --------->16   1            5.
```

Now, add the top numbers of the equivalent fractions and put this sum over the common denominator, 16. Your final answer is 27/16, an IMPROPER FRACTION. CHANGE 27/16 TO A MIXED NUMBER.

```
 3     12
 - =   --
 4     16
```

```
 5     10
 - =   --
 8     16
```

```
 5      5
 - =   --
16     16

---------
       27       11
       --  =  1 --
       16       16
```

Answer: $\frac{3}{4} + \frac{5}{8} + \frac{5}{16} = 1\frac{11}{16}$

Directions for ADDING FRACTIONS and MIXED FRACTIONS

C. To add mixed numbers:

Since a mixed number consists of a whole number and a fraction, you add mixed numbers in separate steps.

Step 1: Add the whole numbers.

Step 2: Add the fractions.

Step 3: Combine the two answers into a final sum.

Example 1: Add: $12\frac{3}{4} + 15\frac{7}{8} + 14\frac{1}{2}$

Solution: Add the whole numbers first. Then add the fractions.

Step 1:

$$\begin{array}{r} 12\frac{3}{4} \\ 15\frac{7}{8} \\ 14\frac{1}{2} \\ \hline \end{array}$$

Step 2:

$$\begin{array}{r} 12\frac{3}{4} \\ 15\frac{7}{8} \\ 14\frac{1}{2} \\ \hline \end{array}$$

Step 3:

$$41 + 2\frac{1}{8} = 43\frac{1}{8}$$

Answer: $12\frac{3}{4} + 15\frac{7}{8} + 14\frac{1}{2} = 43\frac{1}{8}$

REMEMBER TO SELF-INSTRUCT AS YOU PRACTICE ON THE EXAMPLE GIVEN BELOW

HINT: A. QUESTION

B. PLAN

C. FOCUS YOUR ATTENTION

D. CHECK YOUR WORK

E. PRAISE YOURSELF

$$\frac{89}{103} + \frac{98}{103} + \frac{101}{103} + \frac{43}{103} =$$

REMEMBER TO SELF-INSTRUCT AS YOU PRACTICE ON THE EXAMPLE GIVEN BELOW

HINT: A. QUESTION

B. PLAN

C. FOCUS YOUR ATTENTION

D. CHECK YOUR WORK

E. PRAISE YOURSELF

$$\frac{27}{35} + \frac{32}{35} + \frac{30}{35} + \frac{19}{35} =$$

REMEMBER TO **SELF-INSTRUCT** AS YOU PRACTICE ON THE EXAMPLE GIVEN BELOW

HINT: A. QUESTION

B. PLAN

C. FOCUS YOUR ATTENTION

D. CHECK YOUR WORK

E. PRAISE YOURSELF

$$\frac{1}{4} + \frac{4}{5} + \frac{5}{6} =$$

REMEMBER TO SELF-INSTRUCT AS YOU PRACTICE ON THE EXAMPLE GIVEN BELOW

HINT: A. QUESTION

B. PLAN

C. FOCUS YOUR ATTENTION

D. CHECK YOUR WORK

E. PRAISE YOURSELF

$$\frac{1}{2} + \frac{1}{5} + \frac{5}{6} =$$

REMEMBER TO ***SELF-INSTRUCT*** AS YOU PRACTICE ON THE EXAMPLE GIVEN BELOW

HINT: A. QUESTION

B. PLAN

C. FOCUS YOUR ATTENTION

D. CHECK YOUR WORK

E. PRAISE YOURSELF

$$\frac{3}{14} + \frac{69}{70} =$$

REMEMBER TO SELF-INSTRUCT AS YOU PRACTICE ON THE EXAMPLE GIVEN BELOW

HINT: A. QUESTION

B. PLAN

C. FOCUS YOUR ATTENTION

D. CHECK YOUR WORK

E. PRAISE YOURSELF

$$\frac{1}{13} + \frac{4}{5} + \frac{34}{65} =$$

REMEMBER TO **SELF-INSTRUCT** AS YOU PRACTICE ON THE EXAMPLE GIVEN BELOW

HINT: A. QUESTION

B. PLAN

C. FOCUS YOUR ATTENTION

D. CHECK YOUR WORK

E. PRAISE YOURSELF

$$\frac{12}{13} + \frac{1}{5} + \frac{58}{65} =$$

REMEMBER TO **SELF-INSTRUCT** AS YOU PRACTICE ON THE EXAMPLE GIVEN BELOW

HINT: A. QUESTION

B. PLAN

C. FOCUS YOUR ATTENTION

D. CHECK YOUR WORK

E. PRAISE YOURSELF

$$\frac{3}{47} + \frac{8}{94} + \frac{23}{188} =$$

REMEMBER TO **SELF-INSTRUCT** AS YOU PRACTICE ON THE EXAMPLE GIVEN BELOW

HINT: A. QUESTION

B. PLAN

C. FOCUS YOUR ATTENTION

D. CHECK YOUR WORK

E. PRAISE YOURSELF

$$17\ \frac{1}{3} + 4\ \frac{5}{6} + 5\ \frac{4}{9} =$$

REMEMBER TO <u>SELF-INSTRUCT</u> AS YOU PRACTICE ON THE EXAMPLE GIVEN BELOW

HINT: A. QUESTION

B. PLAN

C. FOCUS YOUR ATTENTION

D. CHECK YOUR WORK

E. PRAISE YOURSELF

$$14\frac{11}{16} + 9\frac{3}{4} + 15\frac{25}{64} =$$

# Appendix D

NAME _____

GRADE _____

AGE _____

DATE OF BIRTH _____

MALE _____ FEMALE _____

$$\frac{4}{11} + \frac{5}{11} + \frac{8}{11} + \frac{10}{11} =$$

CHECK ONE:

| _____ | _____ | _____ | _____ | _____ |
|---|---|---|---|---|
| NO WAY ! | WELL, MAYBE NOT | MAYBE I CAN | I THINK I CAN | I KNOW I CAN! |

$$\frac{3}{7} + \frac{5}{7} + \frac{2}{7} + \frac{6}{7} =$$

$$\frac{15}{36} + \frac{28}{36} + \frac{25}{36} + \frac{34}{36} =$$

CHECK ONE:

| _____ | _____ | _____ | _____ | _____ |
|---|---|---|---|---|
| NO WAY ! | WELL, MAYBE NOT | MAYBE I CAN | I THINK I CAN | I KNOW I CAN! |

$$\frac{8}{18} + \frac{11}{18} + \frac{15}{18} + \frac{10}{18} =$$

$$\frac{5}{6} + \frac{3}{4} =$$

| CHECK ONE: | _____ | _____ | _____ | _____ | _____ |
|---|---|---|---|---|---|
| | NO WAY ! | WELL, MAYBE NOT | MAYBE I CAN | I THINK I CAN | I KNOW I CAN! |

$$\frac{2}{3} + \frac{3}{5} =$$

$$\frac{1}{8} + \frac{1}{6} + \frac{3}{4} =$$

| CHECK ONE: | _____ | _____ | _____ | _____ | _____ |
|---|---|---|---|---|---|
| | NO WAY ! | WELL, MAYBE NOT | MAYBE I CAN | I THINK I CAN | I KNOW I CAN! |

$$\frac{1}{2} + \frac{1}{4} + \frac{1}{8} =$$

$$\frac{1}{3} + \frac{1}{8} =$$

| CHECK ONE: | _____ | _____ | _____ | _____ | _____ |
|---|---|---|---|---|---|
| | NO WAY ! | WELL, MAYBE NOT | MAYBE I CAN | I THINK I CAN | I KNOW I CAN! |

$$\frac{1}{2} + \frac{7}{9} =$$

$$\frac{3}{7} + \frac{4}{5} + \frac{9}{10} =$$

| CHECK ONE: | _____ | _____ | _____ | _____ | _____ |
|---|---|---|---|---|---|
| | NO | WELL, | MAYBE | I THINK | I KNOW |
| | WAY ! | MAYBE NOT | I CAN | I CAN | I CAN! |

$$\frac{5}{11} + \frac{2}{3} + \frac{1}{2} =$$

$$\frac{11}{15} + \frac{5}{18} =$$

| CHECK ONE: | _____ | _____ | _____ | _____ | _____ |
|---|---|---|---|---|---|
| | NO | WELL, | MAYBE | I THINK | I KNOW |
| | WAY ! | MAYBE NOT | I CAN | I CAN | I CAN! |

$$\frac{3}{17} + \frac{6}{51} =$$

$$\frac{1}{69} + \frac{2}{138} + \frac{4}{276} =$$

CHECK ONE:

| _____ | _____ | _____ | _____ | _____ |
|---|---|---|---|---|
| NO WAY ! | WELL, MAYBE NOT | MAYBE I CAN | I THINK I CAN | I <u>KNOW</u> I CAN! |

$$\frac{2}{19} + \frac{7}{76} =$$

$$24\ \frac{9}{16} + 15\ \frac{5}{8} + 24\ \frac{30}{32} =$$

CHECK ONE:

| _____ | _____ | _____ | _____ | _____ |
|---|---|---|---|---|
| NO WAY ! | WELL, MAYBE NOT | MAYBE I CAN | I THINK I CAN | I KNOW I CAN! |

$$13\ \frac{3}{4} + 7\ \frac{4}{5} + 15\ \frac{1}{2} =$$

$$12\ \frac{4}{5} + 9\ \frac{12}{15} + 11\ \frac{5}{6} =$$

CHECK ONE:

| _____ | _____ | _____ | _____ | _____ |
|---|---|---|---|---|
| NO WAY ! | WELL, MAYBE NOT | MAYBE I CAN | I THINK I CAN | I KNOW I CAN! |

$$25\frac{5}{7} + 23\frac{10}{14} + 47\frac{19}{28} =$$

$$\frac{X}{7} + \frac{2X}{7} =$$

| CHECK ONE: | _____ | _____ | _____ | _____ | _____ |
|---|---|---|---|---|---|
| | NO WAY ! | WELL, MAYBE NOT | MAYBE I CAN | I THINK I CAN | I KNOW I CAN! |

$$\frac{3X}{4} + \frac{2X}{4} =$$

$$\frac{2C}{3} + \frac{C}{3} =$$

CHECK ONE:

| _____ | _____ | _____ | _____ | _____ |
|---|---|---|---|---|
| NO WAY ! | WELL, MAYBE NOT | MAYBE I CAN | I THINK I CAN | I KNOW I CAN! |

$$\frac{A}{14} + \frac{13A}{14} =$$

$$\frac{5C}{8} + \frac{4C}{12} =$$

| CHECK ONE: | _____ | _____ | _____ | _____ | _____ |
|---|---|---|---|---|---|
| | NO WAY ! | WELL, MAYBE NOT | MAYBE I CAN | I THINK I CAN | I KNOW I CAN! |

$$\frac{8X}{7} + \frac{4X}{3} =$$

$$\frac{X}{7} + \frac{3X}{5} =$$

| CHECK ONE: | _____ | _____ | _____ | _____ | _____ |
|---|---|---|---|---|---|
| | NO WAY ! | WELL, MAYBE NOT | MAYBE I CAN | I THINK I CAN | I KNOW I CAN! |

$$\frac{5X}{6} + \frac{3X}{8} =$$

# Appendix E

## Social Comparability Questionnaire

NAME _____

GROUP _____

Please make a checkmark on one of the lines below that best describes what you think. Your answer will be kept confidential.

1. Do you think you did better than your partner? ___
2. Do you think you did just as well as your partner? ___
3. Do you think your partner did much better than you? ___

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