DOCUMENT RESUME

ED 334 270 TM 016 915

AUTHOR	Sink, Christopher A.; And Others
TITLE	Self-Regulated Learning and Academic Performance in Middle School Children.
PUB DATE	Apr 91
NOTE	38p.; Paper presented at the Annual Meeting of the American Educational Research Association (Chicago, IL, April 3-7, 1991).
PUB TYPE	Reports - Research/Technical (143) -- Speeches/Conference Papers (150)
EDRS PRICE	MF01/PC02 Plus Postage.
DESCRIPTORS	*Academic Achievement; Achievement Tests; Affective Behavior; *Elementary School Students; Grade 6; Intermediate Grades; *Learning Processes; Locus of Control; *Middle Schools; *Performance; *Predictor Variables; Self Concept; Standardized Tests
IDENTIFIERS	*Self Regulation

ABSTRACT

The relationship between self-regulation, using measures from the affective and cognitive domains, and academic performance was investigated for 62 middle-school (grade 6) students. Key aspects of self-regulated learning studied were planning and self-assessment. A range of affective variables, including self-concept and locus of control, was also examined. Teachers' perspectives on students' academic ability were obtained, and standardized test scores were used as a measure of academic achievement. Findings indicate that while such metacognitive variables as planning and self-assessment abilities were significantly related to achievement in mathematics, reading, and science, student and teacher perceptions of scholastic ability were more salient factors in predicting academic performance. The locus of control variable did not appear to have much utility in predicting classroom grades and performance on standardized measures of achievement. Implications of these findings for educational practice are discussed. A 47-item list of references is included, and three tables present study data. (Author/SLD)

Self-Regulated Learning and Academic Performance in Middle School Children

Christopher A. Sink, Jerrold E. Barnett,

and Jon E. Hixon

Northwest Missouri State University

Paper presented at 1991 Annual Meeting of American Educational Research Association, Chicago, Illinois

Running Head: SELF-REGULATED LEARNING

Abstract

This study examined the relationship of self-regulation, using measures from the affective and cognitive domains, to the academic performance of 62 middle school subjects. The findings indicate that while such metacognitive variables as planning and self-assessment abilities are significantly related to mathematics, reading, and science achievement, it appears that student and teacher perceptions of scholastic ability are the more salient factors in predicting academic performance. The results also suggest that the locus of control dimension may have little utility in predicting classroom grades and performance on standardized measures of achievement in grade 6 students. The implications of these findings for educational practice are discussed.

Self-Regulated Learning and Academic Performance in Middle School Children

Models of self-regulated learning emphasize the active role students play in determining their own learning and achievement. The specifics vary, but every model combines affective and cognitive elements. Typically cited cognitive components are domain-specific knowledge and strategies, general learning strategies and tactics, and metacognitive control over learning and performance (Brown, Bransford, Ferrara, & Campione, 1983). Of these domains, metacognition is considered to be the crucial element. Metacognition is the assessment and management of cognitive processes and knowledge states (Nelson & Narens, 1990; Paris & Winograd, 1990). Aspects of self-regulated learning from the affective domain include self-efficacy (Zimmerman, 1989), locus of control (Findley & Cooper, 1983), perceived control over outcomes (Skinner, Wellborn, & Connell, 1990), domain-specific perceived competence (Harter, 1981), intrinsic motivation (Pintrich & De Groot, 1990), self-esteem (McCombs & Whisler, 1989), attributions (Borkowski, Carr, Rellinger, & Pressley, 1990), and mastery-orientation (Dweck & Elliot, 1983).

In recent years, instruction in reading and study techniques are incorporating the findings from the metacognition and self-regulation literature (e.g., Borkowski, Carr, Rellinger, & Pressley, 1990; Duffy, Roehler, Sivan, Rackliffe, Book, Meloth, Vavrus, Wesselman, Putnam, & Bassiri, 1987; Paris, Cross, & Lipson, 1984). These programs may be misguided if metacognition becomes an instructional goal. As Paris and Winograd (1990) discuss, metacognition is a means to empowering learners to control their own cognitive and affective functioning, thereby facilitating academic achievement.

Previous research has shown a relationship between metacognition and achievement (Waters, 1982). A meta-analysis by Schneider (1985), for example, found the correlation, summarized across 47 comparisons of metamemory and memory achievement to be about .4. However, much of this work employed artificial tasks which may not generalize to the classroom (Corno, 1987). Further, a recent paper by Nelson and Leonesio (1988) describes a series of studies that found no relationship between metamemory and memory performance. Classroom research is also equivocal on this issue. Significant correlations among self-reported study tactics and achievement have been reported, but these relationships are weak (ranging from .07 to .36 in a recent study by Pintrich & De Groot, 1990).

Similar, modest correlations have been found between affective variables and achievement. Lyon and MacDonald (1990), using Grade 6 pupils, report correlations ranging from .05 to .43 between subscales of the Piers-Harris Children's Self-Concept Scale and standardized achievement test scores. Correlations between self-concept and classroom grades ranged from -.05 to .28. Multiple regression analyses found that academic self-concept made a significant contribution in predicting academic achievement. However, these relationships are especially problematic since linear, causal relationships between affective factors and achievement should not be expected. For example, expectations for future performance and self-efficacy are not directly caused by past achievement, but depend upon attributions for performance along with achievement (Dweck, 1988; McCombs, 1988; Palmer & Willson, 1982).

Given the attention self-regulated learning is receiving in educational literature and the limitations of previous research, this investigation re-examined the relationships among several key elements of self-regulated learning and their role in predicting academic performance. To extend the literature in this area, our study employed four methodological variations to enhance the external validity of models of self-regulated learning.

First, we focused our attention on middle school children. This age is a transitional period in the development of self-regulated learning (Zimmerman & Martinez-Pons, 1990). This is also the age when schools implement study skills instructions and raise expectations for independent learning.

Second, we measured two aspects of metacognition: planning and self-assessment. Planning is one component of the Das-Naglieri Cognitive Assessment System (Naglieri & Das, 1990) and is described as generating plans, goal setting, strategy selection and performance monitoring (Das & Heemsbergen, 1983; Das, Mensink, & Janzen, 1990, Naglieri & Das, 1987, 1988, 1990). Previous studies have linked planning to achievement in reading and in mathematics (Naglieri & Das, 1990).

Self-assessment is the ability to evaluate the state of one's own knowledge. In the classroom, knowing what has been mastered and what is poorly understood is crucial to the intelligent allocation of time and energy. Self-appraisal was measured by having students predict, just prior to regular classroom tests, how they would perform on that test (Andreassen & Waters, 1989; Pressley & Ghatala, 1989). The accuracy of these "feeling-of-knowing" assessments improves developmentally (Andreassen & Waters, 1990; Pressley, Snyder, Levin, Murray, & Ghatala, 1987) and correlates with achievement, at least at the college level (Leal, 1987).

Third, we measured a range of affective variables, including self-concept and locus of control. Harter's Self-Perception Profile for Children (1985a) was selected to assess self-concept. One advantage of this scale is the multidimensional view of the self. A second advantage is that the scale measures teacher-perceived, as well as student-perceived, competence. An important factor in the development of academic self-esteem is feedback from teachers (Hoge, Smit, & Hanson, 1990).

A second affective variable measured in this study was locus of control. Students with an internal locus of control, perceiving that their abilities and efforts control events and their outcomes, should engage in more self-regulated learning. The link between locus of control and achievement was demonstrated in a recent study of ninth graders (Boss & Taylor, 1989). Our measure of locus of control, The Intellectual Achievement Responsibility (IAR) Questionnaire (Crandall, Katkousky, & Crandall, 1968) has also been used to measure learned helplessness (Diener & Dweck, 1978).

Finally, this study investigated the role of cognitive and noncognitive variables in predicting academic achievement across several subject areas, allowing for a test of the generality of these relationships.

While a wide range of variables were examined in this study, this paper presents data bearing on four major research hypotheses. First, metacognition is related to achievement. These correlations will be significant for both the planning tasks and for self-assessment and across all measures of academic achievement. Second, using analysis of variance procedures, metacognitive ability groups will differ significantly in their achievement across academic domains. Third, affective variables (self-perceived academic competence and locus of control) will be strongly related to academic achievement. Finally, A combination of cognitive and affective variables will account for a significant portion of the variance in the different estimates of academic performance.

Method

Subjects

Sixty-two grade 6 pupils from a small, midwestern university town voluntarily participated in the study. The school district is comprised of predominately white students from lower-middle class to middle-class families. The subjects ranged in age from 11 to 13, with a mean age of 11.6 (SD = .61). Twenty-eight boys (45 percent) and 34 girls (55 percent) participated in the study. Additionally, the subjects' five female teachers voluntarily completed a rating scale on each of their students.

Instruments

Estimates of academic self-perception, locus of control (internal and external achievement responsibility), self-regulation (planning and self-assessment skills), and academic achievement (mathematics, reading, and science performance) were obtained on each subject using the following instrumentation.

Self-perception

The Self-Perception Profile for Children (Harter, 1985a) estimates children's perceptions of themselves in six separate domains (Scholastic Competence, Social Acceptance, Athletic Competence, Physical Appearance, Behavioral Conduct and Global Self-Perception). The test manual presents the instrument's factor structure and Cronbach's Alpha reliabilities. The six domains are adequately defined, and the internal consistency reliabilities for three different samples of sixth-graders ranged from .80 to .85.

To obtain the teachers' perspectives on their students' academic ability, each instructor was administered the Teacher's Rating Scale of Child's Actual Behavior (Harter, 1985b). This measure parallels the Self-Perception Profile for Children with one exception; the instructor scale does not provide an index of global self-concept.

Since the investigation is concerned with academic self-perception, the Scholastic Competence (SCS) subscale for the student and teacher (SCST) versions of the instrument were used in subsequent analyses.

Locus of control

Participants completed the Intellectual Achievement Responsibility (IAR) Questionnaire (Crandall, Katkovsky & Crandall, 1965), a group-administered measure of locus of control. Consisting of 34 forced-choice items, the questionnaire appraises, within academic classrooms, students' beliefs in internal versus external reinforcement responsibility. Rather than using the total score (internal or self-responsibility), separate subscores can be obtained for beliefs in internal responsibility for successes (IAR Positive) and for failures (IAR Negative). Crandall et al. (1965) report moderate internal consistency reliabilities (.54 to .60) and stability coefficients (.47 to .74) for the scale. As a measure of locus of control, the validity of the scale is well-established.

Self-regulation

Each subject was administered the Visual Search and Crack-the-Code subtests from the Cognitive Assessment System (Das & Naglieri, 1985). These tasks are designed to estimate planning behavior, including organization, direction of actions, and in general, efficient solutions to problems. Research has consistently shown these tasks to be valid measures of planning (e.g., Das & Heemsbergen, 1983; Das, Mensink, & Janzen, 1990; Lambert, 1990; Naglieri & Das, 1987, 1988, 1990; Telzrow, 1990). The subtests are further described in Das et al., 1990.

To estimate the subjects' self-assessment skills, each student was individually interviewed preceding the administration of teacher-made tests in three subject areas (mathematics, reading, and science). The students' actual test scores were later recorded. Accuracy of self-assessment was calculated as the absolute value of the difference between predicted and actual test scores across the three subject areas. Thus, lower self-assessment scores indicate more accurate predictions.

Academic achievement

As a measure of the students' level of classroom performance, teachers' grades in mathematics, reading and science were collected. Letter grades were assigned a numerical value as follows: A=4, B=3, C=2, D=1, and F=0.

Additionally, the subjects' scores on the Missouri Mastery and Achievement Test (MMAT) (1990) were obtained from the school's cumulative files. Administered to all grade 6 students three months previously, the MMAT is a battery of criterion-referenced achievement tests consisting of four subject areas (mathematics, reading, science, and social studies/civics). In order to compare classroom achievement with MMAT performance, only the mathematics, reading, and science subtest scores were analyzed. Using 1989 data gathered on Grade 6 students, the test manual (1990) reports internal consistency reliabilities ranging from .93 for science to .96 for the mathematics subtest. The test manual provides sufficient evidence for the MMAT's content validity and criterion-related validity.

Procedure

Upon receiving written parental permission, subjects completed the Self-Perception Profile for Children and the Intellectual Achievement Responsibility Questionnaire during a regular class period. Over the next two months, subjects were individually-assessed on the planning tasks. Additionally, teacher ratings and students' MMAT, classroom test, and self-assessment scores were collected.

Results

Subjects were divided into groups of "high" (n = 26) and "low" (n = 36) planning ability using the normative data for 10 to 12-year-old children (Das, 1987-1988). Those students who performed on both planning tasks at the mean or above were designated as the high group; whereas scores below the mean indicated low planning ability. Based on a median split, the children were also separated into "high" (n = 32) and "low" (n = 30) self-assessment groups.

Descriptive statistics are presented in Table 1. Overall means and standard deviations are reported first, followed by the results from the two planning and self-assessment groups. Subjects with average or above average metacognitive skills performed, for the most part, better than the low ability groups across the affective and achievement domains. One finding which appears to be contradictory, involves to the Crack-the-Code task, where total time for correct responses is computed. As anticipated, the two low groups reacted more quickly than the high groups. This result, however, is an artifact, for subjects with few correct answers on this planning task tend to have lower total response times.

Insert Table 1 about here

Table 2 presents the intercorrelation matrix. As predicted, significant relationships were found largely between the metacognitive and achievement variables and the affective measures and achievement variables. With the exception of the Visual Search task, planning

(Crack-the Code Number Correct) is related to achievement test scores in mathematics, reading, and science (r = .35 to .59, $p < .01$). Self-assessment ability correlates moderately with the three measures of achievement as well, ranging from -.25 to a highly significant -.64 ($p < .0001$)

Five out of the six achievement measures are significantly related to the student (SCS) and teacher (SCST) scholastic competency subscales (r = .43 to .64). The classroom reading test did not correlate significantly with any of the affective variables. Of the two locus of control estimates, only IAR Positive was significantly related to any of the achievement variables, correlating with Mathematics MMAT (r = .28, $p < .05$) and Reading MMAT scores (r = .33, $p < .01$). The subjects' ability to assume responsibility for negative academic events or failure situations (IAR Negative) appears to be unrelated to achievement. Consequently, this subscale was not included in the multivariate analyses.

Correlational analyses among the metacognitive and affective variables produced inconsistent results. Self-assessment ability and Crack-the-Code (Number Correct) are moderately related with the SCS and SCST scores (r = .30 to .57, $p < .05$). IAR Positive significantly correlated with one of the metacognitive variables (Crack-the-Code Number Correct, r = .31, $p <$ .05).

Insert Table 2 about here

As hypothesized, ANOVAs performed on the data using teacher-made and standardized measures of achievement as the dependent variables yielded significant planning group effects. Subjects with better planning ability scored significantly higher than those children in the low planning group across all six measures of academic performance. On the teacher-made and standardized mathematics tests (Math Tests and Math MMAT), for example, significant mean differences were found between the two planning groups ($F(1, 58) = 9.33$, $p < .01$). Significant group differences in self-assessment ability were also observed on the science classroom test ($F(1, 58) = 5.64$, $p < .05$) and with Reading MMAT ($F(1, 58) = 8.46$, $p < .01$).

The boys and girls performed similarly in mathematics, reading and science. While teacher perceptions of student academic ability (SCST) revealed no gender effects ($F(1, 58) = 1.78$, $p < .15$), a significant gender difference was found on the Scholastic Competency (SCS) subscale ($F(1, 58) = 8.15$, $p < .01$).

To determine which set of metacognitive and affective variables best predicts mathematics, reading and science achievement, stepwise multiple regression (maximum R procedure) analyses were computed (see Table 3). Student and teacher ratings of scholastic self-concept (SCS and SCST) accounted for 39 percent of the total variance in the classroom mathematics performance. Similarly, when predicting Mathematics MMAT scores, teacher and student ratings coupled with a planning measure (Crack-the-Code Number Correct) yielded a R^2 of .60. The significant predictors of Science Test and Science MMAT scores were Self-Assessment ability and SCST ($R^2 = .49$), and SCS and Self-Assessment ability ($R^2 = .32$), respectively. Only Crack-the-Code was able to

Insert Table 3 about here

significantly predict Reading Test scores ($F(1, 57) = 8.99$, $p < .05$, $R^2 = .14$). Fifty percent of the total variance in Reading MMAT performance was accounted for by SCST, Crack-the-Code, and IAR Positive variables.

Discussion

In large part, the first and third hypotheses were substantiated, in that, certain metacognitive and affective variables are significantly related to mathematics, reading, and science achievement. While only one of two planning tasks (Crack-the-Code) was significantly linked with academic performance, Das and his associates have consistently reported similar findings, particularly in the subject areas of mathematics and reading (see reviews in Naglieri & Das, 1987, 1988, 1990). Those students with better planning skills had significantly higher achievement test scores, providing further evidence for the role planning exerts in students' academic performance. This finding provides partial support for hypothesis two as well.

The ability to self-evaluate readiness for classroom tests was moderately associated with academic performance, extending the results reported in Leal (1987) to middle school students. Significant group differences in self-assessment ability, however, were evident only with two of six achievement measures (teacher-made science test and reading MMAT). This finding suggests that the procedure to divide students into high and low self-assessment groups was problematic. By employing a median split, important subject data was clearly obfusticated. With a larger sample size and more predictions per subject, perhaps, expected achievement differences would be observed between the two groups.

Of the affective variables investigated, it appears that student perception of scholastic competency, along with IAR Positive subscale (to a lesser degree), were the best predictors of classroom and standardized achievement tests. Similar findings are reported in Lyon and MacDonald (1990) and Kelly and Jordan (1990). Using sixth graders, Lyon and MacDonald (1990) provide evidence that academic self-concept is an important variable in predicting achievement, while locus of control (intellectual achievement responsibility for success and failure situations) was not.

Another relevant noncognitive factor unexamined in the previous studies is the teachers' perceptions of their students' scholastic competency. This dimension was moderately and significantly associated with academic performance, supporting the general findings of Hoge et al. (1990) with Grade 6 and 7 students.

The results of the multiple regression analyses partially confirm the fourth hypothesis. Of the six achievement measures, four (Math MMAT, Science Test, Science MMAT, and Reading MMAT) were significantly accounted for by some combination of metacognitive and affective predictors. Important factors for educators to consider in understanding students' academic performance may well be student and teacher perceptions of scholastic competency, along with planning and self-assessment skills. Studies which attempt, therefore, to evaluate and train various self-regulatory components (self-assessment, deployment of strategies, and planning) appear to be worthwhile endeavors (see reviews in Ames & Archer, 1988; Das & Hermsbergen, 1983; Falchikov & Boud, 1989; Kurtz & Borkowski, 1984; Prawat, 1989), however, modifying the students' perceptions of themselves and their academic competence seems to be an essential aspect missing in these studies.

Finally, the influence of teachers, counselors, and parents on middle school students' self-regulatory skills and academic performance may be substantial. Follow-up cross validation studies should include these groups as well as minority and handicapped youngsters.

References

Ames, C., & Archer, J. (1988). Achievement goals in the classroom: Student learning strategies and motivation processes. Journal of Educational Psychology, 80, 260-267.

Andreassen, C., & Waters, H. S. (1989). Organization during study: Relationships between metamemory, strategy use, and performance. Journal of Educational Psychology, 81, 190-195.

Boss, M. W., & Taylor, M. C. (1989). The relationship between locus of control and academic level and sex of secondary school students. Contemporary Educational Psychology, 14, 315-322.

Borkowski, J. G., Carr, M. Rellinger, E., & Pressley, M. (1990). Self-regulated cognition: Interdependence of metacognition, attributions, and self-esteem. In B. F. Jones & L. Idol (Eds.), Dimensions of thinking and cognitive instruction (pp. 53-92). Hillsdale, N.J.: Lawrence Erlbaum Associates.

Brown, A. L., Bransford, J. D., Ferrara, R. A., & Campione, J. C. (1983). Learning, remembering, and understanding. In P. Mussen (Gen. Ed.) & E. Markman & J. Flavell (Vol. Ed.) Carmichael's manual of child psychology. Vol. 3: Cognitive development (pp.77-166). New York: Wiley.

Corno, L. (1987). Teaching and self-regulated learning. In D. C. Berliner & B. V. Rosenshine (Eds.), Talks to teachers. New York: Random House.

Crandall, V. C., Katkovsky, W., & Crandall, V. J. (1965). Children's beliefs in their own control of reinforcement in intellectual-academic achievement situations. Child Development, 36, 91-109.

Das, J. P. (1987-1988). [Normative data for various CAS subtests (Normals: 10 to 12 year olds). Unpublished raw data.

Das, J. P., & Heemsbergen, D. B. (1983). Planning as a factor in the assessment of cognitive processes. Journal of Psychoeducational Assessment, 1, 1-16.

Das, J. P., Mensick, D., & Janzen, H. (1990). The K-ABC, coding, and planning: An investigation of cognitive processes. Journal of School Psychology, 28, 1-11.

Das, J. P., & Naglieri, J. A. (1985). Cognitive Assessment System: Second Field Test (Forms 1 & 2). San Antonio, TX: The Psychological Corporation.

Diener, C. I., & Dweck, C. S. (1978). An analysis of learned helplessness: Continuous changes in performance, strategy, and achievement cognitions following failure. Journal of Personality and Social Psychology, 36, 451-461.

Duffy, G. G., Roehler, L. R., Sivan, E., Rackliffe, G., Book, C., Meloth, M., Vavrus, L., Wesselman, R., Putnam, J., & Bassiri, D. (1987). The effects of explaining the reasoning associated with using reading strategies. Reading Research Quarterly, 16, 403-411.

Dweck, C. S. (1988). Motivation. In R. Glaser & A. Lesgold (Eds.), Cognitive psychology and education (pp. 87-136). Hillsdale, NJ: Lawrence Erlbaum Associates.

Dweck, C. S., & Elliot, E. S. (1983). Achievement motivation. In P. H. Mussen (Gen. Ed.) & E. M. Hetherington (Vol. Ed.), Handbook of child psychology: Vol. IV: Social and personality development (pp. 643-691). New York: Wiley.

Falchikov, N., & Boud, D. (1989). Student self-assessment in higher education: A meta-analysis. Review of Educational Research, 59, 395-430.

Findley, M. J., & Cooper, H. M. (1983). Locus of control and academic achievement: A literature review. Journal of Personality and Social Psychology, 44, 419-427.

Harter, S. (1981). A new self-report scale of intrinsic versus extrinsic orientation in the classroom: Motivational and informational components. Developmental Psychology, 17, 300-312.

Harter, S. (1985a). Manual for the Self-Perception Profile for Children. Denver, CO: University of Denver.

Harter, S. (1985b). Teacher's Rating Scale of Child's Actual Behavior. In S. Harter, Manual for the Self-Perception Profile for Children. Denver, CO: University of Denver.

Hoge, D., Smit, E., & Hanson, S. (19 0). School experience predicting changes in self-esteem of sixth and seventh-grade students. Journal of Educational Psychology, 82, 117-127.

Kelly, K. R., & Jordan, L. K. (1990). Effects of academic achievement and gender on academic and social self-concept: A replication study. Journal of Counseling and Development, 69, 173-177.

Kurtz, B. E., & Borkowski, J. G. (1984). Children's metacognition: Exploring relations among knowledge, process, and motivational variables. Journal of Experimental Child Psychology, 37, 335-354.

Lambert, N. M. (1990). Consideration of the Das-Naglieri Cognitive Assessment System. Journal of Psychoeducational Assessment, 8, 338-343.

Leal, L. (1987). Investigation of the relation between metamemory and university students' examination performance. Journal of Educational Psychology, 79, 35-40.

Lyon, M. A., & MacDonald, N. T. (1990). Academic self-concept as a predictor of achievement for a sample of elementary school students. Psychological Reports, 66, 1135-1142.

McCombs, B. L. (1988). Motivational skill training: Combining metacognitive, cognitive, and affective learning strategies. In C. E. Weinstein, E. T. Goetz, & P. A. Alexander (Eds.), Learning and study strategies (pp. 141-170). San Diego: Academic Press, Inc.

McCombs, B. L., & Whisler, J. S. (1989). The role of affective variables in autonomous learning. Educational Psychologist, 24, 277-306.

Missouri Mastery and Achievement Tests: Guide to Score Interpretation and Use. (1990, Spring). Jefferson City, MO: Missouri Department of Elementary and Secondary Education.

Naglieri, J. A., & Das, J. P. (1987). Construct and criterion-related validity of planning, simultaneous, and successive cognitive processing tasks. Journal of Psychoeducational Assessment, 4, 353-363.

Naglieri, J. A., & Das, J. P. (1988). Planning-arousal-simultaneous-successive (PASS): A model of assessment. Journal of School Psychology, 26, 35-48.

Naglieri, J. A., & Das, J. P. (1990). Planning, attention, simultaneous, and successive (PASS) cognitive processes as a model for intelligence. Journal of Psychoeducational Assessment, 8, 303-337.

Nelson, T. O., & Leonesio, R. J. (1988). Allocation of self-paced study time and the labor-in-vain effect. Journal of Experimental Psychology: Learning, Memory, and Cognition, 14, 476-486.

Nelson, T. O., & Narens, L. (1990). Metamemory: A theoretical framework and new findings. In G. H. Bower (Ed.), The psychology of learning and motivation Vol. 26 (pp. 125-173). New York: Academic Press.

Palmer, D. J., & Willson, V. (1982). Prediction of attributional consequences in an actual achievement setting. Contemporary Educational Psychology, 7, 334-345.

Paris, S. G., Cross, D. R., & Lipson, M. Y. (1984). Informed strategies for learning: A program to improve children's reading awareness and comprehension. Journal of Educational Psychology, 76, 1239-1252.

Paris, S. G., & Winograd, P. (1990). How metacognition can promote academic learing and istruction. In B. F. Jones & L. Idol (Eds.), Dimensions of thinking and cognitive instruction (pp. 15-52). Hillsdale, N.J.: Lawrence Erlbaum Associates.

Pintrich, P. R., & De Groot, E. V. (1990). Motivational and self-regulated learing components of classroom academic performance. Journal of Educational Psychology, 82, 33-40.

Prawat, R. S. (1989). Promoting access to knowledge, strategy, and disposition in students: A research synthesis. Review of Educational Research, 59, 1-41.

Pressley, M., Snyder, B. L., Levin, J. R., Murray, H. G., & Ghatala, E. S. (1987). Perceived readiness for examination performance (PREP) produced by initial reading of text and text containing adjunct questions. Reading Research Quarterly, 22, 219-236.

Pressley, M., & Ghatala, E. S. (1989). Metacognitive benefits of taking a test for children and young adolescents. Journal of Experimental Child Psychology, 47, 430-450.

Schneider, W. (1985). Developmental trends in the metamemory-memory behavior relationship: An integrative review. In D. L. Forrest-Pressley, G. E. MacKinnon, & T. G. Waller (Eds.), Cognition, metacognition, and performance (pp. 57-109). New York: Academic Press.

Skinner, E. A., Wellborn, J. G., & Connell, J. P. (1990). What it takes to do well in school and whether I've got it: A process model of perceived control and children's engagement and achievement in school. Journal of Educational Psychology, 82, 22-32.

Telzrow, C. F. (1990). Does "PASS" pass the test? A critique of the Das-Naglieri Cognitive Assessment System. Journal of Psychoeducational Assessment, 8, 344-355.

Waters, H. S. (1982). Memory development in adolescence: Relationships between metamemory, strategy use, and performance. Journal of Experimental Child Psychology, 33, 183-195.

Zimmerman, B. J. (1989). A social cognitive view of self-regulated academic learning. Journal of Educational Psychology, 81, 329-339.

Zimmerman, B. J., & Martinez-Pc s, M. (1990). Student differences in self-regulated learning: Relating grade, sex, and giftedness to self-efficacy and strategy use. Journal of Educational Psychology, 82, 51-59.

TABLE 1

Means and Standard Deviations For All Variables

	Total Group (n=62)		High Planning (n=26)		Low Planning (n=36)		High Self Assessment (n=32)		Low Self Assessment (n=30)	
VARIABLES	M	SD	M	SD	M	SD	M	SD	M	SD
AFFECTIVE										
SCS	2.9	.6	3.0	.5	2.8	.6	3.1	.5	2.6	.6
SCST	3.1	.7	3.4	.7	2.8	.7	.3	.6	2.9	.8
IAR +	13.1	2.5	13.3	2.3	12.9	2.6	13.6	2.2	12.5	2.6
IAR -	11.1	2.5	10.6	2.7	11.6	2.2	10.5	2.5	11.8	2.4
COGNITIVE										
Self Assessment	9.5	7.6	5.5	2.6	12.2	8.8	4.6	1.8	14.2	8.3
Crack the Code										
(Total correct)	2.7	1.7	4.5	.9	1.8	1.4	3.3	1.6	2.2	1.6
(Total time in seconds)	74.6	77.6	122.1	79.4	40.3	55.8	93.7	77.5	54.3	73.7

Table 1, continued

Visual Search (Total time in seconds)	19.1	4.7	16.6	3.4	20.8	4.7	18.7	5.2	19.4	4.1
<u>ACHIEVEMENT</u>										
Science Test	69.4	9.1	74.2	4.1	66.0	10.1	73.1	6.0	65.5	10.2
Science MMAT	418.7	87.3	451.6	84.4	395.0	82.6	444.7	80.5	391.0	87.0
Math Test	26.9	2.5	28.0	1.3	26.1	2.9	27.5	2.2	26.2	2.7
Math MMAT	384.3	84.2	425.5	85.6	354.6	70.3	410.4	80.1	356.5	80.6
Reading Test	14.8	1.9	15.5	.8	14.2	2.3	15.0	2.0	14.5	1.8
Reading MMAT	314.0	65.5	344.8	64.7	291.8	57.2	341.4	74.6	284.8	36.8

Note. SCS = Scholastic Competence Subscale-Student. SCST = Scholastic Competence Subscale-Teacher Perception. IAR+ = Intellectual Achievement Responsibility-Internal. IAR- = Intellectual Achievement Responsibility-External. Self Assessment = Predictive ability of Ss (across Math, Reading, Science). Crack-the-Code = Total correct and total time in seconds (planning). Visual Search = Total time in seconds (planning). Science Test = Teacher-made test (total correct). MMAT = Missouri Mastery Achievement Test. Math Test = Teacher-made test (total correct). Reading Test = Teacher-made test (total correct).

TABLE 2

Pearson Correlations Among All Variables

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Affective														
1. SCS	1.00	.44***	.37**	.00	-.30*	.37**	.17	-.16	.43**	.46+	.53+	.60+	-.03	.44***
2. SCST		1.00	.11	.00	-.57+	.40**	.24	-.18	.59+	.50+	.47+	.64+	.22	.59+
3. IAR +			1.00	.26*	-.25	.31*	.12	.06	.07	.25	.13	.28*	.11	.33**
4. IAR -				1.00	.08	.00	-.00	.07	-.17	.12	-.08	.13	.15	.06
Cognitive														
5. Self Assessment					1.00	-.37**	-.29**	.14	-.64+	-.46**	-.29*	-.43**	-.25	-.50+
Crack-the-Code														
6. Total correct						1.00	.78+	-.14	.35**	.43***	.39**	.59+	.36**	.56+
Crack-the-Code														
7. Total time							1.00	.03	.30*	.18	.26*	.36**	.27*	.29*
8. Visual Search								1.00	-.16	-.00	-.05	-.18	-.09	-.16
Achievement														
9. Science Test									1.00	.61+	.59+	.58+	.18	.56+
10. Science MMAT										1.00	.47+	.76+	.30*	.72+

Table 2, continued

	11	12	13	14
11. Math Test	1.00	.65+	-.03	.55+
12. Math MMAT		1.00	.29*	.76+
13. Reading Test			1.00	.30+
14. Reading MMAT				1.00

*$p<.05$. **$p<.01$. ***$p<.001$. +$p<.0001$.

Note. SCS = Scholastic Competence-Student. SCST = Scholastic Competence-Teacher Perception. IAR+ = Intellectual Achievement Responsibility-Internal. IAR- = Intellectual Achievement Responsibility-External. Self Assessment = Predictive ability of Ss (across Math, Reading, Science). Crack the Code = Total correct and total time in seconds (planning). Visual Search = Total time in seconds (planning). Science Test = Teacher made test (total correct). MMAT = Missouri Mastery Achievement Test. Math Test = Teacher-made test (total correct). Reading Test = Teacher-made test (total correct).

TABLE 3

Summary of Multiple Regression Analyses

Variable	Beta	SEb	F	df	R^2
1. Criterion = Math Test; Predictors = SCS, SCST, VS, CCCORR, IAR +, and SFLF-ASSESS					
SCS (R^2 = .31)	1.81	.48	13.48+		
SCST (R^2 = .39	1.09	.39	7.14*	2,56	.39
2. Criterion = Math MMAT; Predictors = SCS, SCST, VS, CCCORR, IAR +, and SELF-ASSESS					
SCST (R^2 = .40)	40.73	10.91	13.94+		
CCCORR (R^2 = .53)	15.51	4.79	10.48*		
SCS (R^2 = .60)	43.03	13.30	10.46*	3,55	.60
3. Criterion = Science Test; Predictors = SCS, SCST, VS, CCCORR, IAR +, and SELF-ASSESS					
SELF-ASSESS (R^2 = .42)	-.54	.14	14.96+		
SCST (R^2 = .49)	4.12	1.41	8.47*	2,56	.49
4. Criterion = Science MMAT; Predictors = SCS, SCST, VS, CCCORR, IAR +, and SELF-ASSESS					
SCS (R^2 = .31)	48.05	16.19	8.80*		
SELF-ASSESS (R^2 = .32)	-4.07	1.30	9.93*	2,56	.32
5. Criterion = Reading Test; Predictors = SCS, SCST, VS, CCCORR, IAR +, and SELF-ASSESS					
CCCORR (R^2 = .14)	.43	.14	8.99*	1,57	.14

Table 3, continued

6. Criterion = Reading MMAT; Predictors = SCS, SCST, VS, CCCORR, IAR + and SELF-ASSESS

SCST (R^2 = .35)	38.33	9.02	18.04+		
CCCORR (R^2 = .47)	11.64	4.29	7.36*		
IAR+ (R^2 = .50)	5.25	2.67	3.87*	3,55	.50

*p<.01. +p<.001.

Note. SCS = Scholastic Competency-Student. SCST = Scholastic Competency-Teacher Perception. VS = Visual Search-total time in seconds (planning). CCCORR = Total correct on Crack-the-Code (Planning). SELF-ASSESS = Self Assessment predictive ability of Ss (across math, reading and science). MMAT = Missouri Mastery Achievement Test. IAR + = Intellectual Achievement Responsibility-Internal. Math Test = Teacher-made test (total correct). Science Test = Teacher-made test (total correct). Reading Test = Teacher-made test (total correct).