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ABSTRACT

Computers provide particularly powerful environments in which to examine individual differences in cognitive processing and learning outcomes. The computer's capacity to collect and record response protocols facilitates detailed process analysis. Such analyses contribute to increased understanding of how individuals differ in their ability to profit from instruction and learn most efficiently. The cognitive engagement processes students use are critical in the computer environment as well as in a variety of other learning environments. The cognitive engagement processes used by more or less successful learners in one computer environment were investigated in a group of 48 California junior high school students using a computer problem-solving game called Wumpus. Results indicated that protocols of more and less successful students were distinguishable by the spontaneous use of self-regulated learning processes. Successful students were able to shift levels of cognitive engagement in response to computer stimuli and feedback. Implications for the measurement of self-regulatory processes in computer learning environments were discussed. Two other research projects, the Systems Thinking and Curriculum Innovation (STACI) project and the Structural Thinking Experimental Learning Laboratory with Animation (STELLA), are also described. (Author/GDC)

Computer Learning Environments and the Study of Individual Differences in Self-Regulation

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Computers provide particularly powerful environments in which to examine individual differences in cognitive processing and learning outcomes. The computer's capacity to collect and record response protocols facilitates detailed process analysis. Such analyses contribute to increased understanding of how individuals differ in their ability to profit from instruction and learn most efficiently. The cognitive engagement processes students use are critical in computer as well as a variety of learning environments. The study reported investigated the cognitive engagement processes used by more or less successful learners in one computer environment. Results indicated that protocols of more and less successful students were distinguishable by the spontaneous use of self-regulated learning processes. Successful students were able to shift levels of cognitive engagement in response to computer stimuli and feedback. Implications for the measurement of self-regulatory processes in computer learning environments is examined.

How to improve individual learning is an issue underlying the disciplines of differential psychology, instructional psychology, and applied cognitive cognitive science. Differential and instructional psychology hold that students bring to an instructional situation certain psychological characteristics, called aptitudes, that influence learning. Much research shows that learners with different aptitude profiles learn better under different instructional methods (Cronbach & Snow, 1977). One explanation is that through demand characteristics, instruction stimulates or fails to stimulate certain cognitive processes in learners. Just which cognitive processes are stimulated during learning and how this occurs in computer-assisted instruction (CAI) is an important issue for applied cognitive science (Brown & Burton, 1978; Burton & Brown, 1979).

A related issue for educational psychology is the manner by which various student aptitudes interact with learner cognitive processes and instructional methods. Much media attention has focused on the computer as an effective medium of instruction. Moreover, some computer learning environments provide excellent opportunities in which to examine students' acquisition and transfer of higher-order cognitive skills. Of particular interest in the present line of research is the extent to which students are able to acquire general problem solving and self-regulatory skills and transfer them to related domains.

Metacognitive Skills

Examination of metacognitive and self-regulatory skills has gained increasing prominance in research on individual differences, cognitive processing, and learning (e.g., Brown, 1978; Corno, 1986a, 1986b; Corno & Mandinach, 1983; Flavell, 1976, 1979; Gitomer & Glaser, in press). Metacognition and self-regulation are two similar psychological constructs that are procedural in nature and thought to be applicable across domains. Both constructs, as defined, are composites of behavior, rather than specific skills. Metacognition generally is defined as an individual's knowledge about one's own cognitive processes (Flavell, 1976). It refers to the active monitoring and consequent regulation and orchestration of cognitive processes.

Brown (1978) notes that there are several general metacognitive skills characteristic of efficient thought and of particular importance because they are "transsituational". Prediction is the first component skill. Learners must be able to predict effects and outcomes of actions prior to making a response. Second, learners must be able to plan efficient solutions paths. Third, learners must monitor ongoing activity to determine how they are doing, if the response makes sense, and if there are any errors or inconsistencies. According to Brown, there are other skills, less well defined, that serve controlling and coordinating functions in the learning process.

Metacognition requires active involvement on the part of the learners. It also requires that learners exhibit awareness not only of the demands of the particular task or learning environment, but more importantly of their own capabilities and performances. Thus, learners must be able to evaluate and supervise their own cognitive behavior through the use of self-interrogation. Correspondingly, they must be able to adapt their performance in accord with task demands. Such flexibility requires learners to exhibit sensitivity to task characteristics (Frank, Vye, Auble, Mezynski, Perfetto, Bransford, Stein, & Littlefield, 1982).

Self-regulated learning has been defined as a student's active acquisition and transformation of instructional material (Corno & Mandinach, 1983). The construct consists of two component sets of processes -- information acquisition processes and information transformation processes. Building on cognitive learning theories, a first component consisting of information acquisition processes, includes receiving stimuli, tracking information, and self-reinforcement. These processes are seen as metacognitive when they regulate the second component of information transformation. Important transformation processes include discriminating relevant from irrelevant information, connecting new information with prior knowledge or skills, and planning particular performance routines. Cognitive theories emphasize the significance of the various acquisition and transformation processes in the learning and maintenance of complex knowledge and skills (e.g., Anderson & Bower, 1973; Flavell, 1981; Kintsch & vanDijk, 1978; Posner & Boies, 1971; Reder, 1979).

Self-regulated learning is viewed as a normative ideal that few students use consistently. It is neither appropriate for nor encouraged by all classroom tasks. Rather, students are hypothesized to alternate between different forms of cognitive engagement or variations on self-regulated learning (four forms have been conceptualized -- self-regulation, task-focus, resource management, and recipience), both between and within different task situations (Corno & Mandinach, 1983). Moreover, the impetus of shifts among the variations may often be task demands and/or features of instruction. Learning can become less self-regulated when some self-regulation processes are assumeed by teachers, peers, or characteristics of instructional materials.

Brown and DeLoache (1978) note that novices and children may fail at a task due to a lack of ability and also because they do not regulate their actions or have a conscious awareness of them. If a learner is not familiar with a given task, that lack of knowledge will be manifested in inadequate monitoring and activity selection. Familiarity is experientially based. With time, learners bring to bear such metacognitive skills as predicting, monitoring, testing, and controlling one's actions toward a goal.

As Brown and DeLoache note, "Although absolute novices tend not to incorporate effective metacognitive activities into their initial attempts to solve problems, it is not simply the case that experts do and novices do not engage in effective self-regulation" (p. 14). Simon and Simon (1978) found that experts exhibited less observable self-interrogation than did novices when solving physics problems. It is possible that expert performance is so automatic, in some instances, that overt self-regulation is no longer necessary. Thus, Brown and DeLoache hypothesize that: (a) novices do not engage in self-regulation; (b) self-regulation becomes increasingly important as learners gain experience and knowledge; and (c) experts' performance routines may become so automatic that self-regulation is not required to such a great extent.

Two studies that examine self-regulated learning are reported here. The first is part of a larger, laboratory-based study of which only a subset is described. This research examined the role of strategic planning knowledge and self-regulation in learning an intellectual computer game. The study of self-regulation was a major component of this work. The second study is part of an ongoing research project in which self-regulation is only one of several targeted variables. This research focuses on the impact of computers on learning and transfer and is classroom-based. General implications for the measurement of self-regulated learning in different computer learning environments then are explored.

The Wumpus Study

Method

Sample selection. The sample consisted of 48 seventh and eighth grade volunteers from a San Francisco Bay area junior high school. Sample selection was based on scores from standardized achievement tests (measures of G_c) and scores from a battery of group-administered ability tests (measures of G_f). G_c and G_f represent intellectual ability distinctions found to be important in academic tasks (Cattell, 1971; Snow, 1980). A general intellectual ability (*G*) composite was formed for each student by summing over the G_c and G_f indices.

Wumpus. The study used an instructional version of a computer problem solving game called Wumpus. Wumpus is a "hunt the monster" game in which the student is a hunter whose goal is to track down and kill a mythical creature called a Wumpus, while avoiding several hazards that impede safe movement through a warren of 20 interconnected caves. Task analyses (Mandinach, 1984) demonstrated that successful performance requires the deliberate and efficient application of the strategic planning and logical reasoning processes that define self-regulated learning.

Procedure. Four identical instruction-practice sessions were designed. Each session contained 12 practice games and 12 instructional example sets. Students received a game and then a set of instructional examples. Games were played with minimal external assistance. Following the conclusion of a game, students received an example set, while the experimenter added probes focused on appropriate performance strategies. Alternation of games and instructional examples permitted the assessment of performance variations in two different phases of learning-instruction and practice. Data reported here, from the gaming phase, are a subset from a larger study (see Mandinach, 1984a, 1984b; Mandinach & Corno, 1985 for details).

Results and Discussion

The primary Wumpus performance measure was the percentage of successful games played by each student. Percentage differences are evaluated in terms of effect size coefficients (ES) which reflect the magnitude of differences between groups in terms of standard deviation units but do not depend on sample size (Glass, 1978). High ability students proved more successful on Wumpus than low ability students ($\underline{M}$ = .39 for the high group and $\underline{M}$ = .20 for the low group, ES = 1.42).

Self-regulated learning and strategic planning were measured by an index called "error avoidance." This was the percentage of unnecessary risks successfully avoided during the beginning part of a game. A high score on error avoidance reflected a student's tendency during play to consider alternative solutions and plan a logical sequence of moves. High ability students ($\underline{M}$ = .54 for highs vs. $\underline{M}$ = .31 for lows) displayed more self-regulated learning. Error avoidance also correlated with success on Wumpus $\underline{r}(47) = .66$, $\underline{p} < .001$, suggesting that those who explored more alternative solution paths before assuming an initial risk also were more successful.

In addition to the error avoidnace measure of self-regulated learning, students' verbal protocols, response patterns, and study aids were examined along with experimenter notes for evidence of the cognitive processes that defined the four hypothetical forms of cognitive engagement. Games and instructional example sets were scored by defining specific cognitive skills and behavior that reflected connecting, alertness, selectivity, planning, and monitoring. Evidence of these skills was noted for each occurrence in a game or example set and categorized according to the primary and secondary forms of engagement used across sessions. Reliability of these categorizations was assessed as percent agreement between two independent raters on a subset of protocols. Agreement was 100% for the primary form of engagement coded and 80% for secondary forms.

Table 1 presents the gaming data for all students and is broken down by ability level. Seventy-three percent of the students sampled were observed to adopt and maintain the same form of cognitive engagement throughout the gaming sessions. Only 27% of the students shifted to a different form of cognitive engagement at least once across occasions. Among the form of cognitive engagement noted, self-regulated learning was the most frequent (27%). Resource managment was noted the least frequently (12%) but was the form most often used in combination with other engagement forms. Like resource management, task-focused learning tended to be used in combination with other engagement variations, but less frequently overall.

The two measures of self-regulated learning (i.e., the error avoidance index and the categorizations made here) were correlated in these data. Students whose dominant rating was self-regulation

(M = .68) also had higher scores on error avoidance than the remainder of the sample (M = .33), $t(46) = 6.14$, $p < .001$. Such a relationship provides evidence supporting the construct validity of these measures.

Students who used self-regulated learning were more successful in Wumpus that those who used other forms of cognitive engagement. Self-regulated learners had the highest percentages of success (M = .50) followed by students who combined task-focused and self-regulated learning (M = .38). The least successful students combined recipient learning with resource management (M = .15).

The results of this study should be seen in relation to other research investigating the cognitive processes that underlie effective performance on complex learning tasks. Consistent with data described by Pressley and Levin (1983a, 1983b), we find empirical evidence that students actively engage in a relatively small set of acquisition and transformational processes to aid them in task performance. The Wumpus protocols indicated that performance was better when students used the underlying processes that define self-regulated learning. The transcripts of less successful students were marked by the relative absence of these processes.

The Wumpus computer game was selected, in part, because rational task analyses suggested that effective performance required just such cognitive activity as was observed in the data. The game also provided an attempt to induce the use of key self-regulation activity in students who were not using such processes on their own, and to compare the performance outcomes of students trained with those of spontaneous users (see Mandinach, 1984a, 1984b, 1987 for details of instructional results).

The data also support the notion that differences in student aptitudes may be related to differences in the task approach or cognitive engagement strategies that systematically relate to performance outcomes. Students of different aptitudes also displayed difference levels of self-regulated learning and different forms of cognitive engagement during interaction with the computer. Specifically, high ability students showed more evidence of self-regulated learning and tended to shift among the different hypothetical forms of cognitive engagement as they played. These students shifted in response to computer feedback on their performance. In essence, they were more "response sensitive" than other students to incoming information. The issue of what features of learning tasks are most likely to trigger such strategy shifts is an interesting one to pursue.

Low ability students were found to use different forms of cognitive engagement in this study as well, but the primary form of engagement observed was recipient learning. Some of the low ability student appeared to shift from recipient learning to other forms of engagement as their experience with the game progressed - again indicating a kind of response sensitivity. The manner by which learners of different ability levels react to cues in the computer learning environment has only begun to be investigated (e.g., Mandinach & Fisher, 1985; Webb, 1984).

In sum, patterns of cognitive enagement were found to differ between students of high and low ability. Some students used self-regulated learning in Wumpus but others did not; these differences were related systematically to ability and performance outcomes. Students who used self-regulated learning and the other higher forms of engagement (task-focused learning, resource management) generally were more able and more successful on Wumpus.

The STACI Project

The Systems Thinking and Curriculum Innovation (STACI) project is a two-year research project conducted by Educational Testing Service under the auspices of the Educational Technology Center at the Harvard Graduate School of Education. The project is intended to examine the cognitive demands and consequences of learning from a systems thinking approach to instruction and from using simulation modeling software.

The purpose of the study is to test the potentials and effects of using the systems approach in existing secondary school curricula to teach content-specific knowledge as well as general problem solving skills (see Mandinach & Thorpe, in press for details). The study also examines the effectiveness of using STELLA (Structural Thinking Experimental Learning Laboratory with Animation; Richmond, 1985) as a tool by which to teach system dynamics and content knowledge. The research focuses on (a) the learning outcomes and transfer that result from using such an approach and software in classroom settings, and (b) the general effects of teaching with the technology.

The study is being conducted at a high school in southern Vermont in which four teachers are using systems thinking in their courses. The course content areas include general physical science, biology, chemistry, and an experimental course entitled War and Revolution. These four teachers, trained to use STELLA and system dynamics, are using systems models and illustrating them on the computer.

The intent of the research project is to examine the extent to which students acquire higher-order cognitive skills (specifically self-regulation and general problem solving skills) through interaction with a curriculum infused with systems thinking concepts and subsequently generalize knowledge and skills to problem solving tasks in other substantive areas. Comparisons are being drawn between traditionally taught courses and those that use the systems approach and STELLA. Furthermore, the two-year duration of the research enables the examination of skill and knowledge transfer across content areas as students are exposed to several courses that use the systems approach.

Measurement of Self-Regulated Learning

The STACI Project provides an opportunity to examine self-regulated learning in classroom settings to which substantial computer and thinking skills components have been added. However, real-world constraints of classroom data collection require a substantially different methodology than that used in the Wumpus study. The purpose of discussing the STACI Project is to highlight some of the differences between classroom and laboratory-based studies that attempt to examine higher-order cognitive processes such as self-regulated learning.

Laboratory studies generally allow for a one-to-one interaction between the researcher and the learner. Thus, there is greater opportunity to record systematically incidents of the targeted behavior. For example, in the Wumpus study, data were collected from a variety of sources and triangulated to provide a detailed picture of students' cognitive processing and use of self-regulation. These sources included interviews, think-aloud protocols, teachbacks, experimenter's notes, tape recordings of experimental sessions, keystroke logs, and tasks or indices (e.g, the error avoidance variable) specifically designed to measure higher-order cognitive skills. Each of these sources, separately and in combination, provided valuable evidence of cognitive engagement.

Such an examination of the learner is not possible in a classroom setting because extraneous variables interfere with precise measurement. Often times learning is the outcome of group interaction rather than one student's congitive processing. Thus, methodology must be adapted according to the constraints imposed by the classroom.

The main techniques used in the STACI Project to examine self-regulated learning are instruments specifically designed to assess students' cognitive engagement. The instruments have been designed to measure the various component processes that comprise self-regulated learning and metacognition (i.e., planning, monitoring, alertness, selectivity, connecting). How students perform on these exercises should indicate the extent to which they are able to exhibit forms of cognitive engagement on isolated tasks.

The curricula implemented in the Project's experimental classes (see Mandinach & Thorpe, in press) contain numerous opportunities for students to exhibit self-regulation. These learning activities will be examined with various methodologies (e.g., observation, specific exercises, and interviews) appropriate to classroom situations. Acquisition and the extent to which the targeted skills are exhibited will be assessed within classes.

The design of the study allows for the examination of transfer across content areas. Because students are required to take three years of high school science, we will be able to trace the development and use of the targeted skills and knowledge across science courses. We also will be able to examine the differential effects of the experimental and traditional instructional treatments on the acquisition of higher-order skills and content knowledge. Transfer of these metacognitive skills across domains will be examined as students take additional courses that are taught with the systems thinking approach. Thus, it will be possible to examine level of cognitive processing and the extent to which student use and transfer self-regulation across learning situations.

In sum, attending to, organizing, and using feedback such as the computer supplies was a critical element in success in the Wumpus study and should influence performance in the STACI Project as well. Sensitivity to feedback has been viewed as an importnat component of cognitive engagement. The Wumpus study demonstrated that not all students are alike in the extent to which they can adapt to task demands, respond to feedback, and know when different levels of cognitive engagement are appropriate. The STACI Project intends to followup on this finding. The flexible use of such higher cognitive skills across tasks is a general goal for all education (Corno & Mandinach, 1983; Palincsar & Brown, 1984; Snow & Lohman, 1984). Subsequent research will attempt to illuminate the roles of self-regulated learning and response sensitivity in various classes of learning activities.

Computers provide powerfrul learning, instructional, and research environments. The computer can play a critical role as the medium of instruction, as in both the Wumpus study and STACI Project, and as a research tool, especially in the Wumpus study. The computer's capacity to present stimuli and to collect and record response protocols facilitates analysis of learners' cognitive processing. However, the extent to which indepth analyses of individual learners can be accomplished depends on the design of the research, level of analysis (e.g., classroom, small group, individual learner), and the particular variables targeted for examination. Methodologies must be designed to capture the nuances of each research setting in order to capitalize on the power of the computer as both an instructional medium and research tool.

References

Anderson, J. R., & Bower, G. H. (1973). Human associative memory. Hillsdale, N.J.: Erlbaum.

Brown, A. L. (1978). Knowing when, where, and how to remember: A problem of metacognition. In R. Glaser (Ed.), Advances in instructional psychology (Vol. 1). Hillsdale, N.J.: Erlbaum.

Brown, A. L., & DeLoache, J. S. (1978). Skills, plans, and self-regulation. In R. S. Siegler (Ed.), Children's thinking: What develops? Hillsdale, N.J.: Erlbaum.

Brown, J. S., & Burton, R. R. (1978). Diagnostic models for procedural bugs in basic mathematical skills. Cognitive Science, 2, 155-192.

Burton, R. R., & Brown, J. S. (1979). An investiagtion of computer coaching for informal learning activities. International Jounral of Man-Machine Studies, 11, 5-24.

Cattell, R. B. (1971). Abilities: Their structure, growth, and action. Boston: Houghton Mifflin.

Corno, L. (1986a). The metacognitive control components of self-regulated learning. Contemporary Educational Psychology, 11, 333-346.

Corno L. (1986b). Teaching and self-regulated learning. Paper presented at the annual meeting of the American Educational Research Association, San Francisco.

Corno, L., & Mandinach, E. B. (1983). The role of cognitive engagement in classroom learning and motivation. Educational Psychologist, 18, 88-108.

Cronbach, L. J., & Snow, R. E. (1977). Aptitudes and instructional methods: A handbook for research on interactions. New York: Irvington Publishers.

Flavell, J. H. (1976). Metacognitive aspects of problem solving. In L. B. Resnick (Ed.), The nature of intelligence. Hillsdale, N.J.: Erlbaum.

Flavell, J. H. (1979). Metacognition and cognitive monitoring. American Psychologist, 34, 906-911.

Flavell, J. H. (1981). Cognitive monitoring. In P. Dickson (Ed.), Children's oral communications skills. New York: Academic Press.

Franks, J. J., Vye, N. J., Auble, P. M., Mezynski, K. J., Perfetto, G. A., Bransford, J. D., Stein, B. S., & Littlefield, J. (1982). Learning from explicit versus implicit texts. Jounral of Experimental Psychology: General, 111, 414-422.

Gitomer, D. H., & Glaser, R. (in press). If you don't know it, work on it: Knowledge, self-regulation and instruction. In R. E. Snow & M. J. Farr (Eds.), Aptitude, learning, and instruction (Vol. 3). Hillsdale, NJ: Erlbaum.

Glass, G. V. (1978). Investigative findings: The meta-analysis of research. In L. S. Shulman (Ed.), Review of research in education (Vol. 5). Itasca, Ill.: Peacock.

Kintsch, W., & vanDijk, T. A. (1978). Toward a model of text comprehension and production. Psychological Review, 85, 363-394.

Mandinach, E. B. (1984a). The role of strategic planning and self-regulation in learning an intellectual computer game. Unpublished doctoral dissertation. Stanford University, Stanford, Ca.

Mandinach, E. B. (1984b). The role of strategic planning and self-regulation in learning an intellectual computer game (Tech. Rep. No. 12). Berkeley: University of California, Lawrence Hall of Science, ACCCEL Project.

Mandinach, E. B. (1987). Clarifying the "A" in CAI for learners of different abilities. Journal of Educational Computing Research, 3, 115-130.

Mandinach, E. B., & Corno, L. (1985). Cognitive engagement variations among students of different ability level and sex in a computer problem solving game. Sex Roles, 13, 241-251.

Mandinach, E. B., & Fisher, C. W. (1985). Individual differences and acquisition of computer programming skill (Tech. Rep. No. 23). Berkeley: University of California, Lawrence Hall of Science, ACCCEL Project.

Mandinach, E. B., & Thorpe, M. E. (in press). The systems thinking and curriculum innovation project. Learning and Technology.

Palinscar, A. S., & Brown, A. L. (1984). Reciprocal teaching of comprehension-fostering and comprehension-monitoring activities. Cognition and Instruction, 1, 117-175.

Posner, M. I., & Boies, S. J. (1971). Components of attention. Psychological Review, 78, 391-408.

Pressley, M., & Levin, J. R. (Eds.). (1983a). Cognitive strategy research: Educational applications. New York: Springer-Verlag.

Pressley, M., & Levin, J. R. (Eds.). (1983b). Cognitive strategy research: Psychological foundations. New York: Springer-Werlag.

Reder, L. M. (1979). The role of elaborations in memory for prose. Cognitive Psychology, 11, 221-234.

Richmond, B. (1985). STELLA [Computer program]. Lyme, NH: High-Performance Systems, Inc.

Simon, D. P., & Simon, H. A. (1978). Individual differences in solving physics problems. In R. S. Siegler (Ed.), Children's thinking: What develops? Hillsdale, N.J.: Erlbaum.

Snow, R. E. (1980). Aptitude and achievement. New Directions in Testing and Measurement, 5, 39-60.

Snow, R. E., & Lohman, D. F. (1984). Toward a theory of cognitive aptitude for learning from instruction. Journal of Educational Psychology, 76, 347-376.

Webb, N. M. (1984). Microcomputer learning in small groups: Cognitive requirements and group processes. Journal of Educational Psychology, 76, 1076-1088.

Table 1: Cognitive Engagement in Games (N = 48)

Engagement Form	High Ability		Low Ability		Total	
	n	%	n	%	n	%
Self-regulation (SR)	12	50.0	1	4.2	13	27.1
Task focus (TF)	4	16.7	3	12.5	7	14.6
Resource management (RM)	2	8.3	4	16.7	6	12.5
Recipience (R)	0	0	9	37.5	9	18.8
TF & RM	1	4.2	1	4.2	2	4.2
RM & SR	2	8.3	1	4.2	3	6.3
TF & SR	1	4.2	1	4.2	2	4.2
R & RM	1	4.2	3	12.5	4	8.3
RM, TF, & R	1	4.2	1	4.2	2	4.2