

Autonomy in Children's Learning: An Experimental and Individual Difference Investigation

Wendy S. Grolnick and Richard M. Ryan
University of Rochester

Ninety-one fifth-grade children participated in a study that assessed the effects of motivationally relevant conditions and individual differences on emotional experience and performance on a learning task. Two directed-learning conditions, one controlling and one noncontrolling, were contrasted with each other and with a third nondirected, spontaneous-learning context. Both directed sets resulted in greater rote learning compared with the nondirected-learning condition. However, both the nondirected and the noncontrolling directed-learning sets resulted in greater interest and conceptual learning compared with the controlling set, presumably because they were more conducive to autonomy or an internal perceived locus of causality. Furthermore, children in the controlling condition experienced more pressure and evidenced a greater deterioration in rote learning over an 8- (± 1) day follow-up. Individual differences in children's autonomy for school-related activities as measured by the Self-Regulation Questionnaire (Connell & Ryan, 1985) also related to outcomes, with more self-determined styles predicting greater conceptual learning. Results are discussed in terms of the role of autonomy in learning and development and the issue of directed versus nondirected learning.

Most educators and developmentalists would agree that learning is primarily an active process and occurs most optimally when there is internal motivation on the part of the learner to engage and assimilate information (deCharms, 1976; Thomas, 1980). Nonetheless, a variety of methods of directing or motivating learning exist that vary considerably in the degree to which the learner's internal motivation or autonomy is encouraged (Deci & Ryan, 1985; Ryan, Connell, & Deci, 1985). Thus, some methods rely heavily on external controls, pressures, and incentives, whereas others directly attempt to minimize the salience of external factors in an effort to facilitate self-determination. Furthermore, it has become increasingly evident that the motivation to learn is not solely a function of the immediate environment; it is also a function of the motivational orientation of the learner (Gottfried, 1983; Harter, 1981; Ryan & Grolnick, 1986). In this study, both individual differences in motivational style and varied environments for learning are examined as they affect children's emotional experience and cognitive performance on an ecologically relevant learning task.

The fact that learning can and does occur autonomously can

be observed by exposing children to material in the absence of specific external direction or set to learn. Congruent with major developmental perspectives (Piaget, 1971; White, 1963), children will often take spontaneous interest in and assimilate new material (Danner & Lonky, 1981). Thus, learning can take place without external direction, and in that case, it will be attributable to an internal locus of causality (Ryan, Connell, Plant, Robinson, & Evans, 1984).

Nonetheless, because spontaneous or nondirected learning is not under external control, it does not provide an answer to the question of how to motivate or direct learning in children. Nondirected learning can, accordingly, be contrasted with *directed-learning* conditions in which the learner is provided with an explicit external directive or set to assimilate specific material. Learning that occurs under directed conditions has also been called *intentional learning*, because it is assumed that subjects follow the direction provided by some external source (Klaver, 1984; T. A. Ryan, 1981).

The motivational basis of directed or intentional learning can, however, be expected to vary considerably, particularly with regard to the degree to which it is experienced as self-determined. For instance, children can be directed to learn by using external controls or rewards such as grades, evaluations, or other performance-related contingencies, in which case an external locus of causality is likely to be salient. We refer to such directives as *controlling* because they attempt to incite or control learning through external incentive or pressure. In contrast, a set to learn can also be provided in a manner that affords autonomy or self-determination and where pressure and external contingencies are nonsalient. This type of directive is more likely to foster a perceived internal locus of causality. We refer to it as autonomy affording or *noncontrolling*. We suggest that the controlling versus noncontrolling nature of directed or intentional learning conditions may result in quite divergent motivational sets and, thus, different experiential and learning outcomes.

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Correspondence concerning this article should be addressed to Richard M. Ryan, Department of Psychology, University of Rochester, Rochester, New York 14627.

The present investigation contrasts these three types of learning environments, namely those representing relatively controlling versus noncontrolling directed learning and a nondirected learning set. Specific hypotheses can be derived by considering the various contrasts: first, controlling versus noncontrolling directives to learn and, second, nondirected versus directed or "intentional" learning.

Controlling Versus Noncontrolling Conditions

McGraw (1978) provided an earlier, extensive review on the effects of extrinsic rewards and controls on performance at various learning tasks. He suggested that extrinsic rewards or controls have a differential impact depending on what type or aspect of performance is being assessed. Specifically, he argued that on algorithmic tasks, in which there is a straightforward or rote path to the solution, extrinsic incentives will often facilitate motivation and performance. On heuristic tasks, however, in which a creative, unique, or integrative solution is needed, extrinsic controls or rewards can have a deleterious effect. More recently, Amabile (1983) suggested that rewards or other external contingencies can create an instrumental focus that narrows attention and orients the subject to take the quickest and easiest solution. As a result, activities may become more goal oriented, more pressured, and less enjoyable in their own right. It is also likely that the cognitive style associated with an extrinsic focus interferes with higher level processing of information such as that required for conceptual integration that is more heuristic than algorithmic in nature (Benware & Deci, 1984; Condry & Chambers, 1978). The common theme of these studies and reviews is the contrast between salient external controls or incentives (i.e., those that are controlling) versus conditions that facilitate self-determination or autonomy.

Controlling conditions have also been shown to result in an extrinsic focus and reduced intrinsic motivation (Deci, Nezlek, & Sheinman, 1981; Lepper & Greene, 1978; Pittman, Emery, & Boggiano, 1982; Ryan, 1982). In one relevant study, Koestner, Ryan, Bernieri, and Holt (1984) examined the effects of controlling versus noncontrolling limits on a heuristic task involving creativity. In this study, experimenters set verbal limits on children's neatness at a painting task. When limits were set controllingly, both intrinsic motivation and creativity were undermined relative to the noncontrolling-limits condition and a no-limit control group. Creativity and intrinsic motivation of the two latter groups were similar, which suggested that it was not the limits per se but rather the style in which they were conveyed that accounted for the undermining effect and the reduced creativity.

Most of this previous research comparing controlling and noncontrolling conditions has focused on the effects of those conditions either on subsequent intrinsic motivation or on specialized problem solving on experimental tasks such as anagrams, puzzles, and creative products. To date, no published research has looked at the effects of such conditions on performance at more ecologically common tasks such as text learning and, particularly, both rote- and conceptual-learning outcomes. The impact of these conditions on the acquisition and organization of information is thus of applied as well as theoretical relevance. Furthermore, the controls or incentives usually employed in experimental studies involve tangible rewards or var-

ied styles of praise. In this study, we used grades, because they are perhaps the most widely employed extrinsic incentive system used to promote learning of text material, and when used controllingly, they provide a contextually relevant means of highlighting an external locus of causality (Butler & Nisan, 1986).

We predicted that learning under a controlling- versus a noncontrolling-directed-learning condition would be experienced by children as more pressured, and the task would be rated as less interesting. More centrally, we hypothesized that conceptual integration of material learned under the controlling condition would be lower than under the noncontrolling condition. In contrast, rote performance, which is relatively algorithmic in nature, was not expected to differ substantially between these two groups. Finally, we predicted that the stability or maintenance of rote knowledge would differ in response to a controlling versus a noncontrolling directive. Specifically, we suggest that when one learns in order to achieve a grade or receive a reward, then the material tends to be primarily instrumentally salient. When the goal is attained (e.g., the test completed), the material is no longer relevant and, thus, no longer warrants further processing or retention. It is thus subject to a more rapid rate of loss. Informally, we refer to this as the *core-dump* phenomenon, wherein information once force fed into the system is released following completion of the program. In contrast, information acquired under less controlling, more autonomy-affording conditions is more likely to be actively processed, accompanied by more interest, and experienced as personally relevant. It is therefore more likely to be maintained (Greenwald, 1981). Thus, we hypothesized that recall for rote material would change in the negative direction more rapidly for subjects who learned it under the controlling versus noncontrolling conditions.

In order to test these hypotheses, an experimenter asked 91 fifth-grade children to read grade-level material. The noncontrolling-directed-learning group was asked to read the material and told that they would later be asked questions about it. However, the experimenter emphasized that there would be no evaluations or grades; rather, the purpose was to see what children can learn. The intention was to create a condition conducive to the experience of autonomy in the process of learning, that is, of internal locus of causality. The controlling-directed-learning group was told to read the material and learn it because they would be graded on performance, which highlighted an external locus of causality. Emotional reactions, rote recall, and conceptual integration were assessed immediately and again at an 8-day follow-up.

Directed Versus Nondirected Learning

Both the controlling and noncontrolling conditions described earlier involve a "set" to learn specific material and knowledge that a performance assessment will follow. Thus, both represent forms of what is often called *intentional learning*—the learner is provided with a specific goal or directive to remember the material (Gottfried, 1976; T. A. Ryan, 1981). These intentional- (or directed-) learning conditions can be meaningfully contrasted with a nondirected-learning condition in which subjects are exposed to the material without a specific set to learn or knowledge of a subsequent assessment of their learning. Thus,

whatever is learned in such a condition will primarily be a function of the subject's own proneness, readiness, or tendency to learn.

A recent path analytic investigation by Ryan et al. (1984) demonstrated that in adults nondirected learning was a positive function of interest and task involvement and inversely related to negative emotional states, ego involvement, or pressure. They concluded that such spontaneous learning, when it occurs, stems primarily from natural curiosity, interest, and effectance motives (Piaget, 1981; White, 1959). Conceptually similar findings were also reported by Renninger and Wozniak (1985), who studied recall of objects within a preschool population.

In the current study, we used the nondirected-learning condition for two purposes. First, it served as a comparison group to look at the relative effects of our two learning sets versus a *no-set* condition. Furthermore, it is a substantively interesting condition in its own right. Certainly much of the learning that occurs in everyday contexts is not specifically prompted, directed, or reinforced (Brown, 1982; Neisser, 1982). If such learning is common, it would be important to study its quality and emotional concomitants.

We assumed that nondirected learning would tend to have an internal perceived locus of causality, because it is devoid of pressure or salient external control and, indeed, occurs only from the subject's own tendency or proneness. We therefore predicted that it would parallel our intentional noncontrolling condition, which shares the focus on an internal locus of causality for learning processes, and, thus, results in greater interest and less experienced pressure for subjects compared with the controlling condition. But the nondirected-learning group should display lower levels of rote learning than either directed-learning set because these latter groups both provide specific direction to learn. That is, although all subjects were asked to read the text material, only the directed groups were instructed specifically to learn it, which was expected to evoke a more focused cognitive set and activity. In contrast, we predict that the level of conceptual integration resulting from nondirected learning will be superior to that which results from controlling directed learning and comparable to the noncontrolling-directed-learning group. Here, because the subjects are autonomously approaching the material, they are expected to be least narrow in attentional span and free to actively process and integrate it. The hypotheses for conditions are summarized in schematic form in Table 1.

Individual Differences: Self-Determination for Learning

A number of researchers have demonstrated that individual differences in children's motivational orientation influence achievement-related attitudes and performance (Boggiano, Barrett, & Main, 1985; Harter & Connell, 1984). Typically, motivational orientation has been assessed along a continuum of intrinsic to extrinsic orientations toward learning (e.g., Gottfried, 1983; Harter, 1981).

In this study, the individual difference measurement was focused on the degree to which children were oriented toward engaging in school-related activities for self-determined (internal locus of causality) or non-self-determined (external locus of causality) reasons. We used a scale recently developed and

Table 1

Major Hypotheses for the Effects of Noncontrolling-Directed (NCD), Controlling-Directed (CD), and Nondirected (ND) Conditions and Individual Differences in Autonomy on the Postinduction Dependent Measures

Dependent variable	Condition effects	RAI effects
Reading interest (T_1)	NCD = ND > CD	+
Reading pressure (T_1)	CD > NCD = ND	-
Test interest (T_1)	NCD = ND > CD	+
Test pressure (T_1)	CD > NCD = ND	-
Rote recall (T_1)	CD = NCD > ND	ns
Conceptual learning (T_1)	NCD = ND > CD	+
Interest/willingness (T_2)	NCD = ND > CD	+
Rote-recall change ($T_2 - T_1$)	CD > NCD = ND	-

Note. RAI = Relative Autonomy Index. T_1 = first experimental session. T_2 = second experimental session.

validated by Connell and Ryan (1984, 1985) called the Self-Regulation Questionnaire (SRQ). This scale assesses children's reasons for doing various school activities such as homework, class participation, and classroom study and weights them on a continuum from external to internal. Intrinsic motives for doing school activities are weighted highly internally, for example, doing homework because it is fun or challenging. Reasons pertaining to strong external controls, for example, doing homework in order to avoid punishment, are weighted in the externally motivated direction. More internalized reasons for doing school-related tasks, such as one's sense of their importance for future learning or value, are intermediately weighted. The results can be summarized as a single score that taps the degree to which a child is more or less self-determined in the achievement domain. This score is called the Relative Autonomy Index (RAI; Connell & Ryan, 1985).

Individual differences in the RAI for school-related activities were hypothesized to contribute to both self-report and performance outcomes across our experimentally induced learning contexts. We predicted that across conditions children with more autonomous orientations toward school would find the task of learning more enjoyable and less pressured. We also predicted that because of their tendency toward more active, personal involvement, they would show greater conceptual-learning outcomes. Furthermore, we expected that because of their more active engagement with school tasks, higher RAI children would be more likely to integrate their learning into long-term memory and, as a result, would show better maintenance of what they learned at the follow-up session than would low-RAI subjects. Finally, we expected that as assessed at follow-up, higher RAI children would be most likely to report more interest for the learning task they had performed by reporting more willingness to do tasks of a similar nature again. Hypotheses for the RAI are also listed in Table 1.

Fifth graders were chosen as the target population for three reasons. First, research in the area of memory suggests that toward the later elementary years, children begin using active strategies to remember material (Orenstein, Naus, & Liberty, 1975) when directed to do so and have developed an adequate understanding of how memory works (Brown, 1979). Therefore, fifth-grade children were expected to respond differentially

to our directed and nondirected conditions. Second, previous research (Connell & Ryan, 1985; Ryan, Connell, & Grolnick, *in press*) has suggested that for this age group, individual differences in autonomy can be reliably and validly measured within the school domain. Third, by fifth grade, children have developed adequate reading skills such that learning and comprehension of textual material is a meaningful task.

Method

Overview

All children participated in a two-session experiment. In the first session, they were brought individually to a learning lab. They read a preliminary-grade-level text and then rated their interest/enjoyment and feelings of pressure. They then received one of three experimental inductions—controlling directed, noncontrolling directed, or nondirected—that had been randomly assigned within sex. They then read a second passage and again rated their reactions. Following these ratings, each child was asked to recall as much of the text as possible by using a free-recall paradigm. Next, conceptual integration was assessed by using an essay format. Finally, at the end of the first session, each child was given the Vocabulary subtest of the Wechsler Intelligence Scale for Children-Revised (WISC-R). Eight (± 1) days later in a group session, a separate experimenter asked subjects to complete the SRQ (Connell & Ryan, 1985), which was scored on the RAI. Free recall was subsequently reassessed, and additional supplementary ratings of the learning lab experiences were collected.

Subjects

Subjects were 91 fifth-grade children (43 boys, 48 girls) from three elementary schools in the Rochester, New York, area. Parental consent was obtained prior to participation. The children were randomly assigned by subject number and sex to one of three experimental conditions.

Procedure

The study involved two experimental sessions. In the first, subjects were seen individually on either Monday, Tuesday, or Wednesday. In Session 2, subjects who participated in the first session were seen as a group in their classroom on the Wednesday of the week following Session 1. Four subjects were absent the day of Session 2. Thus, 87 children were present for both experimental sessions. For any given child, Session 2 was conducted either 7, 8, or 9 days following Session 1.

Session 1. One of two female experimenters picked up the subject at his or her classroom and accompanied him or her to a room equipped with a table and two chairs. The child was seated at the table and given a passage from a fifth-grade social studies book to read. This first passage (Text 1) discussed farming methods from the past to the present and the effects of industrialization on food production. The child was instructed to read the passage and let the experimenter know when he or she was finished. No time limit was set for reading the passage. When the subject had finished, the experimenter administered the first *Reading Questionnaire* on which the child rated interest/enjoyment with regard to the passage, how pressured and tense he or she felt while reading, and how difficult the passage was to read. This preinduction questionnaire served primarily as a tool to make the nondirected-learning condition more plausible, because it gave subjects an ostensive reason for reading text aside from learning the material. It was also used to assure appropriate randomization by condition because reading attitudes of the three groups should not have differed prior to inductions.

After completing the first *Reading Questionnaire*, subjects were given another passage to read. Before they began, however, they received one

of three experimental inductions according to their assignment to either the noncontrolling-directed- ($N = 31$), controlling-directed- ($N = 31$), or nondirected- ($N = 29$) learning conditions. Subjects in the noncontrolling-directed condition were told:

After you've finished, I'm going to ask you some questions about the passage. It won't really be a test, and you won't be graded on it. I'm just interested in what children can remember from reading passages. Read it in whatever way is best for you.

Subjects in the controlling-directed condition were told:

After you are finished, I'm going to test you on it. I want to see how much you can remember. You should work as hard as you can because I'll be grading you on the test to see if you're learning well enough.

Finally, children assigned to the nondirected condition were told:

After you are finished, I'll be asking you some questions similar to the ones I just asked about the other passage.

Because the prior questions related only to attitudes toward and enjoyment of Text 1, children in the nondirected condition were not expecting any additional questions regarding the specific material at hand. Following these inductions, all subjects were given a new text sheet (Text 2), also drawn from a fifth-grade-level social studies book. It concerned methods of treating illness from prehistoric through modern times. Both Texts 1 and 2 were selected to represent typical grade-level readings.

When subjects had completed the passage, the experimenter asked them to fill out a second *Reading Questionnaire*, this time assessing their interest, pressure and tension, and ratings of difficulty for Text 2. Subsequently, all subjects were further tested first on their rote recall and, second, for their conceptual integration of the material from Text 2. Methods for scoring these two variables are discussed in the section on measures. After the free recall and conceptual testing were complete, the children filled out another brief supplementary questionnaire to assess aspects of their experience during testing, namely subjective effort, pressure and tension, and interest/enjoyment. This survey was labeled *Test Questionnaire*. Effort was not expected to differ for conditions, but it was checked to control for its influence on the performance variable. The controlling-directed condition was, however, expected to result in greater experienced pressure during the test because it was attached to the performance contingency of a grade. Finally, at the close of Session 1, each subject was administered the Vocabulary subtest of the WISC-R (Wechsler, 1974). We added this measure to control for group differences in verbal ability that could have influenced performance.

Session 2. A male experimenter previously unknown to subjects conducted the second session in the regular classroom groups. Students were not told of any connection between this group session and the learning lab experiment so that the SRQ (Connell & Ryan, 1985) could be administered without being associated with experimental conditions. In fact, to protect further against any contamination effect, the SRQ was given to all fifth-grade children regardless of whether they had participated in the study.

After the questionnaire was completed, the experimenter asked only the study participants to think about the individual sessions they had been in the week before. He stated, "Remember, each of you read a story about which you were asked questions. I want to see what you can still remember about that story." He then used a procedure identical to that used in Session 1 to obtain rote- and conceptual-learning assessments. All participating children then completed an additional questionnaire called "*What I Thought*." It dealt with their reactions to the initial session, specifically how much they liked the learning lab session and would be willing to do more similar activities, and how pressured they felt during it.

Measures

Reading Questionnaire. This 9-item self-report measure was administered to assess children's subjective emotional and other reactions to the reading materials. It was given twice: once following Text 1 and once following Text 2. This questionnaire assesses the experiences of interest/enjoyment (e.g., "How much did you enjoy reading the passage?"), pressure/tension (e.g., "How nervous were you when reading the passage?"), and perceptions of the difficulty of the passage (e.g., "How hard to read did you think the passage was?") on 4-point scales (1 = *not at all*, 4 = *very much*). Prior research has indicated significant relations between interest/enjoyment ratings and behavioral measures of intrinsic motivation (e.g., Harackiewicz, 1979; Ryan, Mims, & Koestner, 1983). In addition, pressure/tension ratings have been associated with externally controlling environments and self-related pressures (Ryan, 1982). A factor analysis of this scale administered following Text 1 revealed, as expected, a three-factor solution with three items loading on an interest/enjoyment factor (eigenvalue = 2.72), three on a pressure/tension factor (eigenvalue = 2.49), and three on a task-difficulty factor (eigenvalue = 1.11). A factor analysis of the administration of this questionnaire that followed Text 2 revealed a similar three-factor solution. Items loading on each factor were averaged to obtain variable scores.

Test Questionnaire. This questionnaire, similar to the Reading Questionnaire just described, was given to assess children's reactions to the rote and conceptual tasks. Nine items tapping three areas—interest, pressure/tension, and degree of effort expended—were administered. A factor analysis of this scale resulted in the expected three-factor solution, with three items loading on the interest factor (eigenvalue = 2.35), three items on a pressure/tension factor (eigenvalue = 2.84), and three on an effort factor (eigenvalue = 1.34). Variable scores represent the average of the three items on each factor.

"What I Thought" Questionnaire. This 7-item questionnaire was administered at Session 2 in order to obtain a follow-up measure of subjects' reflective emotional reactions to the initial session. Included were measures of interest and willingness to do more sessions of the same variety (e.g., "How much would you like to read some more passages like the ones you read last week?") and items assessing pressure/tension on 4-point scales. Factor analysis revealed a two-factor solution with four items loading on the interest/willingness factor (eigenvalue = 2.91) and three on pressure/tension (eigenvalue = 2.10). Again, the average of items loading on a factor was used as the variable score.

Self-Regulation Questionnaire. The 26-item SRQ (Connell & Ryan, 1985) assesses children's styles of self-regulation in the academic domain. We used it to measure individual differences in the degree to which children are self-determined with regard to school-related behaviors such as doing homework, classwork, or answering questions in class. This scale contains three subscales, which represent increasing self-regulation versus regulation by external forces, and a fourth subscale that assesses intrinsic motivation. Scale 1 (external regulation) assesses the degree to which activities are engaged in to avoid negative external consequences or because of external rules or contingencies. Scale 2 (introjected regulation) taps the degree to which behaviors are performed in order to gain or maintain teacher or peer approval, or to avoid internal contingencies such as guilt or anxiety. Scale 3 (identified regulation) assesses the degree to which behavior is engaged in to achieve self-determined outcomes such as better understanding or performance. The fourth subscale (intrinsic) assesses the degree to which school-related behaviors are performed because they are perceived as enjoyable or fun.

Each of the 26 items is worded so that the child can respond with one of four choices: *very true*, *sort of true*, *not very true*, or *not at all true* (scored from 4 to 1). Items from each subscale are then averaged to form four subscale scores. In computing the RAI, Scale 1 (external regulation) is weighted -2, Scale 2 (introjected regulation) -1, Scale 3 (identified regulation) 1, and Scale 4 (intrinsic motivation) 2. This weighting procedure is justified by the simplex structure of the measure (Guttman, 1954). This, then, forms a continuous variable from less to more

self-determined styles of motivation in the academic domain. Connell and Ryan (1984, 1985) have presented extensive evidence for the construct validity of the SRQ from four diverse school samples totaling over 2,000 children. In those studies, the RAI has been shown to correlate positively with scales of intrinsic versus extrinsic motivation (Harter, 1981), and with perceived competence (Harter, 1982) perceptions of the classroom on the origin versus pawn dimension (deCharms, 1976), it has been shown to correlate negatively with perceived control by powerful others or unknown sources (Connell, 1985). This provides multimethod evidence that the RAI adequately assesses the dimension of experienced self-determination in school.

WISC-R Vocabulary subtest. This subtest, taken from the WISC-R (Wechsler, 1974), was given in Session 1 to check for group differences in verbal abilities. The Vocabulary subtest is considered an excellent measure of verbal ability and has a strong (.74) correlation with the full-scale IQ score (Sattler, 1982). The subtest was administered according to the standard procedures outlined in the WISC-R manual.

Rote recall. To examine rote recall for meaningful text elements, we used a modified version of the propositional scoring system originally developed by Kintsch (1974) and previously described by Ryan et al. (1984). In this system, the original text is broken down into propositions, each of which consists of a predictor and arguments that can be combined by specified rules. Two independent raters, blind to the nature of the study, matched the content of the subjects' written recall protocols against the list of text propositions. For each match, a score of 1 was awarded. Intercorrelations for the two raters were .96 for Session 1 and .92 for Session 2 recall, which indicates very high consistency. The two ratings were averaged to result in subjects' rote-recall scores.

Conceptual learning. Conceptual learning was assessed by asking children to answer, in essay form, what they thought was "the main point of the text, or what the author was trying to say." Two trained independent raters scored the responses on a scale of conceptual integration that ranged from 1 (*low level*) to 5 (*high level*). Level 1 responses described an incorrect concept (e.g., the human body and how it works), Level 2 responses contained points mentioned in the passage that were peripheral (e.g., medicine men treat illness), Level 3 responses included a broader point but one that did not include the concept of the past (e.g., people get sick, and there is not enough medicine to help them), Level 4 responses included the concepts of the past and treating the ill (e.g., in the olden days many people were sick and couldn't be cured). Finally, Level 5 responses included concepts of change in people's ability to cure illness over the years or improvement in medical care and knowledge (e.g., in the past there were no cures but now in modern times we have medicine). Two trained raters, blind to condition, independently rated the responses from both Sessions 1 and 2. Interrater reliability as assessed by Pearson correlations was .88 and .89 for Sessions 1 and 2, respectively. Subjects were assigned the average of the two raters' scores.

Results

Preliminary Analyses

A 3×2 (Condition $\times$ Sex) analysis of variance (ANOVA) was performed on all dependent measures in order to examine main effects or interactions for the sex variable. Two main effects emerged, one on subjects' ratings of difficulty on the preinduction Reading Questionnaire pertaining to Text 1, $F(5, 85) = 4.26, p < .04$, and a second on the Session 2 measure of conceptual learning, $F(5, 81) = 5.40, p < .03$. Girls scored higher than boys on both of these variables. There were no significant Condition $\times$ Sex interactions.

We performed the same 3×2 (Condition $\times$ Sex) ANOVA on the WISC-R Vocabulary and RAI variables to check for sex effects and for appropriate randomization across conditions for

Table 2
One-Way Analysis of Variance and Planned Comparison Results for Predicted Condition Effects on Postinduction Dependent Measures Derived From Experimental (T₁) and Follow-Up (T₂) Sessions

Dependent variable	F	Planned comparison	t
Reading interest (T ₁)	3.85**	NCD = ND > CD	2.23**
Reading pressure (T ₁)	9.70***	CD > ND = NCD	4.12***
Test interest (T ₁)	1.83	—	—
Test pressure (T ₁)	3.62**	CD > NCD = ND	2.21**
Rote recall (T ₁)	4.46**	NCD = CD > ND	3.18***
Conceptual recall (T ₁)	3.72**	NCD = ND > CD	2.63**
Interest/willingness (T ₂)	.12	—	—
Rote-recall change (T ₂ - T ₁)	3.33**	CD > NCD = ND	2.13*

* $p < .10$.

** $p < .05$.

*** $p < .01$.

verbal ability and motivational orientation. No main effects or interactions were revealed. All remaining analyses were collapsed across the sex variable.

To determine whether the amount of time between the initial and follow-up sessions influenced either conceptual or rote recall at follow-up, a three-way ANOVA was performed. The three groups were comprised of children in the three interval groups (7, 8, or 9 days), and dependent variables were conceptual- and rote-recall indices. The results of these analyses indicated that there were no differences between the groups of children on any of the follow-up performance measures. Data were collapsed across time interval for subsequent analyses.

Condition Effects

We performed a one-way ANOVA on the ratings of interest, pressure, and difficulty for Text 1 that were administered prior to experimental inductions. As expected, no main effects for condition were obtained.

To test for effects of the three conditions, one-way ANOVAs were also performed on the postinduction variables. When ANOVAs were significant ($p < .05$), we performed planned comparison t -tests for hypothesized effects (as outlined in Table 1). Table 2 presents F values for the one-way ANOVAs and t values for the planned comparisons. Means and standard deviations for the hypothesized effects are presented in Table 3.

Analyses for Text 2 interest indicate that as predicted, children in the noncontrolling-directed and nondirected conditions found the reading material more interesting than did those in the controlling-directed condition. Children in the controlling-directed condition experienced more pressure and tension while reading the text than did those in either the noncontrolling-directed or nondirected conditions who experienced comparable levels. As expected, there were no condition effects for rated difficulty.

Next, one-way ANOVAs were performed on the Test Questionnaire variables that tapped subjects' experiences with regard to the performance assessment. Subjects in the three conditions did not differ in their reported interest or effort. However, subjects in the controlling-directed condition experienced more

pressure than did those in either the noncontrolling-directed or nondirected groups.

Condition effects were also obtained on the performance variables assessed at Session 1. Rote recall differed across the three conditions, with the two intentional-learning groups (noncontrolling and controlling-directed) exhibiting greater rote recall than the nondirected group. Conceptual recall also differed by condition, with noncontrolling-directed and nondirected subjects evidencing greater conceptual learning compared with their controlling-directed counterparts, as predicted.

To test the hypothesis that controlling-directed subjects would show sharper decreases in propositional recall between Sessions 1 and 2 than would the noncontrolling-directed and nondirected groups, a repeated measures ANOVA (Condition $\times$ Time) was performed. The results indicated a significant Condition $\times$ Time effect, with controlling-directed subjects evidencing a sharper decrease in propositional recall compared with the other groups. But because the controlling-directed subjects had recalled more propositions initially, they also had more potential to lose information. Inspection of the means for propositional recall at Session 2 revealed that noncontrolling-directed subjects had a nonsignificant advantage over the other two groups. No condition effects were in evidence for the measures derived from the "What I Thought" Questionnaire that was also given in Session 2.

Individual Difference (RAI) Effects

Before performing the analyses examining the effects of the RAI on the various dependent variables, a separate analysis was obtained to check for possible RAI $\times$ Sex interactions. To accomplish this, the RAI variable was entered first into a hierarchical regression analysis followed by sex, which entered as a contrast coded variable, and finally by the RAI $\times$ Sex interaction. No RAI $\times$ Sex interactions were obtained on any variables. Second, the correlation between RAI and WISC-R Vocabulary was computed to ensure that performance differences owing to RAI could not be attributed to its relation with ver-

Table 3
Means for Hypothesized Noncontrolling-Directed, Controlling-Directed, and Nondirected Condition Effects on Postinduction Performance and Self-Report Variables From Experimental (T₁) and Follow-Up (T₂) Sessions

Dependent variable	Non-controlling directed		Controlling directed		Non-directed	
	M	SD	M	SD	M	SD
Reading interest (T ₁)	3.12	0.62	2.92	0.76	3.39	0.54
Reading pressure (T ₁)	1.62	0.51	2.13	0.59	1.62	0.43
Test interest (T ₁)	3.13	0.58	2.89	0.75	3.18	0.53
Test pressure (T ₁)	2.17	0.58	2.66	0.75	2.45	0.79
Rote recall (T ₁)	12.41	5.72	14.45	8.10	9.62	4.30
Conceptual learning (T ₁)	3.79	1.15	3.22	1.19	4.02	1.15
Interest/willingness (T ₂)	2.82	0.86	2.93	0.82	2.86	0.76
Rote-recall change (T ₂ - T ₁)	-2.02	4.22	-4.16	6.04	-0.96	3.57

Table 4

F Values and R²s From the Hierarchical Regression Analyses Examining the Effects of Relative Autonomy Index (RAI), Condition, and Condition × RAI Interactions on the Postinduction Dependent Variables From Sessions 1 (T₁) and 2 (T₂)

Dependent variable	RAI		Condition		Condition × RAI interaction		Total R ²
	F (1, 88)	R ²	F (2, 87)	R ²	F (2, 85)	R ²	
Reading interest (T ₁)	3.84*	.048	2.51*	.050	1.02	.003	.102
Reading pressure (T ₁)	11.99***	.136	9.02***	.148	0.14	.027	.311
Reading difficulty (T ₁)	1.01	.013	0.95	.020	1.30	.024	.057
Test interest (T ₁)	7.74***	.092	1.59	.032	1.00	.022	.146
Test pressure (T ₁)	1.07	.014	2.74*	.055	1.40	.030	.099
Test effort (T ₁)	0.05	.001	0.65	.013	5.00***	.110	.123
Rote recall (T ₁)	0.08	.001	4.30**	.086	1.42	.028	.115
Conceptual (T ₁)	7.93***	.095	4.57**	.086	0.83	.016	.197
Dependent variable	RAI		Condition		Condition × RAI interaction		Total R ²
	F (1, 84)	R ²	F (2, 83)	R ²	F (2, 81)	R ²	
Interest/willingness (T ₂)	11.42***	.131	0.90	.018	1.83	.035	.184
Pressure (T ₂)	2.26	.029	0.36	.009	0.04	.001	.039
Rote recall (T ₂)	1.36	.018	0.65	.015	3.70**	.079	.112
Conceptual (T ₂)	4.49**	.056	1.63	.035	0.35	.008	.098
Rote-recall change (T ₂ - T ₁)	2.66*	.034	3.40**	.068	0.07	.001	.101

* $p < .10$. ** $p < .05$. *** $p < .01$.

bal ability. As expected, no significant relation was evident ($r = .12$, *ns*).

For all subsequent analyses, the effects of RAI were estimated by using hierarchical regression analyses entering the RAI first, followed by conditions, followed by RAI × Condition interactions. In each analysis, the main effects for condition were entered as contrast codes, that is, noncontrolling-directed and nondirected (1) versus controlling-directed (-2) and noncontrolling-directed (-1) versus nondirected (1). The interactions of the RAI and conditions were entered as the cross products of the RAI and the contrast codes. The R^2 for the RAI and the incremental R^2 for conditions and for the RAI × Condition interactions were then tested for significance by using a procedure recommended by Cohen and Cohen (1983). These results are presented in Table 4.

The first such analysis was performed on the three factors derived from the Reading Questionnaire for Text 1, namely perceived interest, pressure, and text difficulty. RAI effects were apparent only for the pressure variable, $F(1, 88) = 3.24$, $p < .10$. This marginal finding suggested that children with lower self-determined orientations experienced greater pressure during this preinduction task.

For the Text 2 Reading Questionnaire, the RAI significantly predicted experienced pressure and marginally predicted interest in the hypothesized direction. The higher the child's RAI, the less the pressure and the greater the interest reported. There was no effect of RAI on perceived difficulty.

The Test Questionnaire measured subjective reactions to the performance assessment. The RAI again marginally predicted the interest variable, with higher RAI associated with greater interest while taking the test. Pressure and subjective effort were unrelated to the RAI.

The hypothesized effect of the RAI on conceptual learning

was obtained; more self-determined orientations were associated with higher levels of conceptual learning. The main effect of RAI on rote learning was, however, nonsignificant.

At Session 2, RAI was strongly predictive of children's reported interest in the task and willingness to do more subsequently as assessed via the interest/willingness factor of the "What I Thought" Questionnaire, $F(1, 84) = 11.42$, $p < .01$. Session 2 ratings of pressure during Session 1 were unrelated to RAI.

The follow-up measures of conceptual and rote learning related to the RAI in a pattern similar to the initial assessment. That is, conceptual learning was positively associated with the RAI, whereas rote recall remained unrelated. The RAI, however, was marginally negatively associated with the change in rote recall from Session 1 to Session 2, $F(1, 84) = 2.66$, $p < .10$, which indicated that children with higher self-determined orientations had a tendency to lose less information between the two sessions.

RAI × Condition Effects

The results revealed only two significant Condition × RAI interactions. The first occurred on the measure of rote recall assessed at the follow-up session. Analysis of the interaction accounting for the set effect revealed that the RAI was strongly and positively correlated with rote learning for subjects in the nondirected condition but unrelated to recall within either the controlling-directed or noncontrolling-directed groups, $F(1, 81) = 3.96$, $p < .05$. The second interaction occurred for subjects' subjective report of effort while taking the test, and again, it primarily involved the nondirected condition, $F(1, 86) = 6.35$, $p < .05$. This interaction indicated that within the nondirected group, lower self-determination scores were associated

with greater perceived effort, whereas RAI was unrelated to effort ratings in the other two conditions.

The regression analyses depicted in Table 4 present condition effects controlling for the effects of RAI. These condition results can be meaningfully contrasted with those in Table 2, which present effects of the manipulation across variations in the RAI variable. Comparison of these tables indicates a highly similar pattern of findings, which suggests that the main effects of conditions and the RAI on the dependent variables were relatively independent.

Discussion

In this study, we examined the impact of environmental conditions and children's motivational orientations on learning outcomes. Two directed-learning conditions, one noncontrolling and one controlling, were contrasted with each other and with a third nondirected-learning condition. All three environments resulted in learning, but of different types, and all were accompanied by different subjective responses on the part of the children who performed within them.

The two directed, or intentional, learning sets were superior to the nondirected condition in producing recall of propositions. By orienting subjects to the task of learning, greater attention was undoubtedly paid to details, and accuracy of recall was increased. It also appears that controlling- and noncontrolling-directed-learning sets were equally efficacious in producing rote performance approximately one week later. But subjects directed to learn in the more controlling manner evidenced a greater deterioration in rote recall over the 8- (± 1) day follow-up, which suggests that material learned under strong external pressures may be less likely to be maintained.

In contrast, conceptual learning was facilitated by both the nondirected- and the noncontrolling-directed-learning sets relative to the controlling condition. We suggest that the integration of learning requires active processing and organization that is more likely to occur under conditions conducive to a perceived internal locus of causality (i.e., those where there is more autonomy afforded). This notion is supported by subjects' self-report in that children in the controlling condition felt more pressured and somewhat less interested than those in either the nondirected or noncontrolling-directed environments.

The particular strategy used in this study to motivate learning in a controlling manner was intentionally designed to produce a perceived external locus of causality. Undoubtedly, the grade contingency created an atmosphere of evaluation apprehension that, although effective in prompting a high level of rote learning, undermined interest and active integration of the material. This finding supports Smirnov's (1973) observation that some types of learning sets may hinder comprehension of text materials by making the mnemonic task "too dominant." The findings are also congruent with McGraw's (1978) idea that salient external constraints narrow the task focus and interfere with heuristic outcomes. It is not unreasonably speculative to argue that grades as traditionally used in schools often result in the perception of an external locus of causality, produce pressure, and result in force-fed, poorly integrated and maintained learning. Nonetheless, grades can also be administered in more informational styles. That is, they can be used in a way that emphasizes

competence feedback rather than control and that accordingly produces less deleterious effects (Ryan et al., 1985).

Children's individual differences also proved to be of importance in predicting subjective and performance outcomes. In particular, more self-determined styles as indexed by the RAI were associated with greater conceptual learning across conditions. Again, this suggests that the more internal the locus of causality for learning, that is, the more autonomous the process, the more integrated the products of the activity will be.

Although not specifically predicted, the intriguing interaction between learning conditions and the RAI on the follow-up rote-recall measure deserves interpretation. The RAI predicted follow-up recall primarily within the nondirected condition, but not in either of the directed-learning sets. This interaction suggests that individual differences may exert their greatest influence when situational constraints and direction are least salient, a point made long ago by personological theorists (Allport, 1937; Murray, 1938).

Several aspects of the present methodology limit the degree to which the results can be generalized across both age and circumstance. First, because only a single age group was used, the applicability of these findings across the life span remains untested. Theoretically, however, we suggest that this pattern should be replicable at all ages in which voluntary memory is developmentally evident. A second caution applies to our discussion of conceptual learning. We used only a single measure of conceptual integration that was developed specifically for this material. Future studies using other paradigms to assess memory integration and concept formation would enhance the generalizability of the findings. Nonetheless, both the individual difference and condition results of the present study suggest, albeit tentatively, that conceptual learning may be optimized under conditions that facilitate active, autonomous involvement on the part of the learner. These findings also fit with the major developmental and organismic theories that underscore the role of autonomy or self-determination in children's assimilation of that which surrounds them.

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