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Use of Techniques Promoting Students' Self-Determination: Effects on Students' Analytic Problem-Solving Skills[1]

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Based on self-determination theory (Deci & Ryan, 1985, 1987, 1991), we assessed the effect of controlling strategies and restricted choice options on students' performance on analytic reason problems. Subjects in the controlling-directives condition were told by their "teacher" that a given strategy was the way students "should" solve a set of analytical problems. Although subjects in the noncontrolling-directives condition were taught the same strategy, they were encouraged to use any strategy they chose to solve the identical problems. The results indicated, as predicted, that subjects in the controlling-directives condition performed significantly worse than subjects in the noncontrolling-directives condition on a subsequent set of analytic reasoning problems, when tested by an experimenter who was unaware of a subject's condition. Interestingly, subjects in the controlling-directives condition regarded the teacher as qualitatively more competent than noncontrolling-directives subjects, in spite of their poorer performance. Furthermore, feelings about the task, mood differences, or perceptions of performance as a function of condition did not account for these findings. The data are discussed as they relate to the theoretical and practical import of the deleterious use of controlling techniques in a number of contexts, as well as adults' erroneous beliefs about controlling strategies.

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An impressive body of research demonstrates that the use of controlling techniques promotes an extrinsic set in students, i.e., encouraging them to perform activities for external reasons such as evaluation or reward decreases their subsequent intrinsic interest in those activities when the extrinsic reason for task performance no longer is present (Boggiano & Pittman, 1992; Deci & Ryan, 1985, 1987; Harter, 1992; Lepper & Greene, 1978). The most frequently invoked theory to account for these findings is self-determination theory (Deci & Ryan, 1985, 1987; see also Harter, 1978): Under conditions in which controlling strategies or directives are used to induce students to undertake a variety of activities, students' feelings of self-determination are reduced and an extrinsic set is engendered, thereby undermining later intrinsic motivation for these activities.

The present experiment examined the effects of the use of teachers' controlling directives on students' performance on analytical reasoning problems. We proposed that directives which theoretically reduce students' sense of self-determination regarding task regulation (e.g., "You should do X in Y manner"), which, of course, is the inverse of choice, would have detrimental effects on subsequent problem-solving skills.

Why should a sense of attenuated self-determination, i.e., feeling controlled about task regulation or management, impair performance? Based on self-determination theory (Deci & Ryan, 1987) and comparable theoretical vantage points (e.g., Csikszentmihalyi, 1975), feelings of self-determination when undertaking an activity are autotelic and lead to complete involvement with the task at hand. Thus, the person should think and integrate information in a more flexible, less rigid manner. This orientation should produce the optimal mindset for deep, conceptual processing and integration of information.

Conversely, under conditions in which a person undertakes a task in a teleological manner—i.e., for extrinsic reasons or because of pressure from self or others—the absence of self-determination may well produce functional fixedness (McGraw, 1978), thereby impairing the ability to consider the range of useful and often optimal strategies to solve the target task. Hence, an expediency approach may be adopted, and subsequent performance outcomes for students may be qualitatively inferior relative to students not provided with controlling directives.

Several studies have shown results consistent with the notion that controlling statements ("You should do X") have a negative impact on a variety of achievement-related behaviors. In a field experiment, Flink, Boggiano, and Barrett (1990) demonstrated that to the extent that teachers pressured to have their students perform well used controlling statements (e.g., "You should do the task in this manner"), and therefore provided few choice options, children's performance on moderately difficult activities (i.e., story sequence puzzles, anagrams) were significantly worse than when teachers used relatively fewer controlling statements, and thus afforded more choices regarding paths to task solution. Thus, a sense of self-determination, operationalized here as the assumption that one is responsible for the initiation and regulation of activities, is assumed to be an integral component of conceptual learning (see Deci & Ryan, 1987). In Deci and Ryan's terms, "Self-determined behaviors involve a true sense of choice, a sense of feeling free in doing what one has chosen to do. Controlling behaviors...are compelled by some internal or external force; the person feels like he or she *has* to do them..." (Deci & Ryan, 1991, p. 251).

Findings from experimental studies in laboratory settings are also consistent with this proposition. More specifically, several interesting experiments have examined the effect of controlling techniques on achievement behaviors after the strategy is no longer operative, and subsequent performance is assessed by an experimenter blind to condition. This type of methodology minimizes the possibility that distraction as opposed to feelings of self-determination accounts for performance impairment (Lepper & Greene, 1978; Ross, Karniol, & Rothstein, 1976; Smith & Pittman, 1978). In one study, for instance, students who were told they would be tested on difficult material demonstrated attenuated conceptual performance, as assessed by quality of essays (Grolnick & Ryan, 1987). Further, the use of directives such as "You're doing as you *should*" has been found to lower intrinsic motivation, regardless of whether the controlling directives was administrated by self or an experimenter (Ryan, 1982; see also Ryan, Mims, & Koestner, 1983). The use of "oughts" and "shoulds" has also been found to reduce preference to master challenging tasks (Boggiano, Main, & Kats, 1988) and creativity (Koestner, Ryan, Bernieri, & Holt, 1984).

The studies described above examining the effect of controlling strategies on students' performance have used techniques that overtly communicated to students that their performance would be evaluated or compared to that of others. Indeed, in some studies, students felt pressured and tense after being told they would be tested (Groenick & Ryan, 1987). Thus, it may well be anxiety or dislike of the experimenter and not feeling "controlled" that mediates quality of performance. In addition, the few studies examining the effects of controlling strategies on performance have used moderately difficult tasks as dependent variables. If controlling strategies have as marked effects on deep conceptual processes as as-

sumed, the ability to solve extremely difficult analytic problems [e.g., analytic problems used on the Graduate Record Examination (GRE)] should be significantly impaired in comparison to when such directives are not present.

The primary purpose of the present experiment, then, was to assess the effects of controlling directives on students' performance at analytic reasoning problems by restricting choice options. For this purpose, subjects were assigned randomly to either a condition including controlling directives or not. Students were provided with instructions taken *directly* from the GRE booklet published by Educational Testing Service designed to optimize performance on GRE problems[3]. In our controlling-directives condition, the teacher's directives explicitly informed subjects that the use of *her* strategies would optimize performance. Subjects assigned to the noncontrolling-directives condition, on the other hand, after receiving the *identical* hints and strategies provided to their counterparts by the same "teacher," were encouraged to select any methods or approaches that subjects believed would optimize their performance. If an important component of perceptions of self-determination—operationalized here as a sense of *choice* about use of strategies to perform activities—is a critical determinant of conceptual learning, then performance impairment would be evidenced as a result of controlling techniques that reduced a sense of self-determination relative to a condition in which controlling directives were not provided. If this hypothesis were confirmed, an important assumption of self-determination theory—that choice impacts the quality of performance–would be supported. In addition, a study using a procedure that minimizes concern about the dislike of the experimenter and/or feelings of pressure and anxiety would render alternative explanations of this study less likely.

Our major prediction, then, was that controlling directives that theoretically are assumed to lower feelings of self-determination should produce low performance on a highly difficult task relative to subjects exposed to instructions that were less directive about task regulation. In addition, we expected that performance differences would not be a result of differential liking for the teacher and/or mood state (e.g., anxiety) of the students. We also included a rote task along with our conceptual task to assess the extent to which the manipulation would generalize even to a very easy task. Finally, based on our previous findings that controlling teachers are consistently seen as more competent (Flink et al., 1990),

[3]Instructions were taken from page 31 of the *Graduate Record Examination* 1991–1992 *Registration and Information Bulletin* published by the Educational Testing Service (Educational Testing Service, 1991).

we assessed student attitudes toward their teacher as a function of condition.

STUDY 1

Our first study was designed to examine directly the question of whether students given our controlling-directives manipulation would feel controlled, i.e., have lower feelings of self-determination, than subjects given our noncontrolling-directives manipulation.

Method

Subjects

Thirty-four students (18 females, 16 males) participated in the experiment in partial fulfillment of requirements for an introductory psychology course at the University of Colorado at Boulder. Subjects participated in groups averaging five per group.

Procedure

Groups were randomly assigned to one of the two conditions. Eight males and 6 females were assigned to the controlling-directives condition (CD), and 8 males and 12 females were randomly assigned to the noncontrolling-directives (NCD) condition.

The same female experimenter taught all groups, using prewritten scripts designed either to control task regulation by offering choice over strategy selection or not. In each session, the experimenter told subjects that, as a student in the School of Education, she was to be evaluated by the subjects after the session on her teaching methods. She explained that she would teach them how to solve analytic reasoning problems and that, when the learning phase was completed, another person would distribute evaluation forms and testing materials. She encouraged the subjects to be frank in their evaluations. The two scripts varied only in the way the material was presented, *not* in actual information provided to the subjects. To afford students in the noncontrolling-directives condition a sense of regulation over task strategy, they were given 5 min during the 25-min interval to practice problems on their own, whereas subjects in the controlling-directives condition were not given this choice option, and simply practiced problems during the 5-min interval *with* the teacher, using the

strategies she had described. Thus, identical strategies were taught, and the number and type of hints delivered and time to work on the problems (either with the teacher or not) in both scripts did not differ. The presentation of the problems, hints, and strategies for solving the problems in both conditions were taken from the GRE information bulletin published by ETS [see Appendix A (p. 21) for sample problem, hints, and strategies employed in the present study]. In the controlling-directives condition, partial wording of instructions, taken directly from the ETS booklet, were emphasized (italicized below). The experimenter introduced the analytical reasoning problems for subjects in the controlling-directives condition in the following way:

> It is my job as your teacher to ensure that you learn how to solve analytical reasoning problems. I am going to show you what I believe to be a useful way to go about solving these types of problems. Although there are other ways to do them, the hints I give you will help to ensure high performance overall. The conditions *should* be read carefully to determine the exact nature of the relationships involved. (ETS, 1991, p. 31)

In the noncontrolling-directives script, the experimenter did not use controlling directives and introduced the analytical reasoning task in this way:

> I just want you to do the best you can with the information you are given. I am going to teach you a method for solving analytical reasoning problems; however, it will be up to you to decide what methods will work best for you to ensure the best performance overall. You may want to think about the condition carefully to determine the exact nature of the relationships involved.

After subjects finished the analytic reasoning tasks, the teacher left the room and a second experimenter, unaware of the manipulation and the experimental hypotheses, entered the room and asked subjects to complete a question that simply asked them how self-determined they felt (i.e., how much freedom they felt they would have to approach the task as they wanted). Subjects were then fully debriefed about the hypotheses of the study.

Results

Subjects' responses to the question asking how self-determined they felt was examined by a 2 (CD vs. NCD) × 2 (Males vs. Females) ANOVA. Initial analyses examined group effects. As neither this effect nor any interactions involving this effect approached significance, this factor was dropped and the analyses repeated. The same experimenter, unaware of condition and hypotheses, administered the dependent measures to all subjects. As expected, subjects given the controlling-directives script reported lower feelings of freedom regarding task regulation than subjects given the noncontrolling-directives script [$F(1, 30) = 12.64, p < .001$; CD $M = 4.21$ vs. NCD $M = 5.65$]. In addition, there was a significant gender-by-condition interaction, $F(1, 30) = 4.55, p < .05$, indicating that in the controlling-directives condition, girls felt significantly lower feelings of freedom regarding task regulation than boys, $t(30) = 4.70, p < .05$ ($M = 3.33$ vs. 4.75, respectively).[4]

STUDY 2

The results of our first study provided clear support for the hypothesis that our controlling-directives script undermined subjects' feelings of self-determination relative to our noncontrolling-directives script. Our primary question of interest, however, which we examined in our second study, was a direct examination of the effect of controlling versus noncontrolling directives on performance on a conceptually difficult task. To examine this issue, subjects in our second study were exposed to the same scripts employed in study one (controlling vs. noncontrolling) and their subsequent performance, mood state, and perceptions assessed. We did not assess subjects' feelings of self-determination since such priming of attitudes may have impacted performance (nor would students in naturalistic settings be exposed to this type of question before task completion).

Method

Subjects

Eighty-three students (40 females, 43 males) participated in the experiment in partial fulfillment of requirements for an introductory psychology course at the University of Colorado at Boulder. Subjects participated in groups averaging five per group.

Procedure

Groups of subjects were randomly assigned to one of the two conditions, with 23 males and 17 females being assigned to the CD condition,

[4]In addition, although this was not the primary focus of the study, results revealed that subjects taught with the controlling-directives script solved fewer analytic reasoning problems than subjects taught with the noncontrolling-directives script, although this finding was only of marginal significance, $F(1, 30) = 3.33, p < .08$ ($M = 3.71$ vs. $M = 4.70$ for subjects in the controlling-directives and noncontrolling-directives conditions, respectively).

and 20 males and 23 females randomly assigned to the NCD condition. The procedure was identical to that of study one up to the point at which the second experimenter entered to hand out the dependent measures. In study two, subjects completed four packets of materials: (1) a mood questionnaire, (2) a new set of different analytic reasoning problems, (3) a questionnaire assessing perceptions of their performance as well as their perceptions of the task and teacher, and (4) a set of multiplication problems.

Subjects always completed the mood questionnaire first, but the remaining three packets were counterbalanced across subjects. Although subjects were not given time limits for completing the questionnaires, they were given 10 min to complete three analytic reasoning problems and 6-min to complete 18 multiplication problems (the same ordering of packets was used within each group administration of subjects because of the timed measures). For example, one group of subjects may have received the following order of packets: mood questionnaire, analytic reasoning problems, perceptions questionnaire, multiplication problems; whereas another group may have received this order: mood questionnaire, multiplication problems, perceptions questionnaire, analytic reasoning problems. After finishing their packets, subjects were debriefed and thanked for their participation.

Dependent Measures

Mood Questionnaire. To assess affect, subjects rated 30 mood adjectives using 1- to 7-point scales: 1 = the adjective definitely *did not* describe the subject's mood, 7 = the adjective definitely *did* describe the subject's mood. The adjectives were *cooperative, affectionate, lucky, offended, cheerful, patient, good-natured, angry, enthusiastic, sad, sociable, successful, nervous, good, impatient, annoyed, stressed, capable, calm, worrying, hopeless, rejected, interested, warm, irritated, bored, hostile, friendly, helpful,* and *pleasant.*

Analytic Task. Three sample analytic reasoning problems were taken from a Graduate Record Exam information booklet. The problems were composed of a set of related statements or conditions describing the structure of relationships; and the subjects completed three or more questions for *each* problem, testing their understanding of that structure. The problems required the subjects to deduce new information from the stated relationship and to assess conditions used to establish the structure of the relationship. (See Appendix A for a sample problem.)

Multiplication Task. The subjects also received a set of 18 multiplication problems as a rote generalization task. All the problems contained two numbers, from 100 to 999, which were multiplied by hand in the time allotted.

Performance, Task, and Teacher Perception Questionnaire. This questionnaire was designed to examine the effects of the manipulation on subjects' perceptions of the task, the teacher, and of their own performance. Subjects rated on a scale of to 7 (1 = least positive rating, 7 = most positive rating) how much they enjoyed solving the analytic reasoning problems (task), how effective they though the teacher was, how helpful they found the teacher's hints and strategies, and how much they liked the teacher (teacher), and how well they thought they performed in solving the analytic reasoning problems. The order of the questions within this questionnaire was counterbalanced across subjects.

Results

All analyses were conducted using a 2 (manipulation: CD × NCD) × 2 (gender: Males vs. Females) ANOVA. Again, initial analyses examined group effects. As in study one, none was found; thus, this factor was dropped and the analyses repeated. The presentation of the results is divided into the following sections: performance differences, perceptions of performance and the task, mood differences, and perceptions of the teacher and teaching strategies.

Performance Differences

As predicted, subjects taught with the controlling-directives script performed significantly worse on the analytic reasoning problems, as indicated by the number of correct answers, than those taught with the noncontrolling-directives script, $F(1, 79) = 5.90$, $p < .02$, $M = 3.01$ and 3.76, respectively. Thus, use of a script, containing controlling directives detrimentally affected subjects' performance in solving analytic problems relative to the condition which did not contain controlling directives. There were no significant gender differences, nor an interaction between gender and the manipulation. Also, the controlling-directives versus noncontrolling-directives script did not affect subjects; performance on the generalization rote multiplication task, $F(1, 79) = .03$, n.s., $M = 6.34$ and 6.43, respectively. Again, no significant gender differences or interactions were obtained.

Perception of Performance and the Task

Even though subjects in the two groups differed in the number of analytic reasoning problems solved correctly, their perceptions of how well

they performed did not. The groups rated themselves as performing equally well, $F(1, 79) = 1.24$, n.s. (NCD $M = 4.97$; CD $M = 4.60$). Students' perceptions of their performance and their actual performance were significantly correlated for both groups [$r\ (41) = .44$ ($p < .01$) for the noncontrolling-directives conditions, and $r\ (39) = .31$ ($p < .05$) for the controlling-directives condition]. In addition, their self-reported task enjoyment did not differ as a function of condition, $F(1, 79) = .26$, n.s. (NCD $M = 4.42$, CD $M = 4.57$). However, the correlation between task enjoyment and performance was significant for subjects in the noncontrolling-directives condition [$r\ (41) = .32$, $p < .05$], but not in the controlling-directives condition ($p < .35$). There were no gender effects or interactions for either variable.

Mood Differences

To determine whether the controlling manipulation affected mood, we conduced a factor analysis on the 30 mood adjectives rated by subjects immediately after the teaching session. The adjectives were submitted to a principle-components factor analysis, using varimax rotation. Examination of the scree plot of eigenvalues indicated that there were three factors with eigenvalues substantially higher than the remaining factors [see Appendix B (p. 22) for the factor loadings on the three factors]. These three factors reflected the following mood states: Factor I (eigenvalue = 8.89, accounting for 29.6% of the total variance) reflected positive affect; Factor II (eigenvalue = 3.45, accounting for 11.5% of the variance) reflected negative affect, and Factor III (eigenvalue = 2.82, accounting for 9.4% of the variance) reflected feeling stressed. To examine whether subjects' mood states were affected by the controlling versus noncontrolling manipulation, factor scores on each of the three factors were examined by 2 (NCD vs. CD) × 2 (Males vs. Females) ANOVAs. There were no effects of condition, gender, or their interaction on any of the three factors.[4]

[4]We conducted additional analyses of the mood questionnaire to determine whether a subset of the items that best tapped emotion might account for our performance results. We recruited an additional 12 subjects and asked them to select the words they felt best reflected emotions. Theses subjects were in complete agreement on 10 words: annoyed, irritable, hostile, nervous, worried, calm, sad, cheerful, angry, and pleasant. These 10 words were subjected to a factor analysis and produced three factors that paralleled the ones presented above (i.e., factors reflecting positive, negative, and anxious/stressed moods). Employing the analyses discussed above, we found none of the mood factors to be affected by our manipulation, gender, or their interaction. In fact, there were no performance differences as a function of condition on any of the 30 mood adjectives.

Perceptions of the Teacher and Teacher Strategies

Subjects' perceptions of the teacher were assessed by four questions: (1) how much they thought the teacher facilitated their learning to solve the analytic reasoning problems, (2) how helpful they found the teacher's hints and strategies, (3) how effective they found the teacher, and (4) how much they liked the teacher. These four questions were examined by a 2 (CD vs. NCD) × 2 (Males vs. Females) MANOVA, and a significant multivariate effect for the manipulation was found (Wilks's lambda = .86, $p < .03$). There was no effect for gender or the interaction. Subsequent univariate analyses indicated that, interestingly, the significant multivariate effect was accounted for by subjects in the controlling-directives condition giving the teacher *higher* ratings than subjects in the noncontrolling-directives condition on all of the questions except teacher liking, on which the two groups did not differ (NCD $M = 5.93$ vs. CD $M = 5.76$; $F < 1.0$). Subjects in the controlling-directives condition gave the teacher significantly higher ratings than subjects in the noncontrolling-directives condition for how helpful they found the teacher's hints [NCD $M = 5.41$ vs. CD $M = 4.61$; $F(1, 77) = 5.55$, $p < .03$]; how they rated the teacher at facilitating their learning [NCD $M = 5.04$ vs. CD $M = 4.44$; $F(1, 77) = 3.78$, $p = .05$]; and marginally in how effective they found the teacher [CD $M = 5.84$ vs. NCD $M = 4.60$; $F(1, 77) = 354$, $p = .06$]. There were no gender effects or interactions for any of these variables.

Finally, we were concerned that differences in performance might be due to subjects' perceptions of the teacher rather than to the manipulation *per se*. Therefore, we conducted an analysis of covariance, covarying out perceptions of the teacher (e.g., liking, effectiveness, hint helpfulness, and facilitation) in the same factorial design outlined previously. The finding that those exposed to the controlling-directives script performed worse on the analytic reasoning problems than those exposed to the self-determined script remained significant, $F(1, 71) = 6.03$, $p < .02$.

DISCUSSION

The data obtained from our studies indicated that, as predicted, when exposed to instructions controlling task regulation—i.e., the absence of choice options to use methods for problem solving—subjects performed significantly worse on subsequent problems that were different from, but comparable in difficulty level to, the target task relative to subjects in the noncontrolling-directives condition. Although the manipulation affected performance level on additional different analytic reasoning problems,

there was no generalization effect for performance on the rote task. Neither subjects' mood states nor liking for their teacher produced these differences. In fact, students given controlling directives gave the teacher significantly higher ratings (with regard to indices of competence) than did students in the noncontrolling-directives condition. Thus, it appears that constraint of freedom about ways of approaching the activity, and not negative mood nor negative feelings about a "controlling" teacher, is itself a critical determinant of students' performance level on difficult tasks.

Because our primary goal was to determine differences between subjects given controlling instructions or not, we did not include a no-instruction control group. This design parallels studies in the relevant literature examining the effect of performance versus learning goals (e.g., Elliott & Dweck, 1988), and the effect of use of different strategies of teachers in a field setting on students' performance (Flink et al., 1990; see also Ryan, 1982). Of course, it is not possible to ascertain, then, whether choice enhanced performance or whether controlling directives impaired performance.

Although the data from the two studies taken together support the notion that a lack of freedom about how to approach and regulate the activity impairs performance, there are other potential explanations for our findings. For instance, subjects in the noncontrolling-directives condition may have expended more effort or perceived themselves as expending more effort during the 5-min practice time relative to controlling directives subjects. Alternatively, feelings of efficacy because of being provided with choice options may have accounted for performance differences for subjects in the two conditions, Finally, trial and error for noncontrolling-directives subjects, versus modeling for subjects in the controlling-directives conditions, may have impacted performance.

These data parallel experiments in the intrinsic-motivation arena indicating that choice is beneficial to intrinsic motivation (Amabile & Gitomer, 1984, 1992; Sansone, 1986; Swan & Pittman, 1977; Zuckerman, Porac, Latham, Smith, & Deci, 1978). In addition, researchers training teachers to use autonomy-promoting strategies in their classrooms—e.g., choice or increasing students' responsibility for learning experiences—also increased students' interest in schoolwork (Marshall, 1987, 1988). Further, students who are intrinsically motivated experienced a more positive mood state overall, as indexed on their scores on the BDI, EASQ, and actual-ideal selves (Boggiano & Barrett, 1991; Boggiano, Barrett, Silvern, & Gallo, 1991). Indeed, intrinsics report less depression than extrinsics, at as young as eight years of age (Boggiano & Barrett, 1992; see also Boggiano & Katz, 1991; Boggiano et al., 1992).

Interestingly, students' level of performance and linking for the task were positively correlated for subjects in the noncontrolling-directives condition but showed no correlation for controlling-directives subjects. These data parallel to some extent those obtained by Koestner, Bernieri, & Zuckerman (1992), who demonstrated that autonomy-oriented subjects' attitudes and behaviors were positively correlated, whereas for control-oriented subjects there was no significant correlation. As applied to the present study, subjects' performance in the controlling-directives condition may have been based more on controlling thoughts, whereas noncontrolling-directives subjects' performance was predicted by their feelings about the task.

No correlation was found between adjectives depicting mood and subjects' performance or conditions. These data are discrepant with those of Ryan and Grolnick (1986), who found that controlling directives produced greater feelings of pressure and tension than noncontrolling directives. These negative feelings predicted subsequent intrinsic motivation in the Ryan & Grolnick study, but *not* performance. Although it may be the case that other adjectives used (e.g., *pressure* or *tension*) would have adequately tapped subjects' feelings based on condition, it may also be the case that the manipulation impacted feelings about the task at hand (as well as performance) but not feelings about the self. Further research would be needed in order to obtain information regarding the various feelings that may or may not had been induced.

Although it may be argued from field studies that teachers who differ in preference for different motivational strategies also vary with regard to quality of teaching, the data from our laboratory study indicates that, even when identical hints and strategies are employed, the use of controlling techniques undermines performance. Because these controlling statements (e.g., "you should do...") were taken *directly* from the ETS book geared to maximize performance on the GRE analytic reasoning problems, and identical hints and strategies were given to subjects in both conditions, it appears that it is not the use of these particular hints, but, instead, the *option* to use the hints, that impacts the quality of learning.

It seems paradoxical that students in the controlling-directives condition, who performed at a qualitatively lower level than those in the noncontrolling-directives condition, viewed their teacher in a more positive light. The pattern of data obtained in the present study corresponds to that found in several previous studies (Flink et al., 1990; see also Deci, Speigel, Ryan, Koestner, & Kauffman, 1982), which demonstrated that, in a field setting, independent unbiased coders rate female controlling teachers as more competent, interested, and enthusiastic than teachers using more autonomy-promoting techniques.

It may be that the pervasive use of controlling directives in educational settings accounts for subjects' expectations about and acceptance of teachers using such techniques. Further, such habituation to subtle controlling directives may explain why subjects may not have been aware of their mood state reflecting a lack of choice or freedom about task regulation (see also Nisbett & Wilson, 1977). Future research could make choice options more salient (e.g., providing subjects with several options, with one being more effective) to examine the impact of choice versus controlling directives on both mood and performance. It is of interest to note, in this context that an examination of the subjects' raw data indicated that virtually all of our subjects did indeed use the strategy explained by the teacher, regardless of condition.

Although it may appear surprising that teachers who use strategies that impair students' motivation and achievement are regarded highly, these findings appear less paradoxical when considering previous empirical analyses. The proliferation of research exalting behavior modification techniques in the form of token economy systems as optimal ways of achieving students' motivation and achievement has undoubtedly affected educators' philosophy (Kazdin & Bootzin, 1972; Kazdin & Wilson, 1978), and such techniques continue to be widely used. Even parents subscribe to the use of extrinsic incentives to motivate their children and assume that the larger the incentive, the more highly motivated the child (Boggiano, Barrett, Weiher, McClelland, & Lusk, 1987).

Not only do observers and students perceive controlling teachers and their strategies quite favorably, but this halo effect extends as well to children performing schoolwork for extrinsic reasons. More specifically, in contrast to findings indicating that extrinsically motivated children, relative to those intrinsically motivated, show overall lower mastery strivings (Boggiano, Ruble, & Pittman, 1982; Pittman, Boggiano, & Ruble, 1983), parents believe that extrinsics opt for more challenging tasks relative to intrinsics (Barrett & Boggiano, 1988). These beliefs persist even in the face of disconfirming evidence (Boggiano et al., 1987). Clearly, interventions are needed to demonstrate that reinforcers and other controlling techniques are not the panacea for learning.

We are currently examining administrators' assessment of teachers using controlling versus autonomy-promoting strategies. If, indeed, administrators who evaluate teachers' strategies to motivate children view controlling techniques as beneficial to learning, their positive feedback to teachers who use such strategies may well perpetuate the use of these techniques. Moreover, if teachers are chronically exposed to administrative pressures to increase standardized test scores, it appears that they will respond in the classroom by exerting increased controls over their students, which has been found to produce impaired performance (Flink et al., 1990).

While the present findings have clear implications for the educational process, they may also apply to industrial, clinical, and/or apprenticeship settings. To the extent that being an "expert" and directing a task reduces the nonexpert's perceptions of autonomy and/or sense of responsibility for process and outcome, productivity may not be optimal. In other words, a perception of self-determination for the manner under which an activity or behavior is undertaken may be as important in determining outcome as the quality of direction provided by the expert. Thus, even quite benign-appearing advice may operate inadvertently to reduce one's sense of self-determination to achieve a goal or accomplish behavioral change and one's willingness to continue in that vein. In intrinsic motivation terms, the locus of causality must be internal for behavior to be maintained in the absence of extrinsic pressure.

APPENDIX A: SAMPLE PROBLEMS, HINTS, AND STRATEGIES

The following is an example of one of the reasoning problems:

F, H, I, J, K, L, M, and N spoke, but not necessarily in that order. Only one person spoke at a time. F spoke after L and took more time than H. I spoke before M and after H, and took less time than K. J spoke after N and before H and took less time than N and more time than K. N spoke after F and took less time than H.

1. Of the following, which spoke first?
(A) H (B) I (C) J (D) L (E) N

2. Of the following, which took the most time?
(A) F (B) H (C) J (D) K (E) N

3. Which of the following must be true?
(A) F was the second speaker and gave the third lengthiest speech.
(B) H spoke before I and took more time than N.
(C) I spoke last and gave the shortest speech.
(D) J spoke after M and took less time than F.
(E) N spoke after L and took more time than F.

Sample hints and strategies [taken from page 31 of the ETS bulletin (ETS, 1991]:

Many examinees find it useful to underline key points in the conditions or to draw a simple diagram.

Even though some people who solve analytical reasoning problems find diagrams to be helpful, don't be concerned if a particular problem in the test seems to be best approached without the use of diagrams.

APPENDIX B: FACTOR STRUCTURE AND LOADINGS OF MOOD ITEMS

Eigenvalues:			
% of variance accounted for:	8.89 29.6%	3.45 11.5%	2.82 9.4%
Pleasant	.79		
Warm	.74		
Cheerful	.70		
Friendly	.69		
Successful	.65		
Helpful	.61		
Sociable	−.51		
Affectionate	.57		
Lucky	.57		
Enthusiastic	.55		
Good	.52		
Irritable		.80	
Annoyed		.80	
Offended		.74	
Hostile		.67	
Bored		.65	
Impatient		.62	
Patient		−.55	
Good Natured	.48	−.51	
Cooperative		−.48	
Interested		−.46	
Hopeful			.80
Rejected			.74
Stressful			.69
Worried			.68
Sad			.63
Capable			−.62
Nervous			.57
Calm			−.52
Angry			.52

Note: For clarity, only loadings above .45 are included in the table. Prior to computing factor scores, items with negative loadings were recorded and the factor analysis repeated.

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Canadian, Greek, and Japanese Freely Produced Emotion Labels for Facial Expressions[1]

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Observers in Canada (n = *50), Greece* (n = *38), and Japan* (n = *50) were shown seven of Matsumoto and Ekman's (1988) photographs reported to show universally recognizable facial expressions of basic emotions. Observers were asked to name the emotion expressed with any single emotion label they wanted. Across cultures, recognition (percentage of observers agreeing with prediction) was high (>80%) for the* happy *expression (indicating that observers understood the task), low for the* contempt *expression (0 to 2%), and intermediate for the others (14 to 80% for* surprise, sadness, anger, disgust, *and* fear*). Recognition for some facial expressions varied with the culture of the observer: For example, recognition of the* fear *expression was moderate to high in the two Western samples (62 to 87%) but low in the Japanese (14%); indeed, the Japanese modal response was* surprise *rather than* fear.

One of the most pivotal conclusions reached so far in the psychology of emotion has been that specific emotions are signaled by specific facial expressions and that these signals are universally recognized (Ekman, 1984; Izard, 1977). Various lines of evidence have been cited as support for this conclusion, including studies in which facial expressions were shown to ob-

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