Journal of Educational Psychology
1991, Vol. 83, No. 2, 201-211

0022-0663/91/$3.00

Explaining Within-Semester Changes in Student Effort in Junior High School and Senior High School Courses

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Within any course, as a semester progresses some students reduce their effort and others try harder. Virtually every cognitive theory of motivation suggests that changes in ability perceptions partially determine these changes in effort. Researchers have also cited changes in students' valuing of the course and changes in extrinsic pressures as determinants of effort changes. Covariance structure modeling was used to test 4 alternative models concerning the determinants of effort in a sample of 167 junior high school and 155 senior high school students. Models specifying a direct effect of ability-perception change on effort change fit the data better than did models specifying only indirect effects or no effect of ability perceptions on effort. Ability-perception changes also directly affected students' valuing of the subject matter. The results emphasize the importance of helping students develop confidence in their abilities.

Within almost any course, as a semester progresses some students reduce their effort and others try harder. What factors are responsible for within-semester changes in student effort? In this study, we test theoretical models concerning the determinants of student effort during junior high school and senior high school.

During the past two decades, ability perceptions have come to play a central role in many theories of human motivation and action (e.g., Bandura, 1977; Covington & Beery, 1976; Dweck, 1986; Kukla, 1978; Meyer, 1987; Nicholls, 1984; Raynor & Brown, 1985). For example, according to self-efficacy theory, individuals with self-percepts of low ability are easily discouraged by failure to attain the standards they set for themselves, whereas those who are confident of their ability typically intensify their efforts when failure occurs and persist until they succeed (Bandura & Cervone, 1983). Self-worth theorists (Covington & Beery, 1976) have claimed that students who lose confidence in their ability may adopt counterproductive, effort-avoidant strategies so that failure, if it occurs, can be blamed on insufficient effort rather than on low competence. According to attribution theory, attributing failure to low ability is among the causes of learned helplessness and depression (Abramson, Seligman, & Teasdale, 1978; Weiner, 1986).

The emergence of self-perceptions of ability as a cornerstone of theories dealing with achievement-related behavior is not surprising given the importance of the expectancy construct in the pioneering theoretical work of Atkinson (1957). Atkinson defined expectancy for success at a task in terms of perceptions of the probability of success. He and his colleagues (e.g., Atkinson & Birch, 1978) have typically operationalized *subjective expectancy for success* as "perceived task facility" rather than as "perceived self-concept of ability" (Reuman, 1986). That is, Atkinson emphasized the role of easy tasks (rather than the role of high-ability perceptions) in producing high expectancies. Consequently, the most frequently adopted strategy for manipulating expectancies in classic experimental research on persistence and choice (e.g., Feather, 1961) has been to supply subjects with information about the normative difficulty of the task they are attempting. Recent reformulators of Atkinson's achievement motivation theory (e.g., Raynor & Brown, 1985; Reuman, 1986) have pointed out that high-ability perceptions lead to higher expectancies for success than do low-ability perceptions. Recent formulations, therefore—though not disregarding the role of task facility in influencing expectancies—have emphasized the role of personal ability perceptions.

The positive role of ability perceptions in influencing effort, especially in the face of difficulty, has been confirmed in several empirical studies. For example, Helmke (1987) found that students' math-ability perceptions at the end of fifth grade had a positive impact on the quality of students' later efforts (e.g., on their perseverance and on their active engagement during instruction in sixth grade). Brown and Inouye's (1978) data indicated that the higher students' expectancies were concerning their ability to solve anagrams, the longer they persisted on anagrams for which they were unable to find solutions. Likewise, Hallerman and Meyer (1978, cited in Meyer, 1987) found that perceived ability was strongly

This research was made possible by a National Institute of Mental Health (NIMH) traineeship (MH187372) and by support from the Center for Research on Effective Schooling for Disadvantaged Students, a national research and development center funded by the Office of Educational Research and Improvement (OERI), U.S. Department of Education. The opinions presented are those of Douglas J. Mac Iver, Deborah J. Stipek, and Denise H. Daniels, and no official agreement by NIMH or OERI should be inferred.

We are indebted to the teachers and students in the Los Angeles Unified School District who participated in this research project.

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predictive of the persistence of teenage students on insoluble achievement tasks, regardless of whether the tasks were portrayed as normatively easy or normatively difficult. Students who perceived their ability for the achievement task as high exhibited high persistence at both "easy" and "difficult" tasks. Furthermore, there is evidence that attributing one's learning difficulties to insufficient ability leads to decreased persistence (Andrews & Debus, 1978; Diener & Dweck, 1978; Licht, Kistner, Ozkaragoz, Shapiro, & Clausen, 1985; Weiner, 1979). For instance, Licht et al. (1985) found that, for both learning-disabled and non-learning-disabled children, the tendency to attribute one's failures to insufficient ability was negatively related to persistence on a reading task.

Although ability perceptions, especially as they determine one's expectancy for success on an achievement task, have been central in theories of achievement motivation, the value of a task to the individual is also assumed to influence his or her effort on that task. In Atkinson's (1957) theory, *task value* is narrowly defined in terms of the incentive value of success—the amount of pride one expects to experience if one succeeds. Difficult tasks are assumed to have higher incentive value than easy tasks. More recently, Parsons and Goff (1980), Reuman (1986), and others (e.g., Feather, 1988) have suggested that there are other reasons for valuing an achievement activity in addition to the pride one feels if one succeeds. According to Reuman (1986), these include "the inherent, immediate enjoyment one gets from developing, mastering or using a skill involved in the activity" (p. 92), that is, the *intrinsic or interest value* of the activity, and "the importance of the activity for some future goal" (p. 93), that is, the *utility value* of the activity.

Different relationships between expectancies and task values might be predicted depending on how one defines these two constructs. In the classic experimental research, expectancies for success were defined in terms of the inverse of the normative difficulty of the task, and only the incentive value of the task was considered. Expectancies for success (P_s) and the incentive value of success (I_s) were assumed to be perfectly inversely related; that is, $P_s = 1 - I_s$. In contrast, we propose that when expectancies for success are defined in terms of ability perceptions and the value of a task is defined in terms of its intrinsic and utility value, the relationship between expectancies and values will be strongly positive.

Our proposal is similar to Ryan, Connell, and Deci's (1985) proposition that "any event that enhances perceived competence will tend to enhance intrinsic motivation, while those that facilitate the perception of incompetence will diminish intrinsic motivation" (p. 17). In support of this proposition, Ryan et al. (1985) cited studies indicating that students who are provided with positive performance feedback concerning their competence on a task display higher levels of intrinsic motivation for the task than do students who don't receive performance feedback (Harackiewicz, 1979; Ryan, Chandler, Connell, & Deci, 1983). Furthermore, Vallerand and Reid (1982) reported evidence from a path analysis that suggests a causal link between feelings of competence in an activity and intrinsic motivation for that activity. In another study involving causal modeling techniques, Harter and Connell (1984) found that the structural equation models that best fit their data specify that pupils who evaluate their academic competence positively are more likely than others to be intrinsically motivated to engage in academic tasks.

There are at least two reasons to expect that ability perceptions also have a moderate positive effect on students' perceptions of the utility value of a course. First, students who believe that they are unable to master the knowledge and skills taught in a course may understandably question the course's usefulness to them (e.g., "If I can't master it, how will it help me in the future?"). Second, students tend to select career goals that require those talents that they think they have rather than those talents that they think they don't have. As a result, those activities that are perceived by students as useful in helping them reach their long-range goals also tend to be those activities at which they feel at least moderately talented.

In addition to the determinants of effort already mentioned, theories of achievement motivation emphasize that extrinsic pressures for achievement also influence effort (Atkinson, 1964; Ryan et al., 1985). For example, one might study hard in an attempt to please one's parents, even if one's ability perceptions or value perceptions in a course are low. Therefore, one issue we examined in this study is whether increases in the perceived importance of extrinsic pressures lead to increases in student effort.

In summary, effort on school tasks is assumed to be affected by ability perceptions, task-value perceptions, and perceptions of extrinsic pressures. In addition, higher ability perceptions are expected to lead to higher task-value perceptions. In our study, we tested these hypotheses. We also examined the relative importance of these factors in influencing effort and the nature (e.g., direct vs. indirect) of their effects.

In the analyses that follow, we evaluate four alternative models concerning the determinants of student effort in a course during junior high school and senior high school. Each model incorporates specific hypotheses concerning the causal relations among the following five correlated factors: (a) Change in Effort, (b) Change in Self-Concept of Ability, (c) Change in the Intrinsic Value of the Subject Matter, (d) Change in the Utility Value of the Course, and (e) Change in the Importance of Extrinsic Pressure for Achievement. Each model assumes that change in the importance of extrinsic pressures is a direct cause of change in effort. The models differ with regard to the roles in influencing effort that are attributed to changes in self-concept of ability, intrinsic value, and utility value. For example, one model assumes that the causal linkage between self-concept of ability and effort is a direct one. We compare this model with a model that assumes that the causal link between self-concept of ability and effort is mediated entirely through intrinsic value and utility value. A third model posits both direct and indirect causal links. Finally, we compare each of these models with a model that denies self-concept of ability a causal role in influencing effort; in this alternative model, change in self-concept of ability is viewed as a consequence rather than as a cause of changes in intrinsic value, utility value, and effort.

We included (and analyzed separately) data from both junior high school and senior high school students because the role of particular factors may differ in the middle grades

and the high school grades. Utility value was expected to be more strongly associated with effort for high school students (who will confront occupational choices and endeavors sooner than will junior high school students), and the importance of extrinsic pressures was expected to be more strongly associated with effort for junior high school students (who are more influenced by a desire to please parents than are high school students).

Method

Students from two junior high schools and two senior high schools in southern California were recruited for this study. Each school had a diverse student body that included students from a broad spectrum of social classes and ethnic groups. Initially 23 teachers volunteered for the study, but 3 changed their minds and dropped out before the study was completed. Of the teachers who completed the study, 40% were math teachers, 20% were English teachers, 15% were science teachers, and the remaining 25% taught social studies or elective subjects (e.g., Spanish, computer education, photography).

Participating teachers distributed parental permission forms to the students in one or two of their classes. Students who returned signed permission forms were allowed to participate in the study. The number of participating students varied considerably from classroom to classroom because some teachers issued daily reminders to bring back the permission slips before "questionnaire day," whereas others issued few or no reminders. The overall student participation rate was about 60%. Of the participating students, 46% were White, 23% were Hispanic, 13% were Black, and 18% were from other ethnic groups; 46% of the students who participated were boys and 54% were girls.

To obtain multiple indicators of change, several measures of each construct were included on a survey questionnaire that was administered to students twice: once within the first 2 weeks of the semester and once at the end of the semester. A total of 322 students (167 junior high school students and 155 senior high school students) filled out both the beginning-of-semester and the end-of-semester questionnaires. Teachers were asked to complete an assessment of each participating student's effort both at the beginning and at the end of the semester. These effort ratings by teachers were obtained for 282 of the 322 students.

The Appendix lists the items that were used to measure the five constructs assessed. With the exception of two effort items, all items have a response scale ranging from 1 to 7 with various anchors, as indicated in the Appendix. Each item focuses on the subject area of the specific course in which students were given the questionnaire. To maximize the construct validity of the change in effort factor, we combined information from two independent sources (student self-report items and teachers' ratings) in measuring effort changes (see Nunnally, 1978, p. 98). For each item in each factor, the difference between a student's or teacher's rating at the end of the semester and at the beginning of the semester was used as an estimate of change. These change estimates were the basic data used in the analyses in this article.[1]

Results

Overview of Analysis Strategy

We used confirmatory factor analysis to assess the adequacy of the proposed five-factor measurement model. Then we conducted LISREL analyses to test the adequacy of several alternative covariance structure models (models specifying not only the factor structure but also the causal relations among factors). In both types of analyses, we evaluated the adequacy of hypothesized models by examining the congruence between the covariance matrix generated by the hypothesized model and the observed covariance matrix. We used the Tucker-Lewis index (TLI) to assess whether the overall fit (between the covariances generated by the hypothesized model and the observed covariances) was good enough to support the model (Tucker & Lewis, 1973). The TLI is the only widely used goodness-of-fit index that is relatively independent of sample size (Marsh, Balla, & McDonald, 1988). Although there is not universal agreement on what constitutes "good" fit, a value of .90 or better on the TLI is usually considered acceptable (Marsh et al., 1988, p. 393). A TLI of .90 indicates that the proposed model improves the null model by 90% of the amount one would expect from a model that is precisely true.

Confirmatory Factor Analysis

In the confirmatory factor analysis, each indicator of change listed in the Appendix was constrained to load only on the factor that it was designed to measure. The results of the analysis indicated that the hypothesized factor structure fits the data well (χ^2/df ratio = 1.30, TLI = .93). Furthermore, the factor loadings (given in the Appendix) and factor variances were large and statistically significant. (We adopted a .05 probability level for all significance tests reported in this article.) As anticipated, all correlations among factors (see Table 1) were positive and, except for the correlation between change in the importance of extrinsic pressures and change in self-concept of ability, significant.

These means and standard deviations of the five factors were estimated with Bollen's (1989, pp. 306–311) method (See Table 2). These estimates reveal that, on average, there are negative within-semester changes in effort, in the perceived importance of extrinsic pressures, in self-concept of ability, and in intrinsic value. On the other hand, the average within-semester change in students' perceptions of the utility value of their coursework is slightly positive. Finally, the standard deviations in Table 2 indicate that there is considerable variation among students in the within-semester changes that they exhibit.

Covariance Structure Models

The confirmatory factor analysis supported the hypothesis that the within-semester change scores computed from stu-

[1] Even though observed difference scores provide unbiased estimates of true change, many authors have criticized the use of these scores (e.g., Bereiter, 1963; Bohrnstedt, 1969; Kessler, 1977; Linn & Slinde, 1977; O'Connor, 1972). However, as Willett (1988, p. 367) concluded, recent methodological research has revealed that the purported deficiencies of difference scores "are *perceived* rather than *actual*, *imaginary* rather than *real* (Rogosa, Brandt, & Zimowski, 1982; Rogosa & Willett, 1983, 1985; see also Zimmerman, Brotohusodo, & Williams, 1981; Zimmerman & Williams, 1982)."

Table 1
Factor Correlations

Factor	1	2	3	4	5
1. ΔINT	—				
2. ΔEXT	.24	—			
3. ΔUTI	.32	.22	—		
4. ΔSCA	.73	.15	.34	—	
5. ΔEFF	.52	.36	.31	.58	—

Note. ΔINT = Change in the Intrinsic Value of the Subject Matter; ΔEXT = Change in the Importance of Extrinsic Pressures for Achievement; ΔUTI = Change in the Utility Value of the Course; ΔSCA = Change in Self-Concept of Ability; ΔEFF = Change in Effort.

dents' responses to the items in the Appendix measure the five correlated factors that they were intended to measure. Therefore, in the covariance structure analyses, we used the hypothesized five-factor structure as the measurement model. In these analyses, each factor was measured by its four best indicators. The metric of each factor was set (with the reference indicators listed in Table 2) to measure within-semester change on a 13-point scale; the maximum possible positive change was +6 and the maximum possible negative change was −6.[2]

As described earlier, four alternative causal models were tested. In the following sections, we describe the results of analyses conducted to test the fit of each model to the empirical data.

Model 1. The causal relations specified in Model 1 (depicted in Figure 1) reflect our hypothesis that when students lower or raise their estimate of ability in a subject, their effort in the subject is affected, as is their valuing of the subject (e.g., "If I discover I'm good at a subject, I'm more willing to put forth effort in the subject, and I'm more likely to perceive the subject to be interesting and useful"). In addition, Model 1 specifies that changes in the importance of extrinsic pressures (e.g., an increased desire to please parents or to obtain a good grade) affect effort.

Unstandardized maximum-likelihood parameter estimates for Model 1 were obtained separately for junior high school students and senior high school students with simultaneous multisample analysis in LISREL VI. These estimates are reported in Figure 1.[3] For each path, the estimate for junior high school students is listed first (to the left of the slash). Model 1 explains 70% of the variance in change in effort levels in junior high school students and 34% of this variance in senior high school students. In both junior high school and senior high school, a within-semester change in students' self-concept of ability has a substantial and statistically significant impact on their effort in that course. For example, for junior high school students, an increase in self-concept of ability of 1 point is associated with an increase in effort of 0.7 points. Change in the importance of extrinsic pressures has a significant impact on change in effort in junior high school but not in senior high school. In both junior high school and senior high school, change in self-concept of ability is positively associated with change in intrinsic value and with change in utility value. Change in self-concept of ability explains over 50% of the variance in change in intrinsic value and over 10% of the variance in change in utility value in both samples. Finally, Model 1 fits the data well (χ^2/df ratio = 1.15, TLI = .94).

Model 2. Model 2 (depicted in Figure 2) differs from Model 1 in that it specifies that some of the effect of change in self-concept of ability on change in effort is indirect. That is, in addition to directly affecting effort, change in ability perceptions indirectly affects effort by causing changes in the perceived intrinsic value and utility value of the subject matter.

As in Model 1, the parameter estimates in Model 2 are consistent with the following assertions: (a) within-semester changes in students' course-related ability perceptions affect both students' effort and their valuing of the subject matter; and (b) in junior high school, change in the perceived importance of parents and grades as extrinsic motivators leads to changes in effort. In addition, there are several indications from the output associated with Model 2 that the direct effect of change in ability perceptions on change in effort may be more important than its indirect effects. First, Model 2 (which contains the indirect effects) does not fit the data significantly better than Model 1, $\Delta\chi^2 = 3.73$, $\Delta df = 4$, *ns*. Second, the parameter estimates from Model 2 suggest that the direct effect of change in self-concept of ability on change in effort is larger than the sum of the indirect effects; the estimated direct effect is 0.56 in junior high school and 0.41 in senior high school, whereas the sum of the indirect effects is only 0.14 in junior high school and 0.16 in senior high school.

It should be noted, however, that the high correlation between change in self-concept of ability and change in intrinsic value (.73) makes it difficult to estimate precisely the relative magnitudes of the direct effect and the indirect effects. Because of this high correlation, the parameter estimates for the direct effect and one of the indirect effects are highly correlated (−.80). One result of the correlation between these two parameter estimates is that the standard error associated with the effect of change in self-concept of ability on change in effort is 1.7 times higher in Model 2 than it is in Model 1. For this reason, in Model 2 the significance level associated with this effect does not reach conventional levels of significance.

Model 3. Another way of testing the importance of the direct effect of change in self-concept of ability on change in effort is to compare the fit of a model that contains the direct

[2] When interindividual differences in true change are small, the difference between two observed measures tends to be less reliable than either individual measure. In regression analyses and other traditional statistical techniques, unreliable measures increase bias in parameter estimates involving those measures as predictors and inflate standard errors of estimate. However, if change in each construct is measured by several difference scores, covariance structure modeling techniques can be used (as we use them here) to obtain parameter estimates that are unbiased by the random measurement error in the difference scores.

[3] There are three types of parameter estimates reported in Figures 1–4, each represented by a different type of line. A curved line with arrowheads at both ends represents the covariance between exogenous factors. The direct effect of one factor on another is represented by a straight line (or by connected line segments) with one arrowhead to show the assumed direction of causation. Finally, an arrowhead without a tail represents specification error (error in equations or omitted variables).

Table 2
Reference Indicators for Five Change-Score Factors and Estimated Means and Standard Deviations for These Factors

Factor	Wording of reference indicator	Maximum possible change	*M* change	*SD*
ΔINT	How excited are you to learn about this subject matter?	+6 (from *not at all excited* to *very excited*)	−0.17	1.12
ΔEXT	Is doing as well as your parents expect you to do in this class important to you?	+6 (from *not at all important to me* to *very important to me*)	−0.43	1.12
ΔUTI	I am taking this class because it helps prepare me for a job.	+6 (from *not an important reason at all* to *a very important reason*)	+0.07	1.47
ΔSCA	How good are you in this subject?	+6 (from *not good at all* to *very good*)	−0.22	0.91
ΔEFF	How hard are you working to learn about this subject?	+6 (from *not hard at all* to *as hard as I can*)	−0.55	0.91

Note. ΔINT = Change in the Intrinsic Value of the Subject Matter; ΔEXT = Change in the Importance of Extrinsic Pressures for Achievement; ΔUTI = Change in the Utility Value of the Course; ΔSCA = Change in Self-Concept of Ability; ΔEFF = Change in Effort.

effect (e.g., Model 2) with a nested model that eliminates the direct effect (Model 3 in Figure 3). The fit of Model 3 is significantly worse than the fit of Model 2; $\Delta\chi^2 = 7.18$, $\Delta df = 2$, $p < .05$. Thus, the evidence suggests the existence of the direct effect.

In conclusion, the results from the first three models suggests that (a) change in ability perceptions has an important direct effect on change in effort; (b) change in the perceived importance of extrinsic pressures for achievement has a significant positive impact on effort in junior high school but not in senior high school; and (c) as students' ability perceptions in a subject increase, not only do they try harder but they also enjoy the subject more and perceive the subject as more useful.

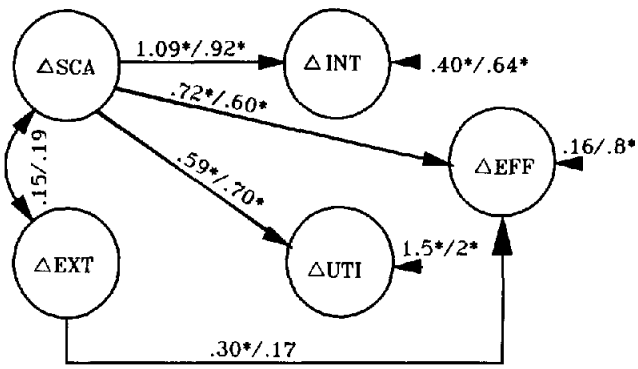

Figure 1. Unstandardized parameter estimates for Model 1. (ΔSCA = Change in Self-Concept of Ability; ΔINT = Change in the Intrinsic Value of the Subject Matter; ΔEFF = Change in Effort; ΔEXT = Change in the Importance of Extrinsic Pressures for Achievement; ΔUTI = Change in the Utility Value of the Course. Values to the left of the slash are for junior high school students, and values to the right of the slash are for senior high school students. There are three types of parameter estimates, each represented by a different type of line. A curved line with arrowheads at both ends represents the covariance between exogenous factors. The direct effect of one factor on another is represented by a straight line [or by connected line segments] with one arrowhead to show the assumed direction of causation. Finally, an arrowhead without a tail represents specification error [error in equations or omitted variables]. An asterisk indicates a coefficient that is greater than or equal to 1.96 times its standard error. Tucker-Lewis index = .94.)

Models 1, 2, and 3 assume that the effect of change in self-concept of ability on change in effort does not depend on the level of students' ability perceptions at the beginning of the course. This assumption was confirmed with multiple regression analyses. In these analyses, students were first categorized into quartiles on the basis of their ability perceptions at the beginning of the semester: low perceived ability (an average rating of 4 or less), moderate perceived ability (an average rating greater than 4 but less than or equal to 5), high perceived ability (an average rating greater than 5 but less than or equal to 5.75), and very high perceived ability (an average rating greater than 5.75). Then we estimated the simple regression of change in effort on change in self-concept of ability separately for each quartile and tested whether the regression coefficients in the separate regression equations were significantly different from each other (i.e., whether or not the regression lines were parallel). These tests revealed that the positive impact of increased ability perceptions on effort is not significantly different for students who begin the year with perceptions of very high, high, moderate, or low ability: in the junior high school sample, $F(3, 142) = 1.60$, $p = .19$, $MS_e = .69$, and in the senior high school sample, $F(3, 136) = 1.46$, $p = .23$, $MS_e = .73$.

Model 4: A Supplementary Analysis to Test an Alternative Explanation. The first three models all assume that changes in self-concept of ability lead to changes in effort. An alternative view is that ability perception change is a consequence rather than a cause of effort change. Perhaps, for example, (a) a student discovers that a subject is more interesting or more enjoyable than he or she originally thought, (b) the student's increased enjoyment prompts him or her to work harder, and (c) the student's hard work increases his or her competence and consequently his or her ability perceptions. This alternative causal sequence is specified in Model 4 (Figure 4). Model 4 fits the data less well than do Models 1, 2, and 3; for Model 4, χ^2/df ratio = 1.24, TLI = .91.[4]

[4] At the suggestion of an anonymous reviewer, we also tested the explanatory power and overall fit of several *state-dependence* models that specify that students' beginning-of-semester perceptions (of intrinsic value, utility value, ability, and extrinsic pressures) determine subsequent effort changes. These models had substantially poorer explanatory power and poorer overall fit than the models reported in this article.

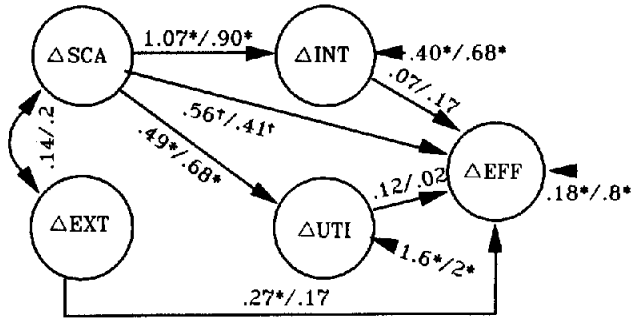

Figure 2. Unstandardized parameter estimates for Model 2. (ΔSCA = Change in Self-Concept of Ability; ΔINT = Change in the Intrinsic Value of the Subject Matter; ΔEFF = Change in Effort; ΔEXT = Change in the Importance of Extrinsic Pressures for Achievement; ΔUTI = Change in the Utility Value of the Course. Values to the left of the slash are for junior high school students, and values to the right of the slash are for senior high school students. There are three types of parameter estimates, each represented by a different type of line. A curved line with arrowheads at both ends represents the covariance between exogenous factors. The direct effort of one factor on another is represented by a straight line [or by connected line segments] with one arrowhead to show the assumed direction of causation. Finally, an arrowhead without a tail represents specification error [error in equations or omitted variables]. An asterisk indicates a coefficient that is greater than or equal to 1.96 times its standard error. A dagger indicates a coefficient that is greater than or equal to 1.65 times its standard error. Tucker-Lewis index = .94.)

Mean Differences in Within-Semester Change Among Courses of Different Types

As reported earlier, averaging across the different types of courses in our sample, we found that students showed negative within-semester changes in effort, in the perceived importance of extrinsic pressure, in self-concept of ability, and in the intrinsic value of the subject matter. Although our study was not designed to allow definitive statements about differences among courses of different types, the data in Table 3 indicate that—at least in our sample—negative within-semester changes tend to be more prevalent and more pronounced in math courses than in other types of courses. Mean change in intrinsic value, change in self-concept of ability, and change in effort scores of students in math courses were significantly lower than those of students in every other course type. Whereas students in math courses did not differ from students in science, social studies, or elective courses in their increasingly negative perceptions of the course's utility value, students in English courses came to view English as significantly more useful as the semester progressed. There were no significant course-type differences on change in the importance of extrinsic pressures, $F(3, 303) = 1.33$, $p = .26$, $MS_e = 0.89$; students in all courses showed negative changes on this factor.

Although there were significant mean differences among course types in change in intrinsic value, change in utility value, change in self-concept of ability, and change in effort, this does not imply that effort changes are related differently to task value or to ability perception changes in courses of different types. On the contrary, regression analyses reveal that course type does not affect the relations of change in effort with change in intrinsic value, change in utility value, change in self-concept of ability, or change in the importance of extrinsic pressures. For example, we estimated the simple regression of effort change on ability-perception change separately for math, English, science, and other courses. Then we tested for significant differences in the estimated regression coefficients. These tests revealed that the positive impact of increased ability perceptions on effort is not significantly different for students in different courses, $F(3, 246) = 0.87$; $p = .46$, $MS_e = 0.55$.

Discussion

As mentioned earlier, in virtually every cognitive theory of motivation, ability perceptions are assumed to affect student effort and thus to have practical, educational importance. In an implicit endorsement of these theories, many of the task forces and commissions attempting to reform the schools attended by young adolescents have emphasized the importance of providing young adolescents with experiences and interactions that help them develop a self-image of intellectual competence (e.g., Carnegie Task Force on the Education of Young Adolescents, 1989; Children's Defense Fund, 1988; Maryland Task Force on the Middle Learning Years, 1989). The results of this study suggest that this emphasis on perceptions of ability may be worthwhile. Models 1 and 2 (which explicitly assume that within-semester change in ability perceptions is a direct determinant of within-semester change in

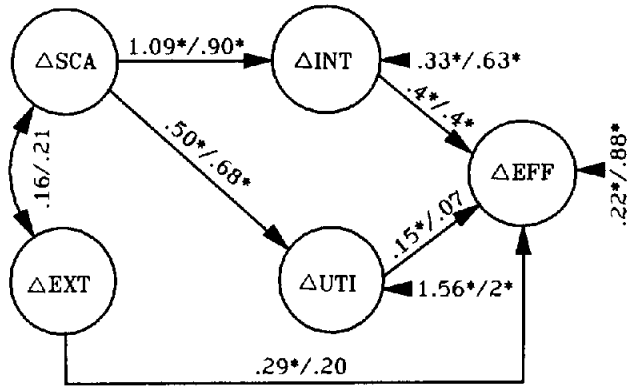

Figure 3. Unstandardized parameter estimates for Model 3. (ΔSCA = Change in Self-Concept of Ability; ΔINT = Change in the Intrinsic Value of the Subject Matter; ΔEFF = Change in Effort; ΔEXT = Change in the Importance of Extrinsic Pressures for Achievement; ΔUTI = Change in the Utility Value of the Course. Values to the left of the slash are for junior high school students, and values to the right of the slash are for senior high school students. There are three types of parameter estimates, each represented by a different type of line. A curved line with arrowheads at both ends represents the covariance between exogenous factors. The direct effect of one factor on another is represented by a straight line [or by connected line segments] with one arrowhead to show the assumed direction of causation. Finally, an arrowhead without a tail represents specification error [error in equations or omitted variables]. An asterisk indicates a coefficient that is greater than or equal to 1.96 times its standard error. Tucker-Lewis index = .93.)

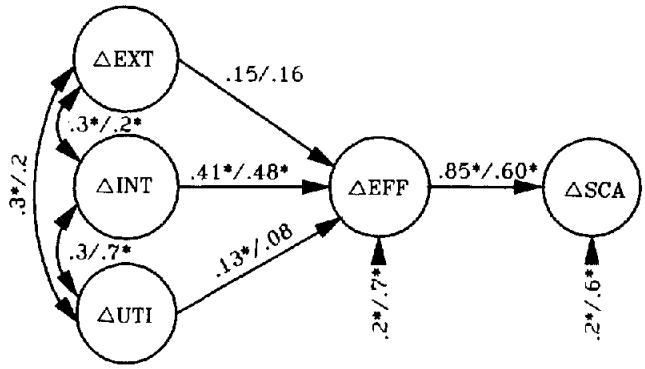

Figure 4. Unstandardized parameter estimates for Model 4. (ΔEXT = Change in the Importance of Extrinsic Pressure for Achievement; ΔINT = Change in the Intrinsic Value of the Subject Matter; ΔEFF = Change in Effort; ΔSCA = Change in Self-Concept of Ability; ΔUTI = Change in the Utility Value of the Course. Values to the left of the slash are for junior high school students, and values to the right of the slash are for senior high school students. There are three types of parameter estimates, each represented by a different type of line. A curved line with arrowheads at both ends represents the covariance between exogenous factors. The direct effect of one factor on another is represented by a straight line [or by connected line segments] with one arrowhead to show the assumed direction of causation. Finally, an arrowhead without a tail represents specification error [error in equations or omitted variables]. An asterisk indicates a coefficient that is greater than or equal to 1.96 times its standard error. Tucker-Lewis index = .91.)

effort) fit the data better than do the alternative models considered here. In other words, the results are consistent with the claim that, by reducing the number of students who believe that they are "not good" in a subject, teachers can increase the number of students who work near their potential.

The findings suggest that increasing students' perceptions of ability will achieve another important goal: for students to value the subject they are learning. Students whose ability perceptions in a subject increase find the subject to be more interesting and more useful; conversely, students devalue subjects that they do not believe they have the ability and skills to master. The effect of ability perceptions on values may have long-term implications. For example, greater valuing of a subject may result in students seeking further learning opportunities in that subject area.

The results of this study support Eccles & Wigfield's (1985a) contention that expectancies (as measured by self-concept of ability) and task values are positively related in naturally occurring achievement settings. Students come to value those subjects at which they believe they can succeed. This relationship is the opposite of the relationship between expectancies and incentive value proposed by Atkinson (1964). Clearly, the distinction between the incentive value of a task (defined narrowly in terms of anticipated pride accompanying success) and task values (more broadly construed and applied to natural achievement contexts) has important theoretical and practical implications.

Previous research has found that students' beliefs concerning the value of academic subjects influence their course enrollment decisions (e.g., Chipman, Brush, & Wilson, 1985; Eccles, Adler, & Meece, 1984). The results of this study suggest, however, that once a student is enrolled in a course, changes in value perceptions may not affect effort. Model 1 (which assumes that effort change and changes in the valuing of a subject are correlated only because of their common dependence on changes in ability perceptions) fits the data quite well. Furthermore, in Model 2, the estimated effects of intrinsic value and utility value changes on effort were small and insignificant. Only Models 3 and 4—which omit the direct effect of ability perception change on effort change and which fit worse than Models 1 and 2—yield any significant effects of value-of-subject changes on effort changes. A useful goal of future research would be to delineate the circumstances under which students' perceptions of the subjective value of a task play an important role in determining effort, after controlling for ability perceptions.

For many junior high school students, the desire to please one's parents by getting a good grade is an important reason for putting forth effort in a class. Increases in the perceived importance of this type of extrinsic pressure for achievement were significantly associated with increased effort among junior high school students but not among senior high school students. This developmental difference probably reflects the declining importance of parental norms and pressures in influencing students' achievement behavior from early to late adolescence (e.g., Montemayor, 1986). It is possible that by high school peer-related extrinsic pressures supersede parental pressures. Of course, peer-based pressures for or against achievement may be important even during the upper-elementary and middle grades (e.g., Slavin, 1986). The relative

Table 3
Means and Standard Deviations for Five Change-Score Composites by Class Type

	Math		English		Science		Other	
Composite	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
ΔINT	−0.40	1.09	+0.03	1.03	+0.20	1.14	−0.08	0.96
ΔEXT	−0.45	0.88	−0.16	0.78	−0.33	1.29	−0.29	0.97
ΔUTI	−0.26	1.29	+0.44	1.09	−0.15	1.44	−0.03	1.11
ΔSCA	−0.42	1.16	−0.08	0.82	+0.03	0.76	−0.06	0.85
ΔEFF	−0.63	0.97	−0.12	0.67	−0.29	0.77	−0.37	0.72

Note. ΔINT = Change in the Intrinsic Value of the Subject Matter; ΔEXT = Change in the Importance of Extrinsic Pressures for Achievement; ΔUTI = Change in the Utility Value of the Course; ΔSCA = Change in Self-Concept of Ability; ΔEFF = Change in Effort.

effects of perceived peer and parent pressure on effort would be useful to examine in future studies.

It is noteworthy that the best model tested in this study explained twice as much of the variance in effort for the junior high school students (70%) as for the senior high school students (34%). Apparently the four psychological factors assessed in the study give a more complete picture of the determinants of effort on school tasks for the younger adolescents. Further research needs to examine additional factors that may influence older students' effort on school tasks. We suspect that competing activities, such as athletic training, jobs, and peer relationships, affect time spent on schoolwork for senior high school students more than for junior high school students.

Educators are searching continually for "promising practices" to improve students' motivation and performance. By adding to our knowledge of the relative importance of factors that affect effort and of the relations among these factors, the results of this study may help teachers select strategies to increase student effort. The results suggest that the most fruitful approach to increasing student effort may involve altering curriculum and instruction, task structures, grouping policies, and evaluation practices to reduce the proportion of students who perceive themselves as having little academic ability (Mac Iver, 1988; Mac Iver & Epstein, 1990). However, raising students' confidence in their abilities is a complicated and difficult task. Seemingly positive teacher behaviors that are motivated by a desire to protect the self-concept of low achievers often inadvertently play a role in damaging this self-concept. For example, Graham & Barker (1990, p. 7) caution that "praise for success at easy tasks, the absence of blame for failure at such tasks, and affective displays of sympathy or compassion can communicate to the recipients of this feedback that they are low in ability (Barker & Graham, 1987; Graham, 1984; Meyer et al., 1979; see also Weiner, Graham, Taylor, & Meyer, 1983)." Increased perceptions of competence cannot be effectively achieved by setting unchallenging standards for success. On this point, we agree with Atkinson that success easily achieved engenders little pride (and also fails to increase self-confidence).

One promising approach to raising students' ability perceptions is to alter classroom evaluation and recognition practices so that success is defined in terms of individually referenced (and personally challenging) improvement goals. Mac Iver (1990) described a program for middle-grade classrooms that follows this approach. The program helps students to set individualized, short-range improvement goals that are challenging but doable. As young adolescents observe their progress in obtaining these goals, many who have reached the premature conclusion that they will "never be good at schoolwork" may develop a renewed confidence in their academic ability and a renewed enthusiasm for learning. A multiyear evaluation study of this program is currently under way.

In addition to building students' self-confidence in their ability, should teachers also stress the utility value of mastering course content and strive to make school tasks intrinsically interesting? These are undoubtedly good teaching strategies. Attempts to make the content of a course more clearly useful to students and to make assignments in a class more interesting may increase students' enjoyment of a course and positive attitudes toward school in general, and they may have long-term effects on the degree to which students seek further learning opportunities in that subject area. However, this study suggests that strategies directed toward ensuring that all students develop faith in their ability may have a greater effect on student's effort and attitudes at least in the short run (e.g., during the course of a semester), than would strategies directed toward increasing the utility value and intrinsic interest of a course. As Eccles and Wigfield (1985b) have argued,

> One of the most important motivational questions facing a student is "Can I succeed at this task if I choose to try?" .... If the answer is yes, then a student will, at least, move on to the next question—"Do I want to?" If the answer is no, then the student will, in all likelihood, give up. (p. 188)

Classroom practices that increase the number of children who gain confidence in their ability may help create a success-prone cycle in individual children. That is, increases in effort (resulting from increases in perceived competence) may lead students to succeed more frequently. This increased success may prompt further increases in confidence and effort, thus creating a success-prone cycle. On the other hand, despite the importance of ability perceptions in motivating effort, heightened ability perceptions will be of little use "unless accompanied by the strategic knowledge that is essential to direct the energy to appropriate ends" (Nickerson, 1988, p. 26; see also Borkowski, Carr, Rellinger, & Pressley, in press). Thus, one critical component of effective confidence-building programs may be the provision of direct instruction in metacognitive strategies.

One limitation of this study is its inability to identify and analyze differences among different socioeconomic and ethnic groups in the determinants of effort changes. We did not collect information on the socioeconomic status of individual students, and we have insufficient numbers of students within each minority group to permit a LISREL analysis of ethnic group differences. Simple regressions conducted within each ethnic group separately indicated that ability perception change is strongly related to effort change within every ethnic group. Nevertheless, future studies in which socioeconomic status measures are collected and in which larger minority group samples are evaluated may find that our best model does not satisfactorily fit the data from certain groups.

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Appendix

Questionnaire Items Administered at the Beginning and the End of a Semester to Measure Within-Semester Change in Five Factors

Item	Response scale anchors	Loading
	Change in the Intrinsic Value of the Subject Matter	
How excited are you to learn about this subject matter?	*Not at all excited*; *very excited*	1.06
How much do you enjoy learning about this subject?	*Not much at all*; *very much*	1.14
How much do you care about learning a lot about this subject?	*Don't care at all*; *care very much*	0.85
How much do you like working on the assignments in this class?	*Not at all*; *very much*	0.90
Do you do things for fun outside of class that are related to or have something to do with what you are learning about in this class?	*Never*; *yes, a lot*	0.57
	Change in the Importance of Extrinsic Pressures for Achievement	
When I work in this class, it is because I want to please my parents.	*Not at all a reason*; *a very important reason*	0.79
Is doing as well as your parents expect you to do in this class important to you?	*Not at all important to me*; *very important to me*	1.19
When I work in this class, it is because I want a good grade.	*Not at all a reason*; *a very important reason*	0.54
How important is it to your parent(s) that you get a good grade in this class?	*Not at all important*; *very important*	0.54
	Change in the Utility Value of the Course	
I am taking this class because it helps prepare me for a job.	*Not an important reason at all*; *a very important reason*	1.46
When I work in this class, it is because the knowledge and skills are useful in my life and/or for my future.	*Not at all a reason*; *a very important reason*	1.22
I am taking this class because I may need to know about this subject in the future.	*Not an important reason at all*; *a very important reason*	1.33
I am taking this class because it helps me do things I want to be able to do.	*Not an important reason at all*; *a very important reason*	0.96
How useful is what you learn in this class for a job you might want?	*Not at all useful*; *very useful*	1.02
I am taking this class because it helps me decide what career or job I want.	*Not an important reason at all*; *a very important reason*	1.14
How useful will what you learn in this class be for future classes you might take?	*Not at all useful*; *very useful*	0.72

Appendix (*continued*)

Item	Response scale anchors	Loading
	Change in Self-Concept of Ability	
How good are you in this subject?	*Not good at all*; *very good*	0.87
How good do you think you are in this subject compared to other students in the class?	*Much worse than other students*; *much better than other students*	0.88
How often do you feel smart in this class?	*Never*; *very often*	0.68
How much natural ability do you have in this subject?	*No ability at all*; *a lot of ability*	0.79
	Change in Effort	
If a student works to his or her highest potential in a class, then we could say that he or she is putting forth 100% effort to learn the subject matter. How much effort do you usually put forth in this class?	*I am not trying at all* (0%); *I am working to my highest potential* (100%)	11.82
How hard are you working to learn about this subject?	*Not hard at all*; *as hard as I can*	0.96
How hard do you study for tests in this class?	*Just enough to pass*; *whatever it takes to get a good grade*	0.61
How hard do you work in this class?	*Much less than most classes*; *much more than most classes*	0.72
If a student works to his or her highest potential in a class, then we could say that he or she is putting forth 100% effort to learn the subject matter. Please estimate how much effort each student listed below is putting forth in this class. [From teacher's questionnaire]	*Student is not trying at all* (0%); *student is working hard enough to fulfill his or her highest potential* (100%)	4.30

Note. All items are from the student's questionnaire, with the exception of the final item. Response scales for each item range from 1 to 7, with the exception of the first and last items in the Change in Effort factor, for which responses were rated on an 11-point scale, ranging from 0% to 100%. Factor loadings are derived from the standardized solution, in which the factors (but not the measured variables) have been standardized. Thus, each loading indicates the expected change in the raw score of a measured variable given an increase of 1 standard score in the factor. The raw difference scores for the first and last item in the Change in Effort factor have a possible range of −100 to +100; the possible range for every other measured variable is −6 to +6.

Received July 5, 1990
Revision received October 18, 1990
Accepted December 6, 1990 ■