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Predicting high school students' cognitive engagement and achievement: Contributions of classroom perceptions and motivation ☆

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Abstract

Path analysis was used to test predictions of a model explaining the impact of students' perceptions of classroom structures (tasks, autonomy support and mastery and evaluation) on their self-efficacy, perceptions of the instrumentality of class work, and their achievement goals in a particular classroom setting. Additionally, the impact of self-efficacy, instrumentality, and goals on students' cognitive engagement and achievement was tested. There were 220 high school students who completed a series of questionnaires over a three-month period in their English classes. Data strongly supported the model demonstrating that student perceptions of classroom structures are important for their motivation. Also supported was the importance of perceiving the current class work as being instrumental for future success. Implications were discussed.

Keywords: Motivation for academic learning; Perceptions of classroom structures; Self-efficacy; Perceived instrumentality; Achievement goals

☆ A version of the study was presented at a Poster Session at the 2002 Annual Meeting of the American Educational Research Association in New Orleans, LA.

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1. Introduction

The purpose of this study was to test the predictions of a causal model that explains the impact of students' perceptions of classroom structures (e.g., mastery focus, autonomy support, and non-competitive evaluation) on their self-efficacy, perceptions of the instrumentality of class work to attaining future goals, and their achievement goals in a particular classroom setting. The model also demonstrates how the motivational variables (self-efficacy, instrumentality, and goals) influence students' cognitive engagement and achievement in that setting. The conceptual foundation for this model is a synthesis of previous work. We first review this previous work and then present the causal model that guided our research.

1.1. Theory and research on cognitive engagement (strategies) influencing achievement

We start with the basic assumption that achievement is related to the cognitive strategies that students use to learn. Based on the influential "levels of processing," and subsequent "elaborative processing" theory (e.g., Anderson & Reder, 1979; Craik & Lockhart, 1972; Jacoby & Craik, 1979), we believe that the use of different types of strategies results in different learning outcomes, and, thus, different levels of achievement. Strategies that involve meaningful (i.e., elaborative) processing attempt to connect or integrate new information with existing knowledge in an effort to form a richer, more coherent mental representation (Weinstein & Mayer, 1986). Shallow processing strategies (i.e., rote processing), such as underlining or mechanically rereading the new information, produce a less elaborate memory representation, limiting the retrieval and generalizability of the information. Research has consistently found that meaningful processing strategies lead to greater performance on achievement measures over the material studied than shallow strategies (e.g., Graham & Golan, 1991; Greene & Miller, 1996; Kardash & Amlund, 1991; Miller, Greene, Montalvo, Ravindran, & Nicholls, 1996; Nolen, 1988; Pintrich & Garcia, 1991). In the present study, our measure of cognitive strategies focused on the use of meaningful strategies. As a result, our model indicates that student achievement is positively influenced by the cognitive strategies they employ to guide their learning.

1.2. Theory and research on the impact of self-efficacy, achievement goals, and perceived instrumentality on cognitive engagement

One of the critical influences on students' choice of cognitive strategies is their motivation to learn. Three motivational factors that have been consistently related to cognitive strategy use in learning situations are self-efficacy (Bandura, 1986, 1997), achievement goals (e.g., Dweck, 1986; Elliott, 1999; Nicholls, 1989), and perceived instrumentality, which is the extent to which school tasks are perceived as instrumental to attaining personally valued future goals (Husman & Lens, 1999; Miller & Brickman, 2004). Bandura (1986) characterized self-efficacy as being both a product of our interactions in the world (enactive engagement) and an influence on the nature and quality of those interactions. In the first case, our cognitive interpretations of

successes and failures influence subsequent self-efficacy beliefs (e.g., Schunk, 1981). In the latter, our self-efficacy beliefs influence our effort, persistence and the cognitive resources we bring to bear in our attempts to interact with the world around us. Research has reliably shown that self-efficacy is positively correlated with measures of meaningful (deep) cognitive strategy use (Ames & Archer, 1988; Greene & Miller, 1996; Meece, Blumenfeld, & Hoyle, 1988; Miller, Behrens, Greene, & Newman, 1993; Miller et al., 1996; Pintrich & DeGroot, 1990; Pintrich & Garcia, 1991; Pintrich & Schrauben, 1992; Zimmerman & Martinez-Pons, 1990). As a result our model depicts self-efficacy influencing our measure of meaningful cognitive strategy use.

A second motivational influence on cognitive strategy use concerns the achievement goals students pursue. Achievement goal theory predicts that the purposes students have for engaging in achievement tasks will influence their level of task engagement. Research demonstrates that students whose purpose is to improve their competence (i.e., learning goals, mastery goals, or task goals) use meaningful processing strategies and self-regulation strategies to a greater extent than do students whose purpose is to demonstrate competence (i.e., performance goals or ego goals) (e.g., Greene & Miller, 1996; Meece et al., 1988; Miller et al., 1993, 1996; Nolen, 1988; Pintrich & Garcia, 1991). Performance goals, both approach-type and avoidance-type, have been associated with greater use of shallow processing strategies when compared to mastery goals (e.g., Elliot & Thrash, 2001; Elliot, McGregor, & Cable, 1999; Greene & Miller, 1996; Meece et al., 1988; Miller et al., 1993, 1996; Nolen, 1988; Pintrich & Garcia, 1991). As a result, our model depicts mastery goals, but not performance-approach goals as influencing meaningful cognitive strategy use.

A third motivational influence on cognitive strategy use is the extent to which students perceive current task performance as instrumental to achieving personally valued future goals, or more simply, perceived instrumentality (Husman & Lens, 1999; Miller & Brickman, 2003, 2004). The model of Miller and Brickman (2003, 2004), which was a synthesis of work on future-oriented motivation (e.g., Marcus & Nurius, 1986; Nuttin, 1984, 1985; Raynor, 1974), with social-cognitive theory (Bandura, 1986), explains how personally valued future goals lead to the development of a system of subgoals that facilitate future goal attainment. The clarity and elaboration of these subgoals helps individuals recognize which of the many choices they face in the immediate environment will be instrumental to reaching their personally valued future goals. Miller and Brickman (2003, 2004) argue that perceiving current tasks as instrumental has two benefits for self-regulated learning, it transmits the incentive value of the future goal to the current task and it influences the achievement goals people adopt.

As Eccles and colleagues (Eccles et al., 1983; Wigfield & Eccles, 2000) have noted, the subjective task value of achievement tasks represents an important incentive for task engagement. In a similar fashion the Miller and Brickman (2003, 2004) model predicts that perceptions of instrumentality influence student cognitive engagement because of the incentive value of personally valued future goals. The concept of perceived instrumentality can be viewed as a subset of Eccles' broader concepts of utility value and attainment value. Perceived instrumentality focuses on the recognition of

the instrumental relationship between one or more current activities and the attainment of a personally valued future goal. Perception of such instrumental relationships arguably carries greater incentive value than other extrinsic outcomes that are less closely tied to self (Ryan & Deci, 2000). In a pair of studies, Miller and colleagues (Miller, DeBacker, & Greene, 1999; Miller et al., 1996) found perceived instrumentality to be a significant predictor of both self-regulation and meaningful strategy use, even when controlling for the influences of mastery goals and perceived ability. Brickman and Miller (1998) found moderate, positive correlations between perceived instrumentality and meaningful strategy use. As a result, our model depicts perceptions of instrumentality as influencing meaningful cognitive strategy use.

1.3. Theory and research on the factors influencing achievement goals

Following Elliott's (1999) revision of achievement goal theory, our Fig. 1 depicts two important factors as influencing the proximal achievement goals students adopt, competence perceptions (self-efficacy) and important needs or concerns, in this case perceptions of instrumentality. In Elliot's revision of achievement goal theory, he proposes that the fundamental causes of proximal achievement goals are the individual's underlying needs and their competence perceptions. Although Elliot has emphasized underlying achievement needs (e.g., Elliott, 1999; Elliot & Thrash, 2001) as a primary cause of achievement goals, he also opened the door to the possibility that other needs or concerns may be causes of achievement goals.

Miller and Brickman (2003, 2004) have hypothesized that the personally valued future goals that individuals aspire to achieve may be one source of such needs or concerns. They argue that the nature of these self-defining personally valued goals shape the way individuals perceive not only what is instrumental to achieving those

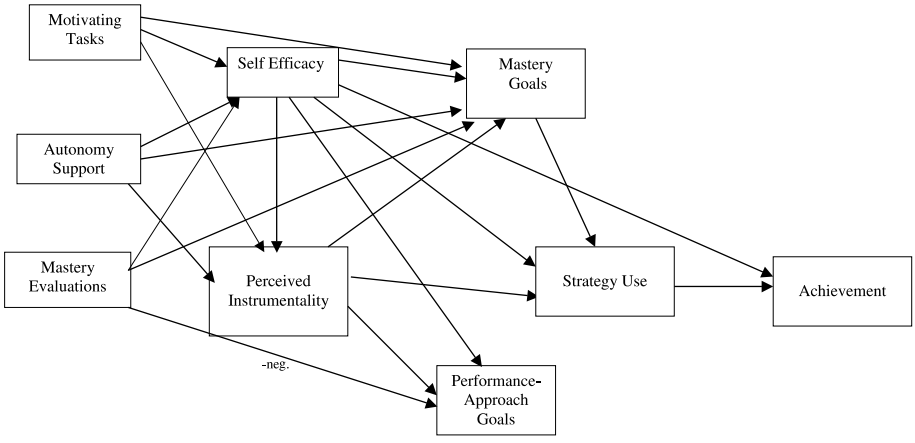

Fig. 1. Theoretical model for predictions from perceptions of class structures to achievement via self-efficacy, perceived instrumentality, goals, and strategy use. *Note.* -neg., negative relationship predicted here, all others were predicted to be positive.

goals, but also the underlying nature of what is valued (see Lens, 2001; Simons, DeWitte, & Lens, 2000, for a related perspective). For example, an individual who aspires to be an educational researcher capable of conducting independent research, will likely view a statistics course quite differently from someone who views the same course as simply a hurdle that must be crossed. The former student is likely to be oriented to mastering the skills and knowledge offered in the course, while the latter is likely to be concerned primarily with demonstrating sufficient competence to earn at least a passing grade. In this way, tasks perceived to be instrumental to the achievement of personally valued future goals have an influence on the proximal achievement goals students adopt.

Research by Nicholls, Patashnick, and Nolen (1985) and Simons et al. (2000) supports this claim. Nicholls et al. (1985) found that some student beliefs about the purposes of schooling (e.g., wealth and status) were more strongly correlated with ego orientation (performance goals), while others (e.g., commitment to society) were more strongly associated with task orientation (learning goals). Simons et al. (2000) used scenarios to manipulate the nature of the instrumental relationship (either intrinsic or extrinsic) between participants' present tasks and assigned future goals. When given an achievement goal questionnaire, those participants receiving the intrinsic instrumental scenario had higher scores on task goals (learning goals), while those receiving the extrinsic instrumental scenario had higher performance goal scores. Consistent with these findings and the model of Miller and Brickman (2004), Fig. 1 depicts perceived instrumentality as having a direct relationship to both learning and performance-approach goals.

Also consistent with Elliot (1999; Elliot & Thrash, 2001), our Fig. 1 also depicts self-efficacy as having a causal influence on achievement goals. In this regard, Elliot has argued that the connection between perceived competence and proximal achievement goals is quite clear: high competence perceptions lead to approach motivation (both mastery and performance-approach), while low competence perceptions lead to avoidance motivation. This is also consistent with Bandura's perspective on the relationship between goals and self-efficacy, wherein self-efficacy is a precursor to adoption of a goal.

This depiction of self-efficacy as influencing achievement goals is not universally accepted. Dweck (1986; Dweck & Elliott, 1988) and Nicholls (1989) hypothesized that competence perceptions were independent of achievement goals, yet they interacted with achievement goals to produce the behavioral patterns (mastery or helpless) discussed in their theories. Nevertheless, research has not consistently supported this hypothesized interaction (see Elliott, 1999 for a detailed review), which was one of the primary reasons for Elliot's revision to achievement goal theory.

Roeser, Midgley, and Urdan (1996) argued that self-efficacy could be seen as a psychological outcome of achievement goal adoption and constructed their path model to reflect this relationship. However, in partial recognition that this perspective was at odds with Bandura's theory, they also acknowledged, "that reciprocal causation among several of these constructs may occur over time (e.g., goals and self-efficacy)" (p. 410). It is also possible to construe expectancy-value theory (Eccles et al., 1983; Wigfield & Eccles, 2000) as supporting a relationship from goals to self-

efficacy; however, research based on expectancy-value theory typically does not include task-related (proximal) achievement goals (Wigfield, 1994). Wigfield (1994) argued that if task-specific goals were included in the expectancy-value model they would likely be shown as being influenced directly by success expectation beliefs and task values. Greene, DeBacker, Ravindran, and Krows (1999) provided evidence that supports this placement of task-specific goals in an expectancy value model. Because Elliott's (1999) theory provided a clear conceptual rationale for positing competence perceptions as a causal influence on achievement goals, one that is consistent with Bandura's social-cognitive theory, we chose it to inform our theoretical model.

1.4. Theory and research on the impact of classroom structures on student efficacy, goals, and instrumentality

Given the research indicating the important roles played by self-efficacy, achievement goals and perceptions of instrumentality in students' task engagement (strategy use) and achievement, it is not surprising that researchers have tried to identify the classroom structures that may influence these variables (e.g., Ames, 1992a, 1992b; Ames & Archer, 1988; Maehr & Midgley, 1991; Rosenholtz & Simpson, 1984). Ames (1992a, 1992b) suggested that classroom structures related to tasks, autonomy, recognition, grouping, evaluation, and time (TARGET) are likely to influence adoption of mastery goals and support high perceptions of ability. Ames (1992b) noted that instructional tasks that include moderate challenge, curiosity, active involvement, and a focus on learning have been found to encourage learning goal adoption. The following practices have all been associated with increased mastery goals and/or high self-efficacy in classrooms: (a) Encouraging students to make choices and decisions (autonomy) regarding their learning; (b) Providing recognition in the form of rewards, incentives, and praise that focuses on individual student effort and progress; (c) Using group activities that encourage working effectively with others on school tasks and developing a sense of belonging; (d) Conducting evaluations that assess progress, improvement, and mastery, while avoiding competitive or "norm referenced" evaluations; and (e) Allowing for time on task to vary with the nature of the task and student needs.

Several studies have supported the predictions regarding the impact of the TARGET structures on student achievement goals and self-efficacy. For example, studies by Anderman and Midgley (1997), Blackburn (1998), Church, Elliot, and Gable (2001), Nolen and Haladyna (1990), Roeser et al. (1996), and Young (1997), have all found that students perceive classroom goal structures as being either learning or performance goal oriented, and their corresponding personal achievement goals for those classes (either learning or performance) were positively related. Those studies that examined self-efficacy or ability perceptions (Anderman & Midgley, 1997; Blackburn, 1998; Roeser et al., 1996) have also found that perceptions of a learning goal or mastery-oriented classroom were positively related to self-efficacy scores. Finally, Blackburn's (1998) study indicated that perceptions associated with task variables, autonomy, and social comparison/competition forms of recognition were significant predictors of perceived instrumentality.

Consistent with Blackburn's work (1998), we have included three measures of classroom perceptions that address three aspects of a learning or mastery goal climate. The first captures the extent to which students find the classrooms task to be meaningful, relevant, and interesting to them (*Motivating Tasks*). The second captures whether or not students think the teacher supports their autonomy through offering choices and encouraging responsibility for learning and self-regulation of learning (*Autonomy Support*). The third measure captures the extent to which students find that the evaluation and recognition practices are fair, focus on learning, and de-emphasize social comparisons and competition (*Mastery Evaluation*).

1.5. The model: The influence of positive motivational climate on motivation, cognitive strategy use and achievement

Fig. 1 depicts the model coordinating all the constructs reviewed previously related to classroom perceptions, motivation, and cognitive influences on achievement. The model depicts the three classroom perception variables (motivating tasks, autonomy support, and mastery evaluation) as each directly influencing self-efficacy and mastery goals (Ames, 1992a, 1992b). Consistent with the Miller and Brickman (2004) model, our model depicts perceptions of three classroom structures and self-efficacy as directly influencing perceived instrumentality. Self-efficacy is also directly influencing mastery and performance-approach goals, strategy use, and achievement. Perceived instrumentality is shown as positively influencing both learning and performance-approach goals. Finally, cognitive strategies are predicted to positively influence student achievement in their classes.

The purpose of the present study is to determine how well this theoretical model fits the data from a sample of high school English students. Because English is a required subject with many divergent components (reading, writing, oral communication, grammar skills, creative expression, etc.), it seemed an intriguing context for studying variability in both student perceptions of classroom structures and motivation. There is a wealth of research on motivation for high school mathematics (e.g., Greene et al., 1999; Meece, Wigfield, & Eccles, 1990; Miller et al., 1996; Pajares, 1996; Pajares & Graham, 1999; Zeldin & Pajares, 2000; Zimmerman & Martinez-Pons, 1990) and much research on motivation for writing (Pajares, 2003; Pajares & Valiante, 1999; Pajares, Britner, & Valiante, 2000; Zimmerman & Bandura, 1994), but very little that examines motivation for all components of English classes (cf., Eccles et al., 1989). Thus, we thought high school English classes would be a good source of information on these constructs.

The present study will help advance our understanding of motivation in the high school English classroom in a number of ways. First, our study will provide a test of the causal relationship between perceived instrumentality and achievement goals proposed by Miller and Brickman (2003, 2004). Although previous studies have reported positive correlations among these variables the causal ordering has not been tested. Second, our study will provide a replication of the findings of previous studies demonstrating the impact of student perceptions of TARGET climate variables on

students' classroom achievement goals and that of Blackburn (1998) showing that these same variables positively influence perceptions of instrumentality. Third, it will provide a replication of previous studies illustrating the positive relationship between self-efficacy, mastery goals, and perceived instrumentality and meaningful cognitive strategies. The causal ordering of the latter relationship, between perceived instrumentality and meaningful cognitive strategies, has not been tested in previous research. Finally, the proposed causal model, in its entirety, has not been subjected to empirical test in previous research. In sum, the findings of this study should enhance our understanding of motivation, cognitive engagement, and achievement in a number of areas.

2. Method

2.1. Sample

The participants were 220 high school student volunteers from a suburban high school in the Midwest who were enrolled in English classes taught by three different teachers. There were 50 sophomores, 42 juniors, 127 seniors, and one student who failed to identify his/her grade level. The sample included 94 males, 125 females, and one student who chose not to report his/her sex. The ethnic/racial composition of the school's student body was 67% Caucasian, 16% Native American, 8% Asian American, 5% African American, and 4% Hispanic.

2.2. Data sources

Participants completed a series of questionnaires over a three-month period in their English classes (see Table 2 for sample items and the Appendix A for full instrumentation). Students first completed a 38-item Survey of Classroom Goals Structures that was based on the instrument validated by Blackburn (1998) whose items were based on the TARGET model of classroom structures (tasks, autonomy, evaluation, recognition, grouping, and time). The phrase "in this class" was included in each item and all items were on a four-point agreement scale. The Likert scales were anchored with "strongly disagree" and "strongly agree."

The participants next completed a seven-item, four-point scale measuring the degree of confidence a student has that he/she can be successful learning in the current class. In keeping with the guidelines put forth by Bandura (1995) we aligned our measure of self-efficacy with our measures of cognitive engagement and achievement so that all three levels were at the same level of specificity (i.e., the current class). This self-efficacy scale has been validated in several published studies (e.g., Greene & Miller, 1996; Miller et al., 1996).

Students also completed a 26-item Approaches to Learning instrument that was a modified version of the survey developed and validated by Miller et al. (1996). Our version measured mastery goals (4 items), performance-approach goals (4 items), perceived instrumentality (6 items), and cognitive strategies used in studying for

the class (12 items, based on the work of Entwistle & Ramsden (1983) and Kardash & Amlund (1991)). All items used a four-point Likert-type format. Each item included the phrase "in this class" in order to keep students focused on the English class in which they were currently enrolled.

The achievement measure was percentage of course points earned for the fall semester in the English class in which the questionnaires were taken. Across all the classes, the percentage grade was based on a combination of exams, projects, and homework assignments.

2.3. Procedure

Parental consent forms were sent home with students at the beginning of the spring semester. The student volunteers with parental consent completed their own assent form, then the classroom teachers administered the surveys throughout the spring semester, with approximately a month intervening between each of the three surveys. The Survey of Classroom Goals Structures was completed in February, the self-efficacy scale was completed in March, and the Approaches to Learning survey was completed the end of April. In June, the teachers reported the percentage grades earned by each participant for the spring semester.

3. Results and discussion

3.1. Preliminary analyses for establishing reliability and validity evidence

Confirmatory factor analysis (CFA) using LISREL 8.52 (Joreskog and Sorbom) was used in order to replicate the factor structure of the Survey of Classroom Goal Structures. Since Blackburn (1998) argued that the scale is comprised of three unique factors, we wanted to confirm her findings by adopting a relatively conservative evidentiary standard. We constrained individual items to load onto pre-specified factors and then evaluated how well the model fit the data. We knew from Blackburn that not all the items would load, so we computed each model twice, deleting items for the second run that did not contribute at least 10% to the explanation of variance in the scale. We identified a Motivating Tasks subscale with 11 items, an Autonomy Support subscale with 6 items, and a Mastery Evaluation subscale with 11 items. The fit statistics for the CFA results are summarized in Table 1. Of the six fit statistics presented, four are in the optimal range (Goodness of fit (GFI) and comparative fit (CFI) $>.90$, $\chi^2/df < 3$, Standardized Root Mean Square Residual (SRMR) $<.10$) and only two are non-optimal (the significant χ^2 & Root Mean Square Error of Approximation (RMSEA) $>.05$). Therefore, the weight of fit evidence is in favor of the model. The Cronbach α reliability coefficients, shown in Table 2, were deemed acceptable.

The Cronbach α reliability coefficients were computed for each of the remaining subscales (self-efficacy, mastery goals, performance-approach goals, perceived instrumentality, and strategy use). These values were (.76–.92) sufficiently high for

Table 1
Results of CFA for motivation and style measurement models

Subscale	Fit statistics						
	χ^2	*df*	χ^2/df	GFI	CFI	SRMR	RMSEA
Motivating Tasks (11 items)	84.67**	44	1.92	.93	.97	.025	.068
Autonomy Support (6 items)	26.14*	9	2.90	.96	.93	.023	.098
Mastery Evaluation (11 items)	122.68**	44	2.79	.90	.92	.067	.095

* $p < .001$.
** $p < .001$.

Table 2
Sample items and descriptive statistics for achievement, positive climate perceptions, self-efficacy, goals, and cognitive engagement

Sample items	Variable				
	Mean	*SD*	*N*	Min–Max	α
Motivating tasks: activities and assignments are interesting	3.09	.44	209	1.45–3.91	.85
Autonomy. support: the teacher wants us to take responsibility for our learning	3.20	.40	217	2.00–4.00	.65
Mastery evaluation: assignments and tests are returned in a way that keeps individual student grades private	3.31	.38	214	1.91–4.00	.80
Perceived instrumentality: my performance is important for becoming the person I want to be	3.15	.61	219	1.33–4.00	.90
Self-efficacy: I am sure I have he ability to understand the ideas and skills taught in this course	3.30	.57	215	1.00–4.00	.91
Mastery goals: learning the ideas and skills in this class is enjoyable	3.21	.56	219	1.00–4.00	.86
Performance-approach goals: I want look to smart to my friends	2.77	.72	217	1.00–4.00	.76
Strategy use: I make sure I understand the ideas that I study	2.71	.50	216	1.33–4.00	.88
Percentage grade	82.32	12.50	219	41.84–100.80	

Note. SD, standard deviation; α, Cronbach α coefficient.

evidence of internal consistency. The Cronbach α coefficients, along with other descriptive statistics, are shown in Table 2.

An examination of zero-order correlations, shown in Table 3, provides validity evidence for our measures. Consistent with theory, our achievement variable was

Table 3
Pearson product–moment correlations among the achievement, strategy use, motivational, and classroom perception variables

Variable	1	2	3	4	5	6	7	8	9
(1) Percentage grade	1.0	.33**	.47**	.245**	.32**	.15*	.20**	.24**	.285**
(2) Strategy use		1.0	.44**	.60**	.65**	.26**	.40**	.31**	.32**
(3) Self-efficacy			1.0	.42**	.48**	.24**	.37**	.44**	.44**
(4) Perceived instrumentality				1.0	.66**	.21**	.48**	.385**	.42*
(5) Mastery goals					1.0	.33**	.545**	.43**	.43**
(6) Performance-approach goals						1.0	.16*	.08	.12*
(7) Motivating tasks							1.0	.78**	.72**
(8) Autonomy support								1.0	.74**
(9) Mastery evaluation									1.0

* $p < .05$ level (one-tailed).
** $p < .01$ level (one-tailed).

positively correlated with strategy use and all the motivation variables; however, the correlation with performance-approach goals was quite weak ($r = .15$). The intercorrelations between performance-approach goals and the other variables were consistently lower, as expected based on theory and prior research. The strongest correlation was with mastery goals. Our strategy use variable had the strongest correlations with mastery goals, perceived instrumentality, and self-efficacy. Self-efficacy scores were most highly correlated with mastery goals, perceived instrumentality, and all three of the variables measuring classroom perceptions. Both mastery goal scores and perceived instrumentality also show strong, positive correlations with the three classroom perceptions variables.

3.2. Path analysis

Path analysis was conducted using LISREL 8.52 (Jörkeskg & Sörbom, 2002) in order to assess how well the proposed model in Fig. 1 fit the data. Fig. 2 depicts the path coefficients for the proposed relationships among the variables in the model. Based on the fit indices, the hypothesized model fit the data quite well. The χ^2 value for the present model was 15.02 (14, $p = .377$), indicating that the observed and model-implied correlation matrices were not significantly different. Furthermore, GFI and CFI indices reached optimal levels (.90 and >) at .98 and 1.00, respectively. The SRMR was .03, well below <.10, indicating acceptable fit. Finally, the RMSEA value for the present model was .019, clearly falling within optimal levels (<.05).

With respect to the predicted paths, our hypotheses were generally supported. Percentage grade was significantly and positively predicted by self-efficacy ($\beta = .38$, $t = 5.29$) and strategy use ($\beta = .15$, $t = 2.08$), whereas self-efficacy was predicted by autonomy support ($\beta = .22$, $t = 2.16$) and mastery evaluation ($\beta = .29$,

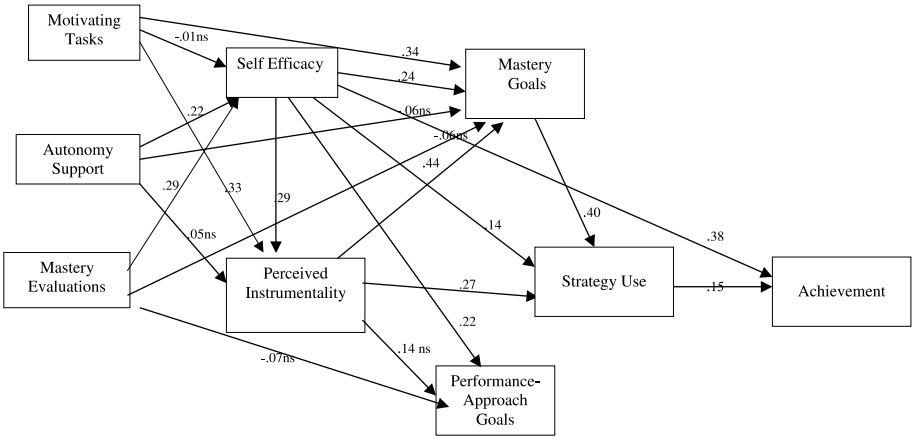

Fig. 2. Path model with path coefficients for predictions from perceptions of class structures to achievement via self-efficacy, perceived instrumentality, goals, and strategy use. *Note.* By default path coefficients are tested using a two tailed test.

$t = 2.53$), but not motivating tasks. The predictors accounted for 22% of the variance in both percentage grade and self-efficacy.

Mastery goals were predicted by self-efficacy ($\beta = .24$, $t = 4.08$), perceived instrumentality ($\beta = .44$, $t = 7.49$), and motivating tasks ($\beta = .34$, $t = 4.00$). The predicted links from the other two classroom perception variables to mastery goals were not confirmed. Perceived instrumentality was predicted by self-efficacy ($\beta = .29$, $t = 4.41$) and motivating tasks ($\beta = .33$, $t = 3.86$). The link from autonomy support was not supported. This set of predictors accounted for a combined 53% of the variance in mastery goals and 31% of the variance in perceived instrumentality, respectively.

The only significant predictor of performance-approach goals was self-efficacy ($\beta = .22$, $t = 2.68$). The path from perceived instrumentality to performance-approach goals, however, does reach significance when a one-tailed test is used ($\beta = .14$, $t = 1.69$; the default is a two-tailed test in LISREL 8.52). It was interesting to note that the anticipated negative relationship from mastery evaluations to performance-approach was not supported. Overall, 7.4% of the variance in performance-approach goals is explained by the set of predictors. Finally, strategy use was predicted by self-efficacy ($\beta = .14$, $t = 2.39$), mastery goals ($\beta = .40$, $t = 5.62$), and perceived instrumentality ($\beta = .27$, $t = 3.85$), with 48% of the variance in strategy use accounted for by those predictors.

4. General discussion

A major contribution of the present study was the empirical test of the model shown in Fig. 1. The results were consistent with a causal model that assumed the

following relationships: achievement outcomes are directly influenced by both meaningful strategy use and self-efficacy; meaningful strategy use is influenced by mastery goals, self-efficacy, and perceived instrumentality, but not by performance-approach goals; mastery goals are influenced by variations in self-efficacy, perceived instrumentality, and perceptions of classroom tasks as meaningful and motivating; self-efficacy is directly influenced by perceptions of classrooms being autonomy supportive and using mastery-oriented evaluation, while perceived instrumentality is influenced by both self-efficacy and perceptions of classroom tasks being meaningful and motivating. Finally, performance-approach goals are influenced by self-efficacy and perceived instrumentality, but do not have a causal influence on any other variables in the model. The data provided good support for the model overall, in that the fit statistics were strong and most of the proposed causal links were supported by the empirical findings.

The results indicated that the hypothesized causal relationship between students' perceptions of the classroom climate and their adaptive motivation (i.e., high self-efficacy, high mastery goals, and perceived instrumentality) is a plausible one. Although previous research had supported the influence of perceived classroom goal structures on student goal adoption and self-efficacy (Anderman & Midgley, 1997; Blackburn, 1998; Roeser et al., 1996), the present findings are the first to support the claim that perceptions of classroom tasks as meaningful, relevant, and interesting (motivating tasks) also influence the extent to which students perceive current learning as instrumental to their future success. We think our finding is important, given the theoretical and empirical relationships between perceived instrumentality and both mastery goals and meaningful strategy use.

Another important aspect of our study was the examination of student perceptions of autonomy support. In our study perceptions of autonomy support were positively related to grades, strategy use, and adaptive student motivation as measured by mastery goals, self-efficacy, and perceived instrumentality. It was also a predictor of self-efficacy. These findings are consistent with earlier work on autonomy support by Deci and colleagues. For example, Deci, Schwartz, Sheinman, and Ryan (1981) found that teachers who were autonomy supporting had students in grades four through six who scored high on intrinsic motivation, perceived competence, and self-esteem. Based on our findings, it seems that the relationships between classroom structures and student motivation found for elementary-aged students are similar for older, high school-aged students like those in the present study.

We also think it is important to note that perceptions of different facets of the classroom climate are differentially related to motivation. Consistent with our predictions, students who perceived their classroom as supporting autonomy and mastery-oriented evaluation rather than competitive evaluation, expressed higher levels of self-efficacy. Also, students who perceived the tasks assigned in class as meaningful and motivating, tended to endorse mastery goals, and perceptions of instrumentality. Contrary to our predictions, mastery goals were not positively predicted by either perceptions of autonomy support or mastery evaluations. This may be the result of a statistical artifact because mastery goals have positive, moderate correlations with the three classroom climate variables, with motivating tasks having the

strongest correlation (see Table 3). These climate variables also were highly correlated with each other (.72–.78). As a result, the predicted relationship between motivating tasks and mastery goals may have accounted for the majority of the shared variance among this collection of variables. In a similar fashion, the relationship between self-efficacy and both autonomy support and mastery evaluation may have accounted for the majority of shared variance in motivating tasks.

Also contrary to our predictions, perceptions of mastery evaluation did not have a significant negative relationship with performance-approach goals. Even the simple correlations of performance-approach goals and the three measures of classroom climate failed to account for much variance. This may indicate performance-approach goals are affected by classroom climate variables other than those included in our measure. Additional research is needed to explain this finding. This collection of findings is new in the literature and suggests that teachers need to attend to different facets of classroom climate if they are going to effectively encourage adaptive motivation in their students.

As expected from previous research (e.g., Greene & Miller, 1996), both self-efficacy and meaningful strategy use were the only variables with direct effects on achievement. Performance-approach goals were not related to achievement or meaningful strategy use. Consistent with Elliott's (1999) perspective on achievement goals, self-efficacy was significantly related to both learning and performance-approach goals. Elliot argued that achievement goals are influenced by both an individual's self-efficacy beliefs and the underlying needs and concerns. In the case of approach motivation, high self-efficacy is a necessary ingredient. Our results are clearly supportive of this theoretical claim. The strength of the relationship, both directly and indirectly, between self-efficacy and both meaningful strategy use and achievement demonstrates how important self-efficacy is for successful learning. Finding multiple ways to positively impact self-efficacy should clearly be a major goal for motivation research. We are encouraged that our results show that one way to positively impact self-efficacy is through students' perceptions of the classroom as supporting mastery evaluation and autonomy.

Another important finding in this study was the empirical support for the hypothesized relationship between perceived instrumentality and students' achievement goals (learning and performance-approach) proposed by Miller and Brickman (2003, 2004). Elliot (1999; Elliot & Thrash, 2001) has argued that achievement goals are partially determined by underlying achievement needs (e.g., need to achieve and fear of failure) and other concerns. Miller and Brickman argued that one set of concerns that may influence achievement goals is the personally valued future goals that people pursue (see also Lens, 2001). When tasks are perceived to be instrumental to personally valued future goals, their incentive value is enhanced through the future goals to which they are connected. It is the incentive value that gives the tasks meaning. When tasks are perceived to be instrumental because of the importance of the skills or knowledge inherent in the task then students are more likely to adopt mastery goals. When tasks are perceived to be instrumental because of the importance of doing well compared to others, students are more likely to adopt performance goals. Data from this study provide solid support for this argument.

We think the role of perceived instrumentality is an important one for both theory and practice. We suspect that there are many situations in the course of one's academic career in which the need to master the material is driven not by an enjoyment of gaining the new knowledge or an abstract want to improve one's knowledge and skill, but rather by the realization that the knowledge will be needed in the future. We also think that having knowledge of how perceived instrumentality affects student motivation and engagement gives teachers another tool with which to work to increase student motivation when mastery for the sake of mastery is just not feasible. Trying to convince students to adopt mastery goals when they lack interest in the task and cannot see its utility for the future is a hopeless venture. We believe that teachers can more easily convince students that current learning is instrumental for future success, thus making mastery goals more plausible. In general, we think the findings of our study support exploring these implications and the search for alternative ways teachers can encourage perceptions of instrumentality in classroom settings.

Our results also indicate that perceived instrumentality, along with mastery goals and self-efficacy, has an important relationship to meaningful strategy use. Numerous studies have supported a positive relationship between meaningful strategy use and both mastery goals and self-efficacy (e.g., Ames & Archer, 1988; Greene & Miller, 1996; Meece et al., 1988; Miller et al., 1993, 1996; Nolen, 1988; Pintrich & Garcia, 1991). A smaller, more recent body of research (e.g., Brickman & Miller, 2001; Greene et al., 1999; Miller et al., 1996) has linked effective cognitive engagement to perceived instrumentality. The conceptual underpinnings of this relationship are as follows: as tasks increase in their perceived instrumentality, the incentive value of success also increases. Students invest greater effort and more appropriate cognitive resources to tasks perceived as having high personal incentive value (Miller & Brickman, 2003, 2004).

Finally, the relationship between student achievement and both meaningful strategy use and self-efficacy is also consistent with previous research (Greene & Miller, 1996; Miller et al., 1993). It is important to note that self-efficacy's relationship to achievement includes both confidence related to the cognitive strategies measured in our strategy use instrument and confidence in the use of strategies not measured by our instrument. Additionally, self-efficacy reflects other cognitive (e.g., knowledge) and motivational (e.g., persistence) factors influencing achievement. Thus, self-efficacy should (as it did in our data) exert a greater influence on achievement than a single measure of meaningful strategy use.

5. Limitations

There are limitations to the present work that should be noted. First, we are inferring plausible influences of one variable on another when our data are correlational. A stronger design would involve re-administering all of the instruments over time to more accurately get at causation. However, we were constrained by the realities of classroom-based research in which multiple hours of testing for re-

search was not deemed a valid use of student time, especially since the result would still be correlational data. It is important to note that although our data were shown to fit the predicted model reasonably well, this does not mean that the data would not fit other configurations of the variables. We tested only a small number of theoretical predictions and we acknowledge that these data may also support other sets of relationships (see Kline, 1998). Additionally, the inclusion of other variables, such as past achievement in English, could also change our findings. In future work we plan to include a measure of past achievement in the hope of explaining more variance.

An additional limitation is that the school we studied was in a largely white, middle to upper-middle class area. We would like to replicate these results in schools with greater racial/ethnic and economic diversity. We do know, though, that earlier findings regarding the importance of perceived instrumentality were from more diverse settings (e.g., Greene et al., 1999; Miller et al., 1996), so we are not concerned about that construct being bound to a relatively privileged sample.

6. Summary

Despite the limitations of the study, we believe these findings are significant for both theory and practice. The findings provide empirical support for the theoretical predictions, provide insight on what classroom structure variables are likely to be critical for encouraging positive goals (those related to the learning tasks), and suggest at least two implications for how teachers can encourage positive motivation. First, since students' perceptions of the instrumentality of the learning tasks were very important, teachers should describe their different learning activities to students in terms of how they are meaningful and relevant to students' interests, goals, and needs. This means that teachers need to consider that different types of lesson introductions and/or encouragement will be required to ensure all students in a given setting develop a sense of instrumentality and adopt mastery goals. Second, students' confidence in their ability to be successful in class was very important for this sample of high school students, as it has been in other studies with high school students (e.g., Brickman & Miller, 2001; Greene et al., 1999; Miller et al., 1996). This suggests that teachers must recognize the self-efficacy concerns that students have in regard to different learning activities. Together these two implications suggest that further research focusing on the development of teacher strategies for highlighting the instrumentality of schoolwork to students' futures and creating positively motivating classroom environments that foster self-efficacy, perceived instrumentality and mastery goals is very important.

Appendix A. Constructs and Items

Motivating tasks

- In this class activities and assignments are interesting.

- In this class, the teacher emphasizes learning the material to gain understanding.
- In this class, the teacher introduces material in ways that are relevant, interesting, and familiar to students.
- The teacher shows how the activities in this class are related to students' everyday lives or future careers.
- In this class, the teacher tries to find out what each student wants to learn about.
- The teacher helps us understand how the activities and assignments in this class will be useful to us.
- The teacher explains ideas in this class in ways that make the information meaningful to the students.
- In this class, students learn mainly by listening to the teacher and taking notes. **R**
- Students learn in this class by participating in class activities and discussions.
- The teacher in this class values creative thinking and original ideas.
- The teacher helps us understand how the activities and assignments in this class will be useful to us.

Autonomy support

- In this class the teacher wants us to take responsibility for our learning.
- Students get to choose projects/topics they want to work on in this class.
- The teacher tells us how we can plan to meet our goals for this class.
- Students get to choose projects/topics they want to work on in this class.
- Students are given a chance to correct their mistakes in this class.
- The teacher provides suggestions and guidance for organizing and managing the activities and assignments in this class.

Mastery evaluation

- In this class, only a few students can get high grades. **R**
- The teacher in this class uses more than one way to determine grades (tests, projects, presentations, journals, etc.).
- The tests in this class match what we learned in class.
- Students have to compete against each other to get high grades in this class. **R**
- In this class, assignments and tests are returned in a way that keeps individual student grades private.
- When students make mistakes they are treated with respect in this class.
- Students can redo work to improve their grades in this class.
- The teacher grades fairly in this class.
- In this class, the teacher pays attention to whether I am improving.
- Students are provided with guidelines for how they will be tested on quizzes or other assignments in this class.
- Only students with the highest grades can keep up with the pace of this class. **R**

Self-efficacy

- I am sure about my ability to do the assignments in this class.
- Compared to others in this class, I think I am good at learning this material.
- I am certain I can understand the material presented in this class.
- I am sure I can do as well as, or better than, other students in this class on exams.

- I am sure I have the ability to understand the ideas and skills taught in this course.
- Compared with other students in this class my learning and study skills are strong.
- I am certain I can learn the ideas and skills taught in this class.

Mastery goals

I do the work in this class because ...

- I want to improve my understanding of the ideas and/or skills.
- I like to understand what I study in class.
- I want to learn new ideas and skills.
- Learning the ideas and skills in this class is enjoyable.
- I like learning new ideas and skills.

Performance goals—approach

I do the work in this class because...

- I want others to think I'm smart.
- I want look to smart to my friends.
- I like to get better grades than other students.
- I like to perform better than other students.

Perceived instrumentality

I do the work in this class because...

- My performance in this class is important for becoming the person I want to be.
- My achievement plays a role in reaching my future goals.
- Mastering the ideas and skills taught in this class will help me in the future.
- My performance in this class is important for becoming the person I want to be.
- Understanding the ideas and skills is important for becoming the person I want to be.
- Learning these ideas and skills is important for achieving my dreams in the future.
- My performance is important for becoming the person I want to be.

Study strategies

- Before a quiz or exam, I plan out how I will study.
- When I finish working practice problems or homework, I check my work for errors.
- I plan my study time for this class.
- I have a clear idea of what I am trying to accomplish in this class.
- If I have trouble understanding something I go over it again until I understand it.
- I try to plan an approach in my mind before I actually start homework or studying.
- When learning new information I try to put the ideas in my own words.
- When doing an assignment I make sure I know what I am asked to do before I begin.
- When I study I am aware of the ideas I have or have not understood.
- It is easy for me to establish goals for learning in this class.
- I answer practice problems to check my understanding.
- I make sure I understand the ideas that I study.

Note. **R** means an item was reverse scored.

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