

What Makes a Good Student? How Emotions, Self-Regulated Learning, and Motivation Contribute to Academic Achievement

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The authors propose a theoretical model linking emotions, self-regulated learning, and motivation to academic achievement. This model was tested with 5,805 undergraduate students. They completed the Self-Regulated Learning, Emotions, and Motivation Computerized Battery (LEM-B) composed of 3 self-report questionnaires: the Self-Regulated Learning Questionnaire (LQ), the Emotions Questionnaire (EQ), and the Motivation Questionnaire (MQ). The findings were consistent with the authors' hypotheses and appeared to support all aspects of the proposed model. The structural equation model showed that students' emotions influence their self-regulated learning and their motivation, and these, in turn, affect academic achievement. Thus, self-regulated learning and motivation mediate the effects of emotions on academic achievement. Moreover, positive emotions foster academic achievement only when they are mediated by self-regulated learning and motivation. The results are discussed with regard to the key role of emotions in academic settings and in terms of theoretical implications for researchers.

Keywords: emotion, academic achievement, self-regulated learning, motivation, structural equation modeling

One of the most important concerns in the field educational psychology is to attempt to understand why some students stop trying when faced with academic difficulties, whereas others rise to the occasion using strategies and perseverance, thus achieving higher grades. Researchers have generated a prolific array of findings with regard to factors that promote and correlate with academic achievement in an attempt to predict and prevent dropout (Winne & Nesbit, 2010). In the present study, we examined the influence of emotions, self-regulated learning, and motivation on students' performance. Specifically, we investigated how emotions relate to self-regulated learning and motivation, and they affect academic achievement.

The Effects of Emotions on Academic Achievement

In the past 10 years, there has been growing interest in the role of positive emotions in academic settings, as demonstrated in four special issues (Efklides & Volet, 2005; Linnenbrink, 2006;

Linnenbrink-Garcia & Pekrun, 2011; Schutz & Lanehart, 2002) and in the book *Emotion in Education* (Schutz & Pekrun, 2007).

Current research on emotions has described *emotions* as a multiple-component process that comprises specific affective, cognitive, psychological and behavioral elements (Pekrun, Goetz, Frenzel, Barchfeld, & Perry, 2011; Scherer, 2009). In Pekrun's control-value theory (2006), *achievement emotions* are defined as emotions directly tied to achievement activities or achievement outcomes. Two types of achievement emotions can thus be distinguished: *activity emotions* pertaining to ongoing achievement-related activities, and *outcome emotions* pertaining to the outcomes of these activities. The latter includes prospective emotions as well as retrospective emotions. Some examples of these activity emotions are enjoyment arising from learning, boredom experienced in academic lectures, and anger when dealing with difficulties. The control-value theory (Pekrun, 2006) implies that prospective outcome emotions are assumed to be a function of outcome expectancy, and retrospective outcome emotions are aroused when success or failure has occurred.

Positive emotional experiences play an important role in academic achievement and have a considerable impact on students' ultimate success in the academic domain (Pekrun, Elliot, & Maier, 2009). Students' enjoyment, hope, and pride relate positively to their academic achievement, whereas hopelessness relates negatively to achievement (Pekrun et al., 2011). Both boredom and anxiety also lead to a negative prediction of generalized achievement as measured by grade point average (GPA; Daniels et al., 2009). Moreover, some students experience both positive and negative emotions in relation to an event, whereas others report only negative emotions. The performance of those students who interpret any arousal as negative would be more impeded than the performance of students who label the increased level of arousal in terms of both negative and positive emotions (Boekaerts, 2003). These results demonstrate the critical role of emotions in academic

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settings and provide evidence suggesting that emotions have a predictive power in explaining students' performance.

However, research on emotions in education is in a state of relative fragmentation, and a conceptual integration of research on emotion, cognition, and motivation seems to be largely lacking. The control-value theory of achievement emotions (Pekrun, Frenzel, Goetz, & Perry, 2007) offers an integrative framework for analyzing the effects of emotions experienced in achievement and academic context. It is assumed that achievement emotions profoundly affect students' performance. Several mediating processes are posited to be responsible for these effects, including cognitive resources, learning strategies, self-regulated learning, and motivation to learn. Emotions are expected to facilitate use of different learning strategies and to promote different styles of regulation including students' self-regulation versus external regulation of learning. Furthermore, emotions are thought to influence students' intrinsic motivation to learn. Therefore, the overall effects of emotions on academic achievement are assumed to be a joint product of these diverse processes and to depend on interactions between these processes and task demands. This implies that the effects of emotions on achievement are inevitably complex, and more research is clearly needed to assess and disentangle the casual relationships of emotions with their outcomes.

Self-Regulated Learning as Predictor of Academic Achievement

Self-regulated learning is a multidimensional construct that emphasizes the active role of the learner (Abar & Loken, 2010; Efklides, 2011; Greene & Azevedo, 2010; Winne, 2010; Zimmerman, 2008). Several different and broad models of self-regulated learning have been proposed to describe how students become responsible learners by regulating their own learning and performance (Azevedo, Moos, Johnson, & Chauncey, 2010; Boekaerts, Pintrich, & Zeidner, 2000; Muis, Winne, & Jamieson-Noel, 2007).

Although these theories present different perspectives on self-regulated learning, they largely share the view that self-regulated learners are actively constructing knowledge and use various cognitive and metacognitive strategies to control and regulate their academic learning (Zimmerman, 2000a). A self-regulated student is characterized as a student who is aware not only of task requirements but also of his own needs with regard to optimal learning experiences (McCann & Garcia, 1999). Self-regulated learners actively avoid behaviors and cognitions detrimental to academic success; they know the strategies necessary for learning to occur and understand when and how to utilize strategies that increase perseverance and performance (Byrnes, Miller, & Reynolds, 1999). In fact, self-regulated learners view learning as a controllable process: they constantly plan, organize, monitor, and evaluate their learning during this process (Ley & Young, 1998). They set standards or goals to strive for in their learning, monitor their progress toward these goals, and then adapt and regulate their cognition, motivation, and behavior in order to reach their goals (Pintrich, 2004). Moreover, certain standards or goals are set for various facets of the learning process, and these are used as a benchmark against which products created during learning are compared. These standards or goals help students decide whether their learning process should continue in the same way or if some change is necessary (Muis, 2007).

To summarize, most theories, models, and frameworks of self-regulated learning assume that it is an active, constructive process. Whereas they tend to agree that in order to be successful, students must actively engage in numerous activities to regulate their academic learning, they also place different emphasis on the various components of self-regulated learning. In this article, self-regulated learning was conceptually and operationally defined by a broad set of indicators, such as organization, elaboration, self-evaluation, strategies for studying for an exam, and metacognition that might better represent the construct. Organization refers to academic time management and involves allocating time for different activities, for example designating particular times throughout the week for the preparation of a particular exam (Ley & Young, 1998; Pintrich, 2004). Elaboration includes behaviors such as summarizing study materials, creating analogies, and generative note taking (Warr & Downing, 2000). Self-evaluation involves a high level of self-awareness and the ability to monitor one's own learning and performance (Van Etten, Freebern, & Pressley, 1997). Strategies for studying for an exam involve behaviors such as monitoring comprehension of a lecture and self-testing through the use of questions about the text material to check understanding (Ruban, McCoach, McGuire, & Reis, 2003). Metacognition includes monitoring one's own thinking, evaluating appropriateness of procedures used, and identifying potential errors (Dinsmore, Alexander, & Loughlin, 2008; Sperling, Howard, Staley, & DuBois, 2004).

Motivation as Predictor of Academic Achievement

Student motivation is considered a dynamic, multifaceted phenomenon (Eccles, Wigfield, & Schiefele, 1998; Graham & Weiner, 1996; Seifert, 2004). Different motivational theories and constructs have been put forward to try to understand how and why students are motivated for academic achievement (Pintrich, 2003).

In this article, we focus on some motivational constructs that appear to be mainly associated with self-regulated learning and play an essential role in understanding student commitment and achievement (Cornoldi, De Beni, & Fioritto, 2003; Ferla, Valcke, & Schuyten, 2008). In particular, we consider three aspects that are theoretically linked (Efklides, 2011): implicit theories of intelligence, self-efficacy, and achievement goals.

Dweck's (1999) social cognitive theory of motivation analyzes implicit theories that learners hold on the nature of intelligence. Some students seem to favor an incremental theory and to conceive intelligence as a malleable, increasable, and controllable quality, whereas other students seem to construct an entity theory and to believe that intelligence is a fixed and uncontrollable trait. Students who endorse the incremental theory of intelligence believe that they can increase their intellectual abilities through effort and learning. By contrast, students who endorse the entity theory of intelligence believe that they are born with a certain amount of intelligence that cannot be changed. Implicit theories of intelligence may underlie key components of self-regulated learning (Bråten & Strømsø, 2004). Students who believe intelligence can be increased may actively use different strategies to control and regulate their academic learning. On the other hand, students who believe intelligence is fixed may reduce their level of strategy use. Moreover, different studies have demonstrated the influence of implicit theories of intelligence on academic success at university

(Dupeyrat & Mariné, 2005; Kennett & Keefer, 2006). A belief in the fixed nature of abilities may undermine a student's long-term academic success by fostering avoidance of difficult yet necessary tasks (Hong, Chiu, Lin, Wam, & Dweck, 1999).

Academic self-efficacy refers to students' convictions that they can successfully perform given academic tasks at designated levels (Bandura, 1997; Schunk, 1991). Beliefs and perceptions of self-efficacy are deeply rooted in past achievements, difficulties, and personal history (Lackaye & Margalit, 2006). Students feel differently about themselves and their academic achievement and choose different courses of action depending on what they believe they are capable of and what they hope to achieve (Zimmerman, 2000b). Students who believe they are able and will do well are much more likely to be motivated in terms of effort, perseverance, and behavior than students who believe they are less able and do not expect to succeed (Pintrich, 2003). Self-efficacy is closely linked to self-regulated learning (Bong & Skaalvik, 2003; Ferla et al., 2008; Pintrich, 2004). Students who believe they are capable are more likely to be self-regulating, to try understand their academic work, and to plan, monitor, and regulate their academic work (Linnenbrink & Pintrich, 2003; Seifert, 2004). Self-efficacious students who are dissatisfied with their progress are apt to change their strategy to a more effective one. Moreover, numerous studies have clearly established that academic self-efficacy has a profound impact on academic performance (Ferla et al., 2008; Walker, Greene, & Mansell, 2006). The level of self-efficacy that students reported during the first year of university is a powerful predictor of performance. Students who enter college with confidence in their ability to perform well academically do perform significantly better (Chemers, Hu, & Garcia, 2001).

Achievement goal theory has been one of the most widely researched motivation frameworks in educational psychology (Huang, 2012). Achievement goals represent the purposes that students pursue as they engage in achievement behavior. Early studies distinguished between **two types of achievement goals: mastery goals, in which the purpose is to develop competence, and performance goals, in which the purpose is to demonstrate competence** (Ames, 1992; Dweck & Leggett, 1988). More recent studies have incorporated the approach-avoidance dimension to identify four types of achievement goals: mastery-approach, performance-approach, mastery-avoidance, and performance-avoidance (Elliot & Thrash, 2002; Pintrich, 2000). **Approach motivation was associated with higher academic achievement, and avoidance motivation was associated with lower academic achievement** (Huang, 2012). The introduction of approach-avoidance dimension to achievement goal theory helped clarify early inconsistencies in the performance goal findings (Brophy, 2005; Elliot, Murayama, & Pekrun, 2011; Midgley, Kaplan, & Middleton, 2001; Murayama, Elliot, & Yamagata, 2011). This new dimension is now widely accepted, with most researchers either studying all four goals or honing in on mastery- and performance-approach goals. Taking the latter approach, in this article, we focus only on mastery-approach and performance-approach goals.

Students oriented toward **mastery-approach goal** focus on increasing their levels of competence by acquiring the knowledge or skills that the task develops. Students oriented toward **performance-approach goal** want to demonstrate their ability relative to others by outperforming them and publicly displaying their task-relevant knowledge or skills (Conley, 2012; Muis & Edwards,

2009). **Students who pursue mastery-approach goals persist, even when facing difficulty; they believe intelligence is malleable, and they self-regulate effectively, making more positive self-statements than students pursuing performance-approach goals** (Barron & Harackiewicz, 2001; Seifert & O'Keefe, 2001; Senko, Hulleman, & Harackiewicz, 2011).

In summary, these findings suggest that **students' implicit theories of intelligence, self-efficacy, and approach achievement goals play an essential role in their motivation**. These different components of motivation are closely linked to self-regulated learning and facilitate and influence various self-regulatory strategies. Therefore, they promote and sustain academic achievement. However, more research is clearly needed to provide understanding of achievement motivation and to explore the relations between diverse patterns of motivation and achievement outcomes.

Conceptual Framework and Hypotheses

Theoretical models have been proposed to integrate emotions into achievement goal theory (Elliot & Pekrun, 2007; Linnenbrink & Pintrich, 2002; Pekrun, Elliot, & Maier, 2006; Seifert, 1995). Some models have suggested that achievement goals are predictors of discrete emotions (Elliot & Pekrun, 2007; Pekrun et al., 2006). In other words, they suggest that mastery-approach goals are positive predictors of enjoyment of learning and hope but are negative predictors of anxiety and shame. On the other hand, performance-approach goals are positive predictors of pride. By contrast, Linnenbrink and Pintrich (2002) proposed that affective states, especially moods, influence a student's goal. Moreover, Seifert (1995) provided some preliminary evidence that emotions are better predictors of achievement goals than achievement goals are predictors of emotions. Further models linking emotions and achievement goals to academic achievement have been tested (Daniels et al., 2009; Pekrun et al., 2009). In these models, discrete emotions are assumed to predict academic achievement and to significantly mediate the effects of achievement goals on academic performance.

Research investigating the links among emotions, achievement goals, and academic performance used achievement goal theory to consider motivation. Nevertheless, as stated earlier, students' motivational beliefs also play an essential role in their motivation to achieve, promote, and sustain academic achievement. Consequently, in this research, we considered different facets of motivation: implicit theories of intelligence, confidence in one's intelligence and personality, self-efficacy, and approach to achievement goals.

Researchers in achievement emotions have assumed that positive emotions enhance students' self-regulated learning and negative emotions facilitate reliance on external guidance (Pekrun et al., 2007). Their findings have shown that enjoyment, hope, and pride positively relate to self-regulated learning, whereas hopelessness and boredom relate negatively to self-regulated learning (Linnenbrink, 2007; Pekrun et al., 2011).

Furthermore, students have been shown to experience a wide range of emotions in different academic settings, such as taking exams and attending classes. By implication, emotions may vary across these contexts (Pekrun et al., 2011). For example, emotions that students feel while studying may be different from emotions experienced while taking tests. In this study, we have evaluated

several positive and negative emotions referring to three settings: self, academic achievement, and study time.

There has been some progress in research in this area. Some studies have analyzed links between emotions and achievement goals; others have analyzed links among emotions, achievement goals, and academic achievement; and yet others have analyzed links between emotions and self-regulated learning. However, no one, so far, has investigated the role of emotions, self-regulated learning, and motivation together as predictors of academic achievement.

We here propose a theoretical model linking emotions, self-regulated learning, and motivation to attain academic achievement. According to the **control-value theory** (Pekrun et al., 2007), students' emotions are thought to influence their self-regulated learning and their motivation, which in turn affect academic achievement. This would suggest that **self-regulated learning and motivation mediate the effects of emotions on academic achievement**. We also tested the direct link of positive emotions on academic achievement.

Method

Participants

Participants were **5,805 undergraduate students** (36.4% men and 63.6% women) from **all disciplines** offered by the University of Padua. They ranged in age from 18 to 35 years ($M = 22.46$, $SD = 3.23$). Some 82.7% regularly attended university courses, 8.8% attended less than 50% of the lectures in their various courses, and 8.5% attended occasionally. Some 44.9% were nonworking students, 27.2% were in temporary jobs, and 27.9% were in part-time or full-time jobs.

Measures

The Self-Regulated Learning, Emotions, and Motivation Computerized Battery (LEM-B) has been developed as a specific instrument to measure aspects linked to self-regulated learning, emotions related to study and motivation to learn in academic settings. It is composed of three self-report questionnaires: the Self-Regulated Learning Questionnaire (LQ), the Emotions Questionnaire (EQ), and the Motivation Questionnaire (MQ).

Self-Regulated Learning Questionnaire (LQ). The LQ is composed of 50 items that describe different facets of self-regulated learning, adapted by De Beni, Moè, and Cornoldi (2003) in order to make them more appropriate for undergraduate students. There are five facets of self-regulated learning: **organization, elaboration, self-evaluation, strategies for studying for an exam, and metacognition**. For each facet, students were invited to answer 10 questions, five of them formulated in a positive direction and the other five in a negative direction. Regarding organization, an example of a positive question is "I try to have a clear idea of all my future study tasks," and an example of a negative question is "I find that I have a lot of material to study only few days before the examination."

Emotions Questionnaire (EQ). The EQ is used to evaluate **positive and negative emotions related to study**. It is composed of 60 items extracted and adapted from the Self-Report Study-Related Emotion Questionnaire (Mega, Moè, Pazzaglia, Rizzato, & De Beni,

2007). Students were required to evaluate how often they felt a list of 10 positive (e.g., "enjoyment," "hope," and "pride") and 10 negative emotions (e.g., "anger," "anxiety," and "shame") referring to the self, academic achievement, and study time.

Motivation Questionnaire (MQ). The MQ was adapted by De Beni et al. (2003) and is composed of 27 items that describe five different motivational beliefs: **implicit theories of intelligence** (eight items; e.g., "To what extent do you think it is possible to modify the ability to solve math problems?"), **confidence in one's intelligence** (three items; e.g., "I usually think I am smart"), **confidence in one's personality** (three items; e.g., "I am sure that people like my personality"), **self-efficacy** (five items; e.g., "How do you rate your study skills?"), and **approach achievement goals** (eight items; e.g., "I manage to face situations that demand intensive study even if there is a risk of failure").

Academic achievement. In the Italian higher education system, students' academic performance is measured using two indicators: productivity and ability. **Productivity corresponds to the number of exams passed by a student divided by the number of university years attended**. In Italy, there is an important distinction between "regular" students and "nonregular" students. Regular students are those who have passed all the exams they are expected to take during the academic year. Nonregular students are those who have not passed all the exams they are expected to take during the academic year. Moreover, the proportion of regular students and regular graduates is considered as a proxy for universities' efficiency. **Ability corresponds to the GPA**. The examination grade functions as a legal indicator of a student's level of preparation; grades range from 18 to 30 with honors. Moreover, a student's GPA at the final degree examination is used by the board of examiners as the starting point from which to determine the final degree grade. There are two facets to the concept of academic success: first, if two students have the same GPA but one has taken two exams per year and the other eight, their academic performance is considered to be different. Second, if two students pass the same number of exams per year but one obtains a GPA of 20 and the other of 27, their academic performance is again considered to be different. We used these two indicators, productivity and ability, as an index of academic achievement. Since their correlation was low ($r = .15$), the two achievement measures did not funnel into a latent construct but have merged into one single variable. This index was calculated by the number of exams passed by each student divided by the number of years spent at the university and then was multiplied by the GPA (Mega, Pazzaglia, & De Beni, 2008).

Procedure

Students found the LEM-B on the web site of the faculties of the University of Padua, and they completed the self-report measures individually. While the order of items within each questionnaire varied randomly from student to student, the order in which the three questionnaires were presented to all students was the same: **Self-Regulated Learning Questionnaire (LQ), Emotions Questionnaire (EQ), and Motivation Questionnaire (MQ)**.

If students answered all the items, they received a profile referring to the eight aspects of the battery: five for the LQ, one for the EQ, and two for the MQ (i.e., one for confidence in their own intelligence and personality and one for self-efficacy). The profile is based on data obtained from previous researches (De Beni et al., 2003; Mega et al., 2007). For each aspect of the battery, three types of feedback were

calculated: high score (> 75 th percentile), medium score (25th–75th percentile), and low score (< 25 th percentile).

Results

Rationale for Analyses

We conducted our analyses in three steps. First, we averaged the means of the five LQ, the six EQ, and the five MQ areas. We also correlated the study variables. Second, we used three separate **confirmatory factor analyses (CFAs)**—one each for the LQ, the EQ, and the MQ—to test the relationship between items and latent variables. This process was recommended by Schreiber (2008) to derive the best indicators of latent variables before testing a structural model. Third, a **structural equation model (SEM)** was estimated using positive affect, negative affect, self-regulated learning and motivation as latent variables and academic achievement as the observed variable.

We conducted measurement and structural analyses using the LISREL Version 8.7 statistical package (Jöreskog & Sörbom, 2004). Among various fit indexes, we adopted the chi-square test, the nonnormed fit index (NNFI), the comparative fit index (CFI), and the root-mean-square error of approximation (RMSEA).

Finally, the issue of normality was also considered. For this purpose, Mardia's measure of relative multivariate kurtosis (MK) was obtained from the PRELIS program (Jöreskog & Sörbom, 2004): MK = 1.14 for the LQ CFA, MK = 1.21 for the EQ CFA, MK = 1.11 for the MQ CFA, and MK = 1.16 for SEM. All values of MK implied nonsignificant departures from normality.

Step 1: Preliminary Analyses

Table 1 displays the psychometric properties for each of the variables in the study. Table 2 presents the correlations among these variables.

The skewness and kurtosis coefficients ranged from $+1$ to -1 . We verified the internal reliability for each questionnaire by calculating Cronbach's alpha coefficient. One item was dropped from the elaboration ($\alpha = .42$) and strategies areas ($\alpha = .47$), and new Cronbach's alpha coefficients were calculated ($\alpha = .52$ and $\alpha = .59$, respectively). Values of variables ranged from .70 to .91, with the exception of elaboration, strategies for studying for an exam, metacognition, and confidence in one's personality (Table 1). In general, values reflected a high degree of internal reliability within the three questionnaires of the battery.

Step 2: Measurement Models

We carried out three CFAs to evaluate whether the LQ, the EQ, and the MQ retained the same structural properties as the original scales and served to validate the three questionnaires using a very wide sample of undergraduate students.

Self-Regulated Learning Questionnaire (LQ). The CFA of the LQ included 48 observed variables and five latent variables: organization, elaboration, self-evaluation, strategies for studying for an exam, and metacognition. **All factor loadings were significant at the .001 level**, and the average factor loading was .44. The fit indexes indicated a good fit of the data to the hypothesized structure of the LQ (Table 3). Organization, elaboration, self-evaluation, strategies for studying for an exam, and metacognition are different facets of self-regulated learning. More specifically, **self-regulated students organized their academic time management, summarized study materials in a personal way, evaluated their own learning and performance, were strategic in preparing for exams, and reflected metacognitively during the study.**

Emotions Questionnaire (EQ). The CFA of EQ included 60 observed variables and six latent variables: positive emotions related to self, negative emotions related to self, positive emotions related to academic achievement, negative emotions related to academic achievement, positive emotions related to study time,

Table 1
Psychometric Properties of All Study Variables

| Variable | No. items | <i>M</i> | <i>SD</i> | α | Range | Skewness | Kurtosis |
|------------------------------------------|-----------|----------|-----------|----------|-------|----------|----------|
| Self-Regulated Learning Questionnaire | | | | | | | |
| Organization | 10 | 3.40 | 0.62 | .77 | 1–5 | –.25 | –.42 |
| Elaboration | 9 | 3.35 | 0.49 | .52 | 1–5 | –.18 | .23 |
| Self-evaluation | 10 | 3.66 | 0.52 | .71 | 1–5 | –.20 | –.12 |
| Strategies | 9 | 3.37 | 0.57 | .59 | 1–5 | –.26 | .10 |
| Metacognition | 10 | 3.29 | 0.56 | .65 | 1–5 | .09 | –.08 |
| Emotions Questionnaire | | | | | | | |
| Positive emotions related to self | 10 | 3.55 | 0.61 | .84 | 1–5 | –.50 | .15 |
| Negative emotions related to self | 10 | 2.68 | 0.74 | .87 | 1–5 | .32 | –.26 |
| Positive emotions related to achievement | 10 | 3.36 | 0.76 | .89 | 1–5 | –.33 | –.29 |
| Negative emotions related to achievement | 10 | 2.48 | 0.90 | .91 | 1–5 | .47 | –.48 |
| Positive emotions related to study time | 10 | 3.36 | 0.68 | .87 | 1–5 | –.29 | –.03 |
| Negative emotions related to study time | 10 | 2.22 | 0.77 | .89 | 1–5 | .84 | .42 |
| Motivation Questionnaire | | | | | | | |
| Implicit theories of intelligence | 8 | 3.65 | 0.57 | .70 | 1–5 | –.19 | .19 |
| Confidence in one's intelligence | 3 | 3.80 | 1.28 | .73 | 1–6 | –.16 | –.83 |
| Confidence in one's personality | 3 | 3.40 | 1.11 | .68 | 1–6 | –.09 | –.60 |
| Self-efficacy | 5 | 3.66 | 0.61 | .74 | 1–5 | –.57 | .44 |
| Approach achievement goals | 8 | 2.96 | 0.74 | .85 | 1–5 | –.06 | –.33 |
| Academic achievement | — | 97.58 | 66.59 | — | — | .64 | .29 |

Table 2
Correlations Matrix for All Study Variables

| Variable | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
|---------------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|------|------|------|------|----|
| Self-Regulated Learning Questionnaire | | | | | | | | | | | | | | | | | |
| 1. Organization | — | | | | | | | | | | | | | | | | |
| 2. Elaboration | .35* | — | | | | | | | | | | | | | | | |
| 3. Self-evaluation | .35* | .32* | — | | | | | | | | | | | | | | |
| 4. Strategies | .57* | .38* | .35* | — | | | | | | | | | | | | | |
| 5. Metacognition | .51* | .45* | .48* | .52* | — | | | | | | | | | | | | |
| Emotions Questionnaire | | | | | | | | | | | | | | | | | |
| 6. Positive emotions related to self | .37* | .31* | .24* | .33* | .33* | — | | | | | | | | | | | |
| 7. Negative emotions related to self | -.31* | -.20* | -.24* | -.23* | -.22* | -.52* | — | | | | | | | | | | |
| 8. Positive emotions related to achievement | .47* | .32* | .27* | .36* | .36* | .72* | -.40* | — | | | | | | | | | |
| 9. Negative emotions related to achievement | -.41* | -.25* | -.30* | -.30* | -.44* | -.74* | .74* | -.57* | — | | | | | | | | |
| 10. Positive emotions related to study time | .42* | .37* | .23* | .34* | .36* | .66* | -.30* | .75* | -.34* | — | | | | | | | |
| 11. Negative emotions related to study time | -.38* | -.26* | -.28* | -.26* | -.27* | -.42* | .72* | -.41* | .78* | -.38* | — | | | | | | |
| Motivation Questionnaire | | | | | | | | | | | | | | | | | |
| 12. Implicit theories of intelligence | .12* | .14* | .08* | .13* | .15* | .22* | -.05* | .19* | -.04* | .25* | -.08* | — | | | | | |
| 13. Confidence in one's intelligence | .28* | .23* | .43* | .19* | .33* | .28* | -.30* | .22* | -.28* | .21* | -.31* | .05* | — | | | | |
| 14. Confidence in one's personality | .20* | .07* | .23* | .16* | .19* | .30* | -.33* | .15* | -.17* | .15* | -.20* | .07* | .36* | — | | | |
| 15. Self-efficacy | .49* | .36* | .35* | .39* | .40* | .51* | -.39* | .62* | -.54* | .54* | -.48* | .14* | .29* | .10* | — | | |
| 16. Approach achievement goals | .28* | .36* | .16* | .17* | .26* | .29* | -.19* | .33* | -.25* | .41* | -.27* | .15* | .13* | .00 | .35* | — | |
| 17. Academic achievement | .21* | .09* | .14* | .16* | .16* | .10* | -.11* | .19* | -.22* | .10* | -.14* | -.00 | .08* | .01 | .26* | .12* | — |

* $p < .001$.

and negative emotions related to study time. All factor loadings were significant at the .001 level, and the average factor loading was .68. The fit indexes indicated a good fit of the data to the hypothesized structure of EQ (Table 3). Students felt diverse positive and negative emotions when they thought of themselves, their academic achievement, and study time, suggesting that students' academic emotions varied across different settings related to study.

Motivation Questionnaire (MQ). The CFA of MQ included 27 observed variables and five latent variables: implicit theories of intelligence, confidence in one's intelligence, confidence in one's personality, self-efficacy, and approach achievement goals. All factor loadings were significant at the .001 level, and the average factor loading was .59. The fit indexes indicated a good fit of the data to the hypothesized structure of MQ (Table 3). Implicit theories of intelligence, confidence in one's intelligence and personality, self-efficacy, and approach achievement goals are different facets of motivation. More specifically, students motivated to learn and to invest effort in studying endorsed the incremental theory of intelligence, had confidence in their intelligence and personality, perceived themselves as capable in academic domains, and pursued mastery-approach goals.

Step 3: Structural Model

We performed SEM to verify our hypotheses that positive emotions positively influence self-regulated learning and motivation, and negative emotions negatively influence self-regulated learning and motivation. In turn, self-regulated learning and motivation affect academic achievement.

Positive emotions, negative emotions, self-regulated learning, and motivation were latent variables, and academic achievement was the observed variable. Positive emotions were represented by three observed variables: positive emotions related to self, academic achievement, and study time. This latent variable expresses students' tendency to experience a wide range of positive emotions in academic settings. Negative emotions were given by three observed variables: negative emotions related to self, academic achievement, and study time. This latent variable represents how frequently students feel different negative emotions in academic situations. Self-regulated learning was represented by five observed variables: organization, elaboration, self-evaluation, strategies for studying for an exam, and metacognition. This latent variable refers to the extent to which students are active participants in their own learning process. High scores indicated that students declared themselves able to organize their academic time, to summarize study materials in a personal way, to evaluate their own learning and performance, to be strategic in preparing for exams, and to reflect metacognitively during study time. Motivation was indicated by four observed variables: implicit theories of intelligence, confidence in one's intelligence, self-efficacy, and approach achievement goals. Confidence in one's personality was not considered because it was assumed not to be linked with academic achievement. In fact, there was no correlation between the two variables. This latent variable reflects the extent to which students are motivated to learn and invest effort in studying. High scores indicated that students endorse the incremental theory of intelligence, had confidence in their intelligence,

Table 3

Results of Confirmatory Factor Analyses of Self-Regulated Learning Questionnaire, Emotions Questionnaire, and Motivation Questionnaire in the Self-Regulated Learning, Emotions, and Motivation Computerized Battery

| Battery questionnaire | χ^2 | df | NNFI | CFI | RMSEA | 90% CI |
|---------------------------------------|----------|------|------|-----|-------|--------------|
| Self-Regulated Learning Questionnaire | 8663.46 | 1070 | .94 | .96 | .042 | [.041, .043] |
| Emotions Questionnaire | 37024.68 | 1695 | .97 | .97 | .061 | [.061, .062] |
| Motivation Questionnaire | 2597.06 | 314 | .97 | .97 | .038 | [.036, .039] |

Note. χ^2 = chi-square test; df = degrees of freedom; NNFI = nonnormed fit index; CFI = comparative fit index; RMSEA = root-mean-square error of approximation; CI = confidence interval.

gence, perceived themselves as capable in academic domains, and pursued mastery–approach goals. Academic achievement was represented by the observed variable academic achievement.

Results of the SEM are shown in Figure 1. All the standardized coefficients were significant at the .001 level. The estimated model demonstrated adequate fit to the data, as indicated by the following fit indexes: $\chi^2(97, N = 5805) = 2678.74, p < .001$, NNFI = .96, CFI = .97, RMSEA = .071, 90% confidence interval (CI) for RMSEA [.069, .073].

The hypothesized model adequately describes the linkages between positive and negative emotions, self-regulated learning and motivation, and their influence on academic achievement. As expected, positive emotions positively affected both self-regulated learning and motivation ($\beta = .53$ and $\beta = .70$, respectively), and negative emotions negatively affected both self-regulated learning and motivation ($\beta = -.25$ and $\beta = -.38$, respectively). In particular, positive emotions had a greater weight on self-regulated learning and motivation than negative emotions. Self-regulated learning and motivation positively in-

fluenced academic achievement ($\beta = .16$ and $\beta = .32$, respectively). In particular, the four aspects of motivation increased academic achievement more than the five facets of self-regulated learning.

The direct effect of positive emotions on academic achievement has also been estimated to better evaluate the role of positive emotions. Direct effect was significant and negative ($\beta = -.24$) but was smaller than the indirect positive effect ($\beta = .31$); consequently, global effect was weak but positive ($\beta = .07$). Positive emotions exerted positive overall effects on achievement, thanks to the indirect paths through self-regulated learning and motivation. These data suggest that feeling positive emotions related to study is not enough to guarantee academic achievement, since self-regulated learning and motivation are also necessary.

Discussion

Although there is abundant theoretical and empirical literature focusing separately on emotion, cognition, and motivation, until recently the interconnection of these constructs within academic

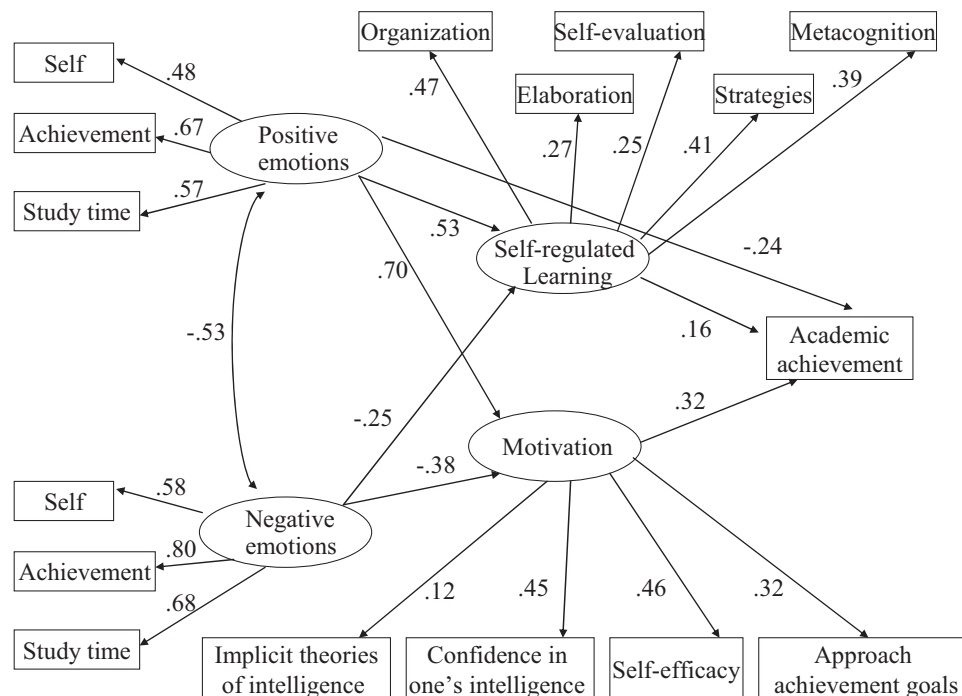


Figure 1. Parameter estimates of the tested model. The numbers refer to standardized structural coefficients.

settings had been the subject of few empirical investigations. The present research adds to researchers' understanding of the relationships among emotions, self-regulated learning, motivation, and academic achievement.

The purpose of this study was to test a theoretical model linking emotions, self-regulated learning, and motivation to academic achievement. According to the control-value theory (Pekrun et al., 2007), the model posits that students' emotions influence their self-regulated learning and motivation, and these, in turn, affect academic achievement. The predictive links among emotions, self-regulated learning, motivation, and academic achievement are strongly supported by our results.

First, the findings demonstrate the influence of emotions on different aspects of self-regulated learning. In particular, students' positive emotions positively affect their organization of academic study time and summarization of study materials in a personal way. Positive emotions also have a positive effect on students' evaluation of learning and performance, strategic preparation for exams, and metacognitive reflection during their study. Our results, therefore, support the hypothesis that emotions predict diverse facets of self-regulated learning for the first time. In fact, a few studies investigating links between emotions and self-regulated learning have analyzed the different aspects separately (Linnenbrink, 2007; Pekrun et al., 2011).

Second, the results show the influence of emotions on diverse facets of motivation to learn. In particular, students' positive emotions enhance their beliefs on incremental theory of intelligence and confidence in their intelligence. They also have a positive effect on their perception of themselves as capable in academic domains and pursuing mastery-approach goals. Moreover, the findings make a further contribution by investigating links between emotions and achievement goals. In fact, in line with the assumptions of the control-value theory (Pekrun et al., 2007), this research revealed that emotions predict approach achievement goals. Nevertheless, recent studies have shown that achievement goals are predictors of emotions (Daniels et al., 2009; Elliot & Pekrun, 2007; Pekrun, Elliot, & Maier, 2006, 2009). Clearly, additional research disentangling the casual relationships of emotions and achievement goals is needed.

Furthermore, positive emotions have greater weight on self-regulated learning and motivation than negative emotions. These results highlight and demonstrate the relevance of positive emotions to self-regulatory strategies and motivation to learn. Our findings, therefore, reinforce the premise that research on students' affect would do well to include a broader range of positive emotions experienced in academic settings.

As assumed in our model, self-regulated learning positively predicts academic achievement. This result is in line with most frameworks of self-regulated learning, which have shown positive relations between self-regulated learning and academic achievement (Abar & Loken, 2010; Efklides, 2011; Greene & Azevedo, 2010; Winne, 2011; Zimmerman, 2008). Furthermore, motivation to invest effort in studying positively predicts academic achievement. This finding is consistent with findings on implicit theories of intelligence (Dupeyrat & Mariné, 2005; Kennett & Keefer, 2006) and self-efficacy (Ferla et al., 2008; Walker et al., 2006). Nevertheless, some studies on achievement goals have shown that the effects of achievement goals on academic achievement are

mediated by emotions (Daniels et al., 2009; Elliot & Pekrun, 2007; Pekrun, Elliot, & Maier, 2006, 2009).

An interesting result arises from the presence of both self-regulated learning and motivation in our model. The effect of motivation on academic achievement is even double that of self-regulated learning. This result underlines the fact that different facets of motivation do help to promote and sustain academic achievement.

Finally, the findings show that the influence of emotions on academic achievement depends on the interplay of self-regulated learning and motivation. As assumed in our model, self-regulated learning and motivation mediate the effects of emotions on academic achievement. In particular, positive emotions positively affect academic achievement when they are mediated by self-regulated learning and motivation. Therefore, positive emotions are not enough to guarantee academic achievement by themselves, since self-regulated learning and motivation are also necessary. This implies that the influence of emotions on achievement is inevitably complex and requires more research to provide greater understanding of how emotions shape students' academic engagement.

Notably, our theoretical model was tested on a very wide and differentiated sample of undergraduate students who were representative of all disciplines offered by the University of Padua. This aspect substantiates the validity of our results and offers a further foundation for the generalizability of the findings. Moreover, these results provide relevant support for many of the propositions forwarded by other researches in relation to links among emotions, self-regulated learning, motivation, and academic achievement.

Despite these strong points, a limitation in our study lies in our use of only self-report questionnaires to assess emotions, self-regulated learning, and motivation. Self-report may indeed be subject to response biases and cannot accurately reflect actual behaviors and render real-time estimates of different processes. By implication, behavioral measures may be needed as well. The findings of recent studies by D'Mello and Graesser (2011, 2012) provide a salient example of how students' emotions can be inferred by multiple behavioral measures, such as facial movements, body posture, and conversational interactions. In these studies, D'Mello and Graesser investigated the emotions that students feel during deep learning activities and therefore explain the dynamic of affective states that learners experience.

In conclusion, our theoretical model implies that emotions are closely linked to self-regulated learning, motivation, and academic achievement. This research, therefore, makes an attempt to provide a framework that integrates constructs and assumptions from a variety of theoretical approaches. We believe that our results highlight the potential advantage of integrating these constructs and these domains of inquiry. In fact, these findings should help to improve research in this area and thus increase ability to integrate emotions into models of self-regulated learning and motivation; they also may help in the development of theoretical and practical suggestions for the role of emotions in educational settings.

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Call for Submissions: Psychological Science in MedEdPORTAL Publications

In recognition of the importance of psychology as both a basic and clinical science in the preparation of the health care workforce, Barney Beins, PhD (Associate Editor, MedEdPORTAL) is now soliciting submissions related to psychological science as part of a collaboration between the American Psychological Association and the Association of American Medical Colleges to create an online-only collection of free, peer-reviewed educational resources in MedEdPORTAL Publications. This repository is used across the health professions in the preparation of future practitioners.

Accepted submissions are complete stand-alone learning or teaching modules that have been successfully implemented in the classroom or clinical training environment. This effort is to collect case studies of pedagogical approaches to promote the scholarship of teaching and learning. See the MedEdPORTAL Publications site (<https://www.mededportal.org/>) for current examples and instructions for submission. We especially encourage submission of resources that facilitate the teaching of foundational psychological science related to behavior and health. Sample topics are listed below, but submissions are not limited to these areas.

- Social, emotional, and cognitive development
- Memory
- Perception
- Psychophysiology
- Psychoneuroimmunology
- Interpersonal relationships
- Behavior change
- Motivation
- Decision making
- Leadership
- Unconscious bias
- Group dynamics and team functioning
- Violence
- Psychometrics
- Stress and coping
- Treatment adherence
- Grief
- Behavioral health risk factors
- Obesity and weight management
- Smoking cessation
- Mental and behavioral disorders
- Health belief models
- Dental anxiety
- Pain
- Provider–patient communication