Academic Emotions and Student Engagement

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Abstract

Emotions are ubiquitous in academic settings, and they profoundly affect students' academic engagement and performance. In this chapter, we summarize the extant research on academic emotions and their linkages with students' engagement. First, we outline relevant concepts of academic emotion, including mood as well as achievement, epistemic, topic, and social emotions. Second, we discuss the impact of these emotions on students' cognitive, motivational, behavioral, cognitive-behavioral, and social-behavioral engagement and on their academic performance. Next, we examine the origins of students' academic emotions in terms of individual and contextual variables. Finally, we highlight the complexity of students' emotions, focusing on reciprocal causation as well as regulation and treatment of these emotions. In conclusion, we discuss directions for future research, with a special emphasis on the need for educational intervention research targeting emotions.

Emotions are ubiquitous in academic settings. Remember the last time you studied some learning material? Depending on your goals and the contents of the material, you may have enjoyed learning or been bored, experienced flow forgetting time or been frustrated about never-ending obstacles, felt proud of your progress or ashamed of lack of accomplishment. Furthermore, these emotions affected your effort, motivation to persist, and strategies for learning—even if you were unaware of these effects. Similarly, think of the last time you took an important exam. You may have hoped for success, been afraid of failure, or felt desperate because you were unprepared, but you likely did not feel indifferent about it. Again, these emotions likely had profound effects on your motivational engagement, concentration, and strategies used when taking the exam.

Empirical findings corroborate that students experience a wide variety of emotions when attending class, doing homework assignments, and taking tests and exams. For example, in exploratory research on emotions experienced by

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university students, emotions reported frequently included enjoyment, interest, hope, pride, anger, anxiety, frustration, and boredom in academic settings (Pekrun, Goetz, Titz, & Perry, 2002a). Until recently, these emotions did not receive much attention by researchers, two exceptions being studies on test anxiety (Zeidner, 1998, 2007) and research on causal attributions of success and failure as antecedents of emotions (Weiner, 1985). During the past 10 years, however, there has been growing recognition that emotions are central to human achievement strivings. Emotions are no longer regarded as epiphenomena that may occur in academic settings but lack any instrumental relevance. In this nascent research, affect and emotions are recognized as being of critical importance for students' academic learning, achievement, personality development, and health (Efklides & Volet, 2005; Linnenbrink, 2006; Linnenbrink-Garcia & Pekrun, 2011; Schutz & Lanehart, 2002; Schutz & Pekrun, 2007).

In this chapter, we consider academic emotions and their functions for students' engagement. As noted by Fredricks, Blumenfeld, and Paris (2004; see also Appleton, Christenson, & Furlong, 2008), student engagement is best viewed as a metaconstruct consisting of several components. In line with this view, we define student engagement as a multicomponent construct, the common denominator being that all the components (i.e., types of engagement) comprise active, energetic, and approach-oriented involvement with academic tasks. We distinguish five types of engagement: *cognitive* (attention and memory processes), *motivational* (intrinsic and extrinsic motivation, achievement goals), *behavioral* (effort and persistence), *cognitive-behavioral* (strategy use and self-regulation), and *social-behavioral* (social on-task behavior), as detailed in our later discussion of emotions and engagement. Given our focus on emotions as precursors to these five forms of engagement, emotional engagement (e.g., in terms of enjoyment of learning) is considered as an antecedent of other components of engagement in this chapter.

These five categories of engagement overlap substantially with the three broad categories of behavioral, emotional, and cognitive engagement described by Fredricks et al. (2004); however, we have expanded this framework to clarify the unique ways in which emotions relate to engagement. Specifically, within Fredricks et al.'s broad category of cognitive engagement, we differentiate among motivational, cognitive, and cognitive-behavioral engagement. Our conceptualization of behavioral engagement is similar to that proposed by Fredricks et al.; however, we take a narrower view focusing specifically on effort and persistence. We also extend Fredricks et al.'s framework to include social-behavioral engagement to better capture forms of engagement related to peer-to-peer learning.

Before discussing the relation of emotions to engagement, we begin by outlining different concepts describing students' emotions, including affect, mood, achievement emotions, epistemic emotions, topic emotions, and social emotions. Next, the effects of emotions on the five types of student engagement and resulting academic achievement are addressed. In the third section, we discuss the individual and social origins of students' emotions, including a brief discussion of the relative universality of mechanisms of emotions and engagement across contexts. We conclude by considering principles of reciprocal causation of emotion and engagement and their implications for emotion regulation, treatment of emotions, and the design of learning environments.

Concepts of Academic Emotions

Emotion, Mood, and Affect

In contemporary emotion research, *emotions* are defined as multifaceted phenomena involving sets of coordinated psychological processes, including affective, cognitive, physiological, motivational, and expressive components (Kleinginna & Kleinginna, 1981; Scherer, 2000). For example, a students' anxiety before an exam can be comprised of nervous, uneasy feelings (affective); worries about failing the exam (cognitive); increased heart rate or sweating (physiological); impulses to escape the situation

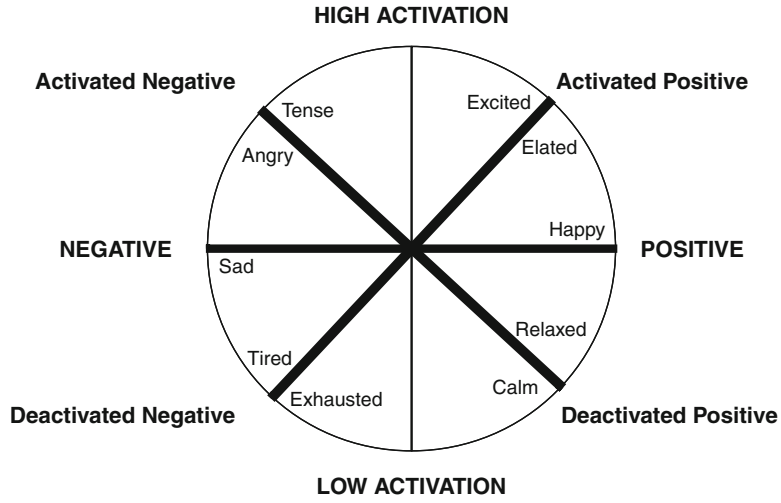

Fig. 12.1 Affective circumplex (Model adapted with permission from Feldman Barrett and Russell [1998], published by the American Psychological Association)

(motivation); and an anxious facial expression (expressive). As compared to intense emotions, *moods* are of lower intensity and lack a specific referent. Some authors define emotion and mood as categorically distinct (see Rosenberg, 1998). Alternatively, since moods show a similar profile of components and similar qualitative differences as emotions (as in cheerful, angry, or anxious mood), they can also be regarded as low-intensity emotions (Pekrun, 2006).

Different emotions and moods are often compiled in more general constructs of *affect.* Two variants of this term are used in the research literature. In the educational literature, affect is often used to denote a broad variety of noncognitive constructs including emotion, but also including self-concept, beliefs, motivation, etc. (e.g., McLeod & Adams, 1989). In contrast, in emotion research, affect refers to emotions and moods more specifically. In this research, the term is often used to refer to omnibus variables of positive versus negative emotions or moods, with *positive affect* being compiled of various positive states (e.g., enjoyment, pride, satisfaction) and *negative affect* consisting of various negative states (e.g., anger, anxiety, frustration). For example, in experimental mood research, most studies have compared the effects of positive versus negative affect on psychological functioning, without further distinguishing between different emotions or moods.

Valence and Activation

Two important dimensions describing emotions, moods, and affect are *valence* and *activation*. In terms of valence, positive (i.e., pleasant) states, such as enjoyment and happiness, can be differentiated from negative (i.e., unpleasant) states, such as anger, anxiety, or boredom. In terms of activation, physiologically activating states can be distinguished from deactivating states, such as activating excitement versus deactivating relaxation. These two dimensions are orthogonal, making it possible to organize affective states in a two-dimensional space. In *circumplex models* of affect, affective states are grouped according to the relative degree of positive versus negative valence and activation versus deactivation (e.g., Feldman Barrett & Russell, 1998; see Fig. 12.1). By classifying affective states as positive or negative, and as activating or deactivating, the circumplex can be transformed into a 2 × 2 taxonomy including four broad categories of emotions and moods (*positive activating:* e.g.,

Table 12.1 A three-dimensional taxonomy of achievement emotions

	Positive[a]		Negative[b]	
Object focus	Activating	Deactivating	Activating	Deactivating
Activity	Enjoyment	Relaxation	Anger Frustration	Boredom
Outcome/ Prospective	Hope Joy[c]	Relief[c]	Anxiety	Hopelessness
Outcome/ Retrospective	Joy Pride Gratitude	Contentment Relief	Shame Anger	Sadness Disappointment

[a]Positive = pleasant emotion
[b]Negative = unpleasant emotion
[c]Anticipatory joy/relief

enjoyment, hope, pride; *positive deactivating:* relief, relaxation; *negative activating:* anger, anxiety, shame; *negative deactivating:* hopelessness, boredom; Pekrun, 2006).

Academic Emotions

In addition to valence and activation, emotions can be grouped according to their object focus (Pekrun, 2006). For explaining the psychological functions of emotions, this dimension is no less important than valence and activation. Specifically, regarding the functions of emotions for students' academic engagement, object focus is critical because it determines if emotions pertain to the academic task at hand or not. In terms of object focus, the following broad groups of emotions and moods may be most important in the academic domain.

General and Specific Mood

Students may experience moods that lack a referent, but may nevertheless strongly influence their performance. Moods can be generalized, being experienced as just positive (pleasant) or negative (unpleasant), without clear differentiation of specific affective qualities. Alternatively, moods can be qualitatively distinct, as in joyful, angry, or fearful mood. While moods, by their very nature, may not be directly tied to a specific academic activity, they nonetheless have the potential to shape the way in which students' engage academically. For instance, a student in a negative mood may have difficulty focusing on the task at hand, thus limiting engagement.

Achievement Emotions

We define achievement emotions as emotions that relate to activities or outcomes that are judged according to competence-related standards of quality. In the academic domain, achievement emotions can relate to academic activities like studying or taking exams and to the success and failure outcomes of these activities. Accordingly, two groups of achievement emotions are activity-related emotions, such as enjoyment or boredom during learning, and outcome-related emotions, such as hope and pride related to success, or anxiety, hopelessness, and shame related to failure. Within the latter category, an important distinction is between prospective emotions related to future success and failure, such as hope and anxiety, and retrospective emotions related to success and failure that already occurred, such as pride, shame, relief, and disappointment. Combining the valence, activation, and object focus (activity versus outcome) dimensions renders a 3 × 2 taxonomy of achievement emotions (Pekrun, 2006; see Table 12.1). To date, research on achievement emotions has focused on outcome emotions such as anxiety, pride, and shame (Weiner, 1985; Zeidner, 2007), but failed to pay sufficient attention to activity emotions such as enjoyment and boredom.

Epistemic Emotions

Emotions can be caused by cognitive qualities of task information and of the processing of such information. A prototypical case is cognitive incongruity triggering surprise and curiosity. As suggested by Pekrun and Stephens (in press),

these emotions can be called epistemic emotions since they pertain to the epistemic aspects of learning and cognitive activities. During learning, many emotions can be experienced either as achievement emotions or as epistemic emotions, depending on the focus of attention. For example, the frustration experienced by a student not finding the solution to a mathematical problem can be regarded an epistemic emotion if it is focused on the cognitive incongruity implied by a non-solved problem, and as an achievement emotion if the focus is on personal failure and inability to solve the problem. A typical sequence of epistemic emotions induced by a cognitive problem may involve (1) surprise, (2) curiosity and situational interest if the surprise is not dissolved, (3) anxiety in case of severe incongruity and information that deeply disturbs existing cognitive schemas, (4) enjoyment and delight experienced when recombining information such that the problem gets solved, or (5) frustration when this seems not to be possible (also see Craig, D'Mello, Witherspoon, & Graesser, 2008).

Topic Emotions

During studying or attending class, emotions can be triggered by the contents covered by learning material. Examples are the empathetic emotions pertaining to a protagonist's fate when reading a novel, the emotions triggered by political events dealt with in political lessons, or the emotions related to topics in science class, such as the frustration experienced by American children when they were informed by their teachers that Pluto was reclassified as a dwarf planet (Broughton, Sinatra, & Nussbaum, 2010). In contrast to achievement and epistemic emotions, topic emotions do not directly pertain to learning and problem-solving. However, they can strongly influence students' engagement by affecting their interest and motivation in an academic domain (Ainley, 2007).

Social Emotions

Academic learning is situated in social contexts. Even when learning alone, students do not act in a social vacuum; rather, the goals, contents, and outcomes of learning are socially constructed. By implication, academic settings induce a multitude of social emotions related to other persons. These emotions include social achievement emotions, such as admiration, envy, contempt, or empathy related to the success and failure of others, as well as nonachievement emotions, such as love or hate in the relationships with classmates and teachers (Weiner, 2007). Social emotions can directly influence students' engagement with academic tasks, especially so when learning is situated in teacher-student or student-student interactions. They can also indirectly influence learning by motivating students to engage or disengage in task-related interactions with teachers and classmates (Linnenbrink-Garcia, Rogat, & Koskey, 2011).

Functions for Students' Engagement and Achievement

Cognitive and neuroscientific research has shown that emotions, and affect more broadly, are fundamentally important for human learning and development. Specifically, experimental mood studies have found that affect influences a broad variety of cognitive processes that contribute to learning, such as perception, attention, social judgment, cognitive problem-solving, decision-making, and memory processes (Clore & Huntsinger, 2007, 2009; Loewenstein & Lerner, 2003; Parrott & Spackman, 2000). However, one fundamental problem with much of this research is that it used global constructs of positive versus negative affect or mood but did not attend to the specific qualities of different kinds of affects. As will be detailed below, this implies that it may be difficult and potentially misleading to use the findings for explaining students' emotions and learning in real-world academic contexts. Specifically, as argued both in Pekrun's (1992a, 2006; Pekrun et al., 2002a) cognitive/motivational model of emotion effects and in Linnenbrink-Garcia's research on affect and engagement (Linnenbrink, 2007; Linnenbrink-Garcia et al., 2011; Linnen brink & Pintrich, 2004), it is not sufficient to differentiate positive from negative affective states but imperative to also attend to the degree of activation implied. As such, the minimum necessary is to distinguish between the four groups

of emotions outlined earlier (positive activating, positive deactivating, negative activating, negative deactivating). For example, both anxiety and hopelessness are negative (unpleasant) emotions; however, their effects on students' engagement can differ dramatically, as anxiety can motivate a student to invest effort in order to avoid failure, whereas hopelessness likely undermines any kind of engagement. Even within each of the four categories, however, it may be necessary to further distinguish between distinct emotions. For example, both anxiety and anger are activating negative emotions; however, paradoxically, whereas anxiety is associated with avoidance, anger is related to approach motivation (Carver & Harmon-Jones, 2009).

Emotions can influence students' engagement, which in turn impacts their academic learning and achievement. By implication, as suggested in our earlier work (Linnenbrink, 2007; Linnenbrink & Pintrich, 2004; Pekrun, 1992a, 2006), we regard engagement as a mediator between students' emotions and their achievement. In the following sections, we first summarize research on the relation of emotions to the five types of engagement outlined at the outset (i.e., cognitive, motivational, behavioral, cognitive-behavioral, and social-behavioral engagement). We then outline implications for the effects of different emotions on students' academic achievement.

Cognitive Engagement

In our discussion of cognitive engagement, we focus on cognitive processes related to attention, mood-congruent memory recall, and memory storage and retrieval implying active involvement with academic tasks. Specifically, cognitive engagement refers to the way in which emotions shape cognitive resources and memory processes that are activated automatically (for intentional and more complex cognitive processes, see the section on "Cognitive-behavioral engagement").

Attention and Flow

Emotions consume cognitive resources (i.e., resources of the working memory) by focusing attention on the object of emotion. This effect was first addressed in interference models of test anxiety, which posited that anxiety reduces performance on complex and difficult tasks; this occurs because anxiety involves worries and produces task-irrelevant thoughts that interfere with task completion (e.g., Eysenck, 1997; Wine, 1971; see Zeidner, 1998). For example, while preparing for an exam, a student may fear failure and worry about the consequences of failure, which in turn may distract her attention away from the task. Interference models of anxiety were expanded by H. Ellis' resource allocation model, which postulated that any negative emotions can consume cognitive resources (Ellis & Ashbrook, 1988). Further expanding the perspective, recent studies found that not only negative emotions, but positive emotions as well can reduce working memory resources and attention (Meinhardt & Pekrun, 2003).

However, the resource consumption effect likely is bound to emotions that have task-extraneous objects and produce task-irrelevant thinking, such as affective pictures in experimental mood research, or worries about impending failure on an exam in test anxiety. In contrast, in task-related emotions such as curiosity and enjoyment of learning, the task is the object of emotion. In positive task-related emotions, attention is focused on the task, and working memory resources can be used for task completion. However, it is possible that some positive task-related emotions, such as overexcitement, may also distract attention away from the task. Corroborating these expectations, empirical studies with K-12 and university students found that negative emotions such as anger, anxiety, shame, boredom, and hopelessness were associated with task-irrelevant thinking and reduced flow, whereas enjoyment related negatively to irrelevant thinking and positively to flow (Pekrun, Goetz, Daniels, Stupnisky, & Perry, 2010; Pekrun, Goetz, Perry, Kramer, & Hochstadt, 2004; Pekrun, Goetz, Titz, & Perry, 2002b; Pekrun et al., 2002a; Zeidner, 1998). A similar pattern was observed with more global measures of positive and negative affect for college students (Linnenbrink & Pintrich, 2002a; Linnenbrink, Ryan, & Pintrich, 1999). These findings suggest that students' emotions have profound effects on their attentional engagement with academic tasks.

Mood-Congruent Memory Recall

Memory research has shown that emotions influence storage and retrieval of information. Two effects that are especially important for the academic context are mood-congruent memory recall and retrieval-induced forgetting and facilitation. Mood-congruent retrieval (Parrott & Spackman, 2000) implies that mood facilitates the retrieval of like-valenced material, with positive mood facilitating the retrieval of positive self- and task-related information, and negative mood facilitating the retrieval of negative information. Mood-congruent recall can impact students' motivation. For example, positive mood can foster positive self-appraisals and thus benefit motivation to learn and performance; in contrast, negative mood can promote negative-self appraisals and thus hamper motivation and performance (e.g., Olafson & Ferraro, 2001).

Retrieval-Induced Forgetting and Facilitation

Retrieval-induced forgetting and facilitation are basic functional mechanisms of human learning that currently get widespread attention in cognitive research. Retrieval-induced forgetting implies that practicing some learning material impedes later retrieval of related material that was not practiced, presumably so because of inhibitory processes in memory networks. In contrast, retrieval-induced facilitation implies that practicing enhances memory for related but unpracticed material (Chan, McDermott, & Roediger, 2006). With learning material consisting of disconnected elements, such as single words, retrieval-induced forgetting has been found to occur. For example, after learning a list of words, practicing half of the list can impede memory for the other half. In contrast, facilitation has been shown to occur for connected materials consisting of elements that show strong interrelations. For example, after learning coherent text material, practicing half of the material leads to better memory for the nonpracticed half.

Emotions have been shown to influence retrieval-induced forgetting. Specifically, negative mood can undo forgetting, likely because it can inhibit spreading activation in memory networks which underlies retrieval-induced forgetting (Bäuml & Kuhbandner, 2007). Conversely, it can be expected that positive emotions should facilitate retrieval-induced facilitation since they promote the relational processing of information underlying such facilitation. However, the generalizability of these laboratory findings to academic learning is open to question. If these mechanisms operate under natural conditions as well, they would imply that negative emotions can be helpful for learning lists of unrelated material (such as lists of foreign language vocabulary), whereas positive emotions should promote learning of coherent material.

Motivational Engagement

Motivation refers to processes shaping goal direction, intensity, and persistence of behavior (Heckhausen, 1991; Schunk, Pintrich, & Meece, 2008). Given the active, energetic, and approach-oriented role of these processes in both initiating and sustaining goal-directed academic effort, it is important to consider motivation directed toward task involvement as a form of engagement (for an alternative perspective, see Appleton et al., 2008). Of course, motivational engagement can in turn shape other forms of engagement (e.g., behavioral, cognitive, or cognitive-behavioral engagement), and motivational processes such as interests and values may not always translate into actually initiating and sustaining behavior. Nonetheless, it is useful to consider how emotions shape motivational engagement.

As compared to cognitive effects, the effects of emotions on motivational engagement have been less well studied. However, emotion research traditionally assumed that specific emotions function to trigger and facilitate impulses for specific action and thus play a role in initiating behaviors. Specifically, each of the major negative emotions is associated with distinct action impulses and serves to prepare the organism for action (or nonaction), such as fight, flight, and behavioral passivity in anger, anxiety, and hopelessness, respectively. For positive emotions, motivational consequences are less specific. Likely, one of the functions of positive emotions such as joy and interest is to motivate

exploratory behavior and an enlargement of one's action repertoire, as addressed in Fredrickson's (2001) broaden-and-build metaphor of positive emotions.

In the academic domain, emotions can profoundly influence students' motivational engagement. The little empirical evidence available to date suggests that affect influences students' adoption of achievement goals, as addressed in Linnenbrink and Pintrich's (2002b) bidirectional model of affect and achievement goals. Specifically, it has been shown that pleasant emotions can have positive effects, and unpleasant emotions negative effects, on undergraduate students' adoption of mastery-approach goals (Daniels et al., 2009; Linnenbrink & Pintrich, 2002b). In line with this evidence, positive achievement emotions such as enjoyment of learning, hope, and pride have been shown to relate positively to K-12 and university students' interest and intrinsic motivation, whereas negative emotions such as anger, anxiety, shame, hopelessness, and boredom related negatively to these motivational variables (Helmke, 1993; Pekrun et al., 2002a, 2002b, 2004, 2010; Zeidner, 1998).

However, as addressed in Pekrun's (1992a, 2006) cognitive/motivational model of emotion effects, motivational effects may be different for activating versus deactivating emotions. This model posits that activating positive emotions (e.g., joy, hope, pride) promote motivational engagement, whereas deactivating emotions (e.g., hopelessness, boredom) undermine motivational engagement (Pekrun et al., 2010). In contrast, effects are posited to be more complex for deactivating positive emotions (e.g., relief, relaxation) and activating negative emotions (e.g., anger, anxiety, and shame). For example, relaxed contentment following success can be expected to reduce immediate motivation to reengage with learning contents, but strengthen long-term motivation to do so. Regarding activating negative emotions, anger, anxiety, and shame have been found to reduce intrinsic motivation but strengthen extrinsic motivation to invest effort in order to avoid failure, especially so when expectations to prevent failure and attain success are favorable (Turner & Schallert, 2001). Due to these variable effects on different kinds of motivation, the effects of these emotions on students' overall motivation to learn can be variable as well.

Behavioral Engagement

Behavioral engagement refers to effort and persistence, with an emphasis on the amount or quantity of engagement rather than its quality (Fredricks et al., 2004; Pintrich, 2000). Several psychological models suggest that positive affect leads to behavioral disengagement, either because one is progressing at a sufficient rate toward one's goals (Carver, Lawrence, & Scheier, 1996) or because it signals that all is well and there is no need to engage (Schwartz & Clore, 1996). Other models question this perspective and instead suggest that positive affect frees resources away from a threat, allowing more expansive task-related action (Fredrickson, 2001). Negative emotions such as sadness (for approach goals) and anxiety (for avoidance goals) may signal that one is not making sufficient progress toward one's goals or that there is a threat in the environment, suggesting that they may also contribute to intensified effort (Carver et al., 1996).

However, these perspectives do not consider the interplay between valence and activation and thus may not fully capture the way in which emotions shape behavioral engagement in academic settings. As noted, activating versus deactivating emotions can exert different effects on students' motivation. By implication, the effects on resulting effort and persistence can differ as well. There is general support that positive activating emotions such as enjoyment of learning are positively associated with effort (Ainley, Corrigan, & Richardson, 2005; Efklides & Petkaki, 2005; Pekrun et al., 2002a, 2002b; Pekrun, Frenzel, Goetz, & Perry, 2007), and that negative deactivating emotions such as hopelessness and boredom are negatively associated with effort (Linnenbrink, 2007; Pekrun et al., 2002a, 2010). In contrast, effects have been shown to be more variable for negative activating emotions such as anger, anxiety, and shame. These emotions often show negative overall correlations with effort,

but in some cases, they may support behavioral engagement as they can serve to energize students (Linnenbrink, 2007; Pekrun et al., 2002a; Turner & Schallert, 2001).

Cognitive-Behavioral Engagement

Cognitive-behavioral engagement refers to complex cognitive processes that are intentionally instigated by the learner, including cognitive problem-solving, use of cognitive and metacognitive learning strategies, and self-regulation of learning. These processes are similar to what Fredricks et al. (2004) referred to as cognitive engagement. We use the term cognitive-behavioral engagement to differentiate these processes both from automatic cognitive processes described earlier and from pure quantity of effort as reflected by behavioral engagement.

Problem-Solving

Experimental mood research has shown that positive and negative moods impact problem-solving. Specifically, experimental evidence suggests that positive mood promotes flexible, creative, and holistic ways of solving problems and a reliance on generalized, heuristic knowledge structures (Fredrickson, 2001; Isen, Daubman & Nowicki, 1987). Conversely, negative mood has been found to promote focused, detail-oriented, and analytical ways of thinking (Clore & Huntsinger, 2007, 2009). A number of theoretical explanations have been proffered for these findings. For example, in mood-as-information approaches, it is assumed that positive affective states signal that all is well (e.g., sufficient goal progress), whereas negative states signal that something is wrong (e.g., insufficient goal progress; e.g., Bless et al., 1996). "All is well" conditions imply safety and the discretion to creatively explore the environment, broaden one's cognitive horizon, and build new actions, as addressed by Fredrickson's broaden-and-build theory of positive emotions. In contrast, "all is *not* well" conditions may imply a threat to well-being and agency, thus making it necessary to focus on these problems in analytical, cognitively cautious ways. Furthermore, positive emotions may facilitate flexible problem-solving via increasing brain dopamine levels (Ashby, Isen, & Turken, 1999), and negative moods may promote effort investment and performance on analytical tasks by inducing a need for "mood repair" (e.g., Schaller & Cialdini, 1990).

Learning Strategies

Judging from the experimental evidence on problem-solving, positive activating emotions such as enjoyment of learning should facilitate use of flexible, holistic learning strategies like elaboration and organization of learning material or critical thinking. Negative emotions, on the other hand, should sustain more rigid, detail-oriented learning, like simple rehearsal of learning material. Correlational evidence from studies with university students generally supports this view (Linnenbrink & Pintrich, 2002a; Pekrun et al., 2002a, 2004). However, for deactivating positive and negative emotions, these effects may be less pronounced. Deactivating emotions, like relaxation or boredom, may produce shallow information processing rather than any more intensive use of learning strategies.

Metastrategies and Self-Regulation

Self-regulation of learning includes the use of metacognitive, metamotivational, and metaemotional strategies (Wolters, 2003) making it possible to adopt goals, monitor and regulate learning activities, and evaluate their results in flexible ways, such that learning activities can be adapted to the demands of academic tasks. An application of these strategies presupposes cognitive flexibility. Therefore, it can be assumed that positive emotions foster self-regulation and the implied use of metastrategies, whereas negative emotions can motivate the individual to rely on external guidance. Correlational evidence from studies with university students is generally in line with these propositions (Linnenbrink & Pintrich, 2002a; Pekrun et al., 2002a, 2004, 2010). However, the reverse causal direction may also play a role in producing such correlations—self-regulated learning may instigate enjoyment, and external directions for learning may trigger anxiety.

Social-Behavioral Engagement

With the growing emphasis on constructivist forms of learning, student-student interactions have become increasingly important in shaping students' learning and achievement. Within these settings, students must engage socially with their peers. This type of social engagement includes behavioral engagement, such as engaging in discussion or listening to one's peers (Fredricks et al., 2004), but it can also include higher-order quality forms of social participation such as working cohesively, respectfully, and supporting other students' learning. Thus, we use the term social-behavioral engagement to refer to a range of social forms of engagement around academic tasks including participation with peers as well as higher-quality social interactions (Linnenbrink-Garcia et al., 2011). Social-behavioral engagement is distinct from other forms of engagement such as emotional engagement, which is focused more on students' emotions in relation to learning tasks, and on feelings of belonging which refer to a sense of general connectedness with peers, teachers, or the school (see Appleton et al., 2008). In this way, social-behavioral engagement includes support for high-quality social interactions that directly facilitate students' engagement and learning within peer-to-peer learning contexts through collaboration.

Instructional settings that require interactions with peers may present unique emotional challenges and evoke strong emotional responses (Crook, 2000; Do & Schallert, 2004; Jarvenoja & Jarvela, 2009; Linnenbrink-Garcia et al., 2011; Wosnitza & Volet, 2005). This is not surprising, especially given the key role that social agents play in shaping emotions across time (Denzin, 1984; Frenzel, Goetz, Lüdtke, Pekrun, & Sutton, 2009; Schutz, Hong, Cross, & Osbon, 2006). As such, we consider the interplay between emotions and social-behavioral engagement both in terms of direct peer-to-peer interactions as well as online peer interactions.

Direct Interaction

There is growing evidence that emotions relate to social-behavioral engagement in direct peer interaction, in both laboratory and field-based research involving small groups and class discussion. This research generally suggests that positive emotions such as feeling happy or calm promote social-behavioral engagement including active listening, supporting one's peers, and increasing group cohesion, while negative deactivating states, such as feeling tired, undermine engagement (Bramesfeld & Gasper, 2008; Do & Schallert, 2004; Linnenbrink-Garcia et al., 2011). Linnenbrink-Garcia et al. (2011) also found that both activated (tense) and deactivated (tired) negative affective states were associated with decreased social-behavioral engagement in the form of social loafing or allowing the other students during small group work to do all the work. Moreover, within small group settings, negative emotions seemed to sustain negative cycles of group interactions such as disrespecting other group members and discouraging their participation. However, this research also suggests that the interplay between emotions and social-behavioral engagement is complex, such that negative emotions can at times support rather than undermine social-behavioral engagement (Do & Schallert, 2004; Linnenbrink-Garcia et al., 2011).

Online Interaction

Studies analyzing online discussions and group work also suggest that emotions and social engagement are related (Nummenmaa & Nummenmaa, 2008; Vuorela & Nummenmaa, 2004; Wosnitza & Volet, 2005). For example, in a study of undergraduates working in an asynchronous web environment (e.g., students post comments and discuss ideas but are not required to interact in real time), social interactions were more likely to evoke emotional responses, as compared with other aspects of the learning environment such as the online web program or the technology (Vuorela & Nummenmaa). There was no relation between mean levels of emotion with social-behavioral engagement; however, students who had more variability (ranging from pleasant to unpleasant emotions) were found to engage more in the online exchange.

In sum, there is growing evidence that emotions are related to social-behavioral engagement when students work with their peers on academic tasks.

Broadly speaking, positive emotions seem to support social-behavioral engagement, while negative emotions can undermine it. However, with social-behavioral engagement as well, it is important to note that the nature of these relations is complex, suggesting the need to consider reciprocal and cyclical relations between emotions and social-behavioral engagement.

Academic Achievement

Since many different mechanisms of engagement can contribute to the functional effects of emotions, the overall effects on students' academic achievement are inevitably complex and may depend on the interplay between different mechanisms, as well as between these mechanisms and task demands. Nevertheless, it seems possible to derive inferences from the existing evidence and the above considerations.

Positive Emotions

Traditionally it was assumed that positive emotions, notwithstanding their potential to foster creativity, are often maladaptive for performance as a result of inducing unrealistically positive appraisals triggered by mood-congruent retrieval, fostering nonanalytical information processing, and making effort expenditure seem unnecessary by signaling that everything is going well (Aspinwall, 1998; Pekrun et al., 2002b). From this perspective, "our primary goal is to feel good, and feeling good makes us lazy thinkers who are oblivious to potentially useful negative information and unresponsive to meaningful variations in information and situation" (Aspinwall, 1998, p. 7).

However, as noted, positive mood has typically been regarded as a unitary construct in experimental mood research. As argued earlier, such a view is inadequate because it fails to distinguish between activating versus deactivating moods and emotions. As detailed in Pekrun's (2006) cognitive/motivational model, *deactivating* positive emotions, like relief or relaxation, may well have the negative performance effects described for positive mood, whereas *activating* positive emotions, such as task-related enjoyment or pride, should have positive effects. The evidence cited earlier suggests that enjoyment preserves cognitive resources and focuses attention on the task; promotes relational processing of information; induces intrinsic motivation; and facilitates use of flexible learning strategies and self-regulation, thus likely exerting positive effects on overall performance under many task conditions. In contrast, deactivating positive emotions, such as relief and relaxation, can reduce task attention; can have variable motivational effects by undermining current motivation while at the same time reinforcing motivation to reengage with the task; and can lead to superficial information processing, thus likely making effects on overall achievement more variable.

Related empirical evidence is scarce, but supports the view that activating positive emotions can enhance achievement. Specifically, enjoyment of learning was found to correlate moderately positively with K-12 and college students' academic performance (Helmke, 1993; Pekrun et al., 2002a, 2002b). Furthermore, students' enjoyment, hope, and pride correlated positively with college students' interest, effort invested in studying, elaboration of learning material, and self-regulation of learning, in line with the view that these activating positive emotions can be beneficial for students' academic agency (Pekrun et al., 2002a, 2002b). Consistent with evidence on discrete emotions, general positive affect has also been found to correlate positively with students' cognitive engagement (Linnenbrink, 2007). However, some studies have found null relations between activating positive emotions (or affect) and individual engagement and achievement (Linnenbrink, 2007; Pekrun, Elliot, & Maier, 2009). Also, caution should be exercised in interpreting the reported correlations. Linkages between emotions and achievement are likely due not only to performance effects of emotions, but also to effects of performance attainment on emotions, implying reciprocal rather than unidirectional causation.

Negative Activating Emotions

As noted, emotions such as anger, anxiety, and shame produce task-irrelevant thinking, thus reducing cognitive resources available for task purposes, and undermine students' intrinsic

motivation. On the other hand, these emotions can induce motivation to avoid failure and facilitate the use of more rigid learning strategies. By implication, the effects on resulting academic performance depend on task conditions and may well be variable, similar to the proposed effects of positive deactivating emotions. The available evidence supports this position.

Specifically, it has been shown that *anxiety* impairs performance on complex or difficult tasks that demand cognitive resources, such as difficult intelligence test items, whereas performance on easy, less complex, and repetitive tasks may not suffer or is even enhanced (Hembree, 1988; Zeidner, 1998, 2007). In line with experimental findings, field studies have shown that test anxiety correlates moderately negatively with students' academic performance. Typically, 5–10% of the variance in students' achievement scores is explained by self-reported anxiety (Hembree, 1988; Zeidner, 1998). Again, in explaining the correlational evidence, reciprocal causation of emotion and performance has to be considered. Linkages between test anxiety and achievement may be caused by effects of success and failure on the development of test anxiety, in addition to effects of anxiety on achievement. The scarce longitudinal evidence available suggests that test anxiety and students' achievement are in fact linked by reciprocal causation across school years (Meece, Wigfield, & Eccles, 1990; Pekrun, 1992b). Furthermore, correlations with performance variables have not been uniformly negative across studies. Zero and positive correlations have sometimes been found, in line with our view that anxiety can exert ambiguous effects. Anxiety likely has deleterious effects in many students, but it may facilitate overall performance in those who are more resilient and can productively use the motivational energy provided by anxiety.

Few studies have addressed the effects of negative activating emotions other than anxiety. Similar to anxiety, *shame* related to failure showed negative overall correlations with college students' academic achievement and negatively predicted their exam performance (Pekrun et al., 2004, 2009). However, as with anxiety, shame likely exerts variable effects (Turner & Schallert, 2001). Similarly, while achievement-related *anger* correlated negatively with academic performance in a few studies (Boekaerts, 1993; Pekrun et al., 2004), the underlying mechanisms may be complex and imply more than just negative effects. In a study by Lane, Whyte, Terry, and Nevill (2005), depressed mood interacted with anger experienced before an academic exam, such that anger was related to improved performance in students who reported no depressive mood symptoms—presumably because they were able to maintain motivation and invest necessary effort. In sum, the findings for anxiety, shame, and anger support the notion that performance effects of negative activating emotions are complex, although relationships with overall performance are negative for many task conditions and students.

Negative Deactivating Emotions

In contrast to negative activating emotions, negative deactivating emotions, such as boredom and hopelessness, are posited to uniformly impair performance by reducing cognitive resources, undermining both intrinsic and extrinsic motivation, and promoting superficial information processing (Pekrun, 2006). However, in spite of the frequency of boredom experienced by many individuals in school today, this emotion has received scant attention, as has the less frequent, but devastating emotion of achievement-related hopelessness. An exception is experimental research on boredom induced by very simple, repetitive tasks, such as assembly-line, vigilance, or data entry tasks. Boredom was found to reduce performance on these tasks (Fisher, 1993). In education, boredom has been discussed as being experienced by gifted students (Sisk, 1988). The little evidence available corroborates that boredom and hopelessness relate uniformly negatively to students' achievement, in line with theoretical expectations (Goetz, Frenzel, Pekrun, Hall, & Lüdtke, 2007; Maroldo, 1986; Pekrun et al., 2002a, 2004, 2010).

In sum, theoretical expectations, the evidence produced by experimental studies, and findings from field studies imply that students' emotions have profound effects on their engagement and academic achievement. As such, administrators

and educators should pay attention to the emotions experienced by students. Most likely, the effects of students' enjoyment of learning are beneficial, whereas hopelessness and boredom are detrimental for engagement. The effects of emotions like anger, anxiety, or shame are more complex, but for the average student, these emotions also have negative overall effects.

Origins of Academic Emotions

Given the relevance of students' emotions for their engagement, it pays to analyze their origins as well. While a more detailed review of the literature is beyond the scope of this chapter, we provide a short overview of current research in this section (for more comprehensive treatments, see Schutz & Pekrun, 2007; Zeidner, 1998). We first address appraisals and achievement goals as individual antecedents of students' emotions, and subsequently the role of learning tasks and social environments.

Appraisals as Proximal Antecedents

Generally, emotions can be caused and modulated by numerous individual factors, including situational perceptions, cognitive appraisals and emotion schemata, neurohormonal processes, and sensory feedback from facial, gestural, and postural expression (Davidson, Scherer, & Goldsmith, 2003; Scherer, Schorr, & Johnstone, 2001). However, the emotions experienced in an academic context pertain to culturally defined demands in settings that are a recent product of civilization. In these settings, the individual has to learn how to adapt to situational demands while preserving individual autonomy—inevitably a process guided by appraisals. As such, cognitive appraisals of task demands, personal competences, the probability of success and failure, and the value of these outcomes likely play a major role in the arousal of academic emotions, and research on the determinants of academic emotions from early on has focused on such appraisals.

Test Anxiety Research

Test anxiety studies were the first to address the appraisal antecedents of students' emotions. In these studies, appraisals concerning threat of failure have been addressed as causing anxiety. In terms of R. S. Lazarus' transactional stress model (Lazarus & Folkman, 1984), threat in a given achievement setting is evaluated in terms of the likelihood and subjective importance of failure ("primary appraisal") and in terms of possibilities to cope with this threat ("secondary appraisal"). A student may experience anxiety when her primary appraisal indicates that failure on an important exam is likely, and when her secondary appraisal indicates that this threat is not sufficiently controllable. Empirical research confirms that test anxiety is closely related to perceived lack of control over performance. Specifically, numerous studies have shown that K-12 and postsecondary students' self-concept of ability, self-efficacy expectations, and academic control beliefs correlate negatively with their test anxiety (Hembree, 1988; Pekrun et al., 2004; Zeidner, 1998).

Attributional Theory

In attributional theories explaining emotions following success and failure, perceived control plays a central role as well. In B. Weiner's (1985, 2007) approach, attributions of success and failure to various causes are held to be primary determinants of these emotions, except "attribution-independent" emotions which are directly instigated by perceptions of success or failure (happiness and sadness/frustration for success and failure, respectively). Pride is assumed to be aroused by attributions of success to internal causes (i.e., causes located within the person, such as ability and effort). Shame is seen to be instigated by failure attributed to internal causes that are uncontrollable (like lack of ability), and gratitude and anger by attributions of success and failure, respectively, to external causes that are under control by others. The stability of perceived causes is posited to be important for hopefulness and hopelessness regarding future performance. Findings from scenario studies asking students how they, or others, might

react to success and failure were largely in line with Weiner's propositions, as were findings from correlational field studies (Heckhausen, 1991; Weiner, 1985).

Control-Value Theory

While test anxiety theories and attributional theories have addressed outcome emotions pertaining to success and failure, they have neglected activity-related emotions. In Pekrun's (2006; Pekrun et al., 2007) control-value theory of achievement emotions, core propositions of the transactional stress model and attributional theories are revised and expanded to explain a broader variety of emotions. The theory posits that achievement emotions are induced when the individual feels in control of, or out of control of, achievement activities and outcomes that are subjectively important—implying that appraisals of control and value are the proximal determinants of these emotions (e.g., Goetz, Frenzel, Stoeger, & Hall, 2010). Control appraisals pertain to the perceived controllability of actions and outcomes, as implied by related causal expectations (self-efficacy expectations and outcome expectations), causal attributions, and competence appraisals. Value appraisals relate to the subjective importance of these activities and outcomes.

Different combinations of control and value appraisals are proposed to instigate different achievement emotions. Prospective, anticipatory joy and hopelessness are expected to be triggered when there is high perceived control (joy) or a complete lack of perceived control (hopelessness). For example, a student who believes he has the necessary resources to get an A+ on an important exam may feel joyous about the prospect of receiving such a grade. Conversely, if he believes he is incapable of preventing to fail the exam, he may experience hopelessness. Prospective hope and anxiety are instigated when there is uncertainty about control, the attentional focus being on anticipated success in the case of hope, and on anticipated failure in the case of anxiety. For example, a student who is unsure about being able to master an important exam may hope for success, fear failure, or both. Similarly, retrospective pride, shame, gratitude, and anger are also seen to be induced by appraisals of control and value.

Regarding activity emotions, enjoyment of achievement activities is proposed to depend on a combination of positive competence appraisals and positive appraisals of the intrinsic value of the action (e.g., studying) and its reference objects (e.g., learning material). For example, a student is expected to enjoy learning if she feels competent to meet the demands of the learning task and values the learning material. If she feels incompetent, or is disinterested in the material, studying is not enjoyable. Anger and frustration are aroused when the intrinsic value of the activity is negative (e.g., when working on a difficult project is perceived as taking too much effort which is experienced as aversive). Finally, boredom is experienced when the activity lacks any intrinsic incentive value (Pekrun et al., 2010).

Nonreflective Induction of Emotions

Importantly, emotions need not always be mediated by conscious appraisals. Rather, recurring appraisal-based induction of emotions can become automatic and nonreflective over time. When academic activities are repeated over and over again, appraisals and the induction of emotions can become routinized to the extent that there is no longer any conscious mediation of emotions—or no longer any cognitive mediation at all (Reisenzein, 2001). In the procedural emotion schemata established by routinization, situation perception and emotion are directly linked such that perceptions can automatically induce the emotion (e.g., the mere smell of a chemistry lab inducing joy). However, when the situation changes or attempts are made to change the emotion (as in psychotherapy), appraisals come into play again.

The Role of Achievement-Related Goals and Orientations

To the extent that cognitive appraisals are proximal determinants of achievement emotions, more distal individual antecedents, such as gender or achievement-related beliefs, should affect these emotions by first influencing appraisals (Fig. 12.2;

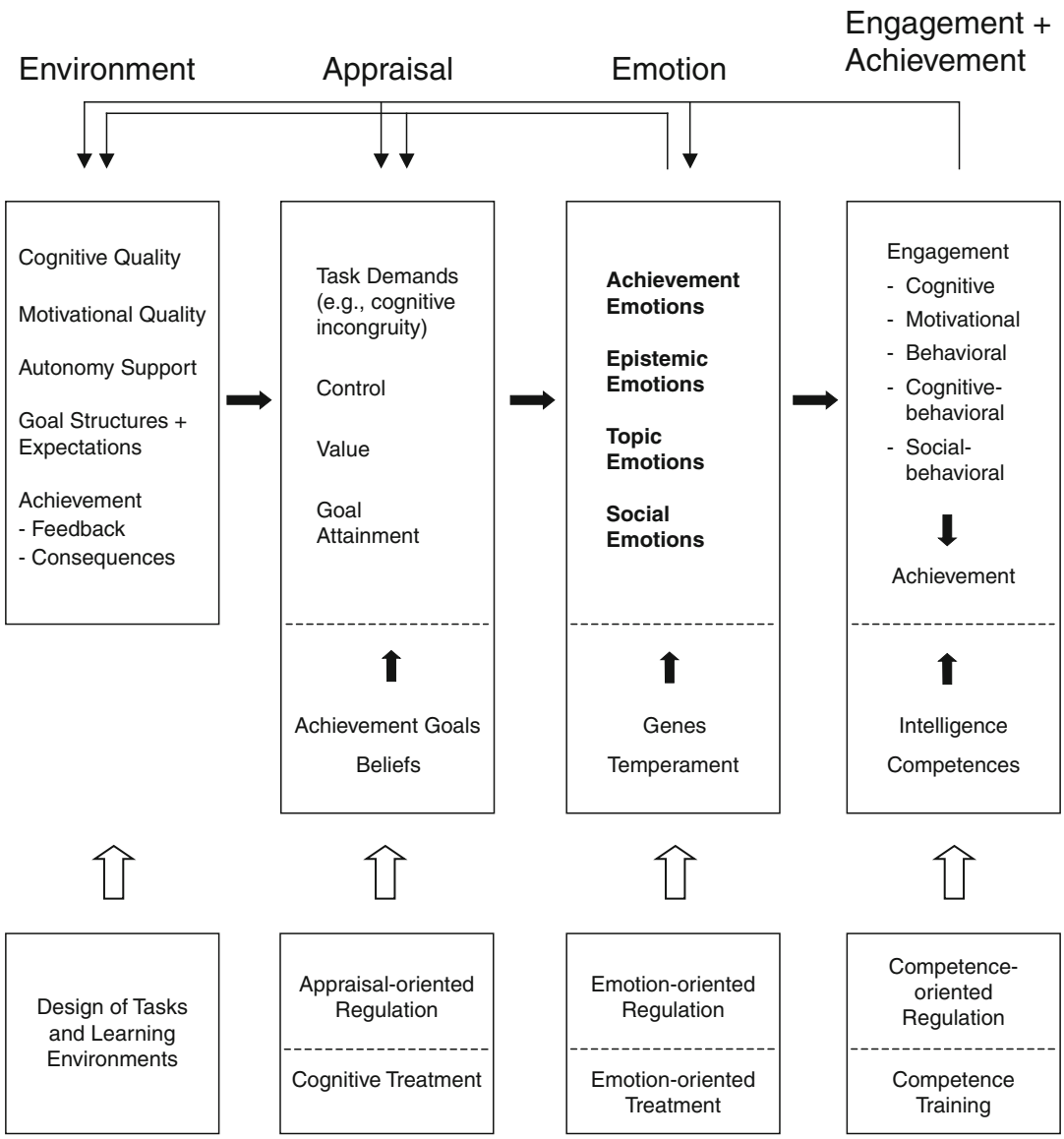

Fig. 12.2 Reciprocal causation of academic emotions, engagement, and their antecedents and outcomes

Pekrun, 2006). This can also be assumed for the influence of achievement-related goals and goal orientations which are thought to direct attentional focus in the course of achievement activities. Specifically, these goals and orientations provide a lens through which individuals interpret and respond to achievement-related settings (Dweck & Leggett, 1988). *Achievement goals* can be defined as the competence-relevant aims that individuals strive for in achievement settings (Elliot, 2005), with different goals being related to different definitions of achievement. In mastery goals, achievement is judged by intraindividual standards or absolute criteria; in performance goals, achievement is judged by normative standards comparing performance across individuals. *Achievement goal orientations* are broader cognitive schemas that comprise achievement goals as well as associated reasons to pursue these goals (Maehr & Zusho, 2009;

Pintrich, 2000). Mastery goal orientations focus on developing competence and learning, whereas performance goal orientations focus on demonstrating competence, often in relation to the others (Dweck & Leggett). Researchers have also proposed that these primary goals and orientations can be further differentiated into approach and avoidance dimensions (Elliot, 1999; Elliot & McGregor, 2001; Pintrich, 2000). In this way, individuals can strive toward success or away from failure, resulting in four possible goals and goal orientations (mastery-approach, mastery-avoidance, performance-approach, performance-avoidance; for a recent revision of this framework, see Elliot, Murayama, & Pekrun, 2011).

As achievement-related goals and goal orientations are central to achievement motivation (Dweck & Leggett, 1988; Elliot & McGregor, 2001; Nicholls, 1984), understanding their relations with emotions is of specific importance for explaining students' engagement. The relation can be explained by assuming that different goals and orientations focus attention on different aspects of current academic activities, thus promoting different kinds of appraisals. Specifically, goals can promote appraisals of the controllability and value of achievement, and of the rate of progress toward goal attainment. Furthermore, they can differentially focus the individual on the task versus the self.

In terms of controllability and value, Pekrun's (2006; Pekrun, Elliot, & Maier, 2006; Pekrun et al., 2009) control-value theory implies that mastery goals should focus attention on the controllability and positive values of task activities, thus promoting positive activity emotions such as enjoyment of learning and reducing negative activity emotions such as boredom. Performance-approach goals should focus attention on the controllability and positive values of success, thus facilitating positive outcome emotions such as hope and pride, and performance-avoidance goals should focus attention on the uncontrollability and negative value of failure, thus inducing negative outcome emotions such as anxiety, shame, and hopelessness.

In terms of the rate of progress toward goal attainment, Linnenbrink and Pintrich's (2002b; Linnenbrink, 2007; Tyson, Linnenbrink-Garcia, & Hill, 2009) bidirectional model of goals and affect proposes that mastery goals promote perceptions of progress toward success since progress is judged relative to one's own improvement, thus facilitating emotions such as elation and happiness. Performance-approach goals are thought to promote emotions such as sadness for the many individuals who perceive insufficient progress toward success due to competition with others, and happiness for those who do perceive sufficient progress; performance-avoidance goals promote perceptions of moving away from or toward failure, thus facilitating relief or anxiety, respectively. Both performance-approach and performance-avoidance goals are proposed to be associated with anxiety, due to the heightened focus on the self. As such, performance-approach goal orientations in particular should be associated with a range of emotions including elation, happiness, sadness, and anxiety, depending both on perceived progress and the salience of the self. Overall, the predictions derived from the two models are complementary and largely consistent, with few exceptions such as differences in the proposed links for hopelessness and sadness (see Pekrun & Stephens, 2009; Tyson et al., 2009).

The available evidence corroborates that students' goals affect their emotions. Relations between achievement goals and omnibus variables of general positive and negative affect tend to lack consistency (Linnenbrink & Pintrich, 2002b; Pekrun et al., 2006, 2009); however, there are fairly clear linkages with discrete achievement emotions, especially for mastery and performance-avoidance goals. The relation between performance-avoidance goals and test anxiety is best documented, but recent research also shows consistent relations for mastery goals and activity emotions (positive for enjoyment, negative for boredom) and for performance goals and outcome emotions other than anxiety, such as pride, shame, and hopelessness (Daniels et al., 2009; Linnenbrink, 2007; Linnenbrink & Pintrich, 2002b; Mouratidis, Vansteenkiste, Lens, & Auweele, 2009; Pekrun et al., 2006, 2009). The close relation between achievement-related goals and subsequent emotions also implies that emotions

can function as mediators of the effects of achievement goals on engagement and achievement. For example, in research by Linnenbrink et al. (1999), general negative affect was a mediator of mastery goal effects on task performance. Similarly, in studies by Elliot and McGregor (1999) and Pekrun et al. (2009), performance-avoidance goals predicted anxiety which in turn was a negative predictor of achievement, implying that anxiety mediated the effects of performance-avoidance goals on achievement.

The Influence of Tasks and Environments

The impact of task design and learning environments on students' emotions is largely unexplored, with the exception of research on the antecedents of test anxiety (see Wigfield & Eccles, 1990; Zeidner, 1998, 2007) and task interest/enjoyment (e.g., Deci & Ryan, 1987). Lack of structure and clarity in classroom instruction and exams, as well as excessively high task demands, relate positively to students' test anxiety. These effects are likely mediated by students' perceptions of low control and resulting expectancies of failure (Pekrun, 1992b). Furthermore, the format of tasks has been found to be relevant. Open-ended formats (e.g., essay questions) seem to induce more anxiety than multiple-choice formats, likely due to higher working memory demands which are difficult to meet when memory capacity is used for worrying about failure (Shaha, 1984; Zeidner, 1987). In contrast, giving individuals the choice between tasks, relaxing time constraints, and giving second chances in terms of retaking tests have been found to reduce test anxiety, presumably so because perceived control is enhanced under these conditions (Zeidner, 1998). These findings are in line with research demonstrating that task structures that function to promote autonomy and a sense of control are positively related to intrinsic motivation, cognitive flexibility, positive affect, and well-being (e.g., Deci & Ryan, 1987).

Regarding social environments, high achievement expectancies from important others, negative feedback after performance, and negative consequences of poor performance (e.g., public humiliation) show moderate to strong positive correlations with students' test anxiety (Pekrun, 1992b; Zeidner, 1998). Also, individual competition in classrooms is positively related to students' anxiety, presumably because competition reduces expectancies for success and increases the importance of avoiding failure (Wigfield & Eccles, 1990). In contrast, in K-12 research, social support from parents and teachers and a cooperative classroom climate have been found to be uncorrelated with students' test anxiety scores (Hembree, 1988). Negative feedback loops of support and anxiety may account for this surprising noncorrelation. Social support can alleviate anxiety (negative effect of support on anxiety), but anxiety can provoke support in the first place (positive effect of anxiety on support), thus yielding an overall zero correlation.

The quality of tasks, expectations from significant others, and functional importance of achievement likely influence academic emotions other than anxiety as well. Related evidence is largely lacking to date. The following factors may be relevant for a broad variety of academic emotions (see Fig. 12.2).

Cognitive Quality

The cognitive quality of classroom instruction and tasks as defined by their structure, clarity, and potential for cognitive stimulation likely has a positive influence on perceived competence and the perceived value of tasks (e.g., Cordova & Lepper, 1996), thus positively influencing students' emotions and engagement. Specifically, the cognitive quality of tasks in terms of inducing appropriate levels of cognitive incongruity may be of primary importance for the arousal of epistemic emotions such as surprise and curiosity. In addition, the relative difficulty of tasks can influence perceived control, and the match between task demands and competences can influence subjective task value, thus also influencing emotions. If demands are too high or too low, the incentive value of tasks may be reduced to the extent that boredom is experienced (Acee et al., 2010; Csikszentmihalyi, 1975; Pekrun et al., 2010).

Motivational Quality

Teachers and peers deliver both direct and indirect messages conveying academic values. Two ways of inducing emotionally relevant values in indirect ways may be most important. First, if tasks and environments are shaped such that they meet students' needs, positive activity-related emotions should be fostered. For example, learning environments that support cooperation should help students fulfill their needs for social relatedness, thus making working on academic tasks more enjoyable and promoting their social engagement as discussed earlier. Second, teachers' own enthusiasm in dealing with tasks can facilitate the adoption of achievement values and related emotions (Frenzel et al., 2009; Turner, Meyer, Midgley, & Patrick, 2003). Observational learning and emotional contagion may be prime mechanisms mediating these effects (Hatfield, Cacioppo, & Rapson, 1994).

Autonomy Support

Tasks and environments supporting autonomy can increase perceived control and, by meeting needs for autonomy, the value of related achievement activities (Tsai, Kunter, Lüdtke, Trautwein, & Ryan, 2008). However, these beneficial effects likely depend on the match between individual competences and needs for academic autonomy, on the one hand, and the affordances of these environments, on the other. In case of a mismatch, loss of control and negative emotions could result.

Goal Structures and Social Expectations

Different standards for defining achievement can imply individualistic (mastery), competitive (normative performance), or cooperative goal structures (Johnson & Johnson, 1974). The goal structures provided in academic settings conceivably influence emotions in two ways. First, to the extent that these structures are adopted, they influence individual achievement goals (Murayama & Elliot, 2009) and any emotions influenced by these goals (Kaplan & Maehr, 1999; Roeser, Midgley, & Urdan, 1996). Second, goal structures determine relative opportunities for experiencing success and perceiving control, thus influencing control-dependent emotions. Specifically, competitive goal structures imply, by definition, that some individuals have to experience failure, thus inducing negative outcome emotions such as anxiety and hopelessness in these individuals. Similarly, the demands implied by an important other's unrealistic expectancies for achievement can lead to negative emotions resulting from reduced subjective control.

Feedback and Consequences of Achievement

Cumulative success can strengthen perceived control, and cumulative failure can undermine control. In environments involving frequent assessments, performance feedback is likely of primary importance for the arousal of academic emotions. In addition, the perceived consequences of success and failure are important, since these consequences affect the instrumental value of achievement outcomes. Positive outcome emotions (e.g., hope for success) can be increased if success produces beneficial long-term outcomes (e.g., future career opportunities) and provided sufficient contingency between one's own efforts, success, and these outcomes. Negative consequences of failure (e.g., unemployment), on the other hand, may increase achievement-related anxiety and hopelessness (Pekrun, 1992b).

In sum, individual antecedents as well as social environments and academic tasks shape students' academic emotions and, consequently, any emotion-dependent engagement with learning. Environments, goals, and appraisals can induce, prevent, and modulate students' emotions, and they can shape their objects and contents. Depending on individual goals and the learning environment provided, students' academic life can be infused with positive affect and joyful task engagement, or with anxiety, frustration, and boredom. However, the strong impact of tasks and the social environment does not imply that basic mechanisms linking students' emotions with their engagement vary as a function of task and social context. Rather, these mechanisms seem to be pretty stable across contexts (Pekrun, 2009). For example, concerning the context provided by different task domains, students' emotions experienced in mathematics,

science, and languages differed in mean levels across domains, but showed equivalent internal structures and linkages with academic achievement across domains in recent research with high school students (Goetz et al., 2007). Similarly, in a cross-cultural comparison of Chinese and German high school students' emotions in mathematics, Frenzel, Thrash, Pekrun, and Goetz (2007) found that mean levels of emotions differed between cultures, with Chinese students reporting more achievement-related enjoyment, pride, anxiety, and shame, and less anger in mathematics. However, the functional linkages of these emotions with perceived control, important others' expectations, and academic achievement in mathematics were equivalent across cultures. Most likely, the general functions of emotions for students' engagement and achievement described earlier are universal across different task domains, social environments, and cultural contexts.

Reciprocal Causation, Emotion Regulation, and Therapy

Academic emotions influence students' engagement and achievement, but achievement outcomes are expected to reciprocally influence appraisals, emotions, and the environment (Pekrun, 2006; see Fig. 12.2). As such, academic emotions, their antecedents, and their effects are thought to be linked by reciprocal causation over time. Reciprocal causation may involve a number of feedback loops, including the following three that may be especially important. First, learning environments shape students' appraisals and emotions, as argued earlier, but these emotions reciprocally affect students' learning environments and the behavior of teachers and classmates. For example, teachers' and students' enjoyment of classroom instruction are likely linked in reciprocal ways, emotional contagion being one of the mechanisms producing these links (see Frenzel et al., 2009). Second, emotions impact students' engagement, and engagement affects students' emotions. For example, enjoyment of learning can facilitate students' self-regulation and use of creative learning strategies, as outlined earlier. Creative, self-directed involvement with tasks may in turn promote students' enjoyment, suggesting that students' enjoyment and their strategy use are reciprocally linked. Similarly, emotions influence students' motivational engagement in terms of adopting various achievement goals, but these goals reciprocally influence students' emotions (Linnenbrink & Pintrich, 2002b). Third, by impacting engagement, students' emotions have an influence on their achievement. Academic achievement outcomes and feedback on these outcomes, however, are primary forces shaping students' emotions, again suggesting reciprocal causation.

In line with perspectives of dynamical systems theory (Turner & Waugh, 2007), it is assumed that such reciprocal causation can take different forms and can extend over fractions of seconds (e.g., in linkages between appraisals and emotions), days, weeks, months, or years. Positive feedback loops likely are commonplace (e.g., in reciprocal linkages between teachers' and students' enjoyment as cited earlier), but negative feedback loops can also be important (e.g., when failure on an exam induces anxiety in a student, and anxiety motivates the student to successfully avoid failure on the next exam).

Reciprocal causation has implications for the regulation of academic emotions, for the treatment of excessively negative emotions, and for the design of "emotionally sound" (Astleitner, 2000) learning environments. Since emotions, their antecedents, and their effects can be reciprocally linked over time, emotions can be regulated and changed by addressing any of the elements involved in these cyclic feedback processes. Regulation and treatment can target (a) the emotion itself (*emotion-oriented* regulation and treatment, such as using drugs and relaxation techniques to cope with anxiety or employing interest-enhancing strategies to reduce boredom; Sansone, Weir, Harpster, & Morgan, 1992); (b) the control and value appraisals underlying emotions (*appraisal-oriented* regulation and treatment; e.g., attributional retraining, Ruthig, Perry, Hall, & Hladkyj, 2004); (c) the competences determining individual agency (*competence-oriented* regulation and treatment; e.g., training of

learning skills); and (d) tasks and learning environments (*design of tasks and environments*).

Emotion regulation and ways to treat excessive negative academic emotions have mainly been studied for test anxiety and related test emotions (e.g., Davis, DiStefano, & Schutz, 2008). Specifically, test anxiety treatment is among the most successful psychological therapies available, effect sizes often being above $d = 1$ (Hembree, 1988; Zeidner, 1998). Empirical evidence on ways to regulate and modify academic emotions more generally is still largely lacking to date, with few exceptions (c.f., Nett, Goetz, & Hall, 2010).

Conclusion

As argued in this chapter, emotions are critically important for students' engagement with academic tasks. This is likely true for all major types of cognitive, motivational, and behavioral engagement contributing to students' academic success. However, much of the research supporting this conclusion has been conducted by cognitive psychologists, social psychologists, and neuroscientists in laboratory studies and is far removed from the reality of academic contexts. Except for studies examining test anxiety, which has been a popular construct in educational research since the 1950s (Zeidner, 1998), research on students' emotions in real-world academic settings is clearly in a nascent stage. Educational research is just beginning to acknowledge the importance of affect and emotions.

To better understand the role of emotions for engagement in school, we suggest several areas for future research. First, researchers should investigate a variety of forms of emotions (mood, achievement, epistemic, topic, social) that may be relevant in educational contexts. There is a growing body of research on achievement emotions, but relatively little research on epistemic emotions or social emotions. We still know very little about how emotions emerge in response to specific task elements or in relation to social interactions in the classroom. Given the close proximity of epistemic and social emotions to the learning activity itself, studying emotions at this level may be especially fruitful for understanding how emotions shape engagement in school. Second, diverse theoretical definitions have plagued emotion research in other fields. Thus, we urge researchers conducting research on emotions in educational settings to be clear about how they define emotions within the context of education and to carefully match the theoretical conceptualization of emotions with their assessment instruments. Third, within the field of psychological neuroscience, great strides have been made in understanding the neurological bases for emotions and their link to other aspects of neurological functioning (c.f., Davidson, Pizzagalli, Nitschke, & Kalin, 2003; Immordino-Yang, McColl, Damasio, & Damasio, 2009). Researchers studying emotions in the classroom should be aware of the implications of this research, especially with respect to the implicit aspects of emotions and the way in which emotions shape underlying cognitive processing. Fourth, as noted earlier, the reciprocal aspects of emotions are often neglected. Yet the models we discussed highlight the dynamic quality of emotions and engagement. Future research needs to develop better methods for unpacking these dynamic relations across time.

Finally, if we are to truly understand the role of emotions in classroom settings, we need to design learning environments that are emotionally adaptive for students and test the effectiveness of these environments. As yet, the few attempts to design academic environments that foster students' positive academic emotions have met with partial success at best (e.g., Glaeser-Zikuda, Fuss, Laukenmann, Metz, & Randler, 2005). The limited success may be due, at least in part, to the need for additional research about which emotions are especially beneficial in educational settings. Nevertheless, the success story of test anxiety research suggests that future research can be successful in developing ways to shape academic settings so that adaptive student emotions fostering students' engagement are promoted and maladaptive emotions prevented.

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