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How Universal Are Academic Emotions?

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A Control-Value Theory Perspective

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Abstract

Control-value theory (CVT) posits that emotions show diversity – their situational triggers, objects, frequency, and intensity vary widely across persons and contexts. Due to this variation, patterns of emotions can be unique for each individual student and teacher. Nevertheless, basic functional relations of emotions with outcomes and origins are thought to be universal, across persons as well as contexts. CVT uses the term "relative universality" to denote this combination of uniqueness and universality. We first provide an overview of CVT, summarize the theory's propositions on relative universality, and outline general advantages of relative universalism in psychological and educational science. We then review existing evidence, which supports both the diversity of academic emotions and the generalizability of their links with control-value appraisals and achievement across genders, ethnic groups, academic domains, learning environments, and cultural contexts. In conclusion, we discuss implications for practice and directions for future inquiry, highlighting the need for context-sensitive within-person research and intervention studies.

Contributor Descriptions

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Thomas Goetz is Professor of Psychology in the Faculty of Psychology at the University of Vienna, Austria. His main research interests relate to the antecedents of academic emotions, the domain specificity of emotional experiences, boredom at school, improving self-regulated learning in students, and teaching quality. He has published 17 books and more than 200 articles and book chapters.

Learning and achievement are critically important for students. Similarly, teaching is a fundamentally important task for teachers. Given personal importance, learning, achievement, and teaching can instigate intense emotions in students and teachers alike. Both positive (i.e., pleasant) and negative (i.e., unpleasant) emotions play a role, such as enjoyment of learning and teaching, hope for success, curiosity about a new problem, anger about task demands that seem unreasonable, anxiety before an exam, or boredom during a monotonous lecture. These emotions are not mere epiphenomena of learning and teaching; rather, they direct students' and teachers' motivation, thought, and action.

Control-value theory (CVT) explains these emotions. In its original version, the theory considered students' and teachers' achievement emotions, defined as emotions related to achievement activities and their outcomes (Pekrun, 2006, 2018; Pekrun et al., in press). The recent generalized version of the theory also explains epistemic, social, and health-related emotions (Pekrun, 2021). The theory considers the origins of these emotions; their functions for learning, performance, and health; their regulation; and related interventions and educational practices (see Figure 1 for an overview).

In this chapter, we first provide an overview of CVT. We then summarize the theory's propositions on universal principles explaining emotions, on the one hand, and variation across persons and contexts, on the other (together called "relative universality" of emotions). Next, we review existing evidence on variation of students' and teachers' emotions and the universal nature of their links with origins and outcomes across genders, learning environments, and cultural contexts. In conclusion, we discuss implications for practice and directions for future research.

Overview of Control-Value Theory

CVT is built on the premise that objective circumstances alone cannot explain human emotions. Rather, it is the subjective perception of the situation that shapes our emotions. For

example, the objective demands of an exam are not sufficient to explain students' anxiety

before the exam – rather, it is students' appraisal of the difficulty of these demands, and the

personal relevance of the exam, which determine if they are anxious or not. CVT proposes

that two types of appraisals are especially important: Perceptions of one's control over

activities and their outcomes, and perceptions of the value (or importance) of these activities

and outcomes. Different types and combinations of these appraisals are thought to instigate

different emotions.

For example, students can enjoy learning if they feel competent to master the material

(high control) and if the material is interesting (high value). If they feel unable to understand

the material, or are disinterested, learning is not enjoyable. When preparing for a test, students

may be fearful if they doubt whether they can pass it (low control) and if the test is deemed

important (high value). If success is subjectively certain, or if the test does not matter, then

there is no reason to be nervous. Similarly, teachers can enjoy teaching a class if they feel

competent to manage the class and deem the class important, and they may be afraid of

teaching if the class is important but seems not manageable.

Students' and teachers' control-value appraisals are considered as proximal

antecedents of their emotions. Factors in the person and the environment that influence these

appraisals also influence the emotions. Gender, personal goals, and learning-related beliefs

are examples at the person side; the classroom environment, family context, and cultural

values are examples at the side of the environment (Figure 1). Control-value theory uses a

socio-ecological perspective to conceptualize environments, with immediate learning

environments being embedded in broader institutional, economic, and socio-cultural contexts

(Bronfenbrenner, 1979).

Emotions, in turn, influence students' and teachers' learning and performance. The

cognitive-motivational model of emotion effects that is part of CVT can be used to explain

these influences. For example, effects of students' anxiety on their achievement are thought to be due to the impact of anxiety on task-irrelevant thinking, intrinsic and extrinsic motivation, use of learning strategies, and the regulation of learning, with overall effects varying across tasks and individuals (Pekrun, 2006).

Emotions, their outcomes, and their antecedents can be linked by reciprocal effects over time. For example, enjoyment of learning can promote successful performance, and success, in turn, further strengthens enjoyment. The reciprocal nature of these links implies that emotions can be regulated by targeting any of the elements of the resulting cyclic feedback processes (Pekrun & Stephens, 2009). Similarly, emotion-oriented educational interventions and classroom practices can target various components of these processes (Figure 1).

Relative Universality and the Role of Context

From these propositions of CVT, it follows that situational factors – from the immediate social environment to broader cultural contexts – play a crucial role in shaping emotions. However, does this mean that the processes generating emotions and determining their effects also depend on context? CVT proposes that the basic psychological functions that relate emotions to their origins and outcomes are universal within our species. Nevertheless, the composition of these functions, and the objects of emotions, are thought to vary widely across persons, environments, socio-cultural contexts, and historical times. It is this duality of the role of context – context-general nature of basic functions combined with context-specific variation – which is called "relative universality" in CVT (see Pekrun, 2009, 2018).

More specifically, CVT proposes that the links between perceived control, perceived value, and emotions are universal. For example, high perceived value should generally enhance enjoyment of learning and reduce boredom, across students and contexts. Similarly, the functions of emotions for basic processes mediating learning are thought to be universal,

such as enjoyment broadening attention and enhancing flexible thinking. It is conceivable that moderators, such as physiological properties of the brain systems of affective working memory, influence the strengths of these relations. Nevertheless, the general functional form of the relations (positive, negative, nonlinear) is thought to be universal. From a statistical perspective, this implies that effect sizes may vary, but that the direction of effects is the same across persons and contexts.

In contrast, situational triggers of emotions, their person- and situation-specific objects, and process parameters such as frequency, intensity, and decay rates are thought to differ. For example, some students are afraid of math, others are afraid of language classes, and still others rarely experience anxiety, or are afraid of school generally – depending on their socialization and personal profile of control and value beliefs. Similarly, some educational contexts are prone to be enjoyable, such as well-designed learning games, whereas others may exacerbate students' fears, such as environments emphasizing performance goals. On a broader scale, levels of academic emotions are expected to differ between cultural contexts, depending on the variation of values, epistemic activities, or styles of teaching across these contexts.

Furthermore, given that the strength of basic functions can differ across individuals, relations with origins and outcomes that are based on the interplay of several single mechanisms can also vary. The effects of students' emotions on their academic achievement are a case in point. For example, CVT proposes that anxiety generates irrelevant thinking and undermines intrinsic motivation, which should reduce overall performance, but can prompt strong motivation to invest effort to avoid failure, which can enhance performance. These oppositional effects may be balanced differently in different students, explaining why overall effects on achievement can vary (although they may be negative in the vast majority of students).

Finally, relations with origins and outcomes that depend on the interplay of task demands and psychological mechanisms can vary across task contexts. Again, the effects of anxiety on performance can serve as an example. Irrelevant thinking caused by anxiety reduces the working memory resources available for task performance, resulting in negative effects of anxiety on performance at difficult or complex tasks that require many resources. In contrast, performance on easy tasks need not be affected, or can even be enhanced if anxiety leads to increased effort.

From this perspective, universal basic functions of emotions are seen as the building blocks of more complex functional relations, with the latter including several mediating processes that link emotions to origins and outcomes. These complex relations can vary across persons, tasks, and contexts, due to person-, task-, and context-specific combinations of the basic functions that generate them.

Advantages of Relative Universalism

All things being equal, parsimonious explanations are more useful than complex ones. From this perspective, explaining phenomena by use of universal, generalizable laws should be preferable to local theories that only apply to a limited number of phenomena in specific sociocultural contexts. However, while universal laws offer the advantage of explaining many phenomena (provided they are valid), it may be that they do not describe any of these phenomena in sufficient depth. As such, there may be a trade-off between parsimony and depth of explanation. Furthermore, there may be phenomena for which universal laws do not apply at all. Accordingly, where should the science of emotion in education be located on the continuum from universal (or nomothetic or etic) to local (or idiographic or emic)?

CVT's answer is that principles of relative universality hold, as outlined above. Although the concrete form of these principles in CVT is specific to explaining emotions, their general premise (universality of functions combined with situational variation) is not

unique. CVT shares principles of relative universality with other theories in the field. For example, expectancy-value theories of student motivation posit that motivation is generally a positive function of expectancy and value, but that an individual students' expectancies and values depend on the specifics of the situation as well as the student's socialization (e.g., Eccles & Wigfield, 2020). Self-determination theory proposes that need satisfaction universally promotes positive development, and need frustration undermines development, while the triggers for satisfaction and frustration vary across persons and contexts (e.g., Vansteenkiste et al., 2020). Similarly, Marsh's theories of academic self-concept, such as his big-fish-little-pond effect model, posit that the mechanisms of self-concept change are universal across educational institutions and cultures (e.g., Marsh et al., 2019).

From a meta-theoretical perspective, relative universalism avoids the fallacies of (extreme) idiographic and cultural relativism, suggesting that all persons and cultures function differently to the extent that general explanatory principles are invalid and useless. It also avoids the fallacies of the other possible extreme stance, that is, a deterministic perspective positing that all individuals function in exactly the same way across all contexts (see also Richters, 2021). Rather, relative universalism bridges the gap between idiographic and nomothetic perspectives. As such, we consider relative universalism as a cornerstone of a science of psychology and education that acknowledges both generality and specificity.

Empirical Evidence

From the existing empirical evidence on emotions in education, we can infer whether principles of relative universality hold. However, there are two caveats. First, most of the existing findings pertain to students' anxiety, implying that conclusions about other emotions are preliminary. Second, to examine generalizability, it is important to establish equivalence of constructs and measures across persons and contexts. This is less of a problem for objective measures, such as physiological parameters of emotional arousal, but a potential problem for

self-report measures. Self-report items can acquire different meanings for different persons, and even for the same person in different situations. Fortunately, there is evidence that equivalence can be established. Loderer, Gentsch et al. (2020) examined profiles of emotion concepts across samples of students from different countries. The findings suggest that concepts of achievement emotions are largely consistent across languages, as are basic concepts of emotions more generally (Fontaine et al., 2013). In addition, large-scale student assessments, such as the Organisation for Economic Co-Cooperation and Development's (OECD) Programme for International Student Assessment (PISA), established measurement equivalence of self-report instruments across countries (see OECD, 2010, 2013, 2016, 2017). Given equivalence of constructs and measures, it seems possible to reach conclusions about relative universality.

Variation Across Persons and Contexts

Studies that report empirical distributions of emotion scores document broad variation across persons. An example is studies that used the Achievement Emotions Questionnaire (AEQ). The instrument provides 5-point Likert scales to respond to items. Across emotions, standard deviations of item responses are typically around 1.0, and scores are distributed across the full range of response options (e.g., Pekrun et al., 2011, in press).

Emotions also vary across students and teachers differing in gender or ethnicity. For example, female students typically report higher levels of anxiety. In the 2012 cycle of PISA which focused on mathematics, average math anxiety was significantly higher for females in most countries (OECD, 2013; see also Sarfo et al., 2020). In addition, female students report lower positive emotions in mathematics. Frenzel, Pekrun et al. (2007) found that girls reported more anxiety, hopelessness, and shame, but less enjoyment and pride in this subject. CVT provides an explanation for these differences: Female students differ from male students not only in these emotions, but also in their control-value beliefs in mathematics –even if their

performance is similar, they often show less confidence in their abilities, likely due to gender stereotypes about math-related competencies and the lack of competent female role models in math (see also Goetz et al., 2013). In contrast, girls may enjoy language-related activities more than boys do. For example, reading for enjoyment was reported more frequently by girls in 64 out of 65 countries participating in the PISA 2009 assessments (OECD, 2010).

Similarly, emotions can vary widely across cultural contexts. The PISA assessments found particularly high levels of math and science anxiety in East Asian students (OECD, 2004, 2013, 2017; see also Fan et al., 2019). Again, these differences extend beyond anxiety. For example, Frenzel, Thrash et al. (2007) investigated Chinese and German students' emotions in mathematics, using the Achievement Emotions Questionnaire-Mathematics (AEQ-M; Pekrun et al., 2011) after establishing cross-cultural measurement equivalence. On average, the Chinese students reported substantially higher levels of enjoyment, pride, anxiety, and shame, but lower levels of anger than the German students. The findings are consistent with evidence that anger is more avoided in collectivistic cultures, as compared with individualistic cultures (e.g., Grimm et al., 1999).

For differences across contexts as well, CVT provides an explanation. Learning environments differ in features that shape emotion-generating control and value appraisals, thus explaining differences in emotions. Critical features include the cognitive activation provided by classroom instruction which influences competence perceptions and the perceived value of learning; task demands that define difficulty and, therefore, perceptions of control; teachers' displayed enthusiasm which signals value; the provision of autonomy support and social interaction (e.g., through group learning) which promotes perceived values by meeting students' needs for autonomy and relatedness; feedback about achievement which shapes competence perceptions; and the composition of classrooms (e.g., Pekrun et al., 2019). Similarly, differences in emotions across cultural contexts can be explained by the variation

of beliefs about ability, effort, and the value of achievement across societies (see Pekrun, 2018).

Universality of Functional Relations

Given the evidence, it may be considered trivial that emotions vary across students, teachers, and contexts. In contrast, the proposition that functional relations are universal is non-trivial and contentious (see, e.g., Richters, 2021). Furthermore, there are fewer studies that investigated the universality of these relations. However, the evidence from these studies is consistent and clearly supports universality. Effects of moderators are small at best and do not change the direction of effects.

Gender and ethnicity. As described earlier, girls and boys can differ considerably in their emotions in subjects such as mathematics. Nevertheless, it appears that the relations of these emotions with control-value appraisals and achievement do not differ between genders. For example, in the study by Frenzel, Pekrun et al. (2007), we assessed students' competence beliefs in mathematics, the intrinsic value of this domain, and the value of achievement in math. In multigroup analysis, the relations between these appraisals and the emotions had the same sign, were equally significant, and had similar size across genders, thus supporting the universality of relations between appraisals and emotions across genders.

The meta-analysis by Barroso et al. (2021) examined the influence of gender and ethnicity on the relation between anxiety and achievement in mathematics. Neither gender nor ethnicity were significant moderators of this relation. Average correlations were $r = -.24$ and -.28 for male and female students, respectively (based on a total of 90 independent samples). Similarly, ethnicity or race did not significantly moderate the anxiety-achievement relation (based on 176 samples). These findings suggest that relations between emotions and students' achievement are also equivalent across genders, and across ethnicity. Similarly, in the meta-

analysis by Zhang et al. (2019), gender was not a significant moderator of the negative relation between math anxiety and math achievement.

Academic domains. The available evidence suggests that relations of emotions with appraisals and achievement are also equivalent across school subjects. In the study by Goetz et al. (2007), German secondary school students' levels of enjoyment, pride, boredom, anger, and anxiety clearly differed across subjects (i.e., mathematics, physics, German, and English). In contrast, the relations among these emotions and their links with students' achievement proved to be very similar across domains. In all four domains, enjoyment showed positive correlations with pride, the negative emotions also showed positive intercorrelations, and the correlations between positive and negative emotions were negative. Furthermore, the correlations of enjoyment and pride with achievement were consistently positive, and the correlations of the negative emotions with achievement were consistently negative, within all four domains.

Similarly, in the meta-analysis by Camacho-Morles et al. (2021), relations of students' enjoyment, anger, and boredom with their achievement were equivalent across four domains including math, science, psychology, and literacy (57 independent samples; total $N = 31,868$, 11,153, and 28,410 students for enjoyment, anger, and boredom, respectively). Domain was not a significant moderator of these relations. The average correlations with achievement were positive for enjoyment and negative for anger and boredom in all four domains.

Learning environments. Loderer, Pekrun et al. (2020) reviewed 186 studies examining emotions in technology-based learning environments (TBLEs), such as learning with computer tools (e.g., text annotation software), intelligent tutoring systems, or virtual and augmented realities. The authors analyzed relations between emotions (enjoyment, curiosity/interest, anxiety, anger/frustration, confusion, boredom) and their antecedents (control-value appraisals, prior knowledge, gender, TBLE characteristics) and outcomes

(engagement, learning strategies, achievement). The findings show that the levels of the
emotions differed across TBLEs, but that their functional relations with appraisals and
outcomes were equivalent across environments. For example, variables of perceived control
related positively to enjoyment and negatively to anxiety; type of TBLE was not a significant
moderator for these relations. Similarly, enjoyment related positively, and anxiety related
negatively to learning outcomes across types of TBLs. The observed relations were also
equivalent to the relations reported in traditional classroom-based studies, at least in terms of
the direction of effects. As such, the findings support the robustness of links between
emotions, control-value appraisals, and achievement across different types of learning
environments.

      Cultural context. Evidence on the cross-cultural generality of relations between
emotions and appraisals in education is sparse, but also suggests universality. In the study by
Frenzel, Thrash et al. (2007), students' enjoyment of math related positively to their
perceptions of competence and of the value of this domain, whereas anxiety related negatively
to perceived competence and positively to the perceived importance of achievement in math,
in both Chinese and German students. The findings are consistent with evidence for general
control and value beliefs. For example, Luszczynska et al. (2005) reported negative relations
between general self-efficacy and anxiety that were equivalent across samples from various
countries, and Brown and Cai (2010) have shown that attributions to ability predicted pride
after success in both Chinese and US samples.

      More evidence is available for relations between students' emotions and their
achievement. Meta-analyses have shown that the direction of these relations is consistent
across continents and countries. In Barroso et al.'s (2021) analysis, the negative relation
between students' anxiety and achievement in math was consistent across continents,
including North America, South America, Europe, Asia, Africa, and Oceania. Continent was

not a significant moderator of this relation. Camacho-Morles et al. (2021) examined country (i.e., USA, Canada, Australia, the UK, and Germany) as a possible moderator. Some of the relations of emotions with achievement were moderated by country (relations for enjoyment were stronger in German than Canadian samples, and for boredom stronger in German than US samples). However, moderation pertained only to the strength of the relations, but not their direction which was consistent across countries. The between-country differences in the strength of relations may have been due to methodological differences, as suggested by additional findings for type of measurement as a moderator.

Meta-analyses share advantages and disadvantages with the original studies they are based on – they cannot be better than the original data. Most original studies on emotions in education used samples from Western, Educated, Industrialized, Rich, and Democratic (WEIRD) countries, thus limiting generalizability. Large-scale student assessments including a broader range of countries, such as PISA, may be better suited to examine generalizability. Findings from PISA confirm that negative relations between anxiety and achievement are generalizable. In the PISA 2012 assessment, students' anxiety and achievement in math correlated negatively in all of the 64 participating countries, and all of these correlations but one were significant (OECD, 2013). Similarly, in the PISA 2015 assessment, students' schoolwork-related anxiety showed negative correlations with their science performance in 52 of 55 countries participating in the assessment of anxiety (OECD, 2016). The robustness of relations with achievement also extends to positive emotions. In the PISA 2015 assessment, the relation between students' enjoyment of science (based on items adapted from the AEQ; Pekrun et al., 2011) and their performance in science was positive in all of the 68 countries for which this relation was examined (see also Guo et al., 2022).

Conclusion. As predicted by CVT, distributional parameters such as mean levels of emotions differ widely across individual students and teachers. Nevertheless, the links of

these emotions with control-value appraisals and achievement are remarkably consistent across genders, ethnicities, academic domains, learning environments, and cultural contexts (as represented by different countries). Interestingly, generalizability is found not only for the links with appraisals that represent basic functional relations, but also for the relations with achievement that are presumably generated by a more complex interplay of different mechanisms as explained earlier.

Implications and Future Directions

Relative universality implies that educators, administrators, policymakers, and parents should consider both the diversity and the generality of the emotions occurring in education. Students and teachers vary widely in the emotions they experience, in terms of the types, objects, frequency, and intensity of different emotions. Teachers, parents, and principals need to acknowledge the specificity of individual patterns of emotions. Nevertheless, there are regularities in the links of these emotions with antecedents and outcomes. These regularities make it possible to derive conclusions about average effects of emotions and modal types of origins. For example, the evidence indicates that teachers around the world need to know that anxiety is detrimental for academic learning in the average student, be the student female or male, White or non-White, in a traditional classroom or a technology-based environment, and in a Western, Asian, or African country.

However, as noted, much of the available evidence is preliminary and derived from only a few studies. To make further headway, the following developments may be especially important. First, the extant evidence needs to be broadened to include not only achievement emotions but also epistemic and social emotions, such as curiosity, confusion, or compassion. Second, we need more studies with samples beyond the WEIRD countries that dominate current research on generalizability, even in large-scale student assessments such as PISA which primarily focus on OECD countries.

Third, most of the extant research used between-person designs. From between-person studies, we cannot conclude how individual students and teachers function. Between- and within-person relations can differ substantially (Hamaker et al., 2015; Murayama et al., 2017). We need within-person research to better understand students' and teachers' emotions and more fully examine their relative universality. Intensive data with multiple assessments across time and contexts are needed to this end. Recent methodological developments make it possible to examine these data (see Hamaker et al., 2015; Pekrun et al., 2022, in press). Random-effect approaches, such as dynamic structural equation modeling, are especially promising because they not only allow to examine aggregate within-person relations, but also the generalizability of these relations across persons and contexts.

Finally, as yet researchers have focused on investigating emotions as they occur in existing educational contexts. These investigations, and the foundational knowledge they generated, represent crucially important steps. We now need to examine how these insights can be translated into educational interventions and practices. We need studies that answer the question: How can we support students and teachers in promoting adaptive academic emotions and preventing or reducing maladaptive emotions? Successful interventions are available to reduce students' test anxiety (e.g., Putwain et al., in press), suggesting that it should be possible to change other academic emotions as well. From a CVT perspective, a promising avenue is to modify control and value beliefs, especially in terms of enhancing perceived control, increasing intrinsic value, and decreasing excessive importance of success and failure (control-value intervention; Hoessle et al, 2021).

For translational research as well, it will be important to consider both universality and diversity. It seems likely that not all students or teachers benefit from any given intervention. For change to be effective, it is crucial to know who benefits, and for whom an intervention is not beneficial or even detrimental. For example, a treatment enhancing perceived control may

be promising for students who do not believe in their existing competencies, but may be
ineffective in those who are already sufficiently confident, or those who are best supported by
changing the educational institution. Within-person research on change may be a fruitful
avenue to develop personalized interventions and emotion-oriented educational practices that
adequately consider the diversity of students and teachers.

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Figure 1

Control-Value Theory: Basic Propositions