The Role of Academic Buoyancy and Emotions in Students' Learning-Related Expectations and Behaviours in Primary School

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Abstract

Background. Academic buoyancy refers to students' ability to come through ordinary challenges they face in the academic context, and it can positively contribute to students' beliefs and behaviours in learning situations. Although buoyancy has been found to be related to positive academic outcomes, previous studies have not examined how buoyancy influences academic emotions in learning situations and how these emotions further affect students' learning-related expectations and behaviours.

Aims. This study investigated to what extent academic buoyancy predicts students' failure expectations, avoidance behaviour, and task-oriented planning in learning situations, and to what extent academic emotions mediate the effect of academic buoyancy on these expectations and behaviours.

Sample. A total of 845 Finnish students in the sixth grade of primary school.

Methods. Self-report data for academic buoyancy and academic emotions in the autumn semester and learning-related expectations and behaviours in the spring semester were analysed using structural equation modelling, controlling for gender, grade point average, and previous levels of learning-related expectations and behaviours.

Results. The findings showed that high academic buoyancy indirectly predicted lower avoidance behaviour, fewer failure expectations, and higher task-oriented planning via academic emotions. High academic buoyancy was related to high enjoyment and hope as well as low boredom and hopelessness, which further predicted low failure expectations. High hope and low boredom also predicted low avoidance behaviour and high hope was associated with high task-oriented planning.

Conclusions. The findings suggest that academic buoyancy supports positive expectations and adaptive behaviours in learning situations through the regulation of emotions.

Keywords: academic buoyancy; academic emotions; avoidance behaviour; failure expectations; learning-related behaviours; primary school; task-oriented planning

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Previous studies have shown learning-related beliefs and behaviours to play a significant role in learning (e.g., Aunola, Nurmi, Lerkkanen, & Rasku-Puttonen, 2003; Hirvonen, Georgiou, Lerkkanen, Aunola, & Nurmi, 2010; Määttä, Nurmi, & Majava, 2002). This is because students' success expectations and effort determine the extent to which they can use their existing skills and gain new ones. Presumably, learning-related expectations and behaviours are influenced by previous learning experiences (see Wigfield & Eccles, 2000) but it is not yet understood to what extent these expectations and behaviours are affected by

students' ability to recover from previous academic challenges and setbacks; an ability referred to as academic buoyancy (Martin, Colmar, Davey, & Marsh, 2010; Martin & Marsh, 2008). Moreover, although interest in the role of emotions in the learning context has grown remarkably in the past few decades (cf. Linnenbrink-Garcia & Pekrun, 2011; Pekrun, 2006; Valiente, Swanson, & Eisenberg, 2012), empirical studies considering emotions as possible mediators in the relationship between academic buoyancy and learning-related behaviours are still lacking. In the present study, the aim was to examine to what extent buoyancy is related to sixth-grade students' failure expectations, avoidance behaviour, and task-oriented planning directly and indirectly via emotions in learning situations.

The Role of Academic Buoyancy in the Learning Context

Academic buoyancy refers to students' ability to successfully respond to everyday academic setbacks and challenges, such as poor grades or negative feedback (Martin et al., 2010; Martin & Marsh, 2008; see also Datu & Yuen, 2018). In previous studies, academic buoyancy has been found to relate to higher performance in standardized literacy and numeracy tests or high-stakes examinations (e.g., Collie, Martin, Malmberg, Hall, & Ginns, 2015; Martin, 2014; Putwain, Daly, Chamberlain, & Sadreddini, 2015). Furthermore, buoyancy has been associated with high self-efficacy, persistence, and planning (Martin et al., 2010), high emotional and behavioural school engagement (Datu & Yang, 2018; Martin, 2014; Martin, Yu, Ginns, & Papworth, 2017), effective learning strategies (Collie, Ginns, Martin, & Papworth, 2017), and low self-handicapping (Martin, Nejad, Colmar, & Liem, 2013). All students face challenges and school pressure at some point, and thus, it is the ability to recover from these difficulties that determines how positively and persistently students react in subsequent situations.

Academic buoyancy can support students' learning-related self-perceptions and promote subsequent success expectations and task-oriented behaviours (Martin et al., 2010,

2013). In addition, buoyancy may contribute to expectations and behaviours indirectly by creating a positive emotional atmosphere in learning situations that further supports success expectations and task-oriented behaviours. According to the control-value theory of achievement emotions (Pekrun, 2006; Pekrun, Frenzel, Goetz, & Perry, 2007; Pekrun, Goetz, Titz, & Perry, 2002), emotions arise as a result of appraisals of subjective control over learning situations and outcomes and the subjective value of the activity or outcome. Students make evaluations of the level of control they have on whether success can be achieved or failure avoided (prospective appraisals) or to what extent an achieved outcome was caused by subjective control or external factors (retrospective appraisals). Because academic buoyancy refers to the ability to adaptively process previous disappointments and deal with academic challenges, high buoyancy can help students set more positive control appraisals and generally focus more on the probability of success instead of failure in learning situations (see Collie et al., 2015). Similarly, buoyancy can protect value appraisals from diminishing after setbacks. Through supporting control and value appraisals, buoyancy can thus contribute to academic emotions, for example, by promoting positive emotions such as enjoyment of learning (see Martin et al., 2017) and helping control negative emotions such as anxiety (see Collie et al., 2017; Martin et al., 2010; Putwain, Connors, Symes, & Douglas-Osborn, 2012). However, apart from studies showing a negative relationship between buoyancy and anxiety (Collie et al., 2017; Martin & Marsh, 2008; Martin et al., 2010; Putwain et al., 2015; Putwain, Daly, Chamberlain, & Sadreddini, 2016), the associations between academic buoyancy and distinct academic emotions have not yet been studied.

The Mediating Role of Academic Emotions

Academic emotions are defined as emotions that relate directly to achievement activities or outcomes (Pekrun, 2006; Pekrun, Goetz, Frenzel, Barchfeld, & Perry, 2011). The differentiation between activity- and outcome-related emotions is conceptualized as the

object focus of emotions. Examples of outcome emotions are (prospective) anxiety of possible failure and (retrospective) pride of previous success. Examples of activity emotions are boredom or enjoyment of learning. In the present study, two other taxonomies of academic emotions were considered salient: the valence and activation of emotions (Pekrun et al., 2002). Valence differentiates between positive versus negative emotions, and activation refers to the level of physiological activation emotions invoke (e.g., activating hope versus deactivating hopelessness). The control-value theory suggests that different outcome- and activity-related emotions are the function of students' control and value appraisals (see Pekrun, 2006; Pekrun et al., 2007). For example, feelings of pride arise when students attribute a successful outcome to be a result of their own actions or abilities. In contrast, negative emotions such as anxiety or hopelessness are likely to emerge when the probability of failure is high, but students feel that their control over the situation or the outcome is uncertain or lacking.

Emotions in learning situations can further contribute to a number of cognitive and motivational outcomes (Pekrun, 2006; Pekrun et al., 2002). Previous studies have shown that positive activating emotions such as enjoyment of learning, hope, and pride can promote motivation, effort, use of adaptive learning strategies, and self-regulated learning (Ahmed, van der Werf, Kuyper, & Minnaert, 2013; Artino & Jones, 2012; Goetz, Hall, Frenzel, & Pekrun, 2006; Pekrun et al., 2002). In contrast, negative deactivating emotions such as hopelessness and boredom have been associated with low motivation, low effort, task-irrelevant thinking, and lack of self-regulation strategies in learning situations (Ahmed et al., 2013; Artino & Jones, 2012; Pekrun et al., 2002; Pekrun, Goetz, Daniels, Stupnisky, & Perry, 2010). For some emotions, such as anxiety and shame, the effects on motivational and cognitive factors are more ambiguous: whereas these negative emotions can in some cases be detrimental to motivation, effort, and self-regulation, they can also have an activating role

(Pekrun et al., 2002). For example, feelings of anxiety may urge students to cope with the anxiety-provoking situation instead of avoiding it. Similarly, feeling ashamed of past failures may force students to take action in re-evaluating their goals and modifying their strategies for goal pursuit (see Turner & Schallert, 2001).

Learning-Related Expectations and Behaviours

The present study focused on three types of learning-related beliefs and behaviours as outcomes of academic buoyancy and emotions: one representing negative beliefs (failure expectations), one representing maladaptive behaviour (avoidance behaviour), and one representing an adaptive strategy (task-oriented planning). These outcomes were chosen because previous studies have shown that behaviours reflecting a high level of interest and effort, such as task persistence and task-oriented planning of how to proceed in learning situations, are beneficial for students' academic achievement and school adjustment (e.g., Aunola et al., 2003; Hirvonen et al., 2010; Määttä et al., 2002). In contrast, pessimistic beliefs, such as failure expectations, and behaviours related to low effort and task-irrelevant activities, such as task avoidance, have proven to be harmful for students' school adjustment and development of academic skills (e.g., Hirvonen, Tolvanen, Aunola, & Nurmi, 2012; Määttä et al., 2002; Mägi, Häidkind, & Kikas, 2010). Because of their central role in learning situations, it is important to understand how these beliefs and behaviours are influenced by students' emotional and cognitive resources.

In the research literature, emotions have been offered a role in the formation of students' belief and behavioural patterns. For example, it has been suggested that passive avoidance and lack of task-oriented planning may result from an attempt to relieve feelings of anxiety when a student has no belief in personal control (cf. learned helplessness; Maier & Seligman, 1976). Avoidance behaviour and withdrawal of effort may also be a strategy for coping with a fear of failing (cf. self-handicapping; Jones & Berglas, 1978; Nurmi, Onatsu, &

Haavisto, 1995): a student with high failure expectations may choose to fail deliberately rather than take the risk of failing after doing one's best. However, although the associations between control beliefs, emotions, and learning-related behaviours have been previously suggested, the mediating role of positive and negative emotions in the relationship between students' academic buoyancy and learning-related behaviours has not been empirically tested.

Transition to Lower Secondary School in Finland

The present study focused on students in the last grade of primary school before an important transition to lower secondary school. In Finland, this transition takes place at age 12 or 13. This is an age group that has received less attention in research literature on academic buoyancy or emotions in comparison with secondary school or college students. In addition to going through biological, cognitive, and psychological changes related to puberty, students at this age face changes in their daily life at school as a result of the school transition. They move from a classroom teacher system to a subject teacher system, start to study new subjects, and often change to another school. Often students also experience significant changes in daily routines and workload when they transfer to lower secondary school. As a result of these changes, students' motivation and effort can decrease and negative attitudes toward school increase during the school transition. Consequently, in order to help students cope with the demands of a forthcoming transition, it is important to understand how factors like academic buoyancy can contribute to students' emotions at school and further to their learning-related behaviours.

The Present Study

Although previous studies have found academic buoyancy to significantly contribute to various academic and non-academic outcomes, less attention has been paid to possible mediators in this relationship (Datu & Yuen, 2018). The present study examined the role of seven academic emotions as mediators in the relationship between academic buoyancy and

learning-related expectations and behaviours. Three of the examined emotions were positive activating (enjoyment, hope, pride), two negative activating (anxiety, shame), and two negative deactivating (boredom, hopelessness) emotions.

It was hypothesized that high academic buoyancy is related to adaptive learning-related expectations and behaviours, that is, low failure expectations, low avoidance behaviour, and high task-oriented planning (Collie et al., 2017; Datu & Yang, 2018; Martin, 2014; Martin et al., 2010, 2017) via academic emotions. More specifically, buoyancy was expected to relate positively to positive emotions (enjoyment, hope, and pride) and negatively to negative emotions (anxiety, boredom, hopelessness, and shame) (see Collie et al., 2017; Martin et al., 2010, 2017; Putwain et al., 2012). Furthermore, high enjoyment, hope, and pride were expected to further relate to low levels of avoidance behaviour and failure expectations as well as high task-oriented planning because they are considered positive activating emotions that can boost adaptive beliefs and behaviours (Pekrun et al., 2002). In contrast, as boredom and hopelessness are considered negative deactivating emotions, they were expected to be related to high avoidance behaviour, high failure expectations, and low task-oriented planning (Pekrun et al., 2002, 2010). Moreover, it was expected that anxiety and shame could have positive effects on task-oriented planning and negative effects on avoidance behaviour and failure expectations, because despite being negative emotions, they are considered to have an activating role in learning situations (Pekrun et al., 2002; Turner & Schallert, 2001).

The hypothesized relations controlled for the autoregressive effects of prior avoidance behaviour, failure expectations, and task-oriented planning. In addition, the effects of gender and grade point average (GPA) were controlled for as they may relate to students' academic emotions and learning-related expectations and behaviours.

Method

Participants

The present study is part of an extensive longitudinal study (authors removed for blind review) with a focus on students' learning, motivation, and school well-being during the transition from primary school to lower secondary school. The sample consisted of 845 Finnish sixth-grade students (457 or 54.1% girls). The students' age range at the beginning of the study was 11.6 to 14.8 years (M = 12.3, SD = 0.4 years). The students came from 56 school classes ranging in size from 7 to 30 students (M = 21.1, SD = 4.66). The vast majority (96.2%) of the students were Finnish-speaking, 2.0% had another language as their mother tongue, and 1.8% were bilingual. Two-parent families were slightly overrepresented and single-parent households underrepresented in comparison with Finnish families with children under 18 years old (Official Statistics of Finland, 2017). The students' parents were somewhat more educated than adults of the same age on average in Finland (Official Statistics of Finland, 2016). More details of the sample can be found from Authors (2018, 2019).

All families were informed about the study, and parents were advised to discuss it with their children. Parents' written consent was requested for their children's participation, and the children's own willingness to participate was taken into account during the data collections. Two trained testers collected the data in the classrooms on normal school days in the fall (Time 1, T1) and spring (Time 2, T2) of Grade 6. Time span between T1 and T2 was approximately six months. Six students left the study between T1 and T2 and four new students joined at T2. Teachers of the participating classes gave their written consent for the data collections to be conducted during school days. The larger longitudinal study has been evaluated and approved by the ethics committee of the local university.

Measures

Academic buoyancy. Students rated their academic buoyancy at T1 using a four-item scale developed by Martin and Marsh (2008; for reliability and validity, see also Martin, 2013, and Putwain et al., 2012). The items (e.g., *"I don't let study stress get on top of me"*) were answered on a five-point Likert scale (1 = completely disagree; 5 = completely agree).

Academic emotions. Students rated their academic emotions at T1 with a short version of the Achievement Emotions Questionnaire (AEQ; Pekrun et al., 2002, 2011; for reliability and validity, see Peixoto, Mata, Monteiro, Sanches, & Pekrun, 2015; Pekrun et al., 2011). Using a five-point Likert scale (1 = disagree; 5 = agree), the students were asked to evaluate three positive emotions (enjoyment, hope, and pride) and four negative emotions (anxiety, boredom, hopelessness, and shame) separately in literacy and mathematics. Enjoyment, hope, pride, anxiety, hopelessness, and shame were each measured with three items: one in relation to learning (e.g., *"I enjoy acquiring new knowledge"*), one concerning classes (e.g., *"I enjoy being in class"*), and one relating to tests (e.g., *"For me the test is a challenge that I enjoy"*). As an exception, boredom was measured with two items: those concerning learning and classes. Composite scores were created separately for the seven emotions in literacy and mathematics by calculating a mean across the items. The Cronbach alpha reliabilities for the discrete emotions ranged from .62 to .80 in literacy and from .64 to .81 in mathematics.

Learning-related expectations and behaviours. Students rated their expectations and behaviours with respect to learning situations at T1 and T2 using a 10-item scale. They were first given the following instruction: *"At school you receive an assignment that you should finish. What goes through your mind?"* Following were 10 statements to rate on a five-point Likert scale (1 = disagree; 5 = agree). The statements were originally formed based on typical open-ended answers people produced to fictional achievement situations in a projective Cartoon Attribution Strategy Test (CAST; Eronen, Nurmi, & Salmela-Aro, 1997;

Nurmi, Salmela-Aro, & Ruotsalainen, 1994). The statements reflect four types of achievement-related beliefs and behaviours: success expectations (two items, e.g., *"This will turn out fine"*), failure expectations (two items, e.g., *"I can't do this"*), task-oriented planning (three items, e.g., *"I need to make a good plan for how to do the task"*), and avoidance behaviour (three items, e.g., *"I think I'll just think of something else to do"*). Because of relatively high inter-item correlations between success and failure expectations (-.48 to -.66), they were used together to form one latent, four-item factor measuring failure expectations. More information about previous use and validity of the CAST measure can be found in Nurmi et al. (1995) and Määttä et al. (2002).

GPA. The GPA in students' end-of-Grade 5 school report was retrieved from the school registers. The GPA ranged from 5.7 to 9.8 on a scale from 5 (adequate) to 10 (excellent).

Statistical Analyses

The descriptive statistics and internal consistencies of all measures are presented in Table 1. The research questions were examined using structural equation modelling (SEM) in M*plus*8 statistical package (Muthén & Muthén, 1998–2017). First, a measurement model with latent factors for academic buoyancy, seven academic emotions (enjoyment, hope, pride, anxiety, boredom, hopelessness, and shame), and three learning-related expectations and behaviours (avoidance behaviour, failure expectations, and task-oriented planning) at two measurement points was estimated. Second, two SEM models testing the direct and indirect paths from buoyancy to learning-related behaviours via positive and negative academic emotions were estimated. Previous levels of learning-related expectations and behaviours, gender, and GPA in Grade 5 were included as covariates in the SEM models.

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The maximum likelihood estimation and standard non-parametric bootstrapping procedure with 1000 draws were used to obtain standard errors that are robust to non-normality and to obtain non-symmetric 95% confidence intervals (CIs) for the indirect effects (MacKinnon, Lockwood, & Williams, 2004; Muthén & Muthén, 1998–2017). The model fit was evaluated by using the Comparative Fit Index (CFI), the Tucker-Lewis Index (TLI), the root mean square error of approximation (RMSEA), and the standardized root mean square residual (SRMR). Values higher than .90 for CFI and TLI, and lower than .06 for RMSEA and .08 for SRMR were considered a satisfactory fit (Hu & Bentler, 1999; Marsh, Hau, & Wen, 2004).

Intra-class correlation coefficients (ICC) and design effects were calculated to assess the effect of students' clustering in the school classes. The ICCs ranged from .01 (design effect = 1.07) to .07 (design effect = 1.79). The ICCs and design effects could be considered small, and consequently, it was deemed unnecessary to take clustering of data into account in the analyses. However, for completeness, subsidiary models were run using the TYPE = COMPLEX command in M*plus*. The results of these models did not significantly differ from those of the hypothesized models; a discussion of these models is presented in the Supplementary Materials.

Results

The Measurement Model

A measurement model with 14 latent factors was tested: academic buoyancy (four indicators), enjoyment, hope, pride, anxiety, boredom, hopelessness, and shame (two indicators each), T1 and T2 avoidance behaviour (three indicators each), T1 and T2 failure expectations (four indicators each), and T1 and T2 task-oriented planning (three indicators each). All latent factors were allowed to correlate with each other. Covariances between the residuals of all literacy-related emotions and, similarly, covariances between the residuals of

all maths-related emotions were estimated. For avoidance behaviour, failure expectations, and task-oriented planning, the factor loadings for equivalent indicators were constrained equal across T1 and T2 and covariances between the residuals of equivalent indicators at T1 and T2 were estimated. The fit of the measurement model was good: $\chi^2(529) = 1233.17$, $p < .001$; CFI = .97; TLI = .96; RMSEA = .04; SRMR = .03. The standardized estimates of factor loadings for the key constructs were high (range .56–.93), suggesting good construct validity and item reliability. Intercorrelations between the latent variables and control variables are presented in Table 2.

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The Structural Models

To test the effects of academic buoyancy on learning-related expectations and behaviours directly and indirectly via academic emotions, two structural models were estimated. Positive (enjoyment, hope, and pride) and negative emotions (anxiety, boredom, hopelessness, and shame) were analysed in separate models.

The results of the model for positive emotions (Figure 1), $\chi^2(409) = 1220.57$, $p < .001$; CFI = .94; TLI = .93; RMSEA = .05; SRMR = .04, showed that failure expectations were indirectly explained by buoyancy via enjoyment (β = -.02, *SE* = .01, 95% CI = [-.05, -.004]): Higher academic buoyancy was related to more enjoyment, which, in turn, was related to decreased failure expectations. Similarly, buoyancy indirectly explained avoidance behaviour (β = -.06, *SE* = .02, 95% CI = [-.11, -.02]), failure expectations (β = -.05, *SE* = .02, 95% CI = [-.10, -.02]), and task-oriented planning (β = .04, *SE* = .02, 95% CI = [.01, .09]) via hope: Higher academic buoyancy was related to higher hope, which was related to decreased avoidance behaviour and failure expectations and increased task-oriented planning. Non-significant path coefficients were omitted from Figure 1 but are reported in the Supplemental

Materials (Table S1). The effects of the control variables are also reported and discussed in the Supplemental Materials (Table S3).

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The results of the model for negative emotions (Figure 2), $\chi^2(456) = 1243.32$, $p < .001$; CFI = .95; TLI = .94; RMSEA = .05; SRMR = .04, showed that avoidance behaviour (β = -.02, *SE* = .01, 95% CI = [-.06, -.01]) and failure expectations (β = -.03, *SE* = .01, 95% CI = [-.06, -.01]) were indirectly explained by buoyancy via boredom: low academic buoyancy was related to higher boredom, which, in turn, was related to increased avoidance behaviour and failure expectations. Failure expectations were also indirectly explained by buoyancy via hopelessness (β = -.07, *SE* = .03, 95% CI = [-.13, -.03]): low academic buoyancy was related to higher hopelessness, which was further related to high failure expectations. Non-significant path coefficients not shown in Figure 2 as well as the effects of the control variables are reported in the Supplemental Materials (Tables S2 and S4, respectively).

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An additional model was built to test the indirect effects via all positive and negative emotions simultaneously (see the Supplemental Materials, Table S5). With all seven emotions included in the same model, the found indirect effects via enjoyment, hope, and hopelessness remained similar to the models reported above, but boredom was no longer found to mediate the effect of academic buoyancy on avoidance behaviour and failure expectations.

Discussion

The aim of this study was to examine the role of academic buoyancy and academic emotions in sixth-grade students' failure expectations and behaviours in learning situations. The results showed that the effect of high buoyancy at the beginning of sixth grade on low avoidance behaviour, low failure expectations, and high task-oriented planning at the end of

the sixth grade was fully mediated by students' emotions. High buoyancy was related to high enjoyment and hope and low boredom and hopelessness, which further predicted low failure expectations. High hope and low boredom were also associated with low avoidance behaviour and high task-oriented planning. The findings suggest that an adaptive role for buoyancy in relation to positive academic outcomes is partly achieved through the regulation of academic emotions.

Previous studies have shown that academic buoyancy is associated with positive outcomes such as high persistence and planning (Martin et al., 2010) and adaptive learning strategies (Collie et al., 2017). The findings of this study add to previous research by showing similar associations in relation to learning-related expectations and behaviours, and furthermore, by indicating that academic emotions play a significant role in these associations. As expected, the results first showed that high buoyancy was related to the positive emotions of enjoyment and hope, which were further related to low failure expectations, and in the case of hope, also to high task-oriented planning and low avoidance behaviour. It has been shown that high academic buoyancy supports students' sense of control (Collie et al., 2015): students who have past experiences of being able to overcome setbacks and challenges are likely to attribute their success to internal and controllable reasons and see themselves capable of controlling future outcomes (see Weiner, 2010). A sense of being in control of the situation, in turn, is likely to generate positive emotions, such as enjoyment of the situation and hope for achieving a desired outcome (e.g., Pekrun, 2006; Pekrun et al., 2007). Enjoyment and hope are positive activating emotions that create a positive atmosphere in learning situations, help sustain interest and effort, and support the use of adaptive learning strategies and self-regulation (Pekrun et al., 2002), such as task-oriented planning and low avoidance.

As expected, the findings further showed that low buoyancy was related to high boredom and hopelessness, which were further associated with high failure expectations. High boredom was also related to high avoidance behaviour. A low ability to bounce back from previous disappointments and academic challenges is likely to weaken students' sense of control (see Collie et al., 2015), and low control beliefs are further likely to generate deactivating feelings of boredom and hopelessness in learning situations (Pekrun, 2006; Pekrun et al., 2007). Negative deactivating emotions, in turn, can lead to negative expectations and maladaptive behaviours because when students find learning situations boring or feel hopeless about their chances to achieve what they would like to, they are more likely to withdraw their effort and start, for example, daydreaming (Pekrun et al., 2002, 2010). Concerning boredom, however, it should be noted that when positive emotions were added into the same model, boredom no longer had a significant effect on avoidance behaviour and failure expectations. This suggests that the presence of positive emotions may suppress the negative effect of boredom: if positive emotions arise in learning situations, students are unlikely to remain bored. However, the possible interactive effects of emotions should be studied in more detail in future studies.

Interestingly, and somewhat contrary to our expectations, pride, anxiety, and shame were not found to mediate the effect of academic buoyancy on learning-related beliefs and behaviours. Buoyancy was negatively associated with all three emotions, but they were not further related to avoidance behaviour, failure expectations, or task-oriented planning. This can be partly explained by their mediocre to high correlations with other emotions, which may have undermined the predictive power of anxiety, pride, and shame when the effects of the other emotions were taken into account. Another explanation could be that these emotions may have both deactivating and activating effects on students' behaviour. For example, feelings of anxiety or shame may for some students become overwhelming and result in

failure expectations and task avoidance, because the students are uncertain whether they can be in control of the situation (Pekrun et al., 2002, 2007). Conversely, for other students, anxiety or shame may be a source of energy resulting in high effort. Feeling anxious means that the students value the outcome highly and that it is important for them to succeed, which can help them to overcome the anxiety and turn it into positive energy (Pekrun et al., 2007). Shame of previous failures, in turn, can motivate students to plan their actions better to avoid failing and feeling ashamed again (see Turner & Schallert, 2001). Similarly, feeling proud of previous accomplishments can boost motivation for further effort (activation), but in some cases pride may also lead to too much satisfaction and, consequently, a lack of effort (deactivation).

Overall, the study adds to our understanding of the role of emotions in the academic context. The findings highlight the importance of positive activating emotions (enjoyment and hope) in supporting primary school students' adaptive learning-related beliefs and behaviours and the role of negative deactivating emotions (boredom and hopelessness) in increasing maladaptive beliefs and behaviours. The role of other academic emotions (pride, anxiety, and shame) seems less significant or possibly more complex (cf. Pekrun et al., 2002; Turner & Schallert, 2001) and should be further investigated. The relatively strong relations between academic buoyancy and all studied emotions also suggest that buoyancy could be an important antecedent of emotions and a resource for producing desired emotional reactions in learning situations. According to the control-value theory (Pekrun, 2006; Pekrun et al., 2002, 2007), students' appraisals of their subjective control over learning situations and outcomes are crucial for the arousal of positive and negative emotions. The sense of this subjective control could be reinforced by rehearsing academic buoyancy.

There are some limitations that need to be considered when interpreting the findings of the study. First, all measures were self-rated by the students, which may cause common-

method bias in the examined associations. Second, since only two time points were used, the mediating effects and possible reciprocal relationships between academic buoyancy, emotions, and learning-related behaviours could not be thoroughly studied. Third, the study focused on trait-like emotions, that is, students' typical emotional reactions across achievement situations. Trait emotions may reflect students' more general attitudes towards school and learning and thus do not sufficiently capture the fact that emotional reactions can vary across or within situations and, thus, their effects on students' learning-related beliefs and behaviours may also vary across school subjects and situations.

The findings also invoke interesting directions for future research. In future, it would be important to study whether the effect of specific emotions on learning-related expectations and behaviours varies across individuals or situations. In addition, it could be interesting to study interactions between emotions to see, for example, whether anxiety has a negative effect on learning-related behaviours if there is high hopelessness but a more positive effect when combined with low hopelessness. Furthermore, an important direction for future studies using longitudinal study designs and more measurement points would be to examine to what extent the effect of academic buoyancy on learning-related behaviours via academic emotions is further reflected to students' later school performance. Finally, as the findings of this study suggest that academic buoyancy plays a significant role in academic emotions and learning-related expectations and behaviours, buoyancy could be a fruitful target of intervention studies in promoting students' positive learning experiences, adaptive functioning, and performance at school (for suggestions how to improve academic buoyancy, see Martin et al., 2010).

In conclusion, the findings of this study showed that academic buoyancy is a positive attribute by linking to positive academic behaviours through the regulation of emotions. Attention should be paid to students' positive emotional experiences at school, their feelings

of being in control of their learning, and their skills and confidence to overcome challenges, because these promote students' enjoyment of learning and their effort with learning tasks. This is particularly important for students facing an important school transition, as transitions can involve multiple changes in relation to learning environment, teaching methods, study pressure, and social relationships. Promoting students' academic buoyancy could be a key to helping students through these challenges by boosting their control beliefs, positive emotions, success expectations, and adaptive behaviours during the school transition.

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Table 1

Descriptive statistics and internal consistencies of the study measures

	N	Range	*M*	*SD*	α	Skewness	Kurtosis
Academic buoyancy	834	1.00 – 5.00	3.84	0.73	.83	-0.35	-0.02

Enjoyment	839	1.00 – 5.00	3.18	0.83	.81	-0.13	-0.24
Hope	838	1.00 – 5.00	3.69	0.78	.85	-0.49	0.28
Pride	838	1.00 – 5.00	3.57	0.85	.87	-0.46	0.03
Anxiety	839	1.00 – 5.00	1.86	0.76	.89	0.97	0.76
Boredom	839	1.00 – 5.00	2.07	0.97	.86	0.79	0.02
Hopelessness	839	1.00 – 5.00	1.66	0.73	.89	1.13	0.98
Shame	839	1.00 – 5.00	1.78	0.80	.92	1.07	0.68
T1 Avoidance behaviour	833	1.00 – 5.00	1.49	0.80	.81	2.08	4.33
T1 Failure expectations	836	1.00 – 5.00	2.05	0.77	.82	0.73	0.52
T1 Task-oriented planning	833	1.00 – 5.00	3.84	0.83	.68	-0.61	0.15
T2 Avoidance behaviour	835	1.00 – 5.00	1.49	0.78	.84	2.05	4.25
T2 Failure expectations	835	1.00 – 5.00	1.93	0.75	.84	0.89	0.82
T2 Task-oriented planning	836	1.00 – 5.00	3.80	0.83	.74	-0.37	-0.43
GPA	690	5.73 – 9.82	8.23	0.67	-	-0.51	0.11

Note. α = Cronbach alpha reliability coefficient.

Table 2

Intercorrelations between the latent factors and control variables

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1.	Academic buoyancy															
2.	Enjoyment	.32***														
3.	Hope	.43***	.74***													
4.	Pride	.43***	.58***	.76***												
5.	Anxiety	-.52***	-.27***	-.35***	-.25***											
6.	Boredom	-.27***	-.50***	-.46***	-.41***	.39***										
7.	Hopelessness	-.50***	-.27***	-.40***	-.29***	.70***	.45***									
8.	Shame	-.47***	-.14***	-.25***	-.24***	.62***	.30***	.67***								
9.	T1 Avoidance behaviour	-.16***	-.42***	-.47***	-.33***	.28***	.46***	.37***	.18***							
10.	T1 Failure expectations	-.44***	-.54***	-.61***	-.56***	.39***	.42***	.47***	.34***	.60***						
11.	T1 Task-oriented planning	.15**	.50***	.50***	.44***	-.06	-.42***	-.13**	-.00	-.50***	-.55***					
12.	T2 Avoidance behaviour	-.13**	-.40***	-.47***	-.34***	.25***	.40***	.31***	.18***	.66***	.45***	-.43***				
13.	T2 Failure expectations	-.38***	-.53***	-.57***	-.45***	.37***	.43***	.48***	.31***	.51***	.69***	-.48***	.67***			

14.	T2 Task-oriented planning	.19***	.45***	.47***	.37***	-.12**	-.37***	-.19***	-.06	-.44***	-.48***	.70***	-.50***	-.67***		
15.	GPA	.06	.23***	.31***	.16***	-.24***	-.04	-.28***	-.21***	-.32***	-.27***	.10*	-.32***	-.32***	.18***	
16.	Gender[a]	.17***	-.09*	-.06	.05	.02	.11**	-.00	-.04	.23***	.01	-.15***	.19***	.12**	-.21***	-.26***

Note. N = 845. T1 = Time 1; T2 = Time 2. [a] 0 = girl; 1 = boy.

* $p < .05$; ** $p < .01$; *** $p < .001$.

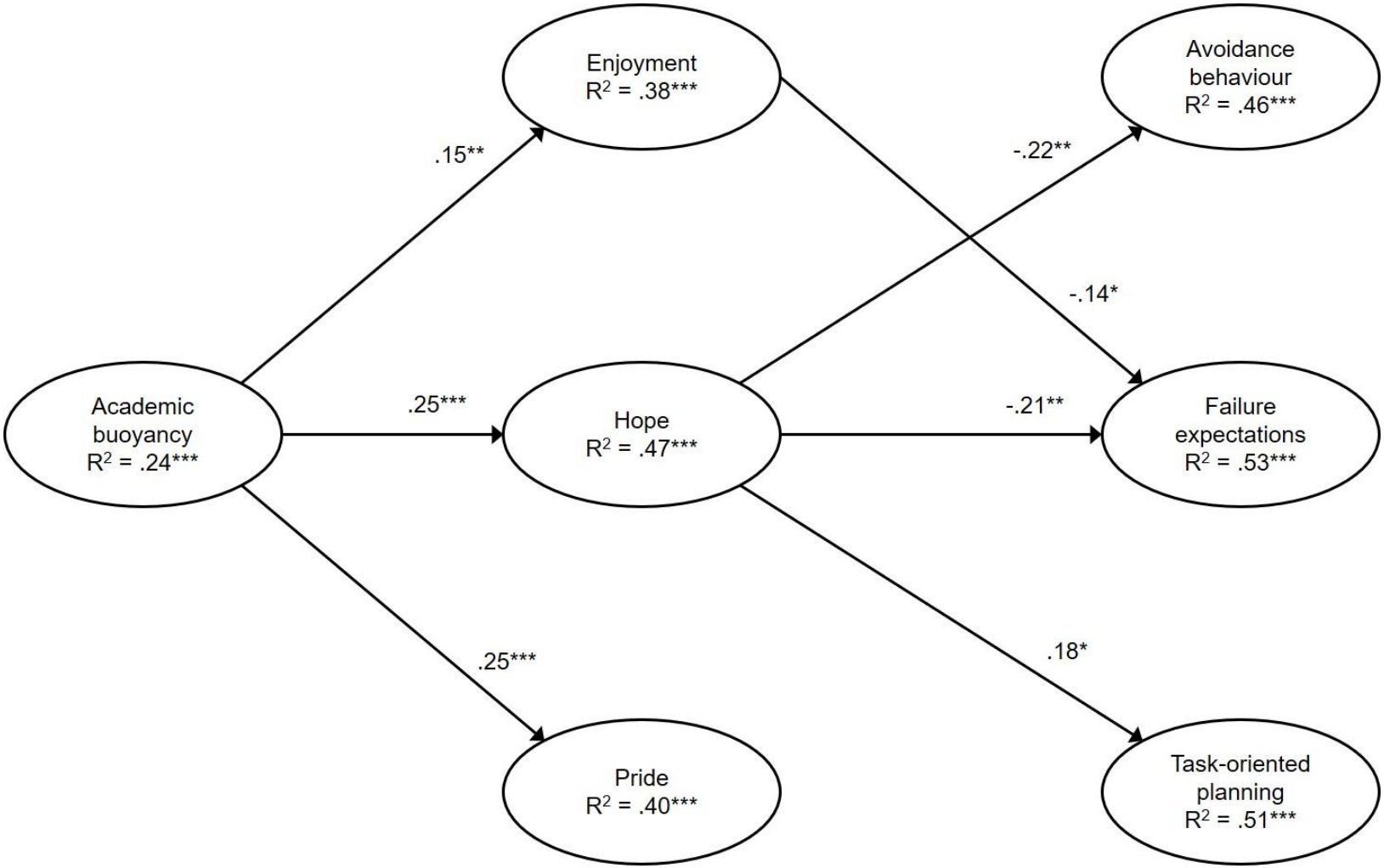

Figure 1. Structural model for the indirect effects of academic buoyancy on learning-related expectations and behaviours via positive emotions, controlling for previous levels of expectations and behaviours, gender, and GPA. For clarity, the measurement model, the control variables, and the covariances between the latent factors are not shown in the figure.
Note. $N = 845$. * $p < .05$; ** $p < .01$; *** $p < .001$.

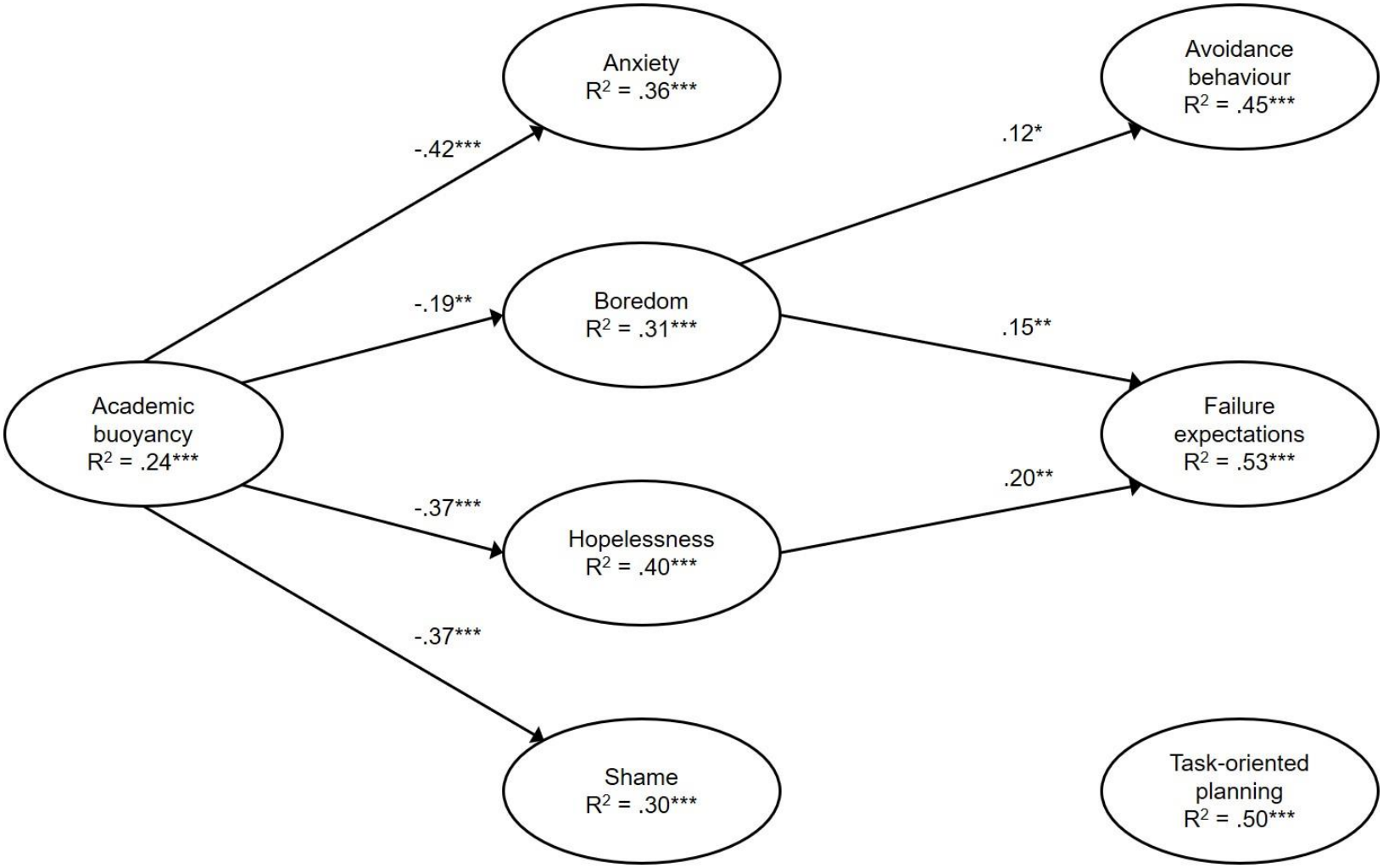

Figure 2. Structural model for the indirect effects of academic buoyancy on learning-related expectations and behaviours via positive emotions, controlling for previous levels of expectations and behaviours, gender, and GPA. For clarity, the measurement model, the control variables, and the covariances between the latent factors are not shown in the figure.
Note. $N = 845$. * $p < .05$; ** $p < .01$; *** $p < .001$.

The Role of Academic Buoyancy and Emotions in Students' Learning-Related Expectations and Behaviours in Primary School

- Supplemental Materials -

This document contains materials designed to supplement the main text. The materials include the following:

Separate models for positive and negative emotions
Combined model for positive and negative emotions
Accounting for the clustering of data
Tables S1-S5

Separate Models for Positive and Negative Emotions

As described in the main text, separate structural models were estimated for positive and negative emotions. For clarity, only statistically significant path coefficients between the latent factors are reported in Figure 1 (positive emotions) and Figure 2 (negative emotions) embedded in the main text. Tables S1 (positive emotions) and S2 (negative emotions) in this supplementary material report the same coefficients but also all the non-significant path coefficients as well as the covariances between the latent factors that were omitted from the figures.

The Effects of Control Variables

The effects of students' gender, GPA, and T1 avoidance behaviour, failure expectations, and task-oriented planning were controlled for in all reported structural models. In the reported models, the control variables were allowed to predict academic buoyancy, and T1 avoidance behaviour, failure expectations, and task-oriented planning were allowed to

predict the same construct at T2. In addition, based on model modification indices, all emotions were allowed to regress on T1 expectations and behaviours as well. These coefficients are reported in Tables S3 (model for positive emotions) and S4 (negative emotions). Gender was positively related and T1 failure expectations negatively related to academic buoyancy. T1 expectations and behaviours also had significant relations with both positive and negative emotions. Finally, as could be expected, the autoregressive effects of T1 expectations and behaviours on T2 expectations and behaviours were relatively strong. Correlations between the control variables were also estimated. Gender was negatively related to GPA (-.09***) and T1 task-oriented planning (-.06***), and positively related to T1 avoidance behaviour (.08***). GPA was negatively related to T1 failure expectations (-.15***) and T1 avoidance behaviour (-.15***). T1 task-oriented planning was also negatively related to T1 avoidance behaviour (-.23***) and failure expectations (-.28***), and avoidance behaviour and failure expectations were positively related (.31***).

Combined Model for Positive and Negative Emotions

In addition to the two separate models, a combined model that included the mediating effects of all positive and negative emotions was estimated. The model showed a good fit to the data, $\chi^2(603) = 1522.63$, $p < .001$; CFI = .96; TLI = .95; RMSEA = .04; SRMR = .04. The findings of this model are reported in Table S5. Similar to the findings reported in the main text for positive and negative emotions separately, academic buoyancy was found to have an indirect effect on avoidance behaviour via hope (β = -.05, *SE* = .02, 95% CI = [-.10, -.02]), on failure expectations via enjoyment (β = -.02, *SE* = .01, 95% CI = [-.05, -.002]), hope (β = -.04, *SE* = .02, 95% CI = [-.09, -.01]), and hopelessness (β = -.07, *SE* = .03, 95% CI = [-.12, -.03]), and on task-oriented planning via hope (β = .04, *SE* = .02, 95% CI = [.01, .10]). In contrast, the indirect effects on avoidance behaviour and failure expectations via boredom were not significant in this combined model.

Accounting for the Clustering of Data

The models reported in the main text did not take clustering of data into account because based on the intra-class coefficients and design effects, differences between the school classes were relatively small. However, to confirm the found effects accounting for the clustering of data, the models for positive emotions and negative emotions were also run using the TYPE = COMPLEX option in M*plus*. The bootstrapping procedure is not possible with COMPLEX and, thus, the models were estimated using maximum likelihood estimation with robust standard errors. The findings were very similar to the models reported in the main text using the bootstrapping procedure. Although some of the standard errors slightly changed using the COMPLEX option, the only difference in the path coefficients and their statistical significance was that the *p* value for the path coefficient from enjoyment to failure expectations was $p = .002$ taking clustering into account and $p = .01$ using bootstrapping.

Table S1

Standardized Coefficients from the Structural Equation Model for Positive Emotions Controlling for Gender, GPA, and Previous Level of Avoidance Behaviour, Failure Expectations, and Task-Oriented Planning

	Enjoyment	Hope	Pride	Avoidance Behaviour	Failure Expectations	Task-Oriented Planning
Academic Buoyancy	.15**	.25***	.25***	.07	-.05	.04
Enjoyment		.57***	.33***	-.03	-.14*	.06
Hope			.59***	-.22**	-.21**	.18*
Pride				-.02	.09	-.07
Avoidance Behaviour					.55***	-.28***
Failure Expectations						-.56***

Note. N = 845. Coefficients are standardized path coefficients for effects of academic buoyancy on positive academic emotions and learning-related behaviours, path coefficients for effects of positive emotions on learning-related behaviours, and correlations for the relations among positive emotions and among learning-related behaviours.

* $p < .05$; ** $p < .01$; *** $p < .001$.

Table S2

Standardized Coefficients from the Structural Equation Model for Negative Emotions Controlling for Gender, GPA, and Previous Level of Avoidance Behaviour, Failure Expectations, and Task-Oriented Planning

	Anxiety	Boredom	Hopelessness	Shame	Avoidance Behaviour	Failure Expectations	Task-Oriented Planning
Academic Buoyancy	-.42***	-.19**	-.37***	-.37***	.03	-.03	.05
Anxiety		.29***	.53***	.44***	.01	-.02	.01
Boredom			.32***	.22***	.12*	.15**	-.05
Hopelessness				.52***	.03	.20**	-.10
Shame					.03	-.06	.04
Avoidance Behaviour						.56***	-.31***
Failure Expectations							-.59***

Note. N = 845. Coefficients are standardized path coefficients for effects of academic buoyancy on negative academic emotions and learning-related behaviours, path coefficients for effects of negative emotions on learning-related behaviours, and correlations for the relations among negative emotions and among learning-related behaviours.

* $p < .05$; ** $p < .01$; *** $p < .001$.

Table S3

The Effects of Control Variables from the Structural Equation Model for Positive Emotions (Standardized Coefficients)

	Academic Buoyancy	Enjoyment	Hope	Pride	T2 Avoidance Behaviour	T2 Failure Expectations	T2 Task-Oriented Planning
Gender[a]	.13**						
GPA	-.01						
T1 Avoidance Behaviour	.10	-.10	-.17**	.03	.53***		
T1 Failure Expectations	-.56***	-.26**	-.29***	-.35***		.52***	
T1 Task-Oriented Planning	-.10	.29***	.22***	.22***			.60***

Note. N = 845. Coefficients are standardized path coefficients for effects of control variables on academic buoyancy, positive academic emotions, and T2 learning-related behaviours. [a] 0 = girl; 1 = boy.

* $p < .05$; ** $p < .01$; *** $p < .001$.

Table S4

The Effects of Control Variables from the Structural Equation Model for Negative Emotions (Standardized Coefficients)

	Academic Buoyancy	Anxiety	Boredom	Hopelessness	Shame	T2 Avoidance Behaviour	T2 Failure Expectations	T2 Task-Oriented Planning
Gender	.13**							
GPA	-.02							
T1 Avoidance Behaviour	.11	.21**	.30***	.27***	.10	.58***		
T1 Failure Expectations	-.57***	.23*	-.00	.29**	.29**		.55***	
T1 Task-Oriented Planning	-.11	.25**	-.26***	.24***	.28***			.65***

Note. N = 845. Coefficients are standardized path coefficients for effects of control variables on academic buoyancy, negative academic emotions, and T2 learning-related behaviours.

* $p < .05$; ** $p < .01$; *** $p < .001$.

Table S5

Standardized Coefficients from the Structural Equation Model for Positive and Negative Emotions Controlling for Gender, GPA, and Previous Level of Avoidance Behaviour, Failure Expectations, and Task-Oriented Planning

	Enjoyment	Hope	Pride	Anxiety	Boredom	Hopelessness	Shame	Avoidance Behaviour	Failure Expectations	Task-Oriented Planning
Academic Buoyancy	.15**	.25***	.25***	-.42***	-.19**	-.37***	-.37***	.11	-.01	.02
Enjoyment		.57***	.34***	-.07	-.28***	-.00	.06	-.01	.13*	.05
Hope			.59***	-.08	-.17**	-.08	.01	-.21**	-.16*	.17*
Pride				.05	-.17**	.03	.00	-.01	.08	-.07
Anxiety					.29***	.53***	.44***	.02	-.03	.02
Boredom						.32***	.21***	.07	.07	-.02
Hopelessness							.52***	.01	.19**	-.07
Shame								.05	-.03	.02
Avoidance Behaviour									.54***	-.28***
Failure Expectations										-.57***

Note. N = 845. Coefficients are standardized path coefficients for effects of academic buoyancy on academic emotions and learning-related behaviours, path coefficients for effects of emotions on learning-related behaviours, and correlations for the relations among emotions and among learning-related behaviours.

* $p < .05$; ** $p < .01$; *** $p < .001$.