# Adaptability: How Students' Responses to Uncertainty and Novelty Predict Their Academic and Non-Academic Outcomes

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Adaptability is defined as appropriate cognitive, behavioral, and/or affective adjustment in the face of uncertainty and novelty. Building on prior measurement work demonstrating the psychometric properties of an adaptability construct, the present study investigates dispositional predictors (personality, implicit theories) of adaptability, and the role of adaptability in predicting academic (motivation, engagement, disengagement) and non-academic (self-esteem, life satisfaction, sense of meaning and purpose, emotional instability) outcomes. This longitudinal study (2 time points, 1 year apart), involving 969 adolescents from 9 high schools, found that personality (conscientiousness and agreeableness—positively; neuroticism—negatively) and implicit theories (effort-related beliefs about intelligence—positively) significantly predicted adaptability (beyond the effects of socio-demographics and prior achievement). Further, adaptability significantly predicted academic (class participation, school enjoyment, and positive academic intentions—positively; self-handicapping and disengagement—negatively) and non-academic (self-esteem, life satisfaction, and sense of meaning and purpose—positively) outcomes beyond the effects of socio-demographic factors, prior achievement, personality, implicit theories, and 2 cognate correlates (buoyancy and self-regulation). These findings hold implications for researchers and practitioners seeking to understand and address young people's responses to their changing academic and non-academic worlds.

*Keywords:* adaptability, motivation, engagement, self-regulation, personality

Across a human lifespan, the world will undergo substantial changes on economic, geo-political, socio-cultural, technological, medical, and other fronts (Hofäcker, Buchholz, & Blossfeld, 2010; Tomasik, Silbereisen, & Heckhausen, 2010). Indeed, individuals' own lives will be characterized by frequent uncertainty and novelty. These include beginning school, adjusting to new year groups and subjects at school, moving out of home, starting and changing jobs, marriage/partnership, child-rearing/care-giving, and retiring from work—to name just some major transitional milestones. Minor transitional elements typically involve the changing nature of tasks and conditions throughout the day. Such changes can disrupt routines and create new circumstances to which individuals must habituate (Pinquart & Silbereisen, 2004; Tomasik & Silbereisen, 2009; Tomasik et al., 2010). How they deal with uncertainty and novelty has been central to formal philosophizing as far back as figures such as Lao Tzu and the Buddha. With a focus on adolescents, this study examines "adaptability" as one potentially relevant psychological construct that may assist them in their academic and non-academic lives.

The American Psychological Association (APA)'s definition of adaptability is "the capacity to make appropriate responses to changed or changing situations; the ability to modify or adjust one's behavior in meeting different circumstances or different people" (VandenBos, 2007, p. 17). Recent research developed and validated a measure of adaptability (the Adaptability Scale) to assess individuals' capacity to appropriately adjust and modify psycho-behavioral functions in response to uncertain and novel circumstances, conditions and situations (Martin, 2012; Martin, Nejad, Colmar, & Liem, 2012). The present study represents a substantial extension of this prior measurement work. It builds longitudinal data into its design. This is important because this enables adjustments for prior variance in outcomes and thereby examines how adaptability predicts upward and downward shifts in these outcomes. We also examine appropriate covariates and appropriate controls for overlapping variance. In so doing, we seek to gain a fuller sense of unique variance attributable to adaptability. Thus, the present study is something of a substantive-methodological synergy (Marsh & Hau, 2007) in that methodological extension and refinement on prior adaptability measurement research enables new and powerful substantive research questions to be addressed.

Consistent with Martin et al. (2012), we do so in the developmental context of adolescence and the academic outcomes (motivation, engagement, disengagement) and non-academic outcomes (self-esteem, sense of meaning, life satisfaction, emotional instability) relevant to this stage of development. We focus on adolescence because development through this stage of life presents many experiences of uncertainty and novelty. These experiences require individuals to adjust and modify appropriate functions to

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maintain healthy development (Heckhausen & Schulz, 1995); thus, adaptability is particularly pertinent during adolescence.

## Adaptability

As noted above, adaptability has been described as an individual's behavioral adjustments and modifications to uncertain and novel circumstances and conditions (VandenBos, 2007). Recently, this concept was expanded to consider adaptability in terms of appropriate cognitive, behavioral, and/or affective adjustments in the face of uncertainty and novelty (Martin et al., 2012). Cognitive adjustment refers to modifications in thinking to deal with new and uncertain demands. Behavioral adjustment refers to modifications in the nature, level, and degree of behavior to deal with new and uncertain situations and conditions (Heckhausen & Schulz, 1995; Heckhausen, Wrosch, & Schulz, 2010). Affective adjustment is considered in terms of "emotional response-tendencies [that] may be modulated" (Gross, 1998, pp. 272–273; see also Pekrun, 2012) to respond to environmental uncertainty and novelty. Based on this tripartite perspective, Martin et al. (2012) developed the Adaptability Scale. The Scale comprised items that each met the following criteria: (a) appropriate cognitive, behavioral, or affective adjustment in response to (b) uncertainty and/or novelty that has (c) a constructive purpose or outcome. Exploratory and confirmatory factor analysis (EFA and CFA, respectively) identified adaptability as a higher order factor subsumed by a reliable first-order cognitive-behavioral factor and a reliable first-order affective factor; however, for operational purposes, a single global adaptability factor was also deemed appropriate.

## Relevant and Related Conceptualizing and Constructs

Alongside our tripartite approach to adaptability is conceptualizing from numerous theoretical traditions that are a basis for further consideration of the construct and its part in young people's academic and non-academic outcomes. Although not intended to span the corpus of work in this area, we map out relevant terrain by briefly discussing some salient frameworks and perspectives that have informed our thinking and operationalization, including the lifespan theory of control, self-regulated learning, models of adaptation, and adversity-related conceptualizing.

### Lifespan Theory of Control

According to the lifespan theory of control, a major part of development involves the individual adaptively adjusting goals to the opportunities and constraints in their ecology (Heckhausen et al., 2010; Wrosch, Schulz, & Heckhausen, 2002). Control is framed in terms of primary control (viz., the behavioral element of goal pursuit), secondary control (viz., the cognitive element of goal pursuit) and—of relevance to adaptability—compensatory control comprising alternative courses of action (compensatory primary control) and reappraising goals, regulating aspirations and altering expectations (compensatory secondary control; Tomasik et al., 2010). Somewhat lacking in these control approaches is an explicit focus on affective adjustments—one of the cornerstones of adaptability. Further, much of lifespan theory's emphasis is on goal disengagement—whereas adaptability focuses on situations and circumstances from which the individual cannot disengage (see

Martin et al., 2012). Thus, we consider the present operationalization of adaptability to add to recent lifespan theory approaches.

## Self-Regulated Learning

Self-regulated learning encompasses monitoring, directing, and controlling actions toward learning goals, building expertise, and improving one's skills (Boekaerts & Corno, 2005; Zimmerman, 2002). Of recent relevance to adaptability is Winne and Hadwin's (2008) four phases of self-regulation that culminate in the adaptation phase in which the learner evaluates his/her performance and identifies the necessary modifications needed to improve next time. We seek to extend such work through our adaptability framework—extending from "classic" self-regulatory models of cognition and behavior to also encompass affect. In addition, whereas self-regulation is about monitoring, directing and managing thought and behavior, adaptability is specifically about adjustments and modifications to thought and behavior (and affect). Further, whereas self-regulatory model tends to focus broadly on learning tasks and academic demands, the adaptability construct is focused squarely on uncertainty and novelty and the purposeful adjustments and modifications to deal with these. We see adaptability as a special case of negotiating situational uncertainty and novelty that is compatible with broad theories of developmental regulation. Hence, the present research work complements self-regulation research with the aligned construct of adaptability, empirically tests the separability of adaptability and self-regulation, and explores their respective contributions to academic and non-academic outcomes.

## Adversity Constructs: Resilience, Buoyancy, and Coping

We separate uncertainty and novelty from adversity, difficulty, and setback. We argue that adaptability addresses the former—and factors such as buoyancy, resilience, and coping address the latter. Resilience has been defined as the process of successful adaptation despite challenging or threatening circumstances (Howard & Johnson, 2000). Such circumstances are not minor or insubstantial; they are characterized in terms of "acute" and "chronic" adversities that are "major assaults" on the developmental process (e.g., see Masten, 2001). Whereas resilience is framed in chronic and acute terms, buoyancy has been developed to address "everyday" challenges (see Martin & Marsh, 2009, for a review). These include study deadlines, difficult schoolwork, and a poor result. Coping is another adversity-related construct defined in terms of cognitive and behavioral efforts to deal with specific demands that are appraised as difficult or perceived as beyond the individual's resources (e.g., see Frydenberg, 2008; Lazarus & Folkman, 1984). Recent research has shown buoyancy and coping to represent distinct adversity-related constructs predicting different outcomes (Putwain, Connors, Symes, & Douglas-Osborn, 2012). All three constructs are separable from adaptability in that they all purposefully and specifically target adversity and difficulty, whereas adaptability purposefully and specifically targets uncertainty and novelty. It may be that adaptability is a special case of negotiating situational uncertainty and novelty that is compatible with broad theories addressing adversity. Given this, we complement buoyancy research with the aligned construct of adaptability, empiri-

cally test the separability of adaptability and buoyancy, and explore their respective contributions to academic and non-academic outcomes.

## Models of Adaptation

Theory and research relevant to subjective well-being have also investigated how people adapt to positive and negative life circumstances. One salient theory in this area is the adaptation theory of well-being (Diener, Lucas, & Scollon, 2006). The adaptation framework is founded on an automatic habituation model in which the individual reacts to deviations from his/her current adaptation level (see Diener et al., 2006, for a review). Diener et al. (2006) have outlined a number of refinements to the theory that are relevant to the present study. Two important dimensions to this refinement are of particular pertinence. The first is that individuals will vary in the specific strategies they use to adapt. In the present investigation this is investigated by way of differences in cognitive, behavioral and affective adjustment in the face of uncertainty and novelty. The second is that a number of individual difference factors predict adaptation. In the present investigation, this signals the need to explore dispositional predictors (personality and implicit theories) of adaptability.

## Summary of Theorizing Relevant to Adaptability

There are numerous theories and concepts that inform and align with adaptability. Although there are a number of ways in which adaptability can be considered separable from other factors, there are grounds for considering adaptability as a special case of negotiating situational uncertainty and novelty that is compatible with broad theories of developmental regulation and adversity. Conceptually, adaptability may be helpful in describing functional versus dysfunctional reactions to novelty and uncertainty. We seek to contribute to current understanding of this developmental terrain and further "round out" current operationalization of related constructs. Accordingly, the present study seeks to examine the empirical terrain explained by adaptability with a view to understanding its role with relevance to academic and non-academic outcomes.

We also argue that because adaptability is considered a special case of negotiating situational uncertainty and novelty, we can draw on these theories to specify conceptual arguments why and in which way adaptability predicts academic and non-academic outcomes. Consistent with the lifespan theory of control (e.g., Wrosch et al., 2002), compensatory control via alternative forms of action and regulation of cognition increases the likelihood of individuals effectively functioning in the context of opportunities and constraints in their environment. Self-regulation theories (e.g., Winne & Hadwin, 2008) articulate the direction and management of action, thought, and emotion leading to adaptive outcomes. Similarly, models of adaptation (e.g., Diener et al., 2006) describe successful habituation to deviations in current adaptation levels. Based on these regulation and adaptation theories, we would predict that the regulatory and habituation aspects of adaptability lead to the promotion of academic and non-academic outcomes.

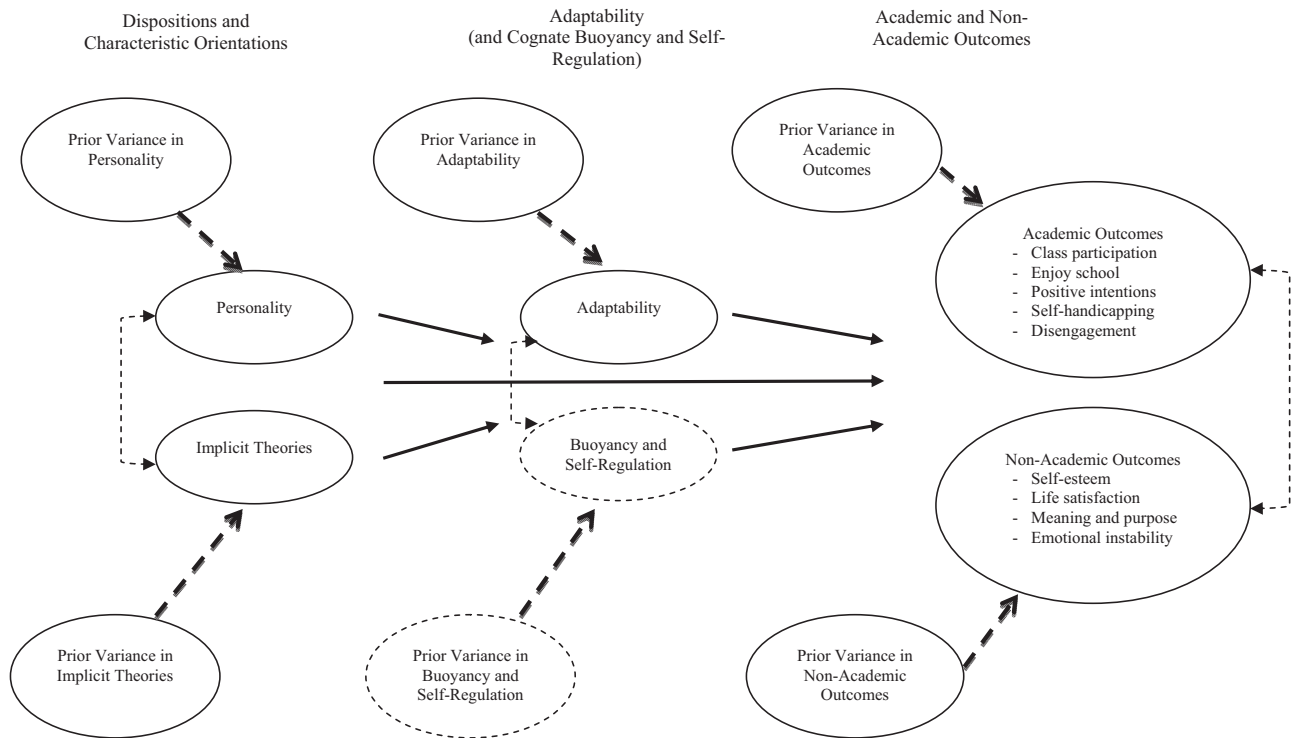## Adaptability and a Process of Youth Development

Consistent with Buss and Cantor (1989; see also McCrae & Costa, 1996) and more recent applications of their framework in the educational context (Martin, Marsh, & Debus, 2001), we explore an adaptability process in which (a) individuals' dispositions or characteristic orientations impact (b) the strategies they use to negotiate demands in their environment that impact (c) their outcomes in this environment. This approach to human functioning identifies strategies and tactics as mediating the link between personality and various outcomes (Kyl-Heku & Buss, 1996; see also McCrae & Costa, 1996). It also addresses how dispositions can be adaptively expressed to solve problems and respond to different stimuli, circumstances, situations, and conditions to bring about positive outcomes (Cantor, 1990).

In this study, we examine a model in which dispositions and characteristic orientations take the form of personality and implicit beliefs about intelligence and performance; strategy takes the form of adaptability; and, outcomes take the form of academic (motivation, engagement, disengagement) and non-academic (self-esteem, sense of meaning and purpose, life satisfaction, emotional instability) factors. As explained below, we include personal contextual factors in the form of socio-demographic and prior achievement factors, and we include buoyancy and self-regulation alongside adaptability to explore their respective contributions to academic and non-academic outcomes.

The design is a longitudinal one (from one academic year to another) and this allows us to adjust for prior variance in academic and non-academic outcomes and thus examine how adaptability predicts upward and downward shifts in these outcomes. The hypothesized model is presented in Figure 1. As shown, personality and implicit theories predict adaptability; buoyancy and self-regulation are located alongside adaptability as cognate correlates; adaptability (and buoyancy and self-regulation) predict academic and non-academic outcomes, as do personality and implicit theories; and, socio-demographic and achievement covariates are included through the model. The rationale for key factors in this process is now described.

## Predictors of Adaptability: Personality and Implicit Theories

Two major factor sets are proposed to represent individuals' characteristic dispositions and orientations as relevant to adaptability: personality and implicit theories intelligence and performance. In their five-factor theory, McCrae and Costa (1996) described how basic tendencies such as personality give rise to individuals' adaptations that take the form of, *inter alia*, regulatory processes. In reviewing evidence on personality and regulatory control, McCrae and Löckenhoff (2010) found that conscientiousness (positively) and neuroticism (negatively) related to control. They suggested that neuroticism comprises poor impulse control and poor self-management whereas conscientiousness comprises persistence, self-control, and effective decision making. Similarly, Hoyle (2010) observed that there are logical connections between key facets of personality and regulatory factors and processes. In terms of deliberate and purposeful adjustment of cognition and behavior, Hoyle argued that conscientiousness ought to play a dominant role, particularly because conscientiousness is concerned

Dispositions and Characteristic Orientations

Adaptability (and Cognate Buoyancy and Self-Regulation)

Academic and Non-Academic Outcomes



*Figure 1.* Hypothesized model of adaptability: Personality and implicit theory predictors and academic and non-academic outcomes. Bold lines represent paths of central interest. Dashed lines represent auto-regression paths. Dashed double-headed arrows represent correlations among factors. Dashed ellipses represent cognate factors to disentangle adaptability variance from buoyancy and self-regulation.

with the ways individuals characteristically manage their behavior. In contrast, individuals low in conscientiousness are not able to effectively control behavior (Costa & McCrae, 1992). Further, De Raad and Schouwenberg (1996) found that extraversion, conscientiousness, and openness were significant factors in the positive development and adaptive adjustment of one's personal resources. Inferring from this presented theory and research, it seems reasonable to posit that personality factors have a role in predicting adaptability.

Implicit theories refer to individuals' beliefs about ability and effort, the extent to which they see intelligence as something that is fixed (an "entity" or "ability" view) or something that is malleable (an "incremental" or "effort" view), and the perceived link between ability, effort, and performance (Dweck, 2000; Stipek & Gralinksi, 1996). In recent applications of implicit theories, Yeager and Dweck (2012) explained that implicit theories might also predict responses to adversity and challenge. They found that a view that intelligence can be developed or that personality characteristics can be changed leads to resilience in academic and social settings, respectively. They argued that these implicit theories shape students' goals, attributions, and learning strategies to affect outcomes. Other work has shown implicit theories of intelligence to predict academic trajectories during times of academic transitions and change through school (Blackwell, Trzesniewski, & Dweck, 2007) and implicit theories of emotion predict adjustment to change in the form of transition from high school to college (Tamir, John, Srivastava, & Gross, 2007).

Along similar lines, it may be that adaptability is also shaped by students' beliefs about ability and effort, their perception of the links between ability and effort and performance, and by implication, the extent to which they may or may not invest (cognitive, behavioral, and emotional) effort to deal with uncertain and novel situations and circumstances. Specifically, individuals with an incremental or effort view may see academic and non-academic outcomes as something that can be addressed through cognitive, emotional, and/or behavioral modification (i.e., effortful regulation). In contrast, individuals holding an entity or ability view may see their competence as fixed and difficult to address, leading to less inclination to make psycho-behavioral adjustments. We adopt the constructs proposed by Stipek and Gralinksi (1996; see also Martin et al., 2001) that explore the extent to which ability ("ability-performance beliefs") and effort ("effort-related beliefs") are seen as determinants of intelligence and performance. Harnessing their particular operationalization of implicit theories enables us to explore the role of both ability and effort beliefs in predicting adaptability. Although ability-performance and effort-related beliefs predominantly operate as two independent constructs, there are some children and young people who see intelligence and outcomes as determined by both ability and effort (Dweck, Chiu, & Hong, 1995; Martin et al., 2001; Stipek & Gralinksi, 1996), and thus inclusion of both accounts for this and controls for shared variance to identify the unique effects of ability-performance and effort-related beliefs. Additionally, in the Method section, we

assess individual items to show how some students can endorse both ability and effort beliefs.

## Cognate Correlates: Buoyancy and Self-Regulation

It is important to understand adaptability in the context of related factors when modeling the proposed process. For the purposes of the present study, we do so by including buoyancy alongside adaptability in all modeling. We choose buoyancy over resilience because resilience deals with chronic and acute adversity that is relevant to a relative minority of students, whereas buoyancy is relevant to everyday adversity and difficulty that is relevant to all students (Martin & Marsh, 2009)—as is adaptability. In addition, buoyancy is operationalized as a unidimensional factor that is parsimonious to include in modeling; coping tends to be multidimensional and thus less parsimonious when not a focus of the study. We also recognize the importance of including self-regulation to better understand the role of adaptability. Earlier in our introduction we distinguished adaptability from self-regulation. However, we also noted that the two share developmental regulatory terrain and that adaptability is a special case of negotiating situational uncertainty and novelty that is compatible with broad theories of developmental regulation. We therefore include self-regulation in our model to ascertain its variance relative to that of adaptability.

## Outcome Factors to Investigate

In the context of adolescence, we propose that psycho-educational development comprises positive and negative academic and non-academic outcomes.

### Academic outcomes.

*Positive academic outcomes.*    For positive academic outcomes, we investigate students' cognitive, behavioral, and affective motivation and engagement (see Fredricks, Blumenfeld, & Paris, 2004) as operationalized by positive intentions, class participation, and enjoyment of school, respectively. In terms of *positive intentions*, it is feasible to consider that students who are better able to deal with novelty and uncertainty are more willing to consider more ambitious and positive future selves in the academic context. With regards to *class participation*, given the speed at which lessons progress and the amount of content to cover in a given lesson (Marzano, 2003), there is a need for students to adapt as new tasks, new task demands, and new task formats are presented to them. Students' capacity to keep up and participate in an ongoing way will in part depend on their capacity to constructively adjust thought, behavior, and/or emotion along the way. *Enjoyment of school* is another outcome of interest. Research has found adaptive self-modulation predicts subjective well-being (e.g., Wrosch & Scheier, 2003) and so it may be that it also predicts academically-oriented subjective well-being in the form of school enjoyment.

*Negative academic outcomes.*    Based on need achievement and self-worth models of motivation, negative outcome typologies can be characterized in terms of failure-avoidant students and failure-accepting students (Covington, 1992; Martin et al., 2001). We suspect that students low in adaptability (and thus less capable of negotiating uncertainty and novelty) may anticipate low efficacy and a greater likelihood of poor performance—and thus be more inclined to maneuver defensively (e.g., self-handicap; Martin et al., 2001) or give up trying altogether (disengage). Hence, from need achievement and self-worth motivation perspectives, we propose *self-handicapping* and *disengagement* as two negative academic outcome factors in the adaptability process.

### Non-academic outcomes.

*Positive non-academic outcomes.*    From a lifespan theory perspective, the sense of control gained from constructively adjusting cognition and behavior and engaging in alternative paths and goals lay a foundation for an enhanced *sense of meaning and purpose* (Wrosch & Scheier, 2003). Furthermore, the enhanced capacity to modulate cognitive, behavioral, and/or affective resources is also likely to be associated with factors such as *self-esteem*. For example, effective adjustment should result in goal realization and fewer failure experiences, leading to a higher sense of self-esteem and perceived self-worth (Wrosch & Scheier, 2003). Research has also associated *life satisfaction* with broadened cognitive capacity and resources (Fredrickson, 2001), and this broadening of capacity is aligned with the adaptability concept.

*Negative non-academic outcomes.*    Lifespan control research argues and finds that failure to adopt alternative approaches to unattainable goals and maladaptive self-regulation is associated with psychological distress and poor mental health outcomes (Wrosch, Scheier, Miller, Schulz, & Carver, 2003). The present study explores poor mental health in the form of *emotional instability*. Emotional instability refers to individuals' moodiness, worry, emotional confusion, and tendency to be unsettled and upset (Marsh, 2007).

## Socio-Demographic and Achievement Covariates

Although not central to the substantive issues under focus, it is important to understand adaptability controlling for numerous socio-demographic and achievement covariates. To the extent that there exists shared variance between these covariates and adaptability—or between these covariates and academic and non-academic outcomes—it is important to account for their presence in the modeling. There are also theoretical bases for their inclusion. Major models of personality processes (e.g., Buss & Cantor, 1989; McCrae & Costa, 1996) suggest antecedent roles for biological and background factors affecting individuals' dispositional tendencies and characteristic adaptations. Although no research has examined the predictive role of these factors on adaptability, we briefly infer from related evidence to argue for their inclusion. Research (e.g., Ferrer & McArdle, 2004) identifies *gender* influencing the development and adjustment of behavioral, cognitive, and emotional capacities. In relation to *age*, García Coll et al. (1996) have found it a positive predictor of children's adaptive capacity to manage life demands. *Socio-economic status* (SES) can shape one's (behavioral, cognitive, affective) personal resources and how these resources are adjusted and regulated (Moffitt, Caspi, Rutter, & Silva, 2001). *Language background* is also relevant in defining and framing how people think, feel, and behave (Organisation for Economic Co-operation and Development, 2006) and so may also be relevant to adaptability. Finally, recent psychometric work found *academic achievement* significantly correlated with cognitive-behavioral and affective adaptability (Martin et al., 2012). Taken together, prior research and theory suggest

the importance of including socio-demographic and achievement factors; factors important to control for in the present study.

## Aims of the Present Study

Building on prior measurement work demonstrating the psychometric properties of adaptability, the present study investigates dispositional predictors (personality, implicit theories) of adaptability and the role of adaptability in predicting academic (motivation, engagement, disengagement) and non-academic (life satisfaction, self-esteem, sense of meaning and purpose, emotional instability) outcomes. The study also controls for variance attributable to buoyancy, self-regulation, socio-demographics, and prior achievement. It is conducted among adolescents across two academic years (2010–2011) at high school, allowing us to adjust for prior variance in academic and non-academic outcomes and thus ascertain the role of adaptability in predicting upward and downward shifts in outcomes over this time. Figure 1 demonstrates the major factors and processes. Following from the review of relevant research and theory, it is hypothesized that conscientiousness will predict adaptability (no clear pattern has previously emerged on other personality factors), as will ability-performance beliefs (negatively) and effort-related beliefs. It is hypothesized that adaptability will positively predict class participation, school enjoyment and positive academic intentions, and negatively predict self-handicapping and disengagement. Adaptability will also positively predict self-esteem, life satisfaction, and sense of meaning and purpose, and negatively predict emotional instability. We further hypothesize that these effects will be invariant across key subgroups (e.g., gender, ability, language background) and that adaptability will at least partially mediate effects between personality and implicit theories and outcomes.

## Method

### Sample and Procedure

The sample comprises 969 high school students in junior high (11–14 years of age; 54%) and senior high (15–19 years of age; 46%) from nine high schools in four major cities on the east coast of Australia. Schools in the sample comprised students of mixed ability (but slightly higher in achievement and socio-economic status than the national average). Four of the schools were co-educational, three schools comprised girls only, and two schools comprised boys only. Just under half (48%) of the respondents were female, and 52% were male. The mean age of respondents was 14.40 ($SD = 1.55$) years. A total of 16% of the sample spoke a language other than English at home. Ethics approval was provided by the researchers' university and parental consent was required. With few exceptions, targeted students in attendance on the day of the testing participated in the survey. Teachers administered the instrument to students during class. The rating scale was first explained and a sample item presented. Students were asked to complete the instrument on their own and to return the completed instrument at the end of class. Students completed the instrument twice, once in Term 1 2010 and again in Term 1 2011, 1 year apart.

Taking into account students who could not have completed both surveys (i.e., students in Year 12 at Time 1 who had gradu-

ated by Time 2; students in Year 7 at Time 2 who were new to the school and not part of Time 1; new students joining the school in any given year group; students leaving the school in any given year group; and, students absent for any reason at either Time 1 or Time 2), we estimated the response rate at 58%. This is 58% of the eligible sample at Time 2 (note that $N = 2,731$ is the sample at Time 1—not Time 2—and which was reported in Martin et al., 2012). To check that there were no significant differences between students participating at both times and students participating only at one time, we performed tests of invariance that compared the factor structure (factor loadings, correlations, residuals, and latent means) for unmatched and matched students at 2010 and 2011. Comparing a model where all parameters were freely estimated and one where all parameters were constrained across the unmatched and matched groups, there was support for invariance (based on a change in comparative fit index [CFI] of no greater than .01, Cheung & Rensvold, 2002, and a root-mean-square error of approximation [RMSEA] no greater than .015, Chen, 2007): Time 1 unconstrained, $\chi^2(5370) = 13,066.884$, $p < .001$, CFI = .91, RMSEA = .032; Time 1 constrained, $\chi^2(5738) = 13,980.410$, $p < .001$, CFI = .90, RMSEA = .032; Time 2 unconstrained, $\chi^2(5370) = 11,247.807$, $p < .001$, CFI = .92, RMSEA = .031; and Time 2 constrained, $\chi^2(5738) = 12,448.022$, $p < .001$, CFI = .91, RMSEA = .032. Based on the comparable measurement properties for the two groups, we conclude that the matched students in the present study can be considered broadly representative of students at the nine schools.

### Materials

Descriptive and psychometric statistics for each of the measures are detailed in the Results section and Table 1.

**Adaptability.** Adaptability is defined as individuals' adjustments of psycho-behavioral functions in response to novel and/or uncertain circumstances, conditions and situations. The Adaptability Scale (Martin et al., 2012) comprises nine items, each item reflecting the following criteria: (a) appropriate cognitive, behavioral, or affective adjustment in response to (b) uncertainty and/or novelty that has (c) a constructive purpose or outcome. Items are rated on a 1 (*Strongly Disagree*) to 7 (*Strongly Agree*) continuum. All nine items are presented in the Appendix. Prior cross-sectional psychometric work with over 2,700 high school students has confirmed the psychometric status of the Adaptability Scale on the basis of distribution properties, reliability, factor loadings, invariance as a function of key sub-groups (e.g., by gender and ethnicity), and correlations with external validity constructs (Martin et al., 2012). Martin et al. (2012) advised that adaptability can be operationalized as a higher order factor (indicated by cognitive-behavioral and affective first-order factors each indicated by six and three items, respectively) or as a first-order factor (indicated by nine items). For parsimony, we adopt the latter operationalization.

**Personality.** Extraversion, openness to experience, neuroticism, conscientiousness, and agreeableness (8 items per factor) were assessed using the 40-item International English Big-Five Mini-Markers (IEBM) instrument (Thompson, 2008). Participants rated the extent to which 40 trait adjectives were accurate descriptors of themselves. Items for the IEBM are each represented by one word in which the respondents rate themselves 1 (*Very Inaccurate*)

Table 1
*Descriptive Statistics, Cronbach's Alphas, and Mean CFA Loadings*

| | M | | SD | | Skewness | | Kurtosis | | Cronbach's α | | M CFA loading | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Variable | T1 | T2 | T1 | T2 | T1 | T2 | T1 | T2 | T1 | T2 | T1 | T2 |
| Personality | | | | | | | | | | | | |
| Extraversion | 4.91 | 4.96 | 1.09 | 1.09 | −0.32 | −0.34 | −0.24 | −0.27 | .83 | .84 | .83 | .85 |
| Agreeableness | 5.68 | 5.67 | 0.83 | 0.86 | −0.94 | −0.92 | 1.60 | 1.51 | .80 | .80 | .82 | .82 |
| Neuroticism | 3.71 | 3.76 | 1.01 | 1.06 | −0.04 | 0.09 | 0.04 | 0.12 | .75 | .75 | .82 | .83 |
| Openness | 5.09 | 5.14 | 0.89 | 0.92 | 0.48 | −0.41 | 0.83 | 0.19 | .75 | .75 | .77 | .78 |
| Conscientiousness | 4.87 | 4.92 | 1.18 | 1.18 | −0.37 | −0.37 | −0.21 | −0.19 | .86 | .86 | .90 | .89 |
| Implicit theories | | | | | | | | | | | | |
| Ability | 2.68 | 2.62 | 1.25 | 1.31 | 0.63 | 0.58 | −0.11 | −0.41 | .79 | .84 | .67 | .72 |
| Effort | 5.81 | 5.73 | 0.99 | 1.08 | −0.99 | −0.94 | 1.15 | 0.98 | .84 | .87 | .72 | .75 |
| Adaptability and cognates | | | | | | | | | | | | |
| Adaptability | 4.98 | 5.09 | .99 | .99 | −.16 | −0.30 | 0.11 | 0.11 | .90 | .92 | .72 | .75 |
| Buoyancy | 4.69 | 4.63 | 1.22 | 1.19 | −.46 | −0.33 | 0.08 | −0.01 | .81 | .77 | .72 | .68 |
| Self-regulation | 4.81 | 4.89 | 1.11 | 1.09 | −.32 | −0.33 | −0.15 | −0.15 | .86 | .87 | .67 | .68 |
| Academic outcomes | | | | | | | | | | | | |
| Enjoy school | 5.60 | 5.54 | 1.23 | 1.24 | −1.06 | −0.95 | 0.93 | 0.71 | .92 | .91 | .86 | .85 |
| Positive intention | 6.00 | 6.06 | 0.95 | 0.99 | −1.43 | −1.56 | 2.61 | 2.85 | .80 | .83 | .72 | .74 |
| Class participate | 5.41 | 5.41 | 1.19 | 1.18 | −.85 | −0.77 | 0.65 | 0.46 | .91 | .90 | .85 | .84 |
| Self-handicapping | 2.45 | 2.43 | 1.24 | 1.26 | .82 | 0.73 | 0.09 | −0.21 | .81 | .84 | .72 | .76 |
| Disengagement | 2.09 | 2.13 | 1.15 | 1.18 | 1.31 | 1.21 | 1.39 | 1.02 | .79 | .82 | .71 | .73 |
| Non-academic outcomes | | | | | | | | | | | | |
| Self-esteem | 5.35 | 5.33 | 1.11 | 1.08 | −0.79 | −0.61 | 0.73 | 0.10 | .80 | .79 | .73 | .75 |
| Life satisfaction | 4.89 | 4.96 | 1.17 | 1.15 | −0.50 | −0.51 | 0.02 | 0.01 | .80 | .81 | .68 | .68 |
| Meaning and purpose | 4.90 | 5.05 | 1.37 | 1.36 | −0.61 | −0.69 | 0.23 | 0.35 | .84 | .87 | .80 | .83 |
| Emotional instability | 3.94 | 3.94 | 1.44 | 1.43 | −0.02 | −0.08 | −0.76 | −0.63 | .84 | .84 | .72 | .72 |

*Note.* CFA = confirmatory factor analysis; T = Time.

to 7 (*Very Accurate*). Sample words for each factor are as follows: "talkative" (extraversion), "creative" (openness), "moody" (neuroticism), "efficient" (conscientiousness), and "warm" (agreeableness). Thompson (2008) has previously demonstrated the reliability and predictive validity of the five factors amongst adolescents.

**Implicit theories (ability and effort beliefs).** In the present study, implicit theories are operationalized using Martin et al.'s (2001) adaptation of Stipek and Gralinksi's (1996) ability-performance beliefs and effort-related beliefs factors. Martin et al.'s adaptation involved changing words such as "kids" to "people" and selecting the highest loading items. The ability-performance beliefs factor holds that ability is the determinant of intelligence irrespective of effort (e.g., "There isn't much some people can do to make themselves smarter"; "People can learn new things but how smart they are doesn't change"). The effort-related beliefs factor holds that intelligence can be developed through the application of effort (e.g., "A person who works really hard can be very smart"; "Any person could get smarter if they worked hard"). Five items comprise the ability-performance beliefs scale and five items comprise the effort-related beliefs scale. Items were rated on a 1 (*Strongly Disagree*) to 7 (*Strongly Agree*) scale. Close inspection of the items suggests students will tend to endorse one factor or the other. However, it is possible that some students can endorse both. For example, a student agreeing with an effort view, can conceivably agree that there is not "much" that "some" students can do to improve intelligence. Similarly, a student agreeing with effort items can conceivably agree with an ability-performance item that recognizes "people can learn new things." Indeed, Dweck et al. (1995) reported that about 15% of individuals may hold something of a mix of entity and incremental beliefs. Based on the

difference in chi-square, CFI, and RMSEA, the one-factor approach to implicit theories yielded a significantly poorer overall model fit than the two-factor (ability and effort beliefs) approach ($\Delta\chi^2/df = 479.29/43$, $\Delta$CFI = .03, $\Delta$RMSEA = .02). Thus, we operationalized implicit theories as two factors. Importantly, however, by including them in the one model, we control for their shared variance and therefore partial out empirical overlap to identify unique variance attributable to ability and effort beliefs.

**Buoyancy.** Buoyancy is assessed using the Academic Buoyancy Scale (ABS; Martin & Marsh, 2008). Academic buoyancy (e.g., "I think I'm good at dealing with schoolwork pressures") refers to students' ability to effectively deal with "everyday" setback, challenge, adversity, and pressure in the academic setting. The ABS is assessed through four items, rated from 1 (*Strongly Disagree*) to 7 (*Strongly Agree*).

**Self-regulation.** Self-regulation is assessed through planning and task management items from the Motivation and Engagement Scale (MES; Martin, 2010b), an instrument that measures school students' motivation and engagement. Two of the 11 factors in the MES address self-regulation: *planning* (e.g., "Before I start an assignment I plan out how I am going to do it") and *task management* (e.g., "When I study, I usually organize my study area to help me study best"). Each is assessed through four items, rated from 1 (*Strongly Disagree*) to 7 (*Strongly Agree*), and for the purposes of the present study is estimated as a single self-regulation factor—in line with previous work showing they can be aggregated into a higher order factor (Martin, 2009).

**Academic outcomes.** Positive academic outcome factors were enjoyment of school, class participation, and positive intentions. *Enjoyment of school* (e.g., "I enjoy being a student"), *class par-*

*ticipation* (e.g., "I get involved in things we do in class"), and *positive intentions* (e.g., "I'd like to continue studying or training after I complete school") each comprised 4 items, which were rated on a scale of 1 (*Strongly Disagree*) to 7 (*Strongly Agree*). These factors have been validated in previous motivation and engagement research (Martin, 2009). Negative academic outcome factors are *self-handicapping* (e.g., "I sometimes don't study very hard before exams so I have an excuse if I don't do so well") and *disengagement* (e.g., "I've pretty much given up being involved in things at school"). These are drawn from the MES (Martin, 2010b). To each item, students rate themselves on a scale of 1 (*Strongly Disagree*) to 7 (*Strongly Agree*).

**Non-academic outcomes.** Non-academic measures comprised self-esteem, sense of meaning and purpose, satisfaction with life, and emotional instability. To all measures, students were asked to rate each statement on a 1 (*Strongly Disagree*) to 7 (*Strongly Agree*) scale. *Self-esteem* (e.g., "Overall, most things I do turn out well") examined students' overall evaluation of their self-worth. The items were drawn from the general self-esteem scale of the Self-Description Questionnaire II (SDQ-II; see Marsh, 2007). The general self-esteem scale has previously demonstrated high reliability (Marsh, 2007). *Sense of meaning and purpose* (e.g., "My personal beliefs give meaning to my life") items were drawn from the World Health Organization Quality of Life Assessment (WHOQOL) instrument (WHOQOL Group, 1998). It has previously shown sound reliability (WHOQOL Group, 1998). *Satisfaction with life* (e.g., "In most ways my life is close to my ideal") assesses participants' satisfaction with their life in general. The items were derived from the Satisfaction with Life Scale (Diener, Emmons, Larsen, & Griffin, 1985). The scale has previously demonstrated good reliability (Pavot & Diener, 1993). *Emotional instability* (e.g., "I worry more than I need to") examines respondents' emotional instability in the forms of worry, moodiness, and stress. The items are from the SDQ-II and have previously shown sound psychometric properties (Marsh, 2007).

**Socio-demographics and prior achievement.** Data were also collected on socio-demographic characteristics including: gender, age, language background, and socio-economic status (SES). On language background, participants were asked if they spoke English (0) or another language (1 = non-English speaking background [NESB]) at home. Gender was coded 0 for females and 1 for males. Age was retained as a continuous variable. Students' SES was scored on the basis of their home postcode using the Australian Bureau of Statistics (ABS) relative advantage/disadvantage index, with higher scores reflecting higher SES. Academic achievement in this study is based on students' results in annual nation-wide assessment of literacy and numeracy (National Assessment Program in Literacy and Numeracy [NAPLAN]) administered by the Australian Curriculum and Assessment and Reporting Authority (ACARA). It is a nationally standardized test for which school students receive a score for each of literacy and numeracy. In the present study, an achievement factor was formed through the average of literacy and numeracy scores.

## Data Analysis

**Descriptive statistics, reliability, and factor structure.** Distributional and psychometric properties were assessed with confirmatory factor analysis (CFA) to test factor structure, reli-

ability (Cronbach's alpha) to assess internal consistency, and skewness and kurtosis to examine distribution properties. CFA was performed with Mplus Version 7.0 (Muthén & Muthén, 2012). In evaluating model fit, the root-mean-square error of approximation (RMSEA) and the comparative fit index (CFI) are emphasized. For RMSEAs, values at or less than .08 and .05 are taken to reflect acceptable and excellent fits, respectively (see Schumacker & Lomax, 1996). For CFI, values at or greater than .90 and .95 are typically taken to reflect acceptable and excellent fits, respectively (McDonald & Marsh, 1990). Maximum likelihood with robustness to non-normality and non-independence of observations (MLR; Muthén & Muthén, 2012) was the method of estimation used. Due to the large number of personality items and parameters relative to sample size, we created item parcels for personality factors, as suggested by Schweizer (2012).

Although we did not have enough schools for multilevel modeling, and the study is focused on intra-psychic constructs not expected to vary at class and school levels, we do adjust for the clustering of students within schools through the Mplus "cluster" command using the "complex" method. This procedure provides adjusted standard errors and so does not bias tests of statistical significance due to clustering of students within schools (Muthén & Muthén, 2012).

**Using composite scores for structural equation modeling.** Modeling longitudinal data using structural equation modeling (SEM) can lead to a lack of stability of parameter estimation and model fit statistics when the ratio of the sample size relative to the parameters to be estimated is large (Holmes-Smith & Rowe, 1994). In the present study, our sample comprised 969 cases, and the hypothesized model is a relatively complex and longitudinal one. That is, given that there are more than 200 observed variables involved in the hypothesized model, the number of parameters to be estimated can be extensive if the traditional SEM is performed (based on the formula $p(p + 1)/2$, with $p$ = the number of observed variables; see Byrne, 2012). To address this problem, and consistent with similar recent approaches to this issue (Liem, Ginns, Martin, Stone, & Herrett, 2012), we performed composite score-based SEM (Holmes-Smith & Rowe, 1994). Essentially, composite score-based SEM is multivariate path analysis corrected for measurement error. In this technique, the number of parameters is reduced because, instead of being predicted by its constituent observed variables, each latent variable is represented by a weighted composite score derived from a one-factor CFA. Proportional factor score regression weights ($\kappa$) generated from a congeneric model solution are used to modify the weight of each item indicator before a composite score is calculated (Holmes-Smith & Rowe, 1994). Factor score regression weights are particularly important because they take into account individual item measurement error and their unique (unequal) contributions to the composite score. The number of parameters in composite score-based SEM are further reduced as the factor loading ($\lambda$) and measurement error variance ($\theta$) of each latent variable in the model are fixed with the values calculated using the weighted composite score reliability of the factor under consideration. The factor loading is calculated through the square-root of $\rho$ and the measurement error variance is calculated by subtracting $\rho$ from 1 (see Holmes-Smith & Rowe, 1994). In this study, one factor CFAs were performed using Mplus Version 7.0 (Muthén & Muthén, 2012) with syntax provided by Raykov (2009).

These composite scores represented latent factors in the central SEM. Consistent with Buss and Cantor (1989) and more recent applications of their framework in the educational context (Martin et al., 2001), we explore an SEM in which individuals' dispositions or characteristic orientations impact the strategies they use to negotiate demands in their environment, which in turn impact their outcomes in this environment. Specifically, (a) personality and implicit theories predict (b) adaptability (and also buoyancy and self-regulation); (c) personality, implicit theories, and adaptability (and also buoyancy and self-regulation) predict academic and non-academic outcomes; (d) all these factors are adjusted for prior variance (auto-regression; MacCallum & Austin, 2000; Martin, 2011); and (e) socio-demographics and prior achievement are covariates, predicting all factors at each point in the process. Figure 1 demonstrates this process.

In all parts of the process model, we sought to understand predictive effects beyond prior variance in the predicted factors. In various forms (e.g., longitudinal models, experimental designs, intervention research), this is a well-established technique to more conclusively establish the effects of independent variables on dependent variables (MacCallum & Austin, 2000; Martin, 2011). Thus, because we assessed the effects of socio-demographic and achievement variables on personality and implicit theories and then the effects of all these on adaptability (and self-regulation and buoyancy) and then the effects of all these on outcomes, we opted to partial out prior variance (i.e., account for auto-regression) for all but the exogenous socio-demographic and achievement factors.

**Subsidiary analyses.** To further understand findings, three subsidiary analyses are conducted. The first is a test of moderation. This involves constraining parallel beta parameters across groups. For example, by constraining parallel beta parameters for boys and girls, we can ascertain if there is significant model fit decline (based on a change in CFI greater than .01, Cheung & Rensvold, 2002; and a change in RMSEA greater than .015, Chen, 2007), which would suggest that the beta parameters for boys and girls are different. We also tested for differences in individual structural parameters as a function of group membership (i.e., test for the statistical significance between two β paths). A second subsidiary analysis explored indirect effects of personality and implicit theory factors on outcomes via adaptability. Indirect effects are based on bootstrapped standard errors (with 1,000 draws; MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002). MLR is not appropriate for indirect bootstrapping models and so the present study implemented maximum likelihood (ML) as the method of estimation here (Muthén & Muthén, 2012). The third subsidiary analysis explores alternative positioning of adaptability in our model, with adaptability operationalized as (a) a dispositional attribute alongside personality and implicit theories predicting buoyancy, self-regulation, and outcomes; and (b) buoyancy and self-regulation predicting adaptability, and all three predicting outcomes. Difference in model fit between the hypothesized model and the alternative models is of interest here.

**Missing data.** Missing data pose problems for data analysis, particularly when it exceeds 5% (e.g., Graham & Hoffer, 2000). Research has identified potential problems with listwise, pairwise, and similar substitution methods (Graham & Hoffer, 2000), leading to recommendation of the Expectation Maximization (EM) Algorithm, as operationalized in our study using LISREL 8.80 (Jöreskog & Sörbom, 2006). In fact, less than 5% of the data were missing, and so the EM Algorithm was employed as the approach to missing data.

## Results

### Descriptive Statistics, Reliability, and Confirmatory Factor Analysis

Table 1 presents scale means (and standard deviations), distributions (skewness, kurtosis), reliability, and mean factor loadings. Means and standard deviations are consistent with prior research (Martin, 2009; Martin & Marsh, 2008). Skewness and kurtosis values indicate approximately normal distributions. Reliability for all factors range between .75 and .92 (mean reliability of .83), suggesting sound internal consistency. Confirmatory factor analysis yielded a good fit to the data at Time 1, $\chi^2(2968) = 6,398.92$, CFI = .91, RMSEA = .04; and Time 2, $\chi^2(2968) = 6,369.74$, CFI = .91, RMSEA = .03. Mean factor loadings are acceptable, ranging from .67 to .90 (grand mean loading of .77), as shown in Table 1.

Additional CFAs were run to test model fit for CFA in which adaptability and buoyancy are estimated as a single factor and model fit for CFA in which adaptability and self-regulation are estimated as a single factor. To the extent that adaptability is deemed a special case of negotiating situational demands, it is aligned with factors such as buoyancy and self-regulation, but must be shown to be sufficiently separate from them. When integrating adaptability and buoyancy into one factor, the fit is poorer than the hypothesized structure at Time 1, $\chi^2(2991) = 7,227.84$, CFI = .88, RMSEA = .04; and Time 2, $\chi^2(2991) = 7,076.96$, CFI = .89, RMSEA = .04. When integrating adaptability and self-regulation into one factor, the fit is worse than the hypothesized structure at Time 1, $\chi^2(2991) = 7,869.20$, CFI = .87, RMSEA = .04; and Time 2, $\chi^2(2991) = 7,723.12$, CFI = .87, RMSEA = .04. Taken together, these results provide a sound measurement basis for the separation of adaptability from buoyancy and self-regulation and for assessing the hypothesized process model.

### Correlations Relevant to Adaptability

Table 2 presents correlations. For brevity, correlations central to hypothesized parameters (i.e., between personality and implicit theory predictors and adaptability; between adaptability and outcomes; between adaptability and cognate correlates) are reported here—all other correlations are available in Table 2. Correlations show extraversion, openness, neuroticism (negatively), conscientiousness, and agreeableness are all significantly correlated with adaptability. Ability-performance beliefs (negatively) and effort-related beliefs are also significantly correlated with adaptability. Adaptability is significantly correlated with buoyancy and self-regulation. In terms of academic outcomes, adaptability is significantly correlated with class participation, school enjoyment, positive intent, self-handicapping (negatively), and disengagement (negatively). For non-academic outcomes, adaptability is significantly correlated with self-esteem, life satisfaction, sense of meaning and purpose, and emotional instability (negatively).

Table 2
*Correlations*

| Variable | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Personality | | | | | Implicit theories | | Adaptability and cognates | | | Academic outcomes | | | | | Non-academic outcomes | | | |
| Prior variance (2010–2011) | .77*** | .72*** | .69*** | .64*** | .71*** | .54*** | .50*** | .59*** | .62*** | .59*** | .61*** | .66*** | .66*** | .53*** | .59*** | .62*** | .65*** | .51*** | .58*** |
| **Covariates** | | | | | | | | | | | | | | | | | | | |
| Age | −.05 | −.08 | .12* | −.08** | −.05 | .13** | −.15*** | −.13** | −.12 | −.12* | −.19** | −.05 | −.13** | .12** | .22*** | −.14** | −.14** | −.03 | .06 |
| Language | −.15*** | .01 | .05 | −.01 | .05 | −.04 | .01 | .01 | .02 | .05 | −.03 | −.03 | −.10* | .04 | −.01 | −.01 | −.03 | .06** | .01 |
| Gender | −.14** | −.22*** | −.11*** | −.09*** | −.06 | .11 | −.01 | .01 | .13** | −.12* | .02 | −.10** | −.05 | .12 | −.01 | −.07 | −.01 | .01 | −.16*** |
| SES | .09* | −.03 | .03 | .06 | −.10* | −.05 | −.08 | −.02 | −.10** | −.03 | .01 | .04 | .09 | −.04 | .01 | −.03 | .01 | −.12 | .05 |
| Prior achieve | −.01 | .15* | −.02 | .14*** | .11 | −.12* | −.04 | .20*** | −.01 | .07 | .10* | .23*** | .18*** | −.24*** | −.14** | .31*** | .10 | −.01 | .06* |
| **Personality** | | | | | | | | | | | | | | | | | | | |
| 1. Extraversion | — | .23*** | −.27*** | .28*** | .05 | −.07 | .02 | .23*** | .17*** | .06* | .21*** | .15* | .42*** | −.07 | −.10 | .19*** | .21*** | .06* | −.20*** |
| 2. Agreeableness | | — | −.21*** | .47*** | .50*** | −.37*** | .39*** | .54*** | .33*** | .39*** | .42*** | .52*** | .47*** | −.37*** | −.45*** | .48*** | .41*** | .36*** | .02 |
| 3. Neuroticism | | | — | −.17*** | −.07 | .05 | −.01 | −.31*** | −.52*** | −.05 | −.25*** | −.14** | −.19*** | .16*** | .24*** | −.27*** | −.35*** | −.07 | .65*** |
| 4. Openness | | | | — | .23*** | −.28*** | .17*** | .36*** | .20*** | .17*** | .22*** | .25*** | .27*** | −.26*** | −.23*** | .31*** | .18*** | .24*** | −.11** |
| 5. Conscientiousness | | | | | — | −.19*** | .26*** | .40*** | .26*** | .52*** | .31*** | .35*** | .35*** | −.34*** | −.43*** | .40*** | .37*** | .31*** | .04 |
| **Implicit theories** | | | | | | | | | | | | | | | | | | | |
| 6. Ability | | | | | | — | −.59*** | −.23*** | −.06 | −.19*** | −.24*** | −.38*** | −.22*** | .35*** | .39*** | −.16*** | −.19*** | −.20*** | .01 |
| 7. Effort | | | | | | | — | .41*** | .25*** | .37*** | .39*** | .48 | .31*** | −.22*** | −.41*** | .33*** | .39*** | .40*** | .03 |
| **Adaptability and cognates** | | | | | | | | | | | | | | | | | | | |
| 8. Adaptability | | | | | | | | — | .59*** | .54*** | .53*** | .57*** | .55*** | −.38*** | −.50*** | .61*** | .58*** | .53*** | −.21*** |
| 9. Buoyancy | | | | | | | | | — | .32*** | .48*** | .41*** | .39*** | −.22*** | −.39*** | .47*** | .47*** | .35*** | −.46*** |
| 10. Self-regulation | | | | | | | | | | — | .38*** | .48*** | .43*** | −.38*** | −.42*** | .38*** | .40*** | .41*** | −.01 |
| **Academic outcomes** | | | | | | | | | | | | | | | | | | | |
| 11. Enjoy school | | | | | | | | | | | — | .69*** | .61*** | −.31*** | −.62*** | .48*** | .58*** | .34*** | −.09*** |
| 12. Positive intentions | | | | | | | | | | | | — | .62*** | −.40*** | −.67*** | .58*** | .50*** | .39*** | −.01 |
| 13. Class participation | | | | | | | | | | | | | — | −.36*** | −.51*** | .50*** | .42*** | .36*** | −.04 |
| 14. Self-handicapping | | | | | | | | | | | | | | — | .59*** | −.41*** | −.35*** | −.21*** | .10** |
| 15. Disengagement | | | | | | | | | | | | | | | — | −.49*** | −.54*** | −.30*** | .13** |
| **Non-academic outcomes** | | | | | | | | | | | | | | | | | | | |
| 16. Self-esteem | | | | | | | | | | | | | | | | — | .66*** | .35*** | −.15*** |
| 17. Life satisfaction | | | | | | | | | | | | | | | | | — | .40*** | −.17*** |
| 18. Sense of meaning and purpose | | | | | | | | | | | | | | | | | | — | .04 |
| 19. Emotional instability | | | | | | | | | | | | | | | | | | | — |

*Note.* SES = socio-economic status.
* *p* < .05. ** *p* < .01. *** *p* < .001.

## Structural Equation Modeling

SEM was used to test Figure 1. The model fit the data well, $\chi^2(342) = 693.29$, CFI = .98, RMSEA = .03. Table 3 presents all findings, and Figure 2 presents central findings. Here, beta coefficients central to the hypothesized model are summarized (i.e., between personality and implicit theory predictors and adaptability; between adaptability and outcomes; between cognate correlates and outcomes). Table 3 presents all other coefficients and explained variance.

Beyond variance explained by socio-demographics, prior achievement, and auto-regression (prior variance), three personality factors significantly predicted adaptability, as follows: neuroticism (negatively), conscientiousness, and agreeableness. Adaptability was also predicted by implicit theories by way of effort-related beliefs but not by ability-performance beliefs.

After controlling for cognate correlates (buoyancy and self-regulation), adaptability explained unique variance in outcomes. Specifically, beyond the variance explained by buoyancy, self-regulation, personality, implicit theories, socio-demographics, prior achievement, and auto-regression (prior variance), adaptability significantly predicted eight of the nine outcome factors: class participation, school enjoyment, positive intent, self-handicapping (negatively), disengagement (negatively), self-esteem, life satisfaction, and sense of meaning and purpose.

In different ways, the two cognate correlates significantly predicted outcomes after controlling for adaptability, confirming that the three factors (adaptability, buoyancy, self-regulation) are separable factors explaining unique variance in academic and non-academic outcomes. Specifically, buoyancy significantly predicted four of the nine outcome factors: school enjoyment, self-esteem, sense of meaning and purpose (negatively), and emotional instability (negatively). Meanwhile, self-regulation significantly predicted three of the nine outcome factors: school enjoyment, self-handicapping (negatively), and disengagement (negatively).

## Subsidiary Analyses

**Investigating moderation: Invariance in predictive parameters.** We examined moderation with multi-group SEMs to test for invariance between parallel adaptability parameters across groups of interest. In order to do so, it was important to first establish invariance in measurement as a function of these groups. In all cases, there was no departure in RMSEA greater than .015 (based on Chen, 2007) when all parameters were constrained. In relation to CFI, the minimum criterion for invariance (invariance in factor loadings; Byrne, 2012) was established in all models. Invariance in CFI was also established when correlations and loadings were constrained and when residuals and loadings were constrained; but in four of 10 models (related to gender and achievement) there was minor departure in CFI greater than .01 (Cheung & Rensvold, 2002) in the final model when all parameters were constrained at once. Thus, we conclude predominant invariance, but advise that the reader is mindful of minor departures on some fit indices for some sets of constrained parameters.

For our focal invariance tests, we then constrained 17 adaptability beta parameters in each of five sets of invariance tests based on gender (boys, girls), age (junior high, senior high), language background (English speaking, non-English speaking), socio-economic status (mean split of low and high), and prior achievement (mean

split of low and high). In comparison to when all parameters were freely estimated, these invariance tests predominantly showed no reduction in CFI > .01 and no change in RMSEA > .015 when the adaptability parameters were constrained across groups: gender (unconstrained CFI = .97, RMSEA = .042; constrained CFI = .96, RMSEA = .050), language background (unconstrained CFI = .97, RMSEA = .041; constrained CFI = .96, RMSEA = .050), age (unconstrained CFI = .96, RMSEA = .045; constrained CFI = .96, RMSEA = .050), socio-economic status (unconstrained CFI = .97, RMSEA = .044; constrained CFI = .95, RMSEA = .052), and prior achievement (unconstrained CFI = .96, RMSEA = .041; constrained CFI = .95, RMSEA = .049). Hence, notwithstanding a minor departure in CFI (but not RMSEA) for socio-economic status, central adaptability parameters are not moderated by gender, age, language background, SES, and prior achievement.

In a further test, we compared each specific structural parameter value (transforming the β to $r$ using Peterson & Brown's, 2005, formula and comparing the derived coefficients using Preacher's, 2002, formula) across the groups involved. Of 85 tests comparing parallel structural parameters, only three were significantly different as a function of group membership: effort-related beliefs → adaptability as a function of gender (female β = .20; male β = .42; difference in β, $p < .001$), effort-related beliefs → adaptability as a function of ability (low ability β = .36; high ability β = .18; difference in β, $p < .01$), and adaptability → self-esteem as a function of gender (female β = .35; male β = .22; difference in β, $p < .05$). Thus, in addition to model invariance (above), there is predominant invariance in specific parameters across groups.

**Testing for indirect effects via adaptability.** The second set of subsidiary analyses involved testing for indirect effects of personality and implicit theories on outcomes via adaptability using bootstrapping (1,000 draws). We found adaptability significantly mediated the relationship between the following factors: neuroticism and self-esteem (β = –.06, $p < .001$), life satisfaction (β = –.05, $p < .01$), sense of meaning and purpose (β = –.07, $p < .001$), enjoyment of school (β = –.03, $p < .05$), positive intentions (β = –.04, $p < .01$), class participation (β = –.04, $p < .01$), self-handicapping (β = .03, $p < .05$), and disengagement (β = .03, $p < .05$); between conscientiousness and self-esteem (β = .06, $p < .001$), life satisfaction (β = .06, $p < .001$), sense of meaning and purpose (β = .08, $p < .001$), enjoyment of school (β = .03, $p < .05$), positive intentions (β = .04, $p < .01$), class participation (β = .04, $p < .01$), self-handicapping (β = –.03, $p < .05$), and disengagement (β = –.03, $p < .05$); between ability-performance beliefs and self-esteem (β = .03, $p < .05$) and sense of meaning and purpose (β = .04, $p < .05$); and, between effort-related beliefs and self-esteem (β = .09, $p < .001$), life satisfaction (β = .08, $p < .001$), sense of meaning and purpose (β = .11, $p < .001$), enjoyment of school (β = .04, $p < .05$), positive intentions (β = .06, $p < .01$), class participation (β = .05, $p < .01$), self-handicapping (β = –.04, $p < .01$), and disengagement (β = –.04, $p < .05$). In sum, not only did adaptability directly predict the bulk of outcome factors, it also significantly mediated the relationship between many personality and implicit theory factors and outcomes. In fact, there were about the same number of significant indirect paths to outcomes via adaptability at $p < .001$ as there were direct paths from personality and implicit theories to outcomes at $p < .001$.

Table 3
*Standardized Beta Coefficients and Explained Variance for Full Process Model*

| Variable | Personality | | | | | Implicit theories | | Adaptability and cognates | | | Academic outcomes | | | | | Non-academic outcomes | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | PART | ENJ | POS | SH | DIS | EST | SAT | MEAN | EMOT |
| Auto-regression (2010–2011) | .77*** | .66*** | .66*** | .65*** | .69*** | .48*** | .44*** | .34*** | .41*** | .39*** | .47*** | .49*** | .45*** | .37*** | .42*** | .36*** | .46*** | .35*** | .23*** |
| Covariates | | | | | | | | | | | | | | | | | | | |
| Age | .01 | .02 | .06** | −.05* | −.02 | .11* | −.11** | .01 | .01 | −.02 | −.05* | −.05* | −.04 | .09** | .11** | −.06* | −.08** | −.03 | −.01 |
| Language | −.05* | −.01 | −.01 | .02 | −.05 | −.04 | .01 | .03 | .04 | .02 | .01 | −.05** | .07** | .03 | −.05 | .01 | .02 | .05* | .04* |
| Gender | −.06 | −.18*** | −.07** | −.06 | −.06 | .09* | −.05 | .02 | .03 | −.02 | .01 | .01 | −.05 | .06 | .01 | −.08 | .01 | .02 | .03 |
| SES | −.01 | −.02 | .01 | .01 | .01 | .03 | −.03 | .05 | .06 | .01 | −.01 | −.01 | .05* | .01 | −.03 | .01 | .02 | −.05 | .04 |
| Prior achieve | −.03 | .10*** | −.05 | .05 | .14*** | −.11** | .06 | .09* | .06* | .05 | .04 | .03 | .09*** | −.08** | −.03 | .23*** | .07* | −.06** | −.01 |
| Personality | | | | | | | | | | | | | | | | | | | |
| 1. Extraversion | | | | | | | | −.01 | .03 | .05** | .19*** | .04 | .03 | −.02 | −.03 | .03 | .03 | −.01 | −.04* |
| 2. Agreeableness | | | | | | | | .10** | −.07 | .03 | .04 | .04 | .03 | .01 | −.09 | .01 | −.02 | .05 | .17** |
| 3. Neuroticism | | | | | | | | −.19*** | −.37*** | −.01 | .06 | .06 | .13** | .06 | .01 | .02 | −.12** | .03 | .49*** |
| 4. Openness | | | | | | | | .05 | −.01 | .05 | .05 | .01 | .04 | .01 | .02 | .08* | .01 | .08 | −.03 |
| 5. Conscientiousness | | | | | | | | .21*** | .18*** | .34*** | .01 | −.03 | .01 | −.04 | .08** | .08* | .06 | −.01 | .01 |
| Implicit theories | | | | | | | | | | | | | | | | | | | |
| 6. Ability | | | | | | | | .10 | .17** | .11*** | −.01 | −.07* | −.05 | .32*** | .19** | .12*** | .12* | .06* | .16* |
| 7. Effort | | | | | | | | .29*** | .23*** | .19*** | .06 | .03 | .17** | .15*** | −.03 | .22*** | .22*** | .13** | .05 |
| Adaptability and cognates | | | | | | | | | | | | | | | | | | | |
| 8. Adaptability | | | | | | | | | | | .18*** | .15*** | .20** | −.15** | −.15* | .29*** | .26*** | .38*** | .05 |
| 9. Buoyancy | | | | | | | | | | | .05 | .11** | .06 | .07 | .07 | .11*** | −.04 | −.10* | −.29*** |
| 10. Self-regulation | | | | | | | | | | | .05 | .11*** | .01 | −.15*** | −.18*** | −.07 | .04 | .06 | .01 |
| Explained variance (%) | 62 | 45 | 46 | 52 | 54 | 30 | 23 | 51 | 53 | 49 | 58 | 51 | 58 | 46 | 52 | 68 | 60 | 45 | 66 |

*Note.* Explained variance in outcomes without adaptability: self-esteem = 64%; life satisfaction = 57%; school enjoyment = 49%; positive intentions = 49%; sense of meaning and purpose = 39%; emotional instability = 65%; class participation = 51%. Additional variance in outcomes explained by adaptability beyond auto-regression: self-esteem = 22%; life satisfaction = 19%; sense of meaning and purpose = 16%; emotional instability = 4%; class participation = 4%; school enjoyment = 13%; positive intentions = 14%; self-handicapping = 8%; disengagement = 12%. PART = class participation; ENJ = school enjoyment; POS = positive intentions; SH = self-handicapping; DIS = disengagement; MEAN = meaning and purpose; EMOT = emotional instability; SAT = life satisfaction; EST = self-esteem; SES = socio-economic status.
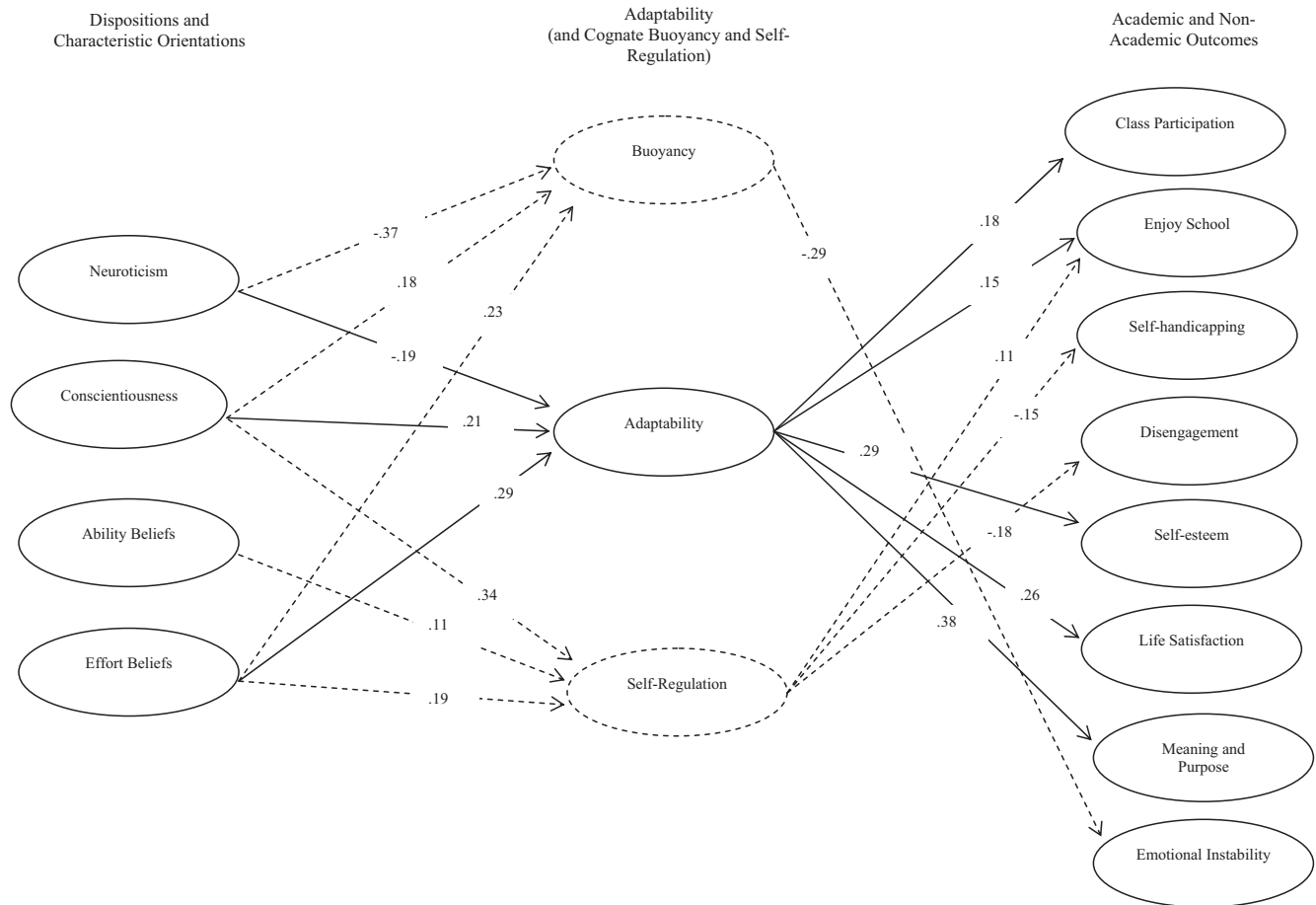$^*$ $p < .05$. $^{**}$ $p < .01$. $^{***}$ $p < .001$.

*Figure 2.* Hypothesized standardized beta paths significant at *p* < .001. See Table 3 for direct paths between personality and outcomes, between implicit theories and outcomes, and for all other effects significant at *p* < .01 and *p* < .05. Bold paths represent parameters leading to and from adaptability. Dashed paths represent parameters leading to and from cognate factors (self-regulation and buoyancy). Dashed ellipses represent cognate factors to disentangle adaptability variance from buoyancy and self-regulation.

**Exploring alternative model ordering.** The final subsidiary analyses involved examining alternative model ordering. Although our process model was ordered on conceptual grounds (see Buss & Cantor, 1989; McCrae & Costa, 1996), the data are available to explore alternative ordering of adaptability. The two conceptually viable alternative orderings are where adaptability is considered a dispositional and characteristic orientation (and thus modeled alongside personality and implicit theories) and where adaptability is dependent of buoyancy and self-regulation (and thus regressed on buoyancy and self-regulation). The first model yielded a higher chi square value than the hypothesized model ($\Delta\chi^2 = 38.65$), and the second model also yielded a higher chi square value than the hypothesized model ($\Delta\chi^2 = 10.79$), providing some support for our positioning of adaptability in the process.

## Discussion

### Adaptability and Outcomes

For academic outcomes, it was hypothesized that adaptable students would be more ambitious in their future plans (positive intent), more able to keep up with the rapid pace and variable nature of lessons (class participation), experience more positive academic outcomes (school enjoyment), and be less inclined to maneuver defensively (self-handicapping) or give up (disengagement; Martin et al., 2012). For non-academic outcomes, we drew on lifespan and adaptation frameworks to argue that adaptability should predict subjective well-being (Diener et al., 2006), sense of purpose (Wrosch & Scheier, 2003), and psychological distress (negatively; Wrosch et al., 2003).

Consistent with hypotheses, adaptability uniquely predicted these outcomes in the expected direction. Furthermore, adaptability significantly mediated the relationship between personality and outcomes and between effort-related beliefs and outcomes. Importantly also, it explained unique variance beyond the cognate academic factors of buoyancy and self-regulation. Thus, beyond the regulatory aspects of self-regulation and the adversity-related aspects of buoyancy, individuals' cognitive, behavioral and/or affective adjustments to uncertainty and novelty play a distinct role in their outcomes.

It is also noteworthy that these effects were beyond the effects of personality and implicit theories. By including these trait fac-

tors, we could show that adaptability is not simply a proxy for other well-known and well-established dispositional constructs. More broadly, by including a very broad range of factors alongside adaptability in a multivariate set-up, we can argue against the classic jingle (scales with the same label reflecting the same construct) and jangle (scales with different labels measuring different constructs) fallacy (Marsh, 1994) by showing that adaptability represents a distinct construct in academic and non-academic development.

It is also worth commenting on explained variance attributable to adaptability. Beyond the effects of auto-regression, adaptability explained large variance in outcomes (up to 22%) and beyond the effects of all factors, adaptability explained up to 6% additional variance. It is therefore a significant factor, but clearly resides alongside other factors that also significantly predict academic and non-academic outcomes. For example, self-regulation and buoyancy also explained significant variance in outcomes. These findings might further support our contention that adaptability may be a special case of negotiating situational uncertainty and novelty that is compatible with broad theories of developmental regulation (and their component constructs). As such, this study contributes to further understanding of this regulatory constellation and may help further "round out" the operationalization of regulatory constructs.

In terms of adaptability intervention, we suggest adaptability might be addressed in similar ways to efforts addressing adversity-related constructs such as resilience. For example, Morales (2000; see also Martin & Marsh, 2009) has proposed a resilience cycle that is aimed at sustaining individuals' ability to deal with risk on an ongoing basis. Adapting this framework, adaptability intervention might comprise the following steps: (1) the individual is taught how to realistically and effectively recognize uncertainty and novelty that might require adaptability; (2) he/she is taught how to make appropriate adjustments to behavior, cognition, and/or affect; (3) these adjustments assist the individual to deal with uncertainty and novelty; (4) he/she is encouraged to recognize the value of these adjustments and then refine and/or progress them; and (5) this continuous refinement and implementation of behavioral, cognitive, and/or affective adjustment sustains the individual's ability to deal with ongoing uncertainty and novelty in academic and non-academic life. There is a long line of cognitive-behavioral and affective intervention research demonstrating that students can change cognition, behavior, and affect to more effectively function in relevant performance domains (e.g., Hattie, 2009; McInerney, McInerney, & Marsh, 1997; O'Mara, Marsh, Craven, & Debus, 2006). These targeted interventions may be a basis for bringing about the type of adjustments required to constructively respond to uncertainty and novelty.

## Juxtaposition With Cognate Correlates

When considering adaptability in the context of buoyancy and self-regulation, it was clear that adaptability accounted for significant variance. Notwithstanding this, buoyancy and self-regulation did explain unique variance in outcomes as well as predict outcomes in notably different ways. For example, buoyancy clearly mapped onto emotional instability in ways that adaptability did not: it was the sole predictor of this outcome factor. Thus, it seems that when mental health (as indicated by emotional instability) is more a focus, adversity-related constructs (such as buoyancy) are perhaps more important. Indeed, along these lines, it was interesting that neuroticism (a major mental health personality indicator) significantly predicted buoyancy and yielded larger paths to buoyancy than to adaptability and self-regulation.

In terms of academic outcomes, it seems that both adaptability and self-regulation are important. It may be that self-regulation is important for the ongoing direction and control of executive and meta-cognitive functions for daily schoolwork (Boekaerts & Corno, 2005; VandenBos, 2007; Zimmerman, 2002)—whereas adaptability may be relevant when new demands and tasks are presented to students (Martin et al., 2012). Thus, across the two factors of adaptability and self-regulation, students are better placed to become, and then stay engaged in the course of the school day and week.

## Predictors of Adaptability

**Personality.** Salient personality predictors of adaptability were conscientiousness, agreeableness, and neuroticism (negatively). Moreover, adaptability significantly mediated the relationship between these three personality constructs and outcomes. In fact, there were about the same number of significant indirect paths to outcomes via adaptability at $p < .001$ as direct paths from personality to outcomes at $p < .001$. Further, our multivariate modeling (that controlled for shared variance among personality factors) extended the bivariate correlational work by Martin et al. (2012) that found adaptability correlated with all personality factors. The present study clarified unique personality predictors after accounting for shared personality variance. Thus, consistent with Cantor (1990; see also McCrae & Costa, 1996), dispositions can be adaptively expressed (in the case of conscientiousness and agreeableness) to respond to different stimuli, circumstances, situations and conditions to bring about positive outcomes. Conversely, dispositions may be maladaptively expressed (in the case of neuroticism) to lead to negative outcomes.

These findings are consistent with what might be predicted by theory. McCrae and Costa's (1996) five-factor theory involves the regulatory and control processes that are shaped by personality. Subsequently, researchers have shown that personality factors predict various regulatory and control factors. Theory and research tends to converge on conscientiousness as a major factor relevant to regulation and control (e.g., De Raad & Schouwenberg, 1996; Hoyle, 2010; McCrae & Löckenhoff, 2010). Conscientiousness is conceptualized as the personality factor giving rise to adaptive self-management, persistence, effective decision making, and control (McCrae & Löckenhoff, 2010). These characteristics are clearly aligned with adaptability and this is in keeping with our framing of adaptability as a special case of personal adjustments associated with situational uncertainty and novelty. Consistent with McCrae and Löckenhoff (2010), neuroticism was also found to be a salient (negative) predictor of adaptability. Interestingly, conceptualizing about neuroticism notes poor impulse control as a major attribute (McCrae & Löckenhoff, 2010). The significant negative association between neuroticism and adaptability suggests that adaptability is not a function of impulsive cognitive, behavioral and affective modulation that might be characteristic of the neurotic individual. In combination with the positive association between conscientiousness and adaptability, the negative neu-

roticism effect suggests that adaptable students' adjustments in cognition, behavior, and affect may be well considered, deliberate, and purposeful. Including personality in our hypothesized model was important in shedding this light on the specific nature of adaptability.

It therefore appears to be the case that some individuals are dispositionally (or temperamentally) better placed for adaptability and others are not. This is important to know because it will impact intervention designed to promote and sustain adaptability. For individuals who may be low in conscientiousness and agreeableness or high in neuroticism, we point to the review by Ginns, Liem, and Martin (2011), who describe how individuals can be taught to change behavior, cognition, and affect in the face of traits that might otherwise leave them "stuck." Practitioners, then, would do well to understand individuals' trait-like profile as they direct intervention at adaptability.

**Implicit theories.** Consistent with hypotheses, effort-related beliefs significantly predicted adaptability, whereas ability-performance beliefs did not. Moreover, adaptability significantly mediated the relationship between effort-related beliefs and outcomes. Individuals with effort-related beliefs see intelligence and performance as malleable through effort whereas students with an ability-performance view see intelligence and performance as relatively fixed (Dweck, 2000). We hypothesized that individuals with an effort-related view would see academic and non-academic outcomes as something that can be addressed through cognitive, emotional, and/or behavioral modification—and thus would be more adaptable than individuals who see their competence as fixed and difficult to address (i.e., see less point in attempting cognitive, emotional and/or behavioral adjustment). It is also interesting that the effort-related beliefs factor was the only substantive predictor of adaptability moderated by students' background characteristics. Specifically, we found that ability (a significantly stronger path for low ability students) and gender (a significantly stronger path for males) significantly moderated the effects of effort-related beliefs on adaptability.

Findings on students' effort-related beliefs hold implications for intervention. Two lines of work are relevant here. First, research into growth mindsets (Dweck, 2006) informs practical approaches aimed at promoting effort-related beliefs about ability that help individuals see that adjustment is possible and how to make such adjustments. Second, recent work has emphasized the utility of growth goals and growth assessment (Martin & Liem, 2010). This growth perspective on student academic and non-academic development is consistent with the adaptability construct and thus adaptability may be an important factor to include in growth-related conceptual and applied frameworks. Research into growth goals (Martin & Liem, 2010) has shown that personal best (PB) goals are positively associated with academic outcomes. Similar growth approaches have been recently proposed in the assessment domain (Anderman, Anderman, Yough, & Gimbert, 2010). Finding that the effects of effort-related beliefs on adaptability were moderated by ability and gender also provides intervention direction. For example, when seeking to target individual students' adaptability, intervention around growth mindsets, growth goals, and growth assessment might be particularly useful for low achievers and males.

**Socio-demographics and prior achievement.** Although not central to hypothesizing, it is important to recognize socio-demographic and achievement factors relevant to adaptability. Inclusion of these factors was important for three reasons. First, it extends prior correlational work that did not control for shared variance among these factors (Martin et al., 2012; thus, we gain a sense of their unique effects). Second, inclusion of these factors enables an understanding of adaptability purged of socio-demographic and achievement variance. Third, socio-demographic and achievement findings hold implications for intervention by identifying the types of students who are likely or not likely to be adaptable.

In correlational findings, age was inversely associated with adaptability; younger adolescents reported higher adaptability than older adolescents. In relation to regulation, the literature reports mixed contentions regarding age. Some research suggests greater capacity to regulate personal functions among older students (e.g., García Coll et al., 1996; Locke, 1996), whereas some research suggests stability in the self-system among older students (e.g., Marsh, 2007). The present findings suggest that older students are less capable of adjusting their cognition, behavior, and affect. Perhaps by this age they are solidifying their characteristic way of negotiating uncertainty and novelty. In any case, educators might look to sustain students' adaptability from early adolescence through to later adolescence. Particularly given the uncertainties and novelties in the transition from school to post-school life (Martinez, Martin, Liem, & Colmar, 2012), sustaining previously higher levels of adaptability may be important. Prior achievement was also significantly associated with adaptability. Achievement in high school requires an aggregation of numerous cognitive, behavioral, and affective skills important for managing multiple demands, diffuse subject matter, new teachers, different classes, diverse performance requirements, academic fear, and the like (Martin, 2010a; Marzano, 2003). Viewed from this perspective, it is perhaps not surprising that students who are able to develop these skills are also building their adaptability which also comprises an aggregation of cognitive, behavioral, and affective skills to deal with situational uncertainty and novelty. From an intervention perspective, low achievers might be identified and supported in the cognitive, behavioral and affective factors and processes relevant to management of multiple academic demands that will concomitantly assist their adaptability.

## Summary of an Adaptable Profile

Based on the present findings, we can posit a profile of the adaptable student. In terms of socio-demographics and prior achievement, this secondary school student is likely to be higher in prior achievement and younger. Drawing on a previous study (Martin et al., 2012), this student is also likely to have parents/caregivers with higher levels of education. In terms of dispositional and characteristic orientations, an adaptable student is likely to hold effort-related beliefs of intelligence and performance (with the positive effects of effort-related beliefs more salient for low achievers and males), be agreeable and conscientious, and unlikely to be neurotic. In relation to other regulatory and adversity-based constructs, an adaptable student is more likely to self-regulate and be buoyant in the face of everyday academic challenge and difficulty. Finally, this student's adaptability is likely to be demonstrated through higher levels of mental health in the form of life satisfaction, self-esteem, and sense of meaning and purpose and

higher levels of academic motivation and engagement in the form of class participation, enjoyment of school, positive academic intentions, and low self-handicapping and disengagement. This profile represents a first step in enabling practitioners to identify the types of students who are likely to be adaptable, assist students who may not reflect some or all of these factors, and assess the effectiveness of their efforts by examining academic and non-academic outcomes to which adaptability intervention should ultimately connect. As discussed below, a second step is now to formally profile adaptability using person-centered analytic approaches (e.g., cluster analysis) and to investigate intervention relevant to the derived profiles.

## Future Directions

There are some limitations to the present study that provide direction for future research. Data were self-reported, and thus there is a need to include other data sources, such as teacher and parent observations and reports of students' responses to uncertainty and novelty. There might also be value including coping measures in future research. Although the present study included both buoyancy and self-regulation as adaptability correlates, further research might seek to disentangle any outstanding variance relevant to coping—particularly adaptive and maladaptive coping techniques. Other personal characteristics (e.g., tolerance for ambiguity, need for closure, risk aversion) relevant to uncertain and novel conditions might also be worth consideration. In line with adversity-related research, it might also be important to understand the cumulative effect of uncertainty or novelty. For example, is there a critical point where too much uncertainty or novelty represents adversity—and would this signal the need for resilience, buoyancy, or coping? In recent research, it seems the presence of two risk factors is sufficient to predict academic failure (Lucio, Hunt, & Bornovalova, 2012)—how does this compare with cumulative instances of uncertainty and novelty? Further, it might be important to understand the limits of adaptability. There may be uncertain and novel situations and conditions where some level of stability and steadfastness is required. If individuals are too often or markedly adjusting their cognition, affect and behavior, is there a cost in terms of a stable sense of self and character?

Further, relevant to limitations and future directions, it must be noted that the adaptability measure is domain general and not specific to a particular context. Perhaps the more focused the measure is on a specific domain or situation the more it may impact outcomes in that domain. Importantly, though, our domain general adaptability measure predicted academic outcomes as well or better than the academically-oriented buoyancy and self-regulation measures predicted academic outcomes. Hence, we suggest that even as a domain general measure, adaptability is noteworthy. Our research is currently exploring adaptability, buoyancy, self-concept, and academic achievement in reading and mathematics among a sample of elementary students. These data will shed light on domain specificity and the operation of adaptability (and its further juxtaposition with buoyancy and self-regulation) with younger children. Additionally, because our measure of achievement was taken before the survey period, we could only use it as a covariate. A post-survey measure of achievement would enhance future research.

In terms of methodology, this study was a quantitative one leading to limits to what can be understood through such data. Future research might involve qualitative data to better understand how and when adaptability may operate. Another direction might be to collect data in the context of a novel situation (e.g., in the laboratory) or at a time of transition (e.g., beginning a school year) to assess the extent to which individuals who score higher on adaptability exhibit more effective adjustments than those scoring lower on adaptability. Indeed, this might entail collecting real-time information from students which would enable contemporaneous quantitative and qualitative data at specific times of uncertainty and novelty (e.g., when beginning a new school year). Recently, Malmberg, Little, Walls, and Martin (2012) demonstrated the efficacy of Personal Digital Assistants (PDAs) as a means of collecting real-time data on learning and instruction from students. Finally, whereas we have adopted a variable-centered approach to adaptability, future work might consider person-centered approaches. This would involve identifying groups of students deemed as adaptable (or not) with a view to identifying factors that determine their group membership. This has the advantage of studying patterns of adaptability occurring "naturally" and may also provide opportunities for in-depth case study research.

## Conclusion

Adaptability refers to appropriate adjustments in cognition, behavior, and/or affect in response to uncertain and novel circumstances, conditions, and situations. Building on prior measurement work demonstrating the psychometric properties of the Adaptability Scale, the present study demonstrated dispositional predictors (effort-related beliefs, conscientiousness, agreeableness, and neuroticism) of adaptability and ways in which adaptability predicted academic outcomes (class participation, school enjoyment, positive academic intentions, self-handicapping, disengagement) and non-academic outcomes (self-esteem, life satisfaction, sense of meaning and purpose). Together, these findings are suggestive of the profile of students who are adaptable and those who are not. They are also indicative of the types of developmental outcomes that adaptability is likely to predict, underscoring its importance on the developmental landscape. Findings hold theoretical and empirical implications for researchers and practitioners seeking to better understand responses to the uncertainty and novelty that are a reality of the world ahead for children and young people.

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# Appendix

## The Adaptability Scale (Martin, Nejad, Colmar, & Liem, 2012)

1. I am able to think through a number of possible options to assist me in a new situation.

2. I am able to revise the way I think about a new situation to help me through it.

3. I am able to adjust my thinking or expectations to assist me in a new situation.

4. I am able to seek out new information, helpful people, or useful resources to effectively deal with new situations.

5. In uncertain situations, I am able to develop new ways of going about things (e.g., a different way of asking questions or finding information) to help me through.

6. To assist me in a new situation, I am able to change the way I do things.

7. I am able to reduce negative emotions (e.g., fear) to help me deal with uncertain situations.

8. When uncertainty arises, I am able to minimize frustration or irritation so I can deal with it best.

9. To help me through new situations, I am able to draw on positive feelings and emotions (e.g., enjoyment, satisfaction).

*Note*. Based on prior factor analyses (Martin et al., 2012), Items 1–6 load on a first-order "cognitive-behavioral" factor, and Items 7–9 load on a first-order "affective" factor. Importantly, however, the two first-order factors are highly correlated, and thus a global factor (i.e., single nine-item factor) or a higher order factor (i.e., nine items represented by two first-order factors that are the indicators of a higher order factor) can also represent Adaptability in statistical analyses—particularly when using Adaptability as a predictor—to avoid issues related to collinearity.