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# The academically engaged life of mastery-oriented students: Causal ordering among positive emotions, mastery-approach goals, and academic engagement☆

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ABSTRACT

Although prior research shows that well-being is linked to effective learning, there is scarce evidence on how positive emotions relate to achievement goals and objective measures of school engagement. Drawing from the broaden-and-build theory of positive emotions, this study examines the reciprocal associations of positive emotions with mastery-approach goals and teacher-reported academic engagement using a two-wave longitudinal design. A survey comprising measures to assess students' positive emotions (i.e., Modified Differential Emotions Scale) and mastery-approach goals (i.e., Achievement Goal Questionnaire – Revised) was administered to 411 Filipino high school students at two separate time points (i.e., 1-month interval). Ten classroom advisers also filled in a teacher-reported measure of academic engagement to provide a more objective estimate of each student's involvement in academic activities. Results of cross-lagged panel structural equation modeling via maximum likelihood estimation approach showed that positive emotions had positive concurrent relationships to mastery-approach goals and all engagement dimensions. Contradicting previous research, positive emotions did not predict subsequent mastery-approach goals and engagement after controlling for auto-regressor effects. Mastery approach goals positively predicted subsequent positive emotions, behavioral engagement, and cognitive engagement. Engagement dimensions did not relate to succeeding positive emotions and mastery approach goals. Results of this investigation highlight the emotional and academic benefits associated with students' intrinsic drive to learn in school contexts.



## La vida comprometida académicamente de los estudiantes orientados al dominio: Orden causal entre emociones positivas, metas de dominio y compromiso académico

*Palabras clave:*
compromiso académico
estudiantes filipinos
metas de dominio
emociones positivas

RESUMEN

Aunque investigaciones previas muestran que el bienestar personal está conectado con un aprendizaje efectivo, existe poca investigación sobre cómo las emociones positivas se relacionan con las metas de logro y las medidas objetivas de participación escolar. Sobre la base de la teoría de la expansión y construcción de emociones positivas, este estudio examina las asociaciones recíprocas entre las emociones positivas sobre metas de dominio y la participación académica estimada por el profesor (usando un diseño longitudinal de dos-ondas). Se ha administrado una encuesta que comprende medidas para evaluar las emociones positivas de los estudiantes (i.e., Modified Differential Emotions Scale; Fredickson et al., 2003) y sus metas de dominio (i.e., Achievement Goal Questionnaire - Revised) a 411 estudiantes de secundaria filipinos, en dos momentos distintos, con un intervalo de un mes. Diez orientadores escolares también han completado una medida de participación académica para proporcionar una estimación más objetiva de

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la intervención de cada estudiante en las actividades académicas. Los resultados de las ecuaciones estructurales de modelo de panel con retraso cruzado ("cross-panel structural equation modeling"), a través del enfoque de estimación de máxima probabilidad, muestran que las emociones positivas tienen relaciones simultáneas positivas con las metas de dominio y todas las dimensiones de compromiso académico. En contraste con investigaciones previas, las emociones positivas no predicen las metas de dominio subsiguientes y el compromiso académico, después de controlar los efectos del auto-regresor. Las metas de dominio predicen positivamente las emociones positivas subsiguientes, así como la implicación comportamental y cognitiva. Las dimensiones de compromiso no se relacionan con las emociones positivas sucesivas y las metas de dominio. Los resultados de esta investigación destacan los beneficios emocionales y académicos asociados con el impulso intrínseco de los estudiantes para aprender en contextos escolares.



## Introduction

Positive emotions serve as one of the essential "markers of flourishing, or optimal well-being" (Fredrickson, 2001, p. 218). Existing literature has also emphasized how positive emotions such as joy, interest, love, pride, and contentment, facilitate increased psychological well-being (Fredrickson, 2001; Yi et al., 2019). Prior research demonstrates that positive emotions can promote positive social connections and build physical health (Kok et al., 2013). In the school settings, higher levels of positive emotions have been linked to increased psychological capital resources (Carmona-Halty et al., 2019a, 2019b), academic engagement (Denovan et al., 2020; Salanova et al., 2011), and academic achievement (Lam et al., 2015; Pekrun et al., 2017). These findings clearly underscore the academic benefits of experiencing positive affective states in various domains.

Despite the promising line of evidence on how positive emotions predict learning outcomes, there are still gaps that remained unaddressed by previous investigations. Firstly, as past studies commonly relied on assessing the link of domain-specific emotions like achievement emotions to students' academic outcomes (Carmona-Halty et al., 2019a, 2019b; Lam et al., 2015), results have limited implications for understanding the role of domain-general or broader emotions in learning processes and academic functioning. Secondly, although there is evidence showcasing how positive emotions predict engagement (Denovan et al., 2020; Salanova et al., 2011), these studies used self-reported measures of academic engagement so findings could have been impacted by social desirability biases and common method variance. Thirdly, as previous studies have been commonly carried out in Western and individualist countries like the United States, findings are not generalizable to non-Western and collectivist contexts. Therefore, this research aims to examine the associations of positive emotions with mastery-approach goals and teacher-reported academic engagement among Filipino high school students using a two-wave longitudinal design.

### *Positive emotions and academic outcomes*

Positive emotions have been linked to increased academic engagement (Carmona-Halty et al., 2019a; Denovan et al., 2020; Oriol-Granado et al., 2017) and achievement (Carmona-Halty et al., 2019b; Lam et al., 2015). For example, there is evidence showing how academic engagement mediated the links between positive emotions and academic achievement among high school (Oriol-Granado et al., 2017) and undergraduate students (Carmona-Halty et al., 2019a). Carmona-Halty et al. (2019b) also showed that high school students' positive emotions could predict academic achievement through the mediating function of psychological capital such as efficacy and resilience. However, these studies mainly relied on self-reported measures of engagement, which is prone to methodological issues like common method variance.

Studies have also provided evidence on the longitudinal links between positive emotions and academic outcomes. Pekrun et al.'s (2017) large-scale, five-wave longitudinal study demonstrated that positive emotions positively predicted subsequent math achievement, and that academic achievement positively predicted positive emotions. Ouweneel et al. (2011) conducted a two-wave, longitudinal study with a 4-week interval among 391 university students and found that the relationship between positive emotions and subsequent academic engagement was non-significant. The finding was inconsistent with Salanova et al.'s (2011) longitudinal study, which showed that positive emotions had a significant impact on university students' activity engagement. Similarly, in Denovan et al.'s (2020) two-wave panel study with 217 undergraduate students, positive emotions have been linked to increased subsequent academic engagement. Indeed, there is mixed evidence on how positive emotions predict engagement.

### *Mastery-approach goals, well-being, and academic engagement*

Mastery-approach goals belong to one type of achievement goals and are viewed as focusing attention on the continual and self-referenced mastery of various academic tasks (Elliot & McGregor, 2001; Pekrun et al., 2014). For this reason, previous literature has paid attention to the role of mastery-approach goals in students' well-being. Recent investigations further confirmed this finding and showed that students' mastery-approach goals were positively associated with positive emotions such as enjoyment (Goetz et al., 2016; Pekrun et al., 2014). Mastery-approach goals have been consistently associated with students' academic well-being (Touminen-Soini et al., 2012), and school-specific positive affect and satisfaction (Tian et al., 2017; Zhou et al., 2020) and reduced boredom (Pekrun et al., 2014). Academic engagement is a multifaceted construct encompassing students' overall involvement in school-related activities which commonly includes cognitive, behavioral, and emotional components (Fredricks et al., 2004). Previous review shows that students' academic engagement is positively associated with positive emotions and academic achievement (Upadyaya & Salmela-Aro, 2013). This review also indicates that engagement is linked to reduced depression and burnout (Upadyaya & Salmela-Aro, 2013).

In terms of the relationship between mastery-approach goals and academic engagement, it has been found that a mastery-oriented classroom climate promotes students' academic engagement (Upadyaya & Salmela-Aro, 2013). Wang et al. (2017) also found that mastery-approach goals are linked to a higher level of students' academic engagement, lower intensity of withdrawal, and avoidance of challenges as well as disruptive behaviors. Wang et al. (2019) study further revealed that mastery-approach goals mediated the relationship between parenting and students' self-reported engagement in school. A longitudinal study of elementary school students revealed a more complex mechanism, which argued that academic engagement plays a mediating role in

the relationship between mastery-approach goals and subjective well-being in school (Yi et al., 2019).

*Theoretical framework*

This study explores the reciprocal associations of positive emotions with mastery-approach goals and academic engagement dimensions among Filipino high school students via a two-wave cross-lagged panel modeling approach. In rationalizing the hypothesized link of positive emotions to such learning-related constructs, this research draws from two existing theoretical theories namely *broaden-and-build theory*, (Fredrickson, 2001) and *hierarchical model of achievement motivation* (Elliot, 1999). First, guided by the *broaden-and-build theory* of positive emotions (Fredrickson, 2001), this study anticipates that positive emotions may positively predict subsequent mastery-approach goals and dimensions of academic engagement. This theory posits that positive emotions broaden our mindsets that are essential in building social, psychological, physical, and performance resources. In this research, it is hypothesized that earlier levels of positive emotions may relate to approach-types of mindset as research shows that positive emotions predict mastery-approach goals (Schweder, 2020). Further, it is logical to anticipate positive association of earlier levels of positive emotions with subsequent academic engagement given the evidence about the role of well-being dimensions (i.e. positive emotions, flourishing, and life satisfaction) in students' academic engagement (Datu & King, 2018; Lewis et al., 2009). There is also evidence showing how domain-general positive emotional states predict longitudinal increases in effective learning outcomes (Denovan et al., 2020; Salanova et al., 2011). Building on the *upward spiral hypothesis* (Burns et al., 2008) of the *broaden-and-build theory*, which suggests that personal resources gained from positive emotions consequently and reciprocally reinforces emotional well-being over time, it makes sense to argue that all academic engagement dimensions can predict positive emotions and mastery-approach goals. These predictions corroborate previous research finding on how academic engagement predicted mastery-approach goals (Upadyaya & Salmela-Aro, 2013).

Second, to rationalize the positive link of mastery-approach goals to subsequent academic engagement dimensions and positive emotions, this study draws from *achievement goal orientation theory* (Elliot, 1999). This theory categorized achievement goals into four domains namely: mastery-approach goals, performance-approach goals, mastery-avoidance goals, and performance-avoidance goals. Specifically, mastery-approach goal is the extent to which an individual accomplishes academic activities to master and strengthen the understanding of the subject while mastery-avoidance pertains to individual's motivation to do academic task to avoid worrying on not learning such. Performance-approach goals, on the other hand, defines students who are driven to excel to outperform their peers while performance-avoidance refers to students who are motivated to learn to avoid being outperformed by their peers. Consistent with the existing literature that mastery approach is the most optimal orientation that link to effective learning outcomes (Elliot, 1999; Elliot & Murayama, 2008), it is likely that mastery-approach goals may positively predict academic engagement dimensions and positive emotions. This corroborates prior research (Datu & Park, 2019) demonstrating positive associations of mastery-approach goals with behavioral, emotional, and cognitive engagement. It also makes sense to argue that this mastery-approach goal may be linked to subsequent positive emotions as prior studies show associations between mastery goals and well-being (i.e. Howell, 2009; Tuominen et al., 2020). In this study, the following hypotheses were tested: *Hypothesis 1*: Positive emotions positively predict subsequent mastery-approach goals and all academic engagement dimensions (i.e. behavioral, emotional, and cognitive engagement) after controlling for auto-regressor effects; *Hypothesis 2*: Mastery-approach goals positively predict succeeding positive emotions and academic engagement dimensions (i.e. behavioral, emotional, and cognitive engagement) after controlling for auto-regressor effects; and, *Hypothesis 3*: All academic engagement dimensions (i.e. behavioral, emotional, and cognitive engagement) predict subsequent positive emotions and mastery-approach goals after controlling for auto-regressor effects.

## Method

*Participants*

This sample comprised 411 Filipino secondary school students from a public high school in Quezon City, Philippines. Commonly, public secondary school students belong to low to middle income families. Convenience sampling approach was used to recruit these participants who agreed to fill in a paper-and-pencil survey at three different times. These students also consented to be evaluated by their respective classroom advisers on their behavioral, cognitive, and emotional engagement in academic tasks. The average of participants was 14.23 with a standard deviation of 1.92. Majority of the participants were girls ($n$ = 226, 54.99%) while the remaining ones were boys ($n$ = 185, 45.01%). This study was drawn from a project which explored longitudinal predictors of students' academic and mental health outcomes.

*Measures*

*Positive emotions.* The 10-item *positive emotions* subscale of *Modified Differential Emotions Scale* (Fredrickson et al., 2003) was used to assess participants' positive affective states for past two weeks. Items were marked on a 5-point Likert scale with 0 indicating *never* and 4 suggesting *most of the time*. Sample items include: "How often have you felt amused, fun-loving, and silly", and "How often have you felt hopeful, optimistic, or encouraged?". The Composite Reliability (CR) and Average Variance Extracted (AVE) values of this scale were: (a) $CR_{Time1}$ = .79; (b) $CR_{Time2}$ = .85; (c) $AVE_{Time1}$ = .28; and (d) $AVE_{Time2}$ = .38.

*Mastery approach goals.* The 3-item *mastery-approach goals* subscale of Achievement Goal Questionnaire – Revised (Elliot & Murayama, 2008) was used to assess the participants' perceived drive to learn due to the intrinsic joy associated with learning. Items were marked on a 5-point Likert scale with 1 suggesting "*Strongly disagree*" and 5 indicating "*Strongly agree*". Sample item in the scale includes: "My aim is to completely master the material presented in this class". The Composite Reliability (CR) and Average Variance Extracted (AVE) values of this scale were: (a) $CR_{Time1}$ = .75; (b) $CR_{Time2}$ = .77; (c) $AVE_{Time1}$ = .51; and (d) $AVE_{Time2}$ = .53.

*Academic engagement.* To provide a more objective estimate of students' *behavioral*, *cognitive*, and *emotional engagement*, items in the *behavioral* and *emotional* engagement subscales of Academic Engagement and Disaffection Scale (AEDS; Skinner et al., 2009) and cognitive engagement subscale of Wolters's (2004) questionnaires were modified to develop a 9-item teacher-reported measure of engagement. Specifically, three items in each subscale of teacher-reported *behavioral* and *emotional engagement* dimensions of the AEDS were used to assess such domains of engagement in this study. Items that overlapped with the content of selected items were no longer included to reduce possible redundancy and teachers' workload linked to answering such survey items. Further, as the items in the *cognitive engagement* scale (Wolters, 2004) were originally constructed to assess students' subjective sense of cognitive and metacognitive engagement in academic tasks, we chose three items that may reflect behavioral indications of this engagement facet. Then, we slightly modified relevant phrases on these

**Table 1**
Descriptive statistics, reliability coefficients, and correlational analyses among the variables

| | α | ω | *M* | *SD* | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Time 1 Positive emotions | .78 | .79 | 2.78 | .55 | – | | | | | | | | | |
| 2. Time 1 Mastery-approach goals | .72 | .79 | 4.10 | .68 | .35*** | – | | | | | | | | |
| 3. Time 1 Behavioral engagement | .95 | .95 | 3.52 | .88 | .31*** | .27*** | – | | | | | | | |
| 4. Time 1 Emotional engagement | .96 | .96 | 3.45 | .87 | .28*** | .24*** | .89*** | – | | | | | | |
| 5. Time 1 Cognitive engagement | .99 | .99 | 3.18 | .92 | .24*** | .23*** | .85*** | .85*** | – | | | | | |
| 6. Time 2 Positive emotions | .85 | .86 | 2.81 | .59 | .49*** | .38*** | .30*** | .31*** | .26*** | – | | | | |
| 7. Time 2 Mastery-approach goals | .76 | .86 | 4.03 | .74 | .27*** | .49*** | .26*** | .25*** | .21*** | .49*** | – | | | |
| 8. Time 2 Behavioral engagement | .97 | .97 | 3.90 | .86 | .25*** | .30*** | .81*** | .75*** | .72*** | .30*** | .25*** | – | | |
| 9. Time 2 Emotional engagement | .95 | .95 | 3.34 | .84 | .23*** | .21*** | .76*** | .74*** | .69*** | .25*** | .23*** | .89*** | – | |
| 10. Time 2 Cognitive engagement | .98 | .98 | 3.24 | .84 | .19*** | .25*** | .75*** | .73*** | .76*** | .26*** | .19*** | .85*** | .84*** | – |

*Note.* * $p < .05$. ** $p < .01$. *** $p < .001$. Omega coefficients are located across the diagonal.

items so that they would be able to assess teachers' perceptions of students' degree of cognitive engagement in school-related tasks. Although the original scale adopted a 7-point likert response format, we chose a 5-point Likert scale with 1 indicating *not at all true* and 5 suggesting *very true* in order to ensure that a similar range of scale options was utilized across engagement subscales in this study. Sample items in each subscale includes: "In my class, this student works as hard as he/she can" (*behavioral engagement*), "For this student, learning seems to be fun" (*emotional engagement*), and "This student tries to relate what he/she learns to what he/she already knows" (*cognitive engagement*). As classroom advisers in this research site typically spend more time with the students/participants who belong to their classes, it is reasonable to expect that they would have better understanding about the extent of students' involvement in school-related activities. The Composite Reliability (CR) and Average Variance Extracted (AVE) values of this scale were: (a) $CR_{Time1} = .98$; (b) $CR_{Time2} = .99$; (c) $AVE_{Time1} = .90$; and (d) $AVE_{Time2} = .91$. Note that all the reliability estimates (i.e., Cronbach's alpha and Omega coefficients) were reported on Table 1.

### *Procedure*

Prior to survey administration, first author distributed active consent forms to participants and their respective parents. After securing their approval, a survey packet was administered to participants at two separate times with 1-month interval in their classrooms. Prior research indicates that a 4-week interval between two measurements of variables are methodologically acceptable in exploring longitudinal associations of well-being with various outcomes (Daniels & Guppy, 1994). Approximately, it took around 25 minutes for students to complete the survey. Further, the class advisers ($n = 10$) of participants were invited to fill in an active consent form to provide an estimate of each student's *behavioral, cognitive*, and *emotional* engagement in their respective classes. Given that there was no institutional review board in first author's college when data collection took place, he secured an ethical clearance application in the Human Research Ethics Committee of The Education University of Hong Kong.

### *Data analyses*

Firstly, the proportion of missing responses and Little's missing completely at random (MCAR) test were used to analyze pattern of missing responses. This served as a basis for adopting specific imputation approach for address missing responses in both phases of data collection. Secondly, Omega reliability coefficients and descriptive statistical values (e.g., mean and standard deviation) were computed via the JASP software. Thirdly, Pearson-r correlational analyses were done to examine the associations among *positive emotions, mastery-approach goals*, and *engagement* at separate time points. Fourthly, given that structural or measurement models with constructs comprising too many indicators tend to yield biased parameter estimates and models with poor fit indices (Little et al., 2002; Matsunaga, 2008), parceling was used to reduce number of indicators for positive emotions construct. We decided to assess the longitudinal invariance of measurement models with these parcel indicators as prior studies adopted a similar approach in establishing comparability of constructs' definitions over time (Zhou et al., 2021). Specifically, three parcels were created for Time 1 positive emotions and another three parcels for Time 2 positive emotions. The final measurement and structural models had 6 parcel indicators and 24 observed indicators. Fifthly, confirmatory factor analysis (CFA) via robust maximum likelihood estimation approach using Analysis of Moment Structure (AMOS 25v) was done separately for Time 1 and Time 2 datasets in order to determine whether hypothesized measurement model involving: (a) the relationships of observed indicators to underlying constructs; and (b) correlations among *positive emotions, mastery-approach goals*, and *engagement* latent constructs were valid at each phase of data collection. Sixthly, longitudinal CFA was conducted to evaluate invariance of hypothesized measurement model across time points. Invariance at specific measurement levels (e.g., configural and metric) was inferred if the differences in Comparative Fit Index (CFI) and Root Mean Square Error of Approximation (RMSEA) values are lower than .01, which corroborated acceptable cut-off values in existing literature (Koomen et al., 2012). Lastly, cross-lagged panel structural equation modeling via maximum likelihood estimation approach using AMOS was utilized to address the study's primary hypotheses. Specifically, the final structural model had 6 latent constructs, 18 indicators, and 18 error terms. Error terms of specific indicators of a Time 1 latent construct (e.g., error term of Time 1 first observed indicator of *positive emotions*) were correlated with error terms of similar Time 2 latent construct' indicators (e.g., error term of Time 2 first observed indicator) as prior research adopted this approach in order to account for the influence of measurement errors which could lead to biased parameter estimates in longitudinal structural models (Marsh & Yeung, 1998). In judging the acceptability of hypothesized measurement and structural model, we relied on the recommended fit indices of Hair et al. (2010) such as: (a) CFI and TLI greater than .90; and (b) RMSEA and SRMR lower than .08.

## Results

### *Preliminary, descriptive, reliability, and correlational analyses*

Result of Little's Missing completely at random test (MCAR; Little, 1988) showed that around 4% of the items had missing responses but these were not missing completely at random, $\chi^2 = 2420$, $df = 1864$, $p < .001$. In this case, expectation-maximization imputation strategy is considered a methodologically acceptable approach to address missing responses (Schlomer et al., 2010). Imputed dataset was used in succeeding analyses.

**Table 2**
Cross-sectional CFA for Time 1 and Time 2

| Model | $\chi^2$ | *df* | $\chi^2/df$ | *p* | CFI | TLI | SRMR | RMSEA | 90% CI RMSEA |
|---|---|---|---|---|---|---|---|---|---|
| Model 1 (Time 1 measurement model) | 152.38 | 80 | 1.91 | <.001 | .99 | .99 | .026 | .047 | .036, .058 |
| Model 2 (Time 2 measurement model) | 259.61 | 80 | 3.25 | <.001 | .98 | .97 | .022 | .074 | .064, .084 |

**Table 3**
Longitudinal measurement invariance of the hypothesized measurement model

| Model | $\chi^2$ | *df* | $\chi^2/df$ | *p* | CFI | ΔCFI | RMSEA | 90% CI RMSEA | Δ RMSEA |
|---|---|---|---|---|---|---|---|---|---|
| Model 1 Configural invariance | 411.99 | 160 | 2.58 | <.001 | .982 | – | .044 | .039, .049 | – |
| Model 2 Metric invariance | 439.64 | 170 | 2.59 | <.001 | .981 | .001 | .044 | .039, .049 | .000 |
| Model 3 invariance | 464.67 | 185 | 2.51 | <.001 | .980 | .001 | .043 | .038, .048 | .001 |
| Model 4 Strict invariance | 588.22 | 200 | 2.94 | <.001 | .972 | .008 | .049 | .044, .053 | .006 |

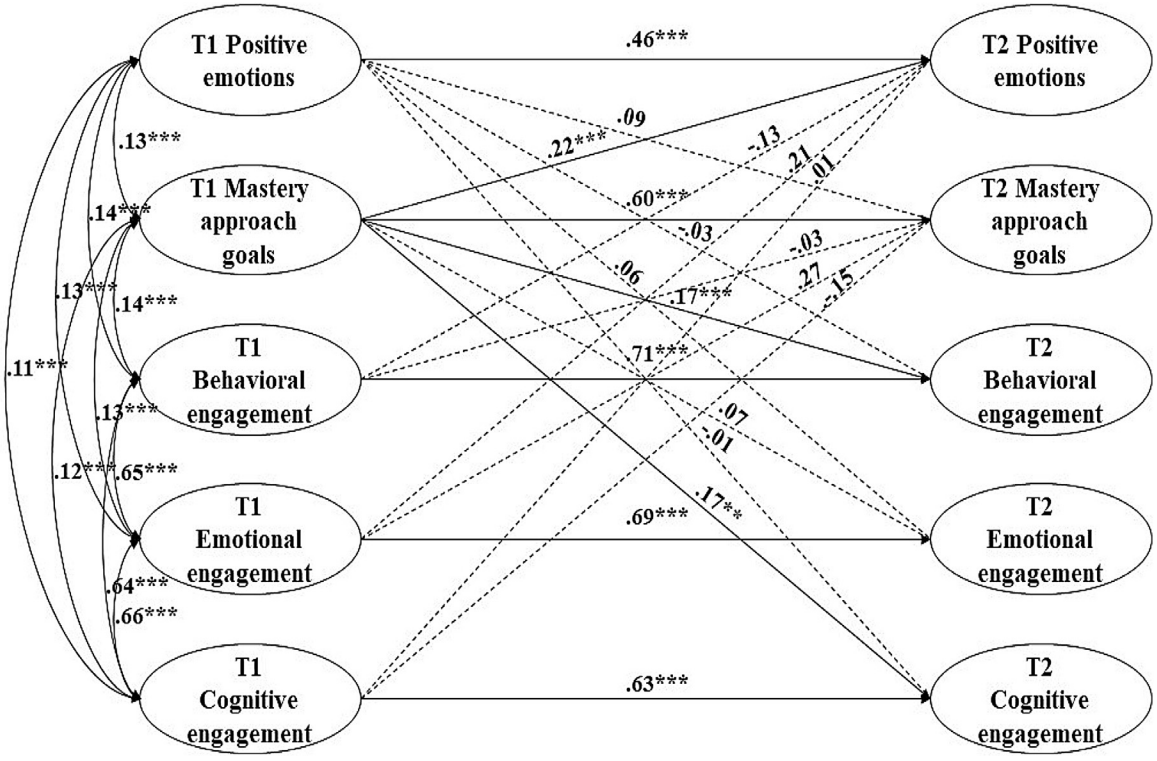


**Figure 1.** Cross-lagged panel structural equation model among positive emotions, mastery-approach goals, and academic engagement dimensions.
*Note.* *** $p < .001$. ** $p < .01$. * $p < .05$. All indicators and errors were omitted in this model to enhance clarity of the schematic diagram.

Table 1 describes the results of descriptive statistics, reliability analyses, and zero-order correlational analyses. A review of Omega coefficients indicate that all scales had moderate to high reliability coefficients across two periods. As expected, Time 1 *positive emotions* had positive correlations with Time 1 *mastery-approach goals*, all dimensions of Time 1 *academic engagement*, Time 2 *mastery-approach goals*, and all facets of Time 2 *engagement*. Further, Time 1 *mastery-approach goals* had positive correlations not only with Time 1 *engagement* dimensions but also to Time 2 *positive emotions* and all Time 2 *engagement* facets. All Time 1 *engagement* dimensions were positively correlated with Time 2 *positive emotions* and Time 2 *mastery-approach goals*.

### *Cross-sectional measurement models and longitudinal measurement invariance test*

CFA performed on Time 1 measurement model showed that the model had good fit: $\chi^2 = 152.38$, $df = 80$, $p < .001$, CFI = .99, TLI = .99, SRMR = .026, and RMSEA = .047 (.036, .058). All observed indicators significantly loaded on their respective latent constructs at $p < .001$. All Time 1 latent constructs (i.e. *positive emotions, mastery-approach goals, behavioral engagement, emotional engagement*, and *cognitive engagement*) had positive correlations.

CFA conducted at Time 2 data also showed good fit: $\chi^2 = 259.61$, $df = 80$, $p < .001$, CFI = .98, TLI = .97, SRMR = .022, and RMSEA = .074 (.064, .084). Observed indicators significantly loaded onto hypothesized latent constructs where they were subsumed. There were positive correlations among all Time 2 latent constructs. Table 2 reports fit indices of hypothesized measurement models.

Longitudinal confirmatory factor analysis (CFA) showed that the hypothesized measurement model was equivalent at both time points. Specifically, results demonstrated that changes in CFI and RMSEA were lower than .01 and .015 respectively for all levels of invariances (e.g., configural and metric invariances). The fit indices and changes in CFI as well as RMSEA are reported in Table 3.

### *Cross-lagged panel structural equation modeling*

Findings of cross-lagged panel SEM which tested: (1) paths from Time 1 *positive emotions* and Time 1 *mastery-approach goals* to Time

2 *academic engagement* domains, (2) paths from Time 1 *mastery-approach goals* to Time 2 *positive emotions*, and (3) paths from Time 1 *engagement* dimensions to Time 2 *positive emotions* and Time 2 *mastery-approach goals*, demonstrated very good fit: $\chi^2 = 828.75$, $df = 351$, $p < .001$, CFI = .97, TLI = .95, SRMR = .049, and RMSEA = .058 (.053, .063). Time 1 positive emotions latent construct had positive correlations with Time 1 *mastery-approach goals* as well as all Time 1 *academic engagement* dimensions. Hypothesis 1 was not supported as Time 1 *positive emotions* did not predict Time 2 *mastery-approach goals* and all Time 2 *engagement* domains after controlling for auto-regressor effects. Hypothesis 2 was partly confirmed as Time 1 *mastery-approach goals* positively predicted Time 2 *positive emotions* $B = .22$, $p < .001$, Time 2 *behavioral engagement* $B = .17$, $p < .001$, and Time 2 *cognitive engagement* $B = .17$, $p < .01$. Results did not corroborate Hypothesis 3 as Time 1 *engagement* dimensions did not predict Time 2 *positive emotions* and Time 2 *mastery-approach goals*.

Further, we tested an alternative structural model, which only examine the unidirectional associations of *positive emotions* and *mastery-approach goals* with subsequent *behavioral, cognitive*, and *emotional* engagement. Results demonstrated good fit: $\chi^2 = 860.26$, $df = 358$, $p < .001$, CFI = .966, TLI = .956, SRMR = .057, and RMSEA = .058 (.054, .064). Time 1 *positive emotions* positively predicted Time 2 *mastery-approach goals* but not Time 2 *engagement* dimensions. Time 1 *mastery-approach goals* positively predicted Time 2 *behavioral engagement* and Time 2 *cognitive engagement*. As the $\chi^2$ *difference* test for the hypothesized and alternative models indicates that there was a statistically significant difference $\chi^2_{diff.} = 31.51$, $df_{diff.} = 7$, $p < .001$, we adopted the hypothesized cross-lagged model (see Figure 1).

## Discussion

There is inconclusive evidence about the role of positive emotions in students' learning, with some research demonstrating how positive emotions or any well-being dimension relate to longitudinal increases in positive academic outcomes (Denovan et al., 2020; Salanova et al., 2011), while others showing non-significant link between positive emotions and engagement (Ouweneel et al., 2011). This research demonstrated that positive emotions did not relate to mastery-approach goals and academic engagement over time.

Contradicting results from previous research, positive emotions did not predict subsequent mastery-approach goals and teacher-reported behavioral, cognitive, and emotional engagement. These results suggest that experiencing positive emotions may not relate to intrinsic desire for learning and overall involvement in school activities, which corroborates past research on the non-significant association between positive emotions and study engagement (Ouweneel et al., 2011). These findings also contradicted prior studies, which showcased the educational benefits associated with students' positive emotional states (Denovan et al., 2020; Pekrun et al., 2017; Salanova et al., 2011). The absence of significant paths between positive emotions and such key learning outcomes may point to issues regarding the generalizability of the fundamental tenets of broaden-and-build theory (Fredrickson, 2001) in non-Western cultural societies such as the Philippines. It is likely that positive emotions may not significantly relate to subsequent behavioral, cognitive, and emotional engagement given that in collectivist contexts (e.g., Philippines), individuals tend to adopt a highly context-sensitive self (Suh, 2007), which increases likelihood that situational and social factors impact on their behaviors, thinking patterns, and emotions. If collectivists espouse a context-sensitive self, it is plausible that they might associate positive emotions with normative or social expectations (e.g., experiencing joy after meeting parental academic expectations) which in turn, may enhance academic-related pressure. For example, it is likely that experiencing socially oriented happiness might serve as a catalyst of positive learning processes and engagement outcomes in collectivist societies given the emphasis of these cultural contexts in promoting smooth interpersonal relations (Suh, 2007). However, this claim is speculative which warrants further research on the role that social factors play in the link between positive emotions and engagement.

Mastery-approach goals positively predicted succeeding positive emotions after controlling for auto-regressor effects. This result indicates that intrinsic desire for learning is associated with increased emotional well-being over time, which confirmed findings from prior studies on the mental health benefits of this achievement goal orientation (Pekrun et al., 2014; Tian et al., 2017; Zhou et al., 2020). It is possible that mastery-oriented goal may be linked to greater levels of positive emotions as extant evidence suggests that students with this achievement goal orientation tend to experience a sense of personal fulfilment in learning or academic-related activities (Elliot, 1999; Elliot & Murayama, 2008). Further, prior research findings also indicate that adoption of mastery-approach goals facilitates better relationships with peers (Liem et al., 2008), which is important in collectivist societies. Generally, these results are consistent with the basic assumptions of the *achievement goal orientation theory* (Elliot, 1999; Elliot & Murayama, 2008), which emphasizes the benefits associated with espousing intrinsic motives for gaining knowledge in various academic subject areas.

In this study, mastery-approach goals were associated with increased levels of behavioral and cognitive engagement over time after controlling for auto-regressor effects. These findings align well with previous research, which demonstrated how mastery-approach goals promote various dimensions of academic engagement (Upadyaya & Salmela-Aro, 2013). It is expected that mastery-approach goals might relate to longitudinal changes in engagement as existing motivational models (Elliot & Murayama, 2008; Ryan & Deci, 2017) have underscored the importance of fostering intrinsic types of motivational orientation in boosting optimal learning outcomes. Despite the resemblance of our findings to existing literature, a unique contribution of this research points to showing preliminary evidence about the role of mastery-approach goals in students' teacher-reported behavioral and cognitive engagement given that prior research relied on subjective measures of school engagement. However, behavioral, cognitive, and emotional engagement did not predict subsequent mastery-approach goals. This non-significant links between engagement dimensions and succeeding mastery-approach goals allude to the possibility that involvement in school-based activities may not precede development of intrinsic desire for learning or mastery-approach goal orientation. Instead, mastery-oriented goals are likely to serve as a predictor of academic engagement. Similar pattern of temporal association was also observed between mastery-approach goals and subsequent positive emotions. These findings, indeed, offer precise insights about causal ordering between mastery-approach goals and engagement as well as affective well-being in selected Filipino high school students.

In addition, this research showed that behavioral, emotional, and cognitive engagement did not predict subsequent positive emotions. These results did not corroborate previous research finding on the positive links of engagement to emotional well-being (Upadyaya & Salmela-Aro, 2013). Coupled with the findings on the non-significant relationships of positive emotions to subsequent engagement, which indicates absence of reciprocal associations between positive emotional states and engagement dimensions, this study did not generate evidence on the 'upward spiral hypothesis' (Burns et al., 2008). It is possible that engagement may not

relate to longitudinal increases in positive emotions as students might associate academic tasks with stress in performing such educational activities and parental academic expectations. However, given the speculative nature of this conclusion, further studies are needed to explore the role of interpersonal and other contextual factors in the possible links between school engagement and well-being outcomes.

This study has limitations. Given that this study adopted a correlational design in investigating the longitudinal associations among positive emotions, mastery-approach goals, and academic engagement dimensions, results do not necessarily offer insights on the causal effects of positive emotions on learning outcomes or the other way around. Future studies can address this limitation through conducting experimental designs. As there was a relatively short time lag between the first and second measurements of positive emotions and academic variables, results may not provide inferences about the long-term associations of positive emotions with achievement goal orientation and engagement. Conducting longitudinal cross-lagged panel studies with longer interval between measurements of affective states and learning variables can generate stronger evidence regarding causal ordering among these variables. Due to the relatively low average variance extracted values (AVE) of the positive emotions and mastery-approach goals, caution should be exercised when evaluating the construct validity of such variables in this investigation. Given that this research concentrated on examining the benefits associated with positive emotions in selected Filipino high school students in one school only, this increases the likelihood of strong dependencies in sampling. Results are also not generalizable to student samples in the Philippines and from other collectivist contexts. Future studies can provide address this methodological shortcoming through carrying out cross-temporal studies involving students from multiple sites in the Philippines as well as other collectivist countries (e.g., South Korea and Thailand) in order to expand this generalizability of findings to non-Western societies. Further, as this study relied on a CFA-based approach in generating evidence about longitudinal measurement invariance even if the dataset involved ordered-categorical indicators which might potentially yield models with inferior parameter estimates (Liu et al., 2017), results on the equivalence of our hypothesized measurement models over time should be treated with caution. Future research can address this shortcoming via adopting more rigorous techniques in assessing invariance of longitudinal measurement invariance models with ordered-categorical data (Liu et al., 2017; Millsap & Yun-Tein, 2004).

Nonetheless, this research has unique contributions to existing educational psychological literature. Although prior studies have used self-reported measures of engagement (Denovan et al., 2020; Pekrun et al., 2017), this is the first research to utilize an objective index of academic engagement in examining the role of students' positive emotions in engagement outcomes. Building on previous research about the cross-sectional association between mastery-approach goals and academic engagement in Filipino high school students (Datu & Park, 2019), this research showed that mastery-approach goals were linked to cross-temporal increases in objective behavioral and cognitive engagement, as well as positive emotions. This study also contributes to inconclusive evidence about the role that affective well-being plays in students' achievement goal orientations and academic engagement by demonstrating that positive emotions did not relate to subsequent mastery-oriented goals and all engagement dimensions. Clearly, this research indirectly contradicts existing evidence on the capacity of positive emotions to "broaden-and-build" students' important learning resources in school contexts.

This study has practical implications. Counselors, school psychologists, and other school-based allied health professionals are encouraged to practice caution in generalizing the benefits of happiness-increasing interventions in students' academic functioning as this study demonstrated non-significant cross-temporal associations of positive emotions with mastery-approach goals and engagement. Given the link of mastery-approach goals to longitudinal increases in objective academic engagement, teachers and school psychologists are recommended to design instructional approaches that cultivate intrinsic joy associated with learning activities in classroom contexts. For example, it is important for teachers to clearly understand students' unique learning needs in order to build instructional strategies that optimize personal drive for learning in specific subjects or domains of academic performance. As mastery-approach goals was linked to increased positive emotions over time, school psychologists and counselors may consider incorporating intrinsic academic motivation in school-wide mental health programs that aim to foster well-being in secondary school students.

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