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Longitudinal examination of personal self-efficacy and engagement-related attributes: How do they relate

Huy P. Phan, Bing H. Ngu

School of Education, University of New England, Armidale NSW 2351 AUSTRALIA

Email address:
hphan2@une.edu.au (H. P. Phan), bngu@une.edu.au (B. H. Ngu)

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Abstract: A synthesis of the contemporary literature indicates that longitudinal examination of self-efficacy beliefs in educational contexts has been limited to a few notable studies. The present study, utilizing a longitudinal research design, makes attempts to explore the distal impact of students' enactive learning experiences on their academic self-efficacy beliefs. More importantly, apart from this research focus, we also examine the interrelations between self-efficacy and three major motivation-related attributes of engagement (e.g., absorption) on students' achievement outcomes in the subject mathematics. This avenue of inquiry, for example, stipulates motivation-related attributes of engagement as potential consequences and antecedents of self-efficacy beliefs. 326 Year 10 students (185 girls, 141 boys) participated in this investigation. We administered a number of Likert-scale questionnaires on multiple occasions over a two-year period, using SEM to analyze the repeated data. M*Plus* 7.11 yielded some key findings for discussion and educational consideration, for example: the positive influence of Time 1 enactive learning experience on Time 2 self-efficacy and Time 3 motivation-related attributes of engagement; and the positive influence of Time 2 and Time 4 self-efficacy beliefs on Time 5 achievement outcomes. Finally, evidence obtained indicated the mediating mechanisms of both self-efficacy and motivation-related attributes.

Keywords: Personal Self-Efficacy, Motivation-Related Attributes of Engagement, Longitudinal Examination, Distal Impact

1. Personal Self-Efficacy: A Brief Revisitation

Personal self-efficacy, situated within the framework of social cognition [1, 2], is a self construct that has been researched extensively in the context of academic learning [3, 4]. Personal self-efficacy, defined as belief in one's capability to execute required courses of action, governs one's choice of behaviors and aspirations, and the mobilization and maintenance of effort [2]. Self-efficacy, as substantial researches have shown, features prominently in human agency, enabling individuals to aspire and achieve a number of ambitious undertakings (e.g., obtaining an average GPA of A). A heightened sense of self-efficacy, in this case, mobilizes affective responses (e.g., weakening one's anxiety), and mobilizes individuals to persist and expend appropriate effort measures. A weakened sense of self-efficacy, in contrast, diminishes one's effort, and results in maladaptive outcomes.

Over the past three decades, since Bandura's (1977) seminal publication (titled: 'Self-efficacy: Toward a unifying theory of behavioral change'), there has been a plethora of research studies that detail the potency of this theoretical construct in both educational and non-educational contexts. One avenue of inquiry, specific to the study of mastery and quality learning outcome, is the relationship between personal self-efficacy and other psychosocial factors and cognitive-motivational processes. A synthesis of the literature, to date, indicates a number of research investigations that have explored this research focus, utilizing complex quantitative methodological approaches [e.g., 5, 6-10]. Evidence ascertained from correlational analyses reveals, for example, the interrelatedness between personal self-efficacy and study processing strategies. A heightened sense of academic self-efficacy, for example, is related to the use of deep cognitive strategies [5, 6, 11, 12]. A weakened sense of self-efficacy may, in contrast, result in adoption of superficial cognitive strategies for learning [6].

One area of research inquiry, which we advance in the present study, is a longitudinal examination of personal

self-efficacy beliefs in academic contexts. This focus, in comparison to other research aims and objectives, has been relatively modest [9, 13-15]. Advantageously, of course, from a methodological perspective, the use of longitudinal designs may provide a stronger premise for statistical inference relating to causality and causal predominance [9, 13, 16, 17]. Multi-wave data, for example, may enable us to contribute, theoretically, to the understanding of personal self-efficacy. How does self-efficacy function (e.g., as antecedent of adaptive outcomes) in a system of change? The work of Martin, et al. (2010), for example, has shown that self-efficacy serves as both an outcome (i.e., Time 1 academic buoyancy → self-efficacy, β = .25) and antecedent (i.e., self-efficacy → Time 2 academic buoyancy, β = .22) of academic buoyancy. This evidence, we contend, illustrates the featuring of self-efficacy, and forms the basis of other complex longitudinal conceptualizations. The theoretical-conceptual model developed for the present study, presented in Figure 1, details a framework that emphasizes the intricacy of self-efficacy over the course of time.

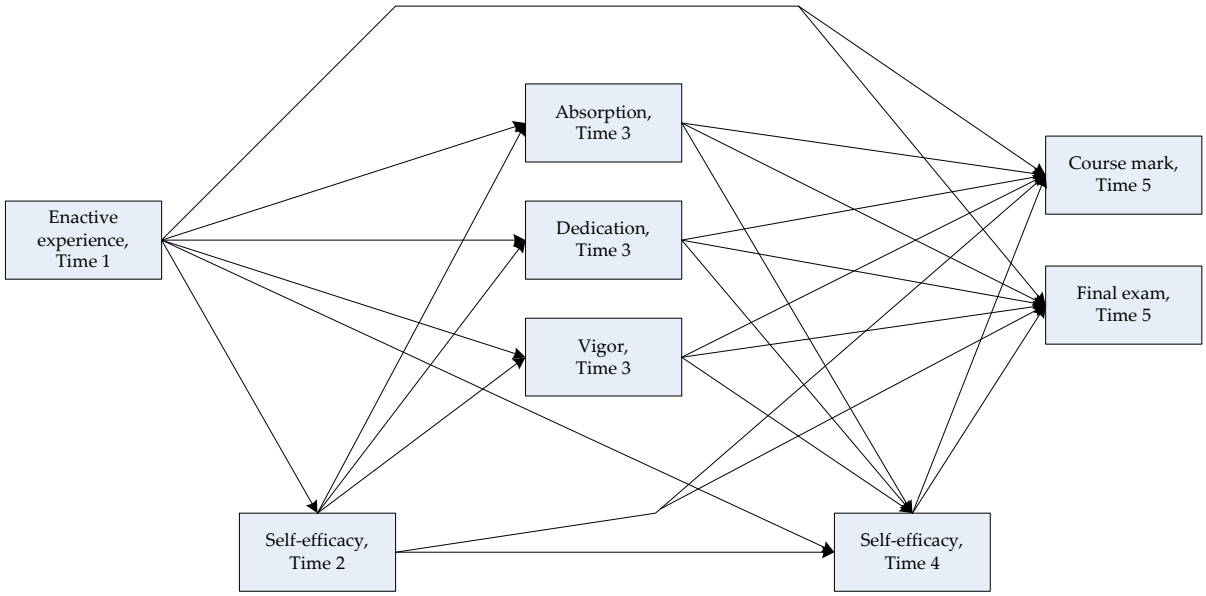

Figure 1. *A Conceptual Model for Examination.*

2. Testing a Longitudinal Model of Personal Self-Efficacy

Personal self-efficacy, according to Bandura (1986, 1997), features prominently in human agency. There is clear and consistent evidence, derived from quantitative analyses, to indicate the predictiveness and mediating role of self-efficacy in educational and non-educational contexts [2-4, 18, 19]. Self-judgments of perceived competence (e.g., 'I feel I have the perceived competence to solve this mathematics problem, $x^2 + 2x = -15$, solve for x'), in this sense, mediate other cognitive-motivational processes to influence individuals' learning and achievement-related outcomes [e.g., 5, 6, 8-10, 20, 21]. The mobilization of effort expenditure and persistence, based on a heightened sense of self-efficacy, for example, may enhance and predict individuals' learning and academic performance outcomes. Expanding the focus on self-efficacy in educational contexts, we contend that there are two major objectives for consideration: (i) the formation of personal self-efficacy, and (ii) the potentials of absorption, dedication, and vigor as consequences of personal self-efficacy.

2.1. Enactive Learning Experience: Formation of Personal Self-Efficacy

One notable inquiry in social cognition [1, 2] relates to the formation of personal self-efficacy. Individuals cognitively appraise their perceived competence via means of four major antecedents, in their order of potency: enactive learning experience (e.g., repeated successes), vicarious experience (e.g., social comparison), verbal persuasion (e.g., attributional feedback), and emotional and physiological states (e.g., mood swing). There is research evidence, derived from self-report measures [e.g., 'I got a high grade in last year's math class': 22], to indicate the potent effect of enactive learning experiences, subject to both mastery and normative evaluative criteria [22-26]. Ongoing successes in a subject matter, for example, are more likely to instill and heighten one's sense of self-efficacy for academic learning. Repeated failures, in contrast, have detrimental consequences, weakening individuals' academic self-efficacy beliefs over time. Educationally, of course, this line of evidence has implications for applied pedagogical practices (e.g., structuring appropriate pedagogical strategies to encourage mastery and deep learning). In essence, considering previous researchers' findings and theoretical contentions, it is of relevance for us to advance

the saliency of this informational source.

An important area for consideration, which we believe is rather limited at present, is the distal impact of one's enactive learning experiences. Does personal academic success in a subject matter, say, hold up over the course of time? Previous cited research [e.g., 22, 24, 27], for example, has predominantly involved cross-sectional data, whereby one's own recall and reflection of personal learning experience is facilitated with the use of self-report questionnaires. This conceptualized approach (i.e., seeking information about an informational source and self-efficacy concurrently) is fundamentally flawed, from our point of view, as educators are seeking to establish an association that is based on individuals' recall of *past* events (e.g., 'I'm sure I obtained a good grade last year') with their present outcomes. What is more meaningful, in terms of rationalization, is the impact of present learning experiences (e.g., 'I also get good results for this unit, Adolescence') on temporally displaced self-judgments of capability. What can educators do, at present, in terms of cultivating mastery in order to foster positive self-beliefs for future reference? Our methodological conceptualization, in this sense, differs from previous investigations, as it is premised on the notion that *present* personal learning accomplishment, and not recall of prior learning experience, makes a major contribution in the formation of self-efficacy.

2.2. Predictors and Consequences of Personal Self-Efficacy Beliefs

Personal self-efficacy, as research has shown [2-4], associates closely with academic achievement and other adaptive behaviors. An important emphasis, which is relatively modest at present, entails the distal impact of personal self-efficacy on a number of cognitive-motivational constructs. The extent to which self-efficacy beliefs make a short-term and/or long-term contribution to the prediction of achievement-related outcomes can be validated from modelling of longitudinal data. In the context of the present investigation, and extending previous research inquiries [9, 13, 14], we focus on the importance of engagement and academic achievement as adaptive outcomes of personal self-efficacy beliefs.

Academic engagement, as a theoretical orientation in motivational research, has been detailed and researched extensively in educational settings [28-33]. Relatively diverse in scope, academic engagement has undergone an evolution over the past seven decades, with its definition revised to reflect the ongoing research development and individuals' varying patterns in cognition, motivation, and behavior. Researchers have also concurred that the construct of engagement is multifaceted, and encompasses different attributes [30, 34]. The work of Schaufeli, et al. [32, 35], in particular, is of significance, especially in the context of student motivation. This conceptualization, according to the authors, details three major motivation-related attributes that reflect students' academic engagement: (i) *absorption* (i.e., an individual's engrossment in a learning activity), (ii) *dedication* (i.e., an individual's sense of enthusiasm, pride, and inspiration for engaging in learning), and (iii) *vigor* (i.e., an individual's sense of persistence and resilience, with the mobilization of effort).

We contend that Schaufeli, et al.'s conceptualization [32, 35] is of significance, providing a basis for researchers to gauge into the motivational aspect of student engagement. There has been limited research regarding the potency of absorption, dedication, and vigor attributes in both non-educational [e.g., 36, 37-39] and educational [e.g., 35, 40, 41, 42] settings. In relation to educational contexts, in particular, researchers have focused on a number of related objectives. Adhiambo, et al.'s (2011) recent investigation involving secondary school students found, for example, that high achievers differed from the low achievers in their responses to the measures of absorption, dedication, and vigor. Caliskan and Mercangoz's (2013) research involving university students, similarly, reported that engagement, as reflected by absorption, dedication, and vigor, differed in accordance in school satisfaction. Students who were highly satisfied tended to report high scores on the three attributes stipulated [32]. In essence, based on collective evidence that illuminates the potency of Schaufeli, et al.'s theoretical contentions, it is important for us to advance this line of inquiry. Notably the focus for examination, which may make theoretical contributions, is the impact of absorption, dedication, and vigor on academic achievement. The work of Salmela-Aro, et al. (2009) is also of relevance, highlighting the relation between achievement strategies and absorption, dedication, and vigor. Over three occasions, spanning the period of 17 years, the authors found that achievement strategies were related to engagement later on in life; for example, optimistic strategies used predicted engagement, whereas pessimism and task-avoidance led to less engagement.

Our emphasis, similarly, extends previous research and makes attempts to situate Schaufeli, et al.'s conceptualization of academic engagement [32, 35] within the framework of personal self-efficacy [1, 2]. This integration emphasizes the extent to which personal self-efficacy beliefs would influence individuals' absorption, dedication, and vigor for academic learning. This premise is based on prior empirical findings, which detail the predictive effect of academic self-efficacy beliefs [e.g., 5, 6, 8-11, 20, 21]. A heightened sense of self-efficacy, for example, motivates a desire for mastery [6, 21] and may compel individuals to strive for academic excellence, using different means. This cognition and behavior (e.g., investing in time and effort), in essence, reflects individuals' proactive engagement towards schooling and academia. Empirical validation using longitudinal data, similar to that of previous investigations [e.g., 9, 13], would advance our understanding of both short and long-term associations between self-efficacy and other variables.

In a similar vein, methodologically, the use of longitudinal research designs enables researchers to explore differing patterns (e.g., reciprocality) in relations between

variables [9, 16, 43]. In the context of the present investigation, in particular, we focus on the potential impacts of absorption, dedication, and vigor on personal self-efficacy beliefs. Examination of this pattern of absorption, vigor, and dedication, in this instance, may yield relevant information regarding sources of personal self-efficacy [2, 44]. Bandura's (1997) theoretical tenets, in this analysis, indicate that individuals formulate their self-efficacy beliefs from different informational sources, such as personal learning experiences in a particular subject domain [5, 22, 24, 27]. Other motivational research studies have, similarly, reported positive influences from a variety of psychosocial factors and processes [e.g., 8, 9]. Martin, et al. (2010), for example, found that academic buoyancy exerted a positive effect on self-efficacy beliefs ($\beta = .25$, $p < .001$). Fast, et al. (2010), similarly, found individuals who perceived their classroom environment as positive (e.g., more caring) has significantly higher levels of self-efficacy for mathematics learning. We posit, based on this collective evidence, that engagement-related constructs such as absorption would also predict self-efficacy beliefs.

Overall, from a longitudinal perspective, it is of considerable interest for us to explore the patterns in relations between absorption, dedication, and vigor [32, 35] and personal self-efficacy beliefs [1, 2]. Apart from its positive contributions on absorption, dedication, and vigor, we contend that these three motivation-related attributes could also exert positive effects on self-efficacy beliefs for academic learning. Evidence ascertained from statistical testing, in this sense, would yield relevant insights into the 'cause-and-effect' relations between the two mentioned theoretical orientations.

3. Aims of the Present Study

The present study has two major aims. First, extending existing research investigations, we explore the role of enactive learning experience (e.g., academic success) as a positive antecedent of self-efficacy beliefs [1, 2]. Similar to previous correlational studies [e.g., 22, 24, 25, 45, 46], we used a self-report measure (e.g., 'I always get good marks from my teacher for this subject') at Time 1 to gauge into students' enactive learning experiences and their potential impacts on subsequent personal self-efficacy at Time 2 and Time 4, engagement at Time 3, and academic achievement at Time 5. Second, apart from enactive learning experience, we seek to explore the extent to which both self-efficacy at Time 2 and Time 4 and motivation-related attributes of engagement at Time 3 would interrelate to influence academic achievement at Time 5. Based on our previous study [47], we included two index measures of academic achievement at Time 5: (i) end-of-term final examination for mathematics, and (ii) end-of-term course mark for mathematics.

In totality, we proposed four major research hypotheses for examination:

- *HP1*: It is hypothesized that Time 1 enactive learning experience will exert positive effects on Time 2 self-efficacy, Time 3 motivation-related attributes (e.g., absorption at Time 3), Time 4 self-efficacy, and Time 5 course mark index.
- *HP2*: It is hypothesized that Time 2 self-efficacy will exert positive effects on Time 3 motivation-related attributes (e.g., absorption at Time 3), Time 4 self-efficacy, and Time 5 achievement index measures.
- *HP3*: It is hypothesized that Time 3 motivation-related attributes (e.g., absorption at Time 3) will exert positive effects on Time 4 self-efficacy, and Time 5 achievement index measures.
- *HP4*: It is hypothesized that Time 4 self-efficacy will exert positive effects on Time 5 achievement indexes.

The four hypotheses outlined are, in part, derived from previous theoretical tenets [1, 2] and empirical evidence. The potential impacts of enactive learning experience at Time 1 on Time 2 self-efficacy and Time 3 motivation-related attributes, say, are based on clear and consistent findings [e.g., 5, 22-24] that attest to its potency. The positive contribution of self-efficacy beliefs (e.g., self-efficacy → academic achievement), similarly, has been verified by a number of correlational studies [e.g., 6, 8, 10, 11, 20, 21]. Consideration of motivation-related attributes and their influences, in contrast, is exploratory, given that there is limited research, at present, regarding the featuring of Schaufeli, et al.'s conceptualization [32, 35] in educational contexts.

4. Methods

4.1. Sample

Three hundred and twenty-six Year 10 secondary school students (185 girls, 141 boys) from four schools in Central Suva participated in this study (Note: the original sample comprised of 340 students; missing data consisted of 14 cases, as a result of absenteeism, institution migration, etc.). Procedurally, as outlined in this section, we formulated and started the research project when the participants were in Year 9: (i) Time 1, first week of November, Year 9 (Enactive learning experience measure), (ii) Time 2, Mid-February, Year 10 (Self-efficacy measure), (iii) Time 3, Mid-April, Year 10 (Absorption, vigor, and Dedication measures), Time 4, last week of May, Year 10 (Self-efficacy measure), and (v) Time 5, first week of November, Year 10 (Achievement index measures: course mark and final examination). The stipulated time points were structured based on the flexibility and logistics of the schools and students involved.

4.2. Measure

Enactive Learning Experience. We used Bandura's (1997) theoretical tenets as a basis to develop five items to measure students' enactive learning experiences at Time 1. This scale, Enactive Learning Experience Subscale (ELE-S), contains three positively worded items (e.g., 'I always get good marks from my teacher for this subject') and two negatively

worded items (e.g., 'I don't do so well in this subject (mathematics), even when I study hard'), rated on a 7-point scale (1 (completely disagree) to 7 (completely agree)). In order to proceed with this measure, a factorial validity of the five items was tested by using confirmatory factor analysis (CFA) procedures [48, 49]. We specified a one-factor solution, whereby the five items were hypothesized to load onto this factor, titled 'Enactive learning experience'. We evaluated the fit of the model by using the following fit indices: the ratio between chi-squared and degree of freedom (χ^2/df)[e.g., values < 5.00: 50], the comparative fit index (CFI)[e.g., CFI values > .90: 51], the Tucker-Lewis index (TLI)[e.g., TLI values > .95: 52], and the root mean square error of approximation (RMSEA)[e.g., RMSEA values < .08: 53]. The results showed a good model fit, as indicated by the various goodness-of-fit index values (e.g., χ^2/df = 3.429, p < .001, CFI = .994, TLI = .984, RMSEA = .086). The factor loadings ranged from .67 to .95 for the five items. This finding (e.g., construct validity), overall, is similar to those findings obtained in our previous research studies [54, 55].

Academic Self-efficacy. We used the self-efficacy subscale of the MSLQ [56, 57] to measure personal self-efficacy at Time 2 and Time 4. The eight items, rated on a 7-point scale (1 (not at all true of me) to 7 (very true of me)), included, for example: 'I'm certain I can understand the most difficult material presented in the readings for this subject, mathematics'. Recognizing Bandura's (1997) theoretical tenets pertaining to the issue of contextualization, we modified some wordings to reflect the participants' learning in the subject mathematics.

Engagement-related Outcomes. Schaufeli, et al.'s (2002) engagement-related outcomes scales were used to measure absorption, vigor, and dedication at Time 3. The three subscales, rated on a 7-point scale (1 (not at all true of me) to 7 (very true of me)), included items such as: 'When I am studying mathematics, I forget everything else around me' (Absorption subscale, 6 items), 'When I get up in the morning, I feel like going to mathematics class' (Vigor subscale, 6 items), and 'To me, my studies in mathematics are challenging' (Dedication subscale, 5 items). We used CFA procedures to explore the factorial validity of the three subscales. We performed two competing models: a three-factor model versus a correlated three-factor model. The goodness-of-fit index values, in conjunction with the $\Delta\chi^2$ test (180.326, p < .001), indicated a preference for the latter model (e.g., χ^2/df = 3.939, p < .001, CFI = .921, TLI = .900, RMSEA = .095) over that of the former model (e.g., χ^2/df = 7.059, p < .001, CFI = .828, TLI = .790, RMSEA = .137). We are mindful, of course, that the correlated three-factor model, in this case, is average in model fit.

Achievement Indexes. Similar to previous research studies [10, 20, 47], we decided to use two index measures to define students' academic achievements: (i) end-of-term final examination (Note: this consisted of a three-hour exam, administered at the end of the school term), and (ii) end-of-term course mark (Note: this consisted of students' results for coursework in the subject, involving in-class quizzes, research projects, etc.). The end-of-term final exam, we contend, is high stake and indicates a performance-based, normative approach to learning. Course mark for a subject matter, in contrast, may indicate an emphasis on mastery [47].

5. Statistical Analyses

Causal modeling (SEM)[49, 58, 59] was performed using M*Plus*, Version 7.11 [60]. This statistical approach to analyze the data collected involved the use of covariance matrix [48, 61], and the Yuan-Bentler T_2 test statistics [60, 62, 63]. The MLR χ^2 statistics is rather robust under non-normality (e.g., our sample indicated kurtosis and skewness values that were greater than 2), and sample size is small or medium. In our subsequent analyses, we also used the following goodness-of-fit index values to decide the appropriate model fit of the hypothesized model: the ratio between chi-squared and degree of freedom (χ^2/df)[50], the comparative fit index (CFI)[51], the Tucker-Lewis Index (TLI)[52], and the root mean square error of approximation (RMSEA)[53].

Table 1. *Descriptive Statistics*

Variables	Mean scores			Kurtosis	Skewness	Reliability
	Total	Girls	Boys			
Enactive learning, Time 1	5.60 (1.08)	5.56 (.92)	5.63 (1.18)	1.84	-1.08	.93
Self-efficacy, Time 2	5.07 (1.23)	5.05 (1.17)	5.08 (1.27)	-.22	-.48	.78
Self-efficacy, Time 4	4.96 (1.42)	5.00 (1.45)	4.94 (1.40)	-.29	-.44	.73
Absorption, Time 3	6.31 (1.18)	6.45 (.92)	6.21 (1.34)	6.48	-2.53	.89
Dedication, Time 3	5.53 (1.24)	5.48 (1.24)	5.57 (1.25)	1.02	-1.20	.74
Vigor, Time 3	4.44 (1.54)	4.39 (1.48)	4.48 (1.58)	-1.12	-.09	.64
Course mark, Time 5	84.28 (14.20)	85.04 (13.23)	83.71 (14.89)	1.70	-1.13	
Final exam, Time 5	81.33 (17.83)	81.86 (16.36)	80.93 (18.91)	1.09	-1.18	

Table 1 presents the descriptive statistics and Cronbach's alpha values, whereas Table 2 shows the correlations among the variables for analysis. The correlations, statistically significant at p < .05 and .01, ranged from .12 to .56. In our analysis of the hypothesized model, illustrated in Figure 1, we specified the following structural paths: (i) Time 1 enactive learning experience to Time 2 and 4 self-efficacy, Time 3 motivation-related attributes of engagement, and Time 5 achievement indexes, (ii) Time 2 self-efficacy to Time 3 motivation-related attributes of engagement, Time 4 self-efficacy, and Time 5 achievement indexes, (iii) Time 3 motivation-related attributes of engagement to Time 4

self-efficacy, and Time 5 achievement indexes, and (iv) Time 4 self-efficacy to Time 5 achievement indexes. In this model testing, we also specified correlated variances between the two achievement index values, and between the three motivation-related attributes. The results for this a priori model indicated an excellent model fit, as indicated by the goodness-of-fit index values: χ^2/df = 1.373 (p = .241), CFI = .998, TLI = .976, RMSEA = .034.

Table 2. *Bivariate Correlations for Examination*

Variables	1		2		3		4		5		6		7		8
1. Enactive, Time 1	1.00														
2. Self-efficacy, Time 2	.19	**	1.00												
3. Absorption, Time 3	.37	**	.09		1.00										
4. Dedication, Time 3	.51	**	.30	**	.39	**	1.00								
5. Vigor, Time 3	.49	**	.19	**	.38	**	.56	**	1.00						
6. Self-efficacy, Time 4	.20	**	.46	**	.12	*	.31	**	.28	**	1.00				
7. Course mark, Time 5	.45	**	.17	**	.37	**	.43	**	.44	**	.26	**	1.00		
8. Final exam, Time 5	-.01		.31	**	.03		.03		.07		.13	*	-.01		1.00

Note: * p < .05, ** p < .01.

Figure 2 presents all the statistically significant standardized path coefficients between the variables. Of the structural paths tested, we noted 13 paths that were statistically significant (β values ranging from .08 to .68). As expected, and in accordance with Bandura's (1986, 1997) theoretical tenets, we found that Time 1 enactive learning experience was a positive predictor of Time 2 self-efficacy, Time 3 absorption, dedication, and vigor, and Time 5 course mark achievement index. Time 2 self-efficacy, similarly, was found to be a positive predictor of Time 5 final exam achievement index, whereas Time 4 self-efficacy was found to be a positive predictor of Time 5 course mark achievement index. There were also differential effects for the three motivation-related attributed of engagement: Time 3 absorption and dedication were found to be positive predictors of Time 5 course mark achievement index, whereas Time 3 vigor was found to be a positive predictor of Time 4 self-efficacy, and Time 5 course mark achievement index.

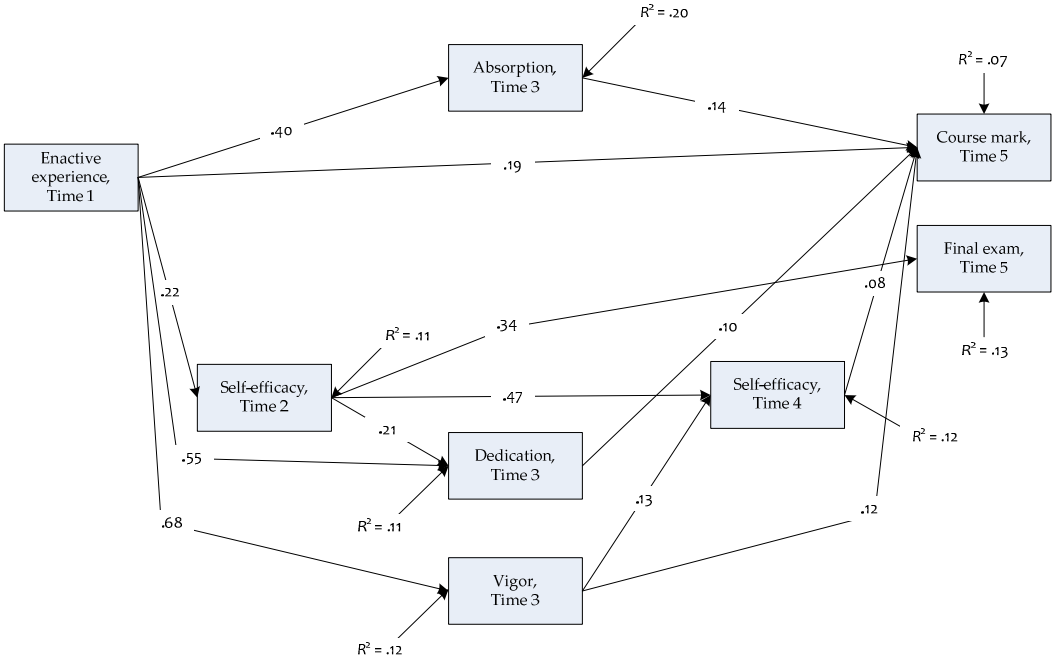

Figure 2. *Final Solution for the Hypothesized Model.*

Note: Structural paths are statistically significant at p < .05, p < .01, p <.001 (See Table 3 for detail). Non-statistical paths have been omitted for clarity.

5.1. Direct, Indirect, and Total Effects

Table 3 presents the decomposition of the standardized direct, indirect, and total effects of the relations depicted in Figure 1. Interestingly, we observed five indirect effects:

Table 3. *Direct and Indirect Effects*

Effect	Direct		Indirect		Total	
Course mark, Time 5						
• Self-efficacy, Time 4	.08	*	-		.08	
• Absorption, Time 3	.14	*	-.00		.14	*
• Dedication, Time 3	.10	*	.01		.11	*
• Vigor, Time 3	.12	**	.01		.13	**
• Self-efficacy, Time 2	-.01		.08	**	.07	
• Enactive experience, Time 1	.19	**	.19	***	.38	***
Final exam, Time 5						
• Self-efficacy, Time 4	-.00		-		-.00	
• Absorption, Time 3	.03		.00		.03	
• Dedication, Time 3	-.11		.00		-.11	
• Vigor, Time 3	.05		.00		.05	
• Self-efficacy, Time 2	.34	***	-.02		.32	***
• Enactive experience, Time 1	-		.05		.05	
Self-efficacy at Time 4						
• Absorption, Time 3	-.02		-		-.02	
• Dedication, Time 3	.13		-		.13	
• Vigor, Time 3	.13	*	-		.13	*
• Self-efficacy, Time 2	.47	***	.04	*	.51	***
• Enactive experience, Time 1	.01		.25	***	.26	**
Absorption at Time 3						
• Self-efficacy, Time 2	.03		-		.03	
• Enactive experience, Time 1	.40	***	.01		.41	***
Dedication at Time 3						
• Self-efficacy, Time 2	.21	***	-		.21	***
• Enactive experience, Time 1	.55	***	.05	*	.60	***
Vigor at Time 3						
• Self-efficacy, Time 2	.12		-		.12	
• Enactive experience, Time 1	.68	***	.03		.71	***
Self-efficacy at Time 2						
• Enactive experience, Time 1	.22	***	-		.22	***

Note: * $p < .05$, ** $p < .01$, *** $p < .001$.

Time 1 enactive learning experience exerted a small indirect effect:

i. on Time 3 dedication, via Time 2 self-efficacy,
ii. on Time 4 self-efficacy, via Time 2 self-efficacy ($\beta = .10$, $p < .01$) and Time 3 vigor ($\beta = .09$, $p < .05$),
iii. on Time 5 course mark index, via Time 3 absorption ($\beta = .05$, $p < .05$), dedication ($\beta = .06$, $p < .05$), and vigor ($\beta = .08$, $p < .01$.), and
iv. on Time 5 final exam index, via Time 2 self-efficacy ($\beta = .07$, $p < .01$).

Time 2 self-efficacy exerted a small indirect effect:

v. on Time 4 self-efficacy, via Time 3 absorption, dedication, and vigor; however, these mediating effects, as indicated, are statistically non-significant, and
vi. on Time 5 course mark index, via Time 3 absorption, dedication, and vigor, and Time 4 self-efficacy; however, these mediating effects, as indicated, are statistically non-significant.

6. Discussion

The present research investigation explored two major aims: (i) the impact of enactive learning experience, as a source of information, in accordance with Bandura's (1986, 1997) theoretical tenets, and (ii) the interrelations between self-efficacy and motivation-related attributes of academic engagement. The conjunctive use of longitudinal data within the framework of causal modeling procedures has provided empirical evidence, supporting in part our theoretical-conceptual model (Figure 1).

6.1. The Impact of Enactive Learning Experience

A key finding of the present investigation is the impact of enactive learning experience on personal self-efficacy. Bandura's (1997) theoretical tenets emphasize the importance of authentically and experientially-based information on the cognitive appraisal of capability. Positive

learning experiences, subject to both mastery and normative evaluative criteria, are integral to the formation of self-efficacy. One major research inquiry, consequently, consists of the validation of this informational source. This line of research has led to the use of different types of measures to gauge into the impact of enactive learning experience, notably: self-report measures [e.g., 22, 24, 27] versus actual performance-based indexes [5, 26, 45].

Our use of a self-report measure has yielded findings that are consistent with those identified in previous studies [5, 22, 25, 27, 46], attesting to the predictive effect of enactive learning experience. Enactive learning experience at Time 1, in this case, is found to predict Time 2 self-efficacy, and Time 3 absorption, dedication, and vigor. This indication is notable, emphasizing a number of educational implications for consideration. In particular, from our point of view, the notion of ongoing academic successes (e.g., repeated successes in a subject matter) is of significance for encouragement and fostering. Structuring subject contents and learning activities that emphasize the saliency of mastery and deep, meaningful learning may, in this sense, foster enriched personal experiences and appreciation for learning. Devaluing normative evaluative criteria and social comparison, similarly, may weaken feelings of despondency, helplessness, etc. Positive learning experiences, reflective of both successes and failures, in totality, may serve to enhance students' self-efficacy beliefs for academic learning.

By the same token, taking into consideration Schaufeli, et al.'s conceptualization [32, 35], the positive contribution of enactive learning experience is of relevance. Personal accomplishments in a subject matter motivate students to engage in their academic learning, reflected in this case, by a number of motivation-related attributes – for example, an increase in persistence and resilience, and more inclination for students to expend effort in their learning. It is interesting to note that Time 1 enactive learning experience also exerted a positive effect on Time 5 course mark index of achievement. This finding, consistent with previous research studies [e.g., 5, 10, 64, 65], indicates the importance of prior learning and accomplishment on subsequent performance outcome. Students who have history of sound academic track records are more likely to succeed, compared to those who have low achievement experiences.

The use of an approximate measure to elicit information regarding one's enriched learning experience is methodological and, in part, subjective. This research aspect of social cognition [1, 2] has gained interests more recently, especially given the importance of this informational source in the formation of personal self-efficacy [22, 24, 25, 27]. Considering this topical inquiry, which may generate disparate patterns in findings, we chose to use the traditional self-report measure. Having said this, however, there is some research [e.g., 5, 26, 45] that has preferred using individuals' actual prior academic grades to define enactive learning experience. Actual grades, subject to either mastery or normative evaluative criteria, in contrast, are an accurate indication of one's present state of learning experience. On this basis, as a point of clarification, it would advance our understanding for researchers to consider comparing different types of indexes to reflect the enactive learning experience source [55].

6.2. Personal Self-efficacy, Engagement, and Academic Achievement

There is some evidence, arising from our statistical analyses, to suggest a pattern in relations between self-efficacy and motivation-related attributes: Time 2 self-efficacy was found to predict Time 3 dedication, whereas Time 3 vigor was found to predict Time 4 self-efficacy. These differential effects, although requiring further research development, indicate a potential ongoing, reciprocal relation between the two theoretical orientations. Heightened self-efficacy beliefs, in this case, instill a sense of enthusiasm, pride, and inspiration for engaging in academic learning; this engagement, resulting in persistence, resilience, and effort expenditure may, similarly, continue to heighten students' self-efficacy beliefs. This established pattern, apart from supporting the tenets of social cognition [2, 3], strengthens the study of Schaufeli, et al.'s work [32, 35] in educational context.

Interesting, and contributing to the study of absorption, dedication, and vigor [e.g., 35, 40, 41, 42], we found that these three motivation-related attributes at Time 3 predicted Time 5 course mark index of academic achievement (β values ranged from .10 to .14). As a point of contemplation, academic engrossment may, in this case, instill a sense of enthusiasm and compel students to persist and expend more effort in their learning. This motivational approach in academic engagement, in turn, may assist students in their subsequent learning and performance outcomes. This finding is of significance, given that there is limited research in this area, at present. Educationally, similar to students' self-efficacy beliefs, it is important to consider strategies and instructional practices that could heighten students' inclination to engage and experience in learning engrossment, persistence, resilience, etc.

Personal self-efficacy, as theorized by Bandura (1986, 1997), is a strong predictor of quality learning and achievement-related outcomes. There is empirical research, as cited previously, which has produced clear and consistent evidence, attesting to the potent role of self-efficacy [e.g., 6, 8, 10, 11, 20, 21, 64]. Contributing theoretically to the study of social cognition [1, 2], we found that Time 2 self-efficacy predicted Time 5 final exam index of achievement, and Time 4 self-efficacy predicted Time 5 course mark index of achievement. A heightened sense of academic self-efficacy, in this case, assists students in their learning and achievements. Weakened self-efficacy beliefs, in contrast, are more likely to result in academic dysfunctions and low achievement outcomes.

The positive contribution of personal self-efficacy on academic learning and achievement-related outcomes has been verified previously [2, 3]. Educationally, similarly, there have been ongoing discussions and recommendations

regarding the enhancement of academic self-efficacy beliefs in educational contexts [9, 66]. This avenue of inquiry, from our point of view, is supported by the established finding that emphasizes the saliency of enactive learning experience. Encouraging students to consider mastery and to enjoy learning, for example, may enhance their self-efficacy beliefs [2]. The work of Schunk, likewise, indicates the use of role modeling and social comparison [67-71].

6.3. Mediating Relations of Personal Self-Efficacy and Engagement-Related Attributes

The present research investigation has also yielded some notable findings regarding the mediating roles of both personal self-efficacy and engagement-related attributes of engagement. This indication, as illustrates in Table 3, underscores the importance of self-efficacy (e.g., Time 1 enactive experience → Time 3 dedication, via Time 2 self-efficacy), absorption (e.g., Time 1 enactive learning experience → Time 5 course mark index, via Time 3 absorption), dedication (e.g., Time 1 enactive experience → Time 5 course mark index, via Time 3 dedication), and vigor (e.g., Time 1 enactive experience → Time 4 self-efficacy, via Time 3 vigor) as mediators. Validation of self-efficacy, as a mediator of successful learning and achievement outcome, coincides with Bandura's (1997) theoretical tenets and previous findings [8-10, 20]. It is interesting to note, though, that our inquiry into the mediating roles of absorption, dedication, and vigor is exploratory, given the limited research that has been conducted, to date. Findings established in this study, in this sense, make a contribution, attesting to the central featuring of motivation-related attributes of engagement [32, 35] in the learning process.

There are implications for educational practices regarding the mediating mechanisms of both self-efficacy and motivation-related attributes of engagement. Educational interventions, focusing on the enhancement of absorption, say, may assist in mediating students' learning experiences on their subsequent performance outcomes. In a similar vein, self-efficacy enhancement in classroom settings [e.g., using attributional feedback to enhance self-efficacy: 72, 73, 74], periodically, may mediate students' learning experiences, as a source of information, on their sense of enthusiasm, inspiration, and pride for academic learning. In totality, taking into account both self-efficacy and motivation-related attributes of engagement, it is important for educators to consider various means and strategies that could cultivate and foster these theoretical orientations.

7. Conclusion

Student motivation is an important tenet, which may account for significant variances in individuals' thought patterns, behaviors, and self-beliefs. Personal self-efficacy, in this instance, is an exploratory theoretical concept that operates in tandem with other cognitive-motivational processes to influence individuals' learning and performance outcomes. One of educators' main roles in schooling entails structuring appropriate measures to encourage students to feel efficacious towards their academic learning. Our use of complex methodological approaches has provided empirical grounding for further scientific advancement into the study of self-efficacy and its predictive and mediating roles [2].

Also of significance is the advancement in research development, pertaining to the work of academic engagement by Schaufeli and his colleagues [32, 35]. Our findings, based on the use of the Engagement Scales, have yielded additional theoretical insights into the central featuring and operational nature of absorption, dedication, and vigor (e.g., the mediating role of absorption). Empirical grounding from our causal analyses has made an in-depth contribution towards the study of personal self-efficacy [2, 3], especially in terms of its relationships with the identified motivation-related attributes of learning.

We are cognizant that, despite the contributions made, there are a few major caveats, which warrant for additional research development. First, from a methodological perspective, our research design was relatively limited, and did not include a structured collection of data for academic engagement. Multiwave panel designs [16, 17] with the collection of data for absorption, dedication, and vigor at Time 2 and Time 4 would, in this case, provide a stronger basis for examination into the issue of reciprocality – for example, Time 2 absorption → Time 3 self-efficacy → Time 4 absorption, and Time 2 self-efficacy → Time 3 absorption → Time 4 self-efficacy. Additional information for subsequent time points (e.g., Time 5 self-efficacy, Time 5 absorption, etc.) may, similarly, provide grounding for statistical testing into the initial states and growth trajectories of both theoretical constructs [75-77].

Second, we acknowledge that the sample used was relatively modest in terms of size. Likewise, as a result of logistic reasoning, our choosing of the sample was purposive, in nature, and findings that were established do not necessarily reflect the wider student population in terms of engagement or self-efficacy patterns. We recommend, in this case, the use of bigger samples, situated within different subject disciplines (e.g., mathematics versus science), for possible comparative analyses. Multilevel modelling may also be undertaken to identify patterns in associations between self-efficacy and academic engagement that are based on stratification and group clusters [60].

Appendix

I always get good marks from my teacher for this subject.
I always seem to do well in assignments for this subject.
I am quite successful, academically, with this subject.
I don't do so well in this subject, even when I study hard.*
I often fail and do not seem to understand this subject. *
Note: * Negative valence item.

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