

Using the Motivation and Engagement Wheel to Examine the Interplay Between Learner Engagement, Motivation, Year Level, and Academic Achievement in an EFL Tertiary Context

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Abstract—This study utilized Martin's (1999-2022) Motivation and Engagement Wheel (MEW) framework and its associated Motivation and Engagement Scale for University/ College (MES-UC) students to identify four typologies based on positive and negative academic engagement and motivation. It also investigated the latent factors comprising positive and negative motivation and engagement that greatly impact second language (L2) learner academic achievement and the relationship between L2 learner engagement and motivation level, on one hand, and academic year level and grade point average (GPA) on the other. Data collected from 456 female undergraduates majoring in English at a public university in Saudi Arabia were analyzed using descriptive statistics and structural equation modeling. The results largely supported the hypothesized effects of positive engagement, positive motivation, and negative motivation and six of their latent factors on L2 learner academic achievement. It also showed that the participants' positive engagement and motivation levels decreased as they progressed in the academic years of their program.

Index Terms—L2 learner engagement, motivation, student achievement, academic year, Smart PLS-SEM

I. INTRODUCTION

Learner motivation and engagement in academic life are recognized as enablers (DiPerna & Elliott, 2002) that facilitate learning and academic success (Christenson et al., 2012; Bakker et al., 2015; Dotterer & Lowe, 2011). While engagement is associated with observable actions and behaviors (Martin et al., 2017), motivation is the force and energy that drive the relevant actions for learning and achieving. Mercer and Dörnyei (2020) stress that "no method of language teaching can deliver results without ensuring that students are actively engaged in the process" (p. 4). Engaged L2 learners enjoy deeper interest and greater motivation (Egbert, 2020).

In addition, learner engagement and motivation can result in improving their performance and achievement and increasing their satisfaction (Ma & Wei, 2022; Martin & Bolliger, 2018; Palos et al., 2019). Jang et al. (2010) recognize the importance of engagement for student learning. They state that "engagement is particularly important because it functions as a behavioral pathway through which students' motivational processes contribute to their subsequent learning and development, including the skills they develop and the grades they make" (p. 588). Thus, L2 learner motivation and engagement levels can be key determinants of their success and achievement.

Based on the above benefits of engagement and motivation for L2 learners, it is significant for L2 teachers to assess and evaluate the engagement and motivation levels of their learners. Such assessment will assist teachers in boosting and maintaining the engagement and motivation levels of their students who are already engaged and motivated so that they continue to achieve to their potential (Martin, 2019). Similarly, when identifying disaffected and unmotivated learners, teachers can design appropriate intervention plans to actively involve and engage them in their language learning, thus increasing their chances for success (Mercer, 2019).

A widely utilized and validated conceptual model to evaluate university learner academic engagement and motivation and identify learner typologies is Martin's (1999-2022) Motivation and Engagement Wheel (MEW) and its associated Motivation and Engagement Scale for University/ College (MES-UC) students. Elphinstone and Tinker (2017), Yin and Wang (2016), and Yu et al. (2019) employed the MEW along with the MES-UC to identify student engagement and motivation typologies. The MES-UC provides good model fit, reliability, and is invariant across younger and older university students and gender (Martin, 2009).

The purpose of the present study is to use Martin's MEW model and its accompanying MES-UC (2022) to assess the motivation and engagement of a sample of 456 Saudi undergraduate English-major students and identify their engagement and motivation typologies. The study also aims to find out the effect of the MEW's four higher-order factors and their 11 first-order factors on the academic achievement of the participants as reflected in their grade point

average (GPA). The interplay between the higher-order and first-order factors and L2 learner academic year level will also be explored. The study aims to answer the following research questions:

1. To what extent are Saudi undergraduate English-major students motivated and engaged in their learning?
2. Are Saudi undergraduate English-major students' levels of motivation and engagement consistent with their GPA?
3. How do Saudi undergraduate English-major learner motivation and engagement levels vary as they progress from the first to the fourth academic year in the program?
4. What factors have the greatest impact on Saudi undergraduate English-major learner engagement and motivation levels and their academic achievement?

II. CONCEPTUAL FRAMEWORK AND RESEARCH HYPOTHESES

The conceptual framework guiding the present study is Martin's updated MEW model and its associated MES-UC (2022). The MEW is a framework made up of 11 factors that fall within four higher-order factors. The first higher-order factor is positive motivation, which reflects students' positive attitudes and orientations towards their academic learning. This dimension is comprised of three first-order factors: self-belief, valuing, and learning focus. Self-belief reflects enabling agentic cognitive and emotional responses to challenges in academic learning. In tandem with self-belief to gain desirable academic outcomes (Schunk & Mullen, 2012), valuing entails that students who value the task are more motivated to carry it out and move to a higher level (Martin, 2022). Learning focus stems from the goal orientation framework and focuses on mastery and performance goals.

The second higher-order construct is positive engagement, which reflects learners' positive behavior and engagement in their learning. This factor subsumes three first-order behavioral factors: planning, task management, and persistence. Planned behavior includes planning work and assignments and keeping track of progress. Task management refers to how students organize and manage their study time. Persistence entails continuing to work on a challenging task until it is accomplished.

The third higher-order factor is negative motivation, reflecting students' attitudes and orientations that handicap academic learning. It comprises three first-order factors: anxiety, failure avoidance, and uncertain control. Anxiety has been identified as having a debilitating effect on L2 learning and achievement (Dewaele et al., 2018). Failure avoidance, characterized by fear of failure, results in students' attempts to find excuses to justify their setbacks. Uncertain control refers to learners' uncertainty about their ability to succeed or avoid failure.

Finally, negative engagement entails two first-order factors: self-sabotage and disengagement. Self-sabotage means that students actively handicap their chances of success, while disengagement refers to the fact that learners may abandon effort and give up (Covington, 2000).

Martin (1999-2022) integrated several theoretical perspectives into the MEW model. Figure 1 below clearly matches the 11 factors with the theoretical perspectives that informed their synthesis within the MEW model to help conceptualize positive and negative engagement and motivation.

Central theoretical perspectives and associated constructs that inform the Motivation and Engagement Wheel. Reproduced from Martin, A.J. (1999-2022). *Motivation and Engagement Scale: Test User Manual*. Sydney: Lifelong Achievement Group, with permission from Lifelong Achievement Group (www.lifelongachievement.com)

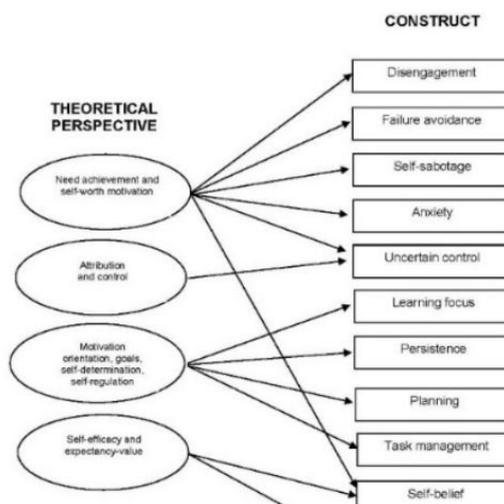


Figure 1 Theoretical Perspectives that Inform the MEW

For example, the self-belief and valuing factors located within the positive motivation quadrant align with self-efficacy, which stipulates that how people behave is often better predicated on the beliefs they hold about their

capabilities than on what they are capable of accomplishing (Bandura, 2006). The uncertain control factor included in the negative motivation quadrant is informed by the controllability dimension of Weiner's (1986) attribution theory. Controllability refers to achievement causes that can (e.g., skills) or cannot (e.g., luck) be controlled (Weiner, 1986). Chan and Moore (2006) emphasized the need to help learners attribute failure to controllable causes and gain control over their learning.

The MES-UC has been used to measure the motivation and engagement levels of university learners. Fredricks and McColskey (2012) recognized the MES-UC as a comprehensive measure with strong empirical and theoretical support for investigating student behavioral, affective, and cognitive engagement and motivation. The MES-UC has been validated for the university learner population and found to be reliable in research conducted on undergraduate students (e.g., Edgar, 2015; Elphinstone & Tinker, 2017; Fredricks & McColskey, 2012; Martin, 2008; Wu, 2019; Wurf & Croft-Piggin, 2015; Yin & Wang, 2016; Yu et al., 2019).

Furthermore, the MEW model and its associated MES-UC enable scholars to establish a relationship between the academic year level at university and the degree of engagement and motivation of students. For example, Shi et al. (2011) reported that first-year students were more motivated and engaged in their academic life, while third- and fourth-year students were motivated but less engaged and placed less significance on their learning. However, Yin and Wang (2016) revealed in their study that second-year students were less motivated and engaged due to their academic burdens compared to first-year students. Such varied results from one context to another could reflect the adaptability of the MEW model and its associated MES-UC to be implemented in a variety of contexts.

Based on the above discussion of the MEW and its associated MES-UC, the present study proposes the following research hypotheses:

- H1: Positive engagement significantly and positively influences student achievement.
- H2: Positive motivation significantly and positively influences student achievement.
- H3: Negative engagement significantly and negatively influences student achievement.
- H4: Negative motivation significantly and negatively influences student achievement.
- H5(a): Learning focus significantly and positively influences student achievement.
- H5(b): Self-belief significantly and positively influences student achievement.
- H5(c): Valuing significantly and positively influences student achievement.
- H6(a): Persistence significantly and positively influences student achievement.
- H6(b): Planning significantly and positively influences student achievement.
- H6(c): Task management significantly and positively influences student achievement.
- H7(a): Anxiety significantly and negatively influences student achievement.
- H7(b): Failure avoidance significantly and negatively influences student achievement.
- H7(c): Uncertain control significantly and negatively influences student achievement.
- H8(a): Self-sabotage significantly and negatively influences student achievement.
- H8(b): Disengagement significantly and negatively influences student achievement.

III. METHODOLOGY

A. *Study Context and Participants*

This study was conducted in a four-year Bachelor of Arts in English Language program at a female campus of a large public university in Saudi Arabia. The EFL program consists of 120 credit hours of coursework, including 14 credit hours of cultural preparation courses in Arabic and 106 credit hours of content subject matter courses in language skills, linguistics, English literature, and translation. In the academic year 2021-2022, the total number of enrolled female students was 947. All students enrolled in the program were sent an email in Arabic, informing them about the research topic and aims and seeking their voluntary participation. The students were asked to complete the Arabic version of the MES-UC, which was posted online using Google Forms. Individual consent was obtained from each student at the start of the survey. A total of 456 participants completed the MES-UC. The participants' demographics are presented in Table 1 below.

TABLE 1
DEMOGRAPHIC STATISTICS

	Frequency	Percent	Total
Year			456
1	74	16.2	
2	128	28.1	
3	140	30.7	
4	114	25.0	
GPA			456
A	123	27.0	
A+	3	0.7	
B	86	18.9	
B+	59	12.9	
C	73	16.0	
C+	26	5.7	
D	52	11.4	
D+	34	7.5	

B. Instrument

In this research, the instrument for data collection was the MES-UC. A few questions asking the participants to indicate their academic year level and GPA were added. Dörnyei (2010) provided guidance on translating questionnaires from one language to another, and two experienced, certified translators translated the survey from English to Arabic, as "the quality of the obtained data increases if the questionnaire is presented in the respondents' own mother tongue" (Dörnyei, 2010, p. 49). The MES-UC consists of 44 items that assess 11 first-order factors. The following are samples of the MES-UC items used to assess the 11 factors:

1. Self-belief: "If I work hard enough, I believe I can get on top of my university work."
2. Valuing: "It is important to understand what I am taught in university."
3. Learning: "I feel very pleased with myself when I learn new things in university."
4. Planning: "I usually stick to a study timetable or study plan for university."
5. Task management: "When I study for university, I usually study at times I can concentrate."
6. Persistence: "When I'm taught something that is difficult, I keep trying till I understand it."
7. Anxiety: "In terms of university, I consider myself anxious and nervous."
8. Failure avoidance: "Often the main reason I work in my English courses is because I do not want people to think I am stupid and a loser."
9. Uncertain control: "I'm often unsure how I can avoid doing poorly again".
10. Self-sabotage: "I sometimes do things other than study the night before an exam, so I have an excuse if I do not do well on the exam."
11. Disengagement: "I don't really care about university anymore."

Each item was measured using a 7-point Likert scale, ranging from 1 (strongly disagree) to 7 (strongly agree), with a maximum sub-score of 28 (7 x 4) for each factor. Each dimension was weighted by 3.57, and the overall score was calculated by aggregating all the sub-scores, with a maximum total score of 100.

C. Data Analysis

IBM SPSS v28 was used to perform descriptive statistics (mean, standard deviation, and ANOVA). The missing value analysis revealed that there were no missing values, so no cases were dropped or imputed. To test the significance of score differences by level, ANOVA analysis was conducted along with the post-hoc Tukey test. K-means cluster analysis was also performed to identify student typologies, and the subsequent clusters were related to the academic year level and student achievement using the Chi-square test. Furthermore, structural equation modeling was used to test the proposed hypotheses (Hair et al., 2011). The relationships were computed using Partial Least Square Smart PLS 3.3.4 (Senaviratna & Cooray, 2019). The use of Smart PLS was justified because it increases the possibility of producing correct calculations of moderating impact (Hair et al., 2022). Smart PLS also provides good validity and reliability for the measurement constructs. The two-step method suggested by Hair et al. (2022) and the bootstrapping procedure recommended by Hair et al. (2011) will be used to determine the level of significance for the regression coefficients, with a resample size of 5000 for the algorithm and bootstrapping method.

IV. FINDINGS

A. Engagement and Motivation Levels

The first research question aims to find out to what extent Saudi English-major students are motivated and engaged in their learning. The summary statistics for the MEW four higher-order factors (a second-order measurement model) and 11 factors (a first-order measurement model) were computed and presented in Table 2 and Table 3, respectively.

TABLE 2
4-FACTOR SUMMARY STATISTICS AND INTERCORRELATIONS (N = 456)

	Mean	SD	Correlation Coefficients				
			Cronbach	1	2	3	4
1. Positive Motivation	79.78	20.109	.837				
2. Positive Engagement	74.52	21.112	.880	.924			
3. Negative Motivation	40.41	22.400	.795	-.911	-.923		
4. Negative Engagement	38.40	23.664	.846	-.899	-.917	.910	1.000

* - all coefficients <0.05

TABLE 3
11-FACTOR SUMMARY STATISTICS AND INTERCORRELATIONS (N = 456)

	Mean	SD	Correlation Coefficients											
			1	2	3	4	5	6	7	8	9	10	11	
1. Learning Focus	83.51	20.965												
2. Valuing	79.20	20.852	.815											
3. Self-Belief	76.63	22.333	.817	.847										
4. Planning	70.93	21.574	.789	.840	.844									
5. Task Management	76.06	22.439	.776	.826	.840	.826								
6. Persistence	76.57	22.991	.789	.814	.867	.853	.841							
7. Anxiety	43.66	25.021	-.807	-.820	-.845	-.828	-.830	-.855						
8. Failure Avoidance	38.30	22.341	-.725	-.769	-.772	-.770	-.790	-.769	.791					
9. Uncertain Control	39.27	24.604	-.785	-.813	-.843	-.823	-.813	-.839	.858	.769				
10. Self-Sabotage	40.12	24.863	-.791	-.813	-.833	-.839	-.833	-.850	.860	.756	.839			
11. Disengagement	36.69	24.540	-.783	-.824	-.815	-.824	-.802	-.831	.840	.749	.827	.835	1.00	

* - all coefficients <0.05

From the overall findings, Table 2 shows that higher scores were reported for positive motivation (M = 79.78, SD = 20.109) and positive engagement (M = 74.52, SD = 21.112), while lower scores were received for negative motivation (M = 40.41, SD = 22.400) and negative engagement (M = 38.40, SD = 23.664). According to the user manual (Martin, 2022), higher scores are better for positive factors and lower scores are better for negative factors. These results confirm that among the participants, positive motivation and engagement were more prevalent than negative motivation and engagement. All the intercorrelations were statistically significant.

With respect to positive motivation, the highest rating was for learning focus (M = 83.51, SD = 20.965), followed by valuing (M = 79.20, SD = 20.582), and the lowest was self-belief (M = 76.63, SD = 22.333) as shown in Table 3. For positive engagement, persistence (M = 76.57, SD = 22.991) had the highest mean rating, while task management (M = 76.06, SD = 22.439) was second, and planning (M = 70.93, SD = 21.574) was the lowest. On the other hand, for negative motivation, anxiety (M = 43.66, SD = 25.021) was rated higher, followed by uncertain control (M = 39.27, SD = 24.604), and the lowest was failure avoidance (M = 38.30, SD = 22.341). For negative engagement, self-sabotage (M = 40.12, SD = 24.863) had the highest mean rating, while disengagement (M = 36.69, SD = 24.540) was the lowest. All the intercorrelations were statistically significant.

B. The Relationship Between Academic Year and Student Engagement and Motivation

This study also aimed to examine the relationship between the academic year level of the participants and their levels of engagement and motivation. ANOVA analysis was conducted to determine if the mean ratings were significantly different based on the participants' academic year level. The results for the MES-UC are presented in Table 4.

TABLE 4
ANOVA - COMPARISON OF MES BY ACADEMIC YEAR LEVEL (N = 456)

	Year Level								ANOVA	
	1		2		3		4		F	p
	Mean	SD	Mean	SD	Mean	SD	Mean	SD		
Learning Focus	87.31 _a	17.39	86.66 _a	19.63	80.74 _b	23.11	80.89 _b	21.16	3.229	0.022
Valuing	83.54 _{a,b}	19.09	84.07 _a	17.77	75.87 _{b,c}	22.44	75.00 _c	21.69	6.345	0.000
Self-Belief	79.58 _{a,b}	20.85	80.80 _a	20.66	74.29 _{a,b}	23.33	72.90 _b	23.07	3.555	0.014
Planning	73.79 _a	22.35	73.35 _a	19.11	69.62 _a	23.12	67.95 _a	21.45	1.881	0.132
Task Management	78.14 _a	21.95	79.32 _a	18.77	73.57 _a	25.46	74.09 _a	22.27	1.994	0.114
Persistence	80.89 _a	22.46	79.35 _a	21.01	73.14 _a	25.00	74.87 _a	22.34	2.274	0.081
Anxiety	40.49 _a	24.18	40.76 _a	22.31	46.35 _a	26.72	45.68 _a	26.01	1.763	0.154
Failure Avoidance	37.74 _a	23.24	36.38 _a	21.25	38.70 _a	22.85	40.32 _a	22.41	0.653	0.581
Uncertain Control	35.18 _a	22.79	35.66 _a	22.15	41.94 _a	26.10	42.70 _a	25.80	2.124	0.097
Self-Sabotage	37.21 _a	23.07	36.72 _a	24.23	43.42 _a	26.45	41.76 _a	24.29	2.139	0.095
Disengagement	32.87 _{a,b}	23.96	32.42 _a	20.80	40.38 _b	25.76	39.41 _{a,b}	26.39	3.469	0.016
Positive Motivation	83.48 _{a,b}	17.77	83.84 _a	17.74	76.96 _b	21.67	76.26 _{b,c}	21.05	4.771	0.003
Positive Engagement	77.61 _a	21.18	77.34 _a	18.51	72.11 _a	23.05	72.31 _a	20.95	2.338	0.073
Negative Motivation	37.81 _a	21.52	37.60 _a	20.59	42.33 _a	23.69	42.90 _a	23.04	1.826	0.142
Negative Engagement	35.04 _{a,b}	22.74	34.57 _a	20.91	41.90 _b	25.33	40.59 _{a,b}	24.41	3.000	0.030

Note: Values in the same row and sub-table not sharing the same subscript are significantly different at $p < 0.05$ in the two-sided test of equality for means. Cells with no subscript are not included in the test. Tests assume equal variances.¹

1. Tests are adjusted for all pairwise comparisons within a row of each innermost sub-table using the Bonferroni correction.

The comparison of scores by academic year of study revealed that there were statistically significant differences ($p < 0.05$) mainly between first and second years and third and fourth years. These differences were observed for two broad factors: positive motivation ($F(3,452) = 4.771, p = 0.003$) and negative engagement ($F(3,452) = 3.00, p = 0.030$). The mean ratings for positive motivation were higher for the first and second years compared to the third and fourth years. On the other hand, the mean ratings for negative engagement were lower for the first and second years compared to the third and fourth years.

For positive motivation, significant differences were seen for the sub-dimension of valuing ($F(3,452) = 6.345, p = 0.000$), with the first and second years having higher mean ratings than the third and fourth years. The second major difference was observed for self-belief ($F(3,452) = 3.555, p = 0.014$), with the first and second years having higher mean ratings than the third and fourth years. The least significant difference was observed for learning focus ($F(3,452) = 3.229, p = 0.022$), with the first and second years having higher mean ratings than the third and fourth years. For negative engagement, the only sub-dimension with a significant difference among year levels was disengagement ($F(3,452) = 3.469, p = 0.016$), with the first and second years having lower mean ratings than the third and fourth years.

C. Learners' Engagement and Motivation Typologies

While the foregoing analysis provided an overall perspective of the engagement and motivation of students, to identify the dominant characteristics of the students and detect the student motivation and engagement typologies, a K-means cluster analysis was conducted for the four higher-order constructs of positive motivation, positive engagement, negative motivation, and negative engagement. The Gap statistic method determined that four clusters were optimum, and these four were extracted. The cluster plot is shown in Figure 2.

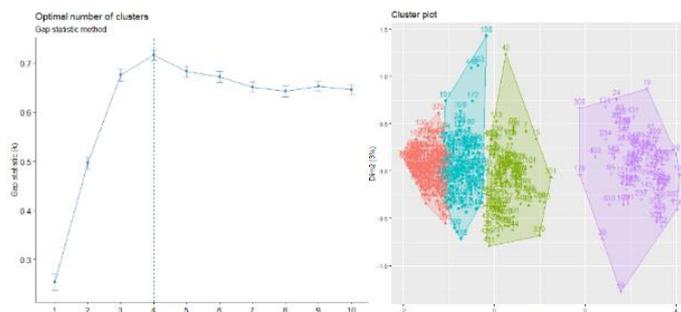


Figure 2 Optimal Clusters and Cluster Plot

To distinguish the typologies, a discriminant analysis was further carried out using the extracted clusters as the grouping variable and the four dimensions. The differences in the cluster attributes were found to be statistically significant, $\chi^2(12) = 1591.789, p < 0.05$. The extent of correct classification of the respondents was 97.6%, indicating the accuracy of the cluster analysis. The centered scale means for the four motivation and engagement dimensions are related to the clusters and are illustrated in Figure 3.

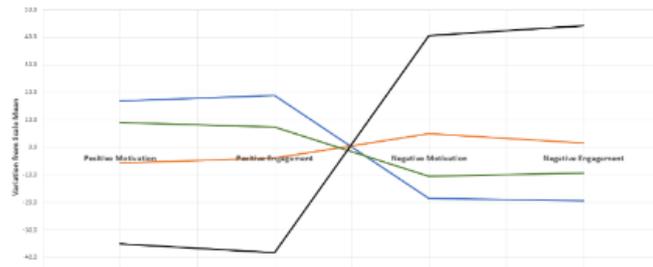


Figure 3 Centered Scale Means by Cluster

From the results, Cluster one, consisting of 146 highly engaged and motivated students, displayed high levels of positive motivation and engagement. Cluster two, consisting of 101 students with moderate negative engagement and negative motivation, had below-average levels of positive motivation and engagement but slightly above-average levels of negative motivation. Cluster three, consisting of 101 students with moderate positive engagement and motivation, had slightly above-average levels of positive motivation and engagement and slightly below-average levels of negative motivation and engagement. Lastly, Cluster four, consisting of highly demotivated and disengaged students, displayed high levels of negative motivation and negative engagement. The distribution of the clusters by academic year level and GPA is presented below.

TABLE 5
DISTRIBUTION OF THE FOUR CLUSTERS BY LEVEL AND GPA

	Cluster								χ^2	p	
	Cluster 1		Cluster 2		Cluster 3		Cluster 4				
	N	%	N	%	N	%	N	%			
Level Year 1	32	43.2	16	21.6	15	20.3	11	14.9	17.223	0.045	
Year 2	47	36.7	32	25.0	33	25.8	16	12.5			
Year 3	40	28.6	30	21.4	36	25.7	34	24.3			
Year 4	27	23.7	23	20.2	39	34.2	25	21.9			
GPA	D	0	0.0	0	0.0	0	0.0	52	100.0	986.098	0.000
	D+	0	0.0	0	0.0	0	0.0	34	100.0		
	C	0	0.0	67	91.8	6	8.2	0	0.0		
	C+	0	0.0	24	92.3	2	7.7	0	0.0		
	B	19	22.1	6	7.0	61	70.9	0	0.0		
	B+	15	25.4	4	6.8	40	67.8	0	0.0		
	A	109	88.6	0	0.0	14	11.4	0	0.0		
	A+	3	100.0	0	0.0	0	0.0	0	0.0		

The results indicate that with respect to academic year level, the majority of highly motivated and engaged students (Cluster one) were in their first year (43.2%) and second year (36.7%), while the moderately motivated and engaged students (Cluster three) were distributed almost evenly across all levels. The same was true for moderately demotivated and disengaged students (Cluster two). However, the majority of completely demotivated and disengaged students were in their fourth year. The association between the clusters and academic year level was statistically significant, with a $\chi^2(9)$ value of 17.223 and a p-value of 0.045. Regarding the relationship between the clusters and student achievement, the majority of highly motivated and engaged students (Cluster one) had high grades, with 100% of those who received an A+ belonging to this cluster, as well as 88.6% of those who received an A. Moderately motivated and engaged students (Cluster three) were primarily associated with either a B or a B+, as 70.9% of students who received a B were in this cluster, along with 67.8% of students who received a B+. Moderately demotivated and disengaged students were associated with a C or C+, as 92.3% of students who received a C+ and 91.8% of students who received a C were in this cluster. Completely demotivated and disengaged students were primarily associated with a D or D+, with 100% of students who received either a D+ or a D belonging to this cluster. The association between the clusters and student achievement, expressed as GPA, was statistically significant, with a $\chi^2(21)$ value of 986.098 and a p-value of 0.000.

D. Hypotheses Testing: The Relationships Between MEW's Constructs on Student Achievement

The study also aimed to examine the relationship between motivation and engagement and student achievement, and to identify the most significant factors. To do this, a structural equation model (SEM) was used to test the hypotheses predicting the relationships between the four higher-order constructs, their underlying 11 constructs, and learner achievement. When evaluating structural equation modeling, it is important to check for *multi-collinearity* by examining the Variance Inflation Factor (VIF). A VIF value of 5 or greater suggests potential collinearity problems (Hair et al., 2011). The study ran both first-order and second-order measurement models to test for VIF values and Table 6 shows that there is no collinearity issue between the dimensions in the study.

TABLE 6
MULTI-COLLINEARITY STATISTICS (VIF)

	First-Order Measurement Model	Second-Order Measurement Model
	Student achievement	
Anxiety	2.054	
Disengagement	1.452	
Failure Avoidance	4.209	
Learning Focus	1.908	
Persistence	3.071	
Planning	2.201	
Self-Belief	3.114	
Self-sabotage	2.740	
Student Achievement		
Task Management	3.084	
Uncertain Control	4.452	
Valuing	1.726	
Negative Engagement		2.012
Negative Motivation		1.892
Positive Engagement		1.071
Positive Motivation		1.123

In structural equation modeling, PLS-SEM is a technique that allows the estimation of complex causal relationships in path models that contain latent constructs (Wong, 2013). The statistical significance of several PLS-SEM outcomes can be tested using a non-parametric method known as bootstrapping (Ramayah et al., 2018). Thus, the study utilized the bootstrapping technique with 5000 sub-samples and the maximum iteration capacity. The "beta" values are regression coefficients that multiply the X data to predict the Y data. It is possible to visualize the relative importance of each explanatory variable by plotting the beta values associated with the respective X variables against the corresponding latent variables. The significance level is typically set at .05 in hypothesis testing and is referred to as alpha. For a 5% significance level, the t-value should be greater than +1.96, and the p-value should be less than 0.05 (Afthanorhan, 2013; Ramayah et al., 2018; Wong, 2013). The t-value is used to determine the truth of the hypotheses.

(a). *Second-Order Measurement Model*

Table 7 shows that positive engagement has a statistically significant and positive impact on student achievement ($\beta = 0.084, p = 0.044$), thus accepting hypothesis H1. Positive motivation has a statistically significant and positive impact on student achievement ($\beta = 0.695^{***}, p = 0.000$), thus accepting hypothesis H2. Negative engagement does not have a statistically significant impact on student achievement ($\beta = 0.014, p = 0.797$), thus rejecting hypothesis H3. Meanwhile, negative motivation has a statistically significant and negative impact on student achievement ($\beta = 0.095^*, p = 0.042$), thus accepting hypothesis H4.

TABLE 7
PATH COEFFICIENTS (SECOND-ORDER CONSTRUCTS)

	Original Sample (O)	T Statistics (O/STDEV)	P Values
H3 Negative Engagement -> Student Achievement	0.014	0.257	0.797
H4 Negative Motivation -> Student Achievement	0.095	2.043	0.042
H1 Positive engagement -> Student Achievement	0.084	2.022	0.044
H2 Positive Motivation -> Student Achievement	0.695	25.503	0.000

The results of the analysis of the impact of student motivation and engagement on academic achievement using PLS-SEM are shown in Figure 4.

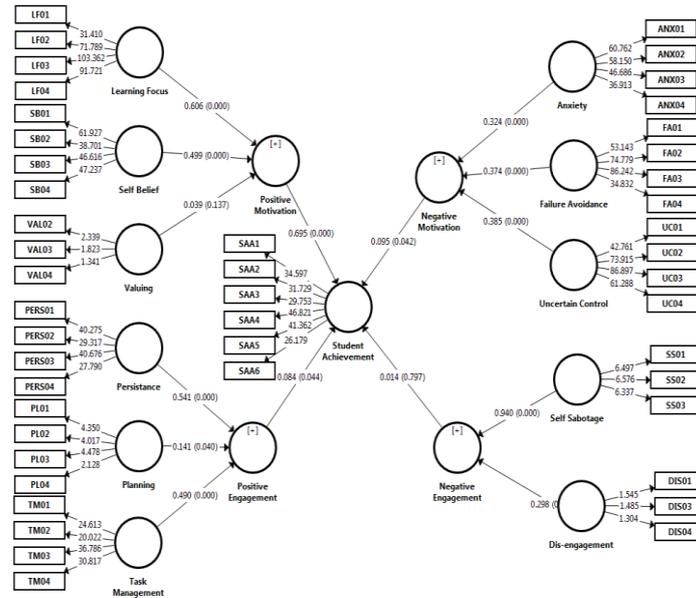


Figure 4 Second-Order Measurement Model

(b). First-Order Measurement Model

Table 8 shows the results of the PLS-SEM analysis that tested the effect of different motivational and engagement factors on student achievement. The results indicate that learning focus has a significant positive effect on student achievement ($\beta = 0.310^{***}$, $p = 0.000$), so hypothesis H5(a) is accepted. Self-belief has a significant positive effect on student achievement ($\beta = 0.263^{**}$, $p = 0.000$), so hypothesis H5(b) is accepted. Valuing does not have a significant positive effect on student achievement ($\beta = 0.016$, $p = 0.688$), so hypothesis H5(c) is rejected. Persistence does not have a significant positive effect on student achievement ($\beta = -0.028$, $p = 0.601$), so hypothesis H6(a) is rejected. Planning has a significant positive effect on student achievement ($\beta = 0.249^{***}$, $p = 0.000$), so hypothesis H6(b) is accepted. Task management does not have a significant positive effect on student achievement ($\beta = 0.079$, $p = 0.174$), so hypothesis H6(c) is rejected. Anxiety has a significant negative effect on student achievement ($\beta = 0.374^{**}$, $p = 0.007$), so hypothesis H7(a) is accepted. Failure avoidance does not have a significant negative effect on student achievement ($\beta = -0.087$, $p = 0.347$), so hypothesis H7(b) is rejected. Uncertain control has a significant negative effect on student achievement ($\beta = -0.222$, $p = 0.002$), so hypothesis H7(c) is accepted. Self-sabotage has a significant negative effect on student achievement ($\beta = 0.140$, $p = 0.012$), so hypothesis H8(a) is accepted. Disengagement does not have a significant negative effect on student achievement ($\beta = 0.010$, $p = 0.808$), so hypothesis H8(b) is rejected.

TABLE 8
PATH COEFFICIENTS (FIRST-ORDER CONSTRUCTS)

	Original Sample (O)	T Statistics (O/STDEV)	P Values
H7(a) Anxiety -> Student Achievement	0.374	2.698	0.007
H8(b) Disengagement -> Student Achievement	0.010	0.243	0.808
H7(b) Failure Avoidance -> Student Achievement	-0.087	0.941	0.347
H5(a) Learning Focus -> Student Achievement	0.310	5.714	0.000
H6(a) Persistence -> Student Achievement	-0.028	0.523	0.601
H6(b) Planning -> Student Achievement	0.249	4.459	0.000
H5(b) Self-Belief -> Student Achievement	0.263	4.404	0.000
H8(a) Self-sabotage -> Student Achievement	0.140	2.524	0.012
H6(c) Task Management -> Student Achievement	0.079	1.362	0.174
H7(c) Uncertain Control -> Student Achievement	-0.222	3.151	0.002
H5(c) Valuing -> Student Achievement	0.016	0.402	0.688

The corresponding SEM model that identifies the key motivation and engagement latent factors that have a significant impact on student achievement is presented in Figure 5.

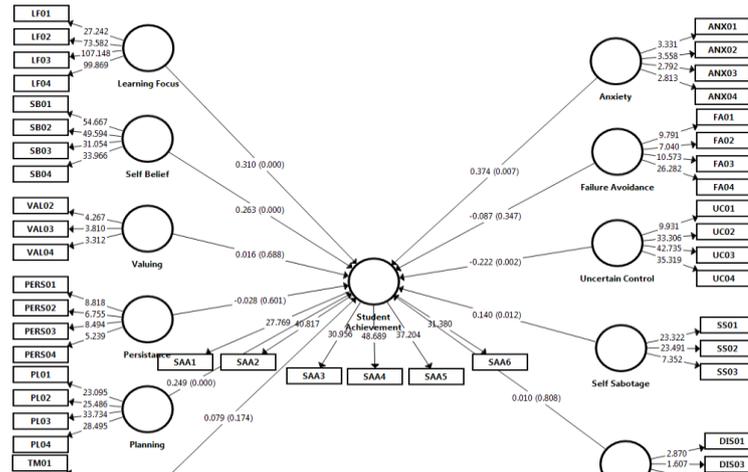


Figure 5 First-Order Measurement Model

Overall, while learning focus, self-belief, and planning significantly influenced student achievement in a positive way, anxiety, uncertain control, and self-sabotage had a negative effect on student achievement.

V. DISCUSSION

The results showed that the participants had a higher prevalence of positive motivation and engagement compared to their negative motivation and engagement. This study reported an average positive engagement level of 74.52%, which is in line with the average student engagement levels among university students in Greece (Dimitriadou et al., 2021), Germany (Körner et al., 2021), and China (Teuber et al., 2021).

This study identified four learner typologies based on their motivation and engagement patterns: highly engaged/motivated students, moderately disengaged/demotivated students, moderately engaged/motivated students, and highly disengaged/demotivated students. The majority of the demotivated and disengaged students were found in their third and fourth years of the program, while the majority of engaged and motivated students were in the first two years, and the relationship was statistically significant. Additionally, the majority of the demotivated and disengaged students had poor grades, while the majority of engaged and motivated students had higher grades. These findings support the premise of other empirical studies (e.g., Elphinstone & Tinker, 2017; Yin & Wang, 2016; Yu et al., 2019) that the MEW and its associated MES-UC are effective in identifying student typologies.

The primary factors that contributed to Cluster one's motivation and engagement were self-belief, valuing university, and persistence. These students can be considered "success-oriented students" (Martin, 2022, p. 19). Several studies have shown the positive impact of self-belief on academic success in EFL classes (e.g., Bassi et al., 2007; Kosimov, 2021; Tilfarlioğlu & Cinkara, 2009). According to the expectancy-value theory (Wigfield & Eccles, 2002), students with a strong belief in their ability to master their academic work typically have positive expectations for success. Additionally, valuing university study leads to higher levels of motivation and engagement (e.g., Fan & Feng, 2012; Varasteh et al., 2016). Martin (2022) also argues that "when students see the utility and importance of what they are taught, they tend to be more engaged and also achieve a higher level" (p. 21). Participants in Cluster one reflected these assumptions with their higher levels of motivation, engagement, valuing, and persistence despite academic and social challenges at university, which led them to excel in their studies. These results support the hypothesis that valuing can strengthen students' abilities and increase their willingness to continue their studies in the future.

The participants in the current study were highly motivated and engaged during the first two years of their program, but their passion for their studies decreased as they advanced to higher levels. This decline in motivation and engagement could be due to personal reasons or distractions in the sociocultural context, especially with modern technology, or the difficulty and complexity of specialized language and literary courses. Research supports this trend, as Martin (2020) and Busse and Walter (2013) found that year level has a significant impact on motivation and engagement, and Yin and Wang (2016) recorded lower levels of positive motivation and engagement among second-year students compared to first-year students. It is expected that the challenges of specialized courses at higher levels are difficult to handle when compared to first-year foundation courses. Such challenges may have made the participants lose control and become failure avoiders as indicated by the data.

The decline in student engagement and motivation levels as they progress through an academic program may indicate a failure by institutions and teachers to effectively connect with and engage students in their learning. The main concern is what has caused students in Clusters two and four, particularly in their third and fourth years at university, to lose motivation and engagement and receive lower cumulative grades of C, C+, D, and D+. Institutions can "help students develop a sense of belonging to provide them with important information on how to succeed at university" (Krause & Coats, 2008, p. 499). Early identification of students' typologies based on measurable factors such as engagement and motivation is likely to lead to more efficient results (Carter et al., 2012). The results of this study can inform the

creation of more effective interventions to improve student engagement in their studies and help them maintain it throughout their academic journey. With the findings indicating at which academic year levels students are more or less engaged, teachers can determine the appropriate timing and type of intervention. Maroco et al. (2016) argue that future research should concentrate on enhancing student engagement as a mediator to improve retention, learning outcomes, and achievement.

Another primary objective of this research was to investigate the impact of the four higher order factors and eleven first-order factors of the MEW on the academic performance of L2 learners. SEM was used to test the hypotheses. The results supported nine out of the fifteen hypotheses: H1, H2, H4, H5(a), H5(b), H6(b), H7(a), H7(c), and H8(a). Positive motivation (H2) was found to have the strongest effect on academic achievement. Positive engagement (H1) and negative motivation (H4) were also significant, while negative engagement (H3) was not. Positive engagement and motivation, along with low levels of negative motivation and disengagement, were found to be good indicators of academic achievement. Pomerantz et al. (2007) pointed out that positive engagement can contribute to academic achievement by providing access to motivation and cognitive skills. Among the 11 first-order factors, learning focus (H5(a)), self-belief (H5(b)), and planning (H6(b)) were significantly and positively associated with academic achievement, while anxiety (H7(a)), uncertain control (H7(c)), and self-sabotage (H8(a)) had a negative effect. Strategies to enhance students' self-belief, learning focus, planning, task management, and persistence can help promote a sense of control over their studies and academic outcomes (Martin, 2019). This sense of control can prevent learners from becoming anxious, avoiding failure, or engaging in self-sabotage and disengagement.

VI. CONCLUSION, LIMITATIONS, AND FUTURE DIRECTIONS

This study was the first empirical study to utilize Martin's MEW model and its associated MES-UC in the Saudi university context to examine L2 learners' engagement and motivation. Four typologies of students were identified based on their engagement and motivation patterns. The study also investigated the latent factors of positive and negative motivation and engagement, which greatly impact L2 learner academic achievement. It also examined the relationship between L2 learner engagement and motivation, on one hand, and their academic year level and GPA, on the other. The results largely supported the hypothesized effects of positive engagement, positive motivation, negative motivation, and six of their latent factors on L2 learner academic achievement. The study showed that the participants' positive engagement and motivation levels decreased as they progressed in their academic years. This study indicates that the MES-UC is a suitable scale for measuring university learner engagement and motivation. It also provides useful implications for Saudi universities to widely employ the MES-UC to assess their students' engagement and motivation levels so they can identify disengaged and unmotivated students and design suitable intervention programs to enhance their engagement and motivation. In line with Coates' (2005) argument, Saudi higher education institutions are encouraged to consider information about student engagement and motivation when determining and improving the quality of their academic programs and outcomes.

This study has a few limitations. Firstly, convenient sampling was used to recruit participants, meaning that highly motivated or engaged L2 learners may have chosen to participate in the study, and thus the findings may not reflect the views of disengaged learners. Secondly, as the sample was collected from one English language program at a female campus in a Saudi university, the findings may not be generalizable to male students, other programs, and institutions. Since this is a cross-sectional study, future researchers are recommended to conduct longitudinal studies using different instruments (e.g., questionnaires, observations, interviews, diaries) to follow the same participants and evaluate their engagement and motivation at different points throughout their four years of study and examine the multiple factors that shape learner engagement and motivation typologies and levels.

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