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Original Article

The Role of Academic and Individual Factors in the Academic Engagement of Dental Students in Babol, Northern Iran: A Structural Equation Modeling Approach

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Abstract

Background: Academic engagement in medical education, particularly within the field of dentistry, is a topic of considerable interest to both academic staff and policymakers. Nevertheless, there remains a need for more extensive research into the individual and academic factors influencing this engagement.

Objectives: The current research investigated the relationships among individual and academic variables and the academic engagement observed in dental students at Babol, Northern Iran.

Methods: This cross-sectional study, conducted in 2023 at Babol University of Medical Sciences in northern Iran, investigated academic engagement among dental students. A total of 315 students (55.9% female) were recruited using a cluster random sampling method. Data collection involved a demographic questionnaire, the Student Engagement in School Questionnaire (SESQ), and measures of individual and academic factors associated with academic engagement. Pearson correlation and structural equation modeling (SEM) were employed for statistical analysis. The significance level for all statistical tests was set at 0.05.

Results: The ultimate path model substantiated that academic factors, encompassing the learning-teaching environment, servant leadership, staff-student interaction, available equipment, welfare amenities, and scientific and extracurricular spaces, significantly influenced perceived academic engagement. These factors exerted both direct ($\beta = 0.20$, $p = 0.002$), and indirect ($\beta = 0.35$, $p < 0.001$) positive effects on academic engagement. Furthermore, individual factors (such as self-efficacy, time management, hope, and support from family and friends) were identified as significant mediators of perceived academic engagement ($\beta = 0.74$, $p < 0.001$).

Conclusion: Academic engagement among dental students at Babol is notably shaped by a combination of academic and individual elements. Universities have the capacity to foster greater engagement by elevating the caliber of their learning-teaching environment. Concurrently, students can cultivate their own academic engagement through the cultivation of hope.

Keywords: Academic Success; Engagement; Students; Dental; Education; Medical; Hope; Learning; Structural Equation Modeling

Background

Academic engagement, which involves cognitive, emotional, and behavioral aspects, is vital for improving the quality of education and promoting academic success (1-3). Recently, there has been a significant focus by university staff and education policymakers on academic engagement among students in medical disciplines, including dentistry. Cognitively engaged

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students demonstrate active participation in learning, critical analysis of information, and a pursuit of profound understanding. Concurrently, emotional engagement encompasses positive affect toward academic pursuits, intrinsic motivation to learn, and a sense of belonging within the academic setting. Behavioral engagement is characterized by active participation, diligent study habits, and a dedicated approach to academic responsibilities (4, 5). Nevertheless, despite the acknowledged significance of academic engagement, there is a limited understanding of its influential factors, especially concerning the interplay between individual and academic environmental variables.

Earlier studies have emphasized the complex characteristics of academic engagement and its relationship with different personal and academic environmental elements. Factors like self-efficacy (6), time management (7), hope (8), and support from family and friends (9) have been recognized as possible factors affecting academic engagement. Academic environmental factors are also acknowledged as influential, encompassing the learning-teaching environment (10, 11), servant leadership (12, 13), staff-student interaction (14), available equipment (15), welfare amenities, and scientific and extracurricular spaces (14, 16, 17). Grasping the influential factors behind the various facets of academic engagement is essential for crafting effective strategies to bolster student learning and success, especially within challenging disciplines like dentistry.

Objectives

This research utilizes a structural equation modeling (SEM) approach to explore how both academic and individual factors influence the academic engagement of Iranian dental students. By examining these complex relationships, this research offers significant insights into the determinants of student success within this challenging discipline.

This study's findings are expected to significantly benefit university administrators, educators, and policymakers within medical education. By identifying the primary determinants of academic engagement, this research aims to inform the creation of targeted interventions and support systems aiming to cultivate a more engaged and successful learning environment specifically for dental students.

Methods

This cross-sectional study was undertaken in 2022, enrolling all dental students at Babol University of Medical Sciences and Health Services. A cluster random sampling method was employed to ensure representation across all academic terms. From a comprehensive list of student names, with each term constituting a distinct cluster, a total of 315 participants were selected. Participation in the study was entirely voluntary. The sample size for this study was calculated using Stata version 17 software for regression models. This calculation was informed by a prior study (14), which reported a beta coefficient of 0.23 for the relationship between academic factors and academic enthusiasm. Based on a previous study's parameter value (14), and aiming for a type I error rate of 5% and a type II error rate of 20%, a minimum of 102 samples was necessary. This calculation accounted for 10 test variables (individual and academic factors) and 83 control variables (items associated with these factors). This determination was made using the Stata command: Power error (0.23), tested (10), and control (82). Given that each semester must be sampled as a cluster, and acknowledging the potential for intra-cluster correlation among students within a class, the sample size requires upward adjustment. This is necessary to account for the violation of the assumption of participant independence. To determine the appropriate sample size for this study, we adjusted the sample size initially calculated by Stata software by incorporating a design effect (DEFF) of 3.0. This adjustment yielded a final required sample size of 306 participants. The design effect was calculated using the formula: DEFF = $1+\delta$ (n−1). In this formula, δ represents the interclass correlation, and n denotes the average cluster size, which was set at 21 students per semester in this study. For this study, a value of $\delta = 0.1$ was assigned to represent academic enthusiasm. This specific index has not been utilized in prior research concerning students, and its current value was determined through expert consensus. Data were collected via paper questionnaires administered in person. The questionnaire commenced by clearly stating the study's objectives. Participants received assurances of anonymity and were informed that their data would be exclusively utilized for research purposes. The paramount ethical consideration guiding the study was the unwavering commitment to preserving human dignity. Verbal informed consent was secured from all student participants, who were apprised of their right to

withdraw from the study without penalty at any point. Prior to commencing the research, ethical approval was granted by Babol University of Medical Sciences.

Measures

The research tools utilized were as follows:

- Demographic and educational questionnaires were utilized to gather information on variables including age, gender, marital status, university entry year, and parents' education level.

- The Student Engagement in School Questionnaire (SESQ), originally developed by Hart et al. in 2011 (18), has demonstrated robust psychometric properties. In Iran, Nekavand et al. (14) further validated the instrument, confirming its acceptable reliability and validity. This 32-item, self-report questionnaire assesses student engagement across three distinct dimensions: Cognitive engagement (11 items), emotional engagement (9 items), and behavioral engagement (12 items). Responses are captured using a Likert scale, with scores ranging from 0 ("very little") to 4 ("very much"). The total score on the SESQ can range from a minimum of 0 to a maximum of 128.

- The Questionnaire of Factors Influencing Academic Engagement, developed by Nekavand et al. (14), is a 93-item instrument designed to assess various elements contributing to academic engagement. This questionnaire categorizes these factors into two main areas: Individual factors (including self-efficacy, time management, hope, and support from family and friends) and academic factors (including the learning-teaching environment, servant leadership, staff-student interaction, available equipment, welfare amenities, and scientific and extracurricular spaces). The questionnaire utilized a Likert scale with responses ranging from 1 (completely disagree) to 5 (completely agree). Total scores for the questionnaire can range from a minimum of 93 to a maximum of 465. The questionnaire's face validity, content validity, and construct validity were thoroughly investigated. Furthermore, reliability testing yielded a Cronbach's alpha coefficient of 0.89 for the SESQ and 0.96 for the Questionnaire of Factors Influencing Academic Engagement (14).

In the current research, the reliability of the questionnaires was re-evaluated, yielding high internal consistency. Specifically, the SESQ demonstrated a Cronbach's alpha coefficient of 0.913, and the Questionnaire of Factors Influencing Academic Engagement showed a Cronbach's alpha of 0.958, both indicating excellent reliability.

Data Analysis: Descriptive statistics were computed for all variables. For quantitative data, the mean, standard deviation, minimum, and maximum values were determined. Frequencies and percentages were calculated for qualitative data. Pearson correlation coefficients were used to assess the relationships between factors. Finally, the proposed hypothetical model was evaluated and examined using SEM. In our assessment of the model's appropriateness, we utilized several established fit indices. These included the chi-square statistic, the comparative fit index (CFI), the Tucker-Lewis index (TLI), the standardized root mean square residual (SRMSR), and the root mean square error of approximation (RMSEA). For a model to demonstrate adequate fit, the chi-square to degrees of freedom (df) ratio should be below 5. Furthermore, TLI and CFI values exceeding 0.90 are indicative of a robust model fit. Moreover, SRMSR and RMSEA values less than 0.08 suggest an acceptable fit, while values below 0.05 denote a strong fit.

Results

The characteristics of the 315 participants in the present study are summarized in Table 1.

Table 2 presents the descriptive statistics for each factor, including their means, standard deviations, and Cronbach's alpha values.

Moreover, Pearson correlation coefficients (r) were calculated to examine the relationships among these factors. The correlations among the engagement factors (emotional, behavioral, and cognitive) ranged from 0.46 to 0.55. For individual factors, the correlation coefficients varied between 0.05 and 0.67. Finally, the academic factors exhibited correlations ranging from 0.11 to 0.59.

Structural Modeling: A final path analysis was conducted to assess the overall fit of the hypothesized model. The findings revealed a strong model fit, as corroborated by various fit indices. The model's chi-square value was 180.68 (χ^2 = 180.68, df = 60), yielding a chi-square to df ratio of approximately 3.01. This ratio falls within the acceptable range, satisfying the recommended threshold of $\chi^2/df < 5$. Complementary fit indices provided further evidence of the model's robust fit. Specifically, the CFI, TLI, and Standardized SRMSR were 0.92, 0.90, and 0.05, respectively. Additionally, a RMSEA of 0.07 indicated an acceptable fit of the model to the observed data (Figure 1).

The model demonstrated several notable direct effects. Specifically, academic factors exhibited direct, positive influences on academic engagement ($\beta = 0.20$, $p < 0.01$) and individual factors ($\beta = 0.49$, $p < 0.001$). Furthermore, individual factors had a direct, positive impact on academic engagement ($\beta = 0.74$, $p < 0.001$). The overall impact of academic factors on academic engagement was found to be both positive and statistically significant ($\beta = 0.55$, $p < 0.001$). Furthermore, the total indirect effect of academic factors on academic engagement also demonstrated a positive and significant relationship ($\beta = 0.35$, $p < 0.001$). Specifically, this significant indirect effect was observed when academic factors influenced academic engagement through individual factors ($\beta = 0.35$, $p < 0.001$) (Table 3).

Discussion

This study reveals the substantial impact of both academic and individual factors on the academic engagement of Iranian dental students. Specifically, academic elements (such as the learning-teaching environment, servant leadership, staff-student interaction, equipment, welfare amenities, and scientific and extracurricular spaces) demonstrate a direct positive correlation with academic engagement. This outcome is consistent with prior research underscoring the critical role of a supportive and enrichingacademic environment in promoting student engagement (10, 13, 14).

Consistent with the findings of Nekavand et al.'s research (14), this study's results demonstrate a more significant influence of individual factors on academic motivation. This could be attributed to the potential mediation of academic factors' effects through individual factors.

The learning-teaching environment stands out as the most impactful academic factor. This highlights the critical role played by positive and supportive interactions between instructors and students, the use of effective teaching methods, and the creation of a generally conducive classroom atmosphere (16). These elements altogether form the educational experience by fostering active participation, motivation, and a sense of belonging among students. Consistent with prior research (19, 20), this study also found a teacher-student interaction, the learning-teaching environment, the enhancement of student extracurricular activities, and servant leadership concerning academic enthusiasm. Moreover, Huang et al. (16) established a significant direct positive correlation between the university atmosphere and students' academic motivation. They found that increased student engagement in learning activities within the university setting, coupled with a pedagogical shift from subject- and teacher-centered instruction to a student-centered approach emphasizing greater student interaction, culminates in enhanced academic motivation. These findings align with the current study. Among the academic factors, “equipment” and “welfare amenities” were identified as the most influential, following the teaching-learning environment, in terms of factor loading. This consistency is further supported by numerous studies indicating that the inadequate provision of sports, educational, and health equipment and facilities in schools detrimentally impacts the overall quality of educational institutions (21).

Individual factors, including self-efficacy, time management, hope, and support from family and friends, demonstrate a significant direct correlation with academic engagement. Of these factors, “hope” was identified as the most potent predictor, consistent with prior research emphasizing its beneficial influence on both academic achievement and resilience (8, 22). In the realm of individual psychological factors, “hope” consistently demonstrates the strongest influence. Students exhibiting higher levels of hope are more inclined to establish and pursue achievable objectives, sustain their engagement, and surmount challenges with greater efficacy. Rand et al.’s (23) research indicates that both hope and optimism serve as significant predictors of students' academic performance and overall mental well-being. Snyder et al. (24) found a strong correlation between elevated levels of hope and positive academic outcomes in college students, including superior overall average grades, higher academic performance, and accelerated graduation rates. Similarly, Khoroushi et al. (25) demonstrated that student self-efficacy and time management skills contribute to increased enthusiasm, which, in turn, facilitates enhanced learning and academic progress. Sohrabi et al. (26) found a significant relationship between time organization, time management behaviors, and academic performance. This finding corroborates the results observed in the present study concerning the time management component.

The study's findings indicate that individual factors exert a greater influence on academic engagement than academic factors do. This phenomenon can be explained by the mediating role of individual factors in the relationship between academic factors and academic engagement. Specifically, the effect of academic factors

on engagement is partially mediated by individual factors, indicating an intricate interaction among these variables.

While this study found that scientific and extracurricular spaces, along with support from family and friends, had the least explanatory power, it is crucial to acknowledge their demonstrated significance in prior research (27, 28). These divergent results may be attributed to the specific contextual factors of the current study, including the homogeneity of the sample and the participants' age and developmental stage.

Limitations: There were several limitations for this study. Firstly, the participant pool was drawn exclusively from a single faculty at one university, resulting in a considerable degree of homogeneity among the students and encompassing both their individual and academic factors. Such homogeneity might account for the observation that individual factors exhibited a higher regression coefficient compared to academic factors. The impact of academic factors might have been more significant if participants had been drawn from a more diverse range of faculties and possessed a wider array of academic factors. To improve the generalizability of these results, future studies should include participants from multiple universities. Additionally, the current research treated the substructures of individual and academic factors, as well as the dimensions of academic engagement, as observed variables. The current study's limited sample size precluded the treatment of certain variables as latent variables, as this could have compromised the achievement of model convergence. To mitigate the risk of measurement error in future research, particularly when analyzing factors across diverse substructures, it is advisable to employ larger sample sizes. Third, the study's reliance on self-report data and the extensive number of survey items (125 items) may have led to respondent fatigue, potentially diminishing the accuracy of responses to later questions and increasing measurement error. Ultimately, the cross-sectional design of the study precludes the establishment of causal inferences among the investigated relationships.

Conclusion

This study underscores the substantial impact of both academic and individual factors on the academic engagement levels observed among Iranian dental students. To foster improved student engagement, universities should focus on optimizing the learning-teaching environment. This includes promoting positive interactions between instructors and students, implementing effective pedagogical approaches, and cultivating a supportive and conducive classroom atmosphere. Cultivating academic engagement can also be achieved through the provision of varied learning opportunities, the promotion of servant leadership principles, the assurance of appropriate facilities and equipment, and the availability of extracurricular activities.

This study emphasizes the significant role of individual attributes, specifically hope, self-efficacy, and time management, in fostering academic engagement. Students can cultivate greater involvement in their studies by nurturing optimism, establishing attainable objectives, demonstrating resilience in the face of difficulties, and refining their time management skills. Moreover, developing supportive relationships with family and friends can also contribute to heightened academic engagement.

While academic and individual factors exert varying degrees of influence, comprehending their complex interactions and the mediating role of individual factors in academic engagement is crucial. Therefore, to cultivate a more engaging and successful learning environment for dental students, it is recommended to implement holistic interventions and support systems that address both academic and individual dimensions.

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Conflict of interests: There is no conflict of interest.

Ethical approval: This research was conducted in adherence to the Declaration of Helsinki and good clinical practices. Approval for this project was granted by the Research Ethics Committee of Babol University of Medical Sciences (Ethics Code: IR.MUBABOL.HRI.REC.1401.202).

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References

1. Fredricks JA, Blumenfeld PC, Paris AH. School Engagement: Potential of the Concept, State of the Evidence. Review of Educational Research. 2004; 74(1): 59-109. doi:10.3102/00346543074001059.
2. Reeve J. A self-determination theory perspective on student engagement. Handbook of research on student engagement. Boston, MA: Springer US; 2012: 149-72.
3. Hosseinmardi AA, Ghorban Shiroodi S, Zarbakhshbahri MR, Tizdast T. The Relationship of Academic Engagement, School Engagement and School Belonging with Academic Achievement by Mediated the Academic Achievement Motivation in Male Students. Sociology of Education. 2022; 7(2): 178-89. doi: 10.22034/ijes.2021.534830.1123.
4. Kahu ER. Framing student engagement in higher education. Studies in Higher Education. 2013; 38(5): 758-73. doi:10.1080/03075079.2011.598505.
5. Trowler V. Student engagement literature review. The higher education academy. 2010;11(1):1-15.
6. Honicke T, Broadbent J. The influence of academic self-efficacy on academic performance: A systematic review. Educational Research Review. 2016;17:63-84. doi:10.1016/j.edurev.2015.11.002.
7. Wolters CA, Hussain M. Investigating grit and its relations with college students' self-regulated learning and academic achievement. Metacognition and Learning. 2015;10(3):293-311. doi:10.1007/s11409-014-9128-9.
8. Rand KL, Martin AD, Shea AM. Hope, but not optimism, predicts academic performance of law students beyond previous academic achievement. Journal of Research in Personality. 2011;45(6):683-6. doi:10.1016/j.jrp.2011.08.004.
9. Galligan SB, Barnett RV, Brennan MA, Israel GD. The Effects of Gender Role Conflict on Adolescent and Emerging Adult Male Resiliency. The Journal of Men's Studies. 2010;18(1): 3-21. doi:10.3149/jms.1801.3.
10. Lange RS. Pascarella, T. and Terenzin, P. How College Affects Students, A Third decade of Research. 2nd ed. San Francisco: Jossey-Bass; 2014: 2. doi:10.14426/jsaa.v2i2.70.
11. Elsayed Abdelhalim G, Mohamed Fouad Kamel N, Abd-ElRasoul SA-EF. Effect of Interactive Learning environment on Nursing Students' Engagement and Academic Self-Concept. Egyptian Journal of Health Care. 2020; 11(1): 384-98. doi:10.21608/ejhc.2021.175131.
12. Aboramadan M, Dahleez K, Hamad M. Servant leadership and academics' engagement in higher education: mediation analysis. Journal of Higher Education Policy and Management. 2020;42(6):617-33. doi:10.1080/1360080X.2020.1774036.
13. Lizzio A, Wilson K, Simons R. University Students' Perceptions of the Learning Environment and Academic Outcomes: Implications for theory and practice. Studies in Higher Education. 2002;27(1):27-52. doi:10.1080/03075070120099359.
14. Nekavand M, Jaafari P, Arasteh H. A Model for Promoting Academic Engagement in Medical Sciences Students. Iran J Med Educ. 2018;18:446-57. [In Persian]
15. Venn E, Park J, Andersen LP, Hejmadi M. How do learning technologies impact on undergraduates' emotional and cognitive engagement with their learning? Teaching in Higher Education. 2023;28(4):822-39. doi:10.1080/13562517.2020.1863349.
16. Huang SL, Fisher DL. Associations of the University Learning Environment with Academic Engagement and Satisfaction among Science Majors in Taiwan. Asia-Pacific Education Researcher (De La Salle University Manila). 2011;20(2):291.
17. Rezapour M, Khanjani N, Mirzaee M. Construct Validity of Maryland Safe and Supportive Schools Climate Survey in Iran: A Validation Study. International Journal of School Health. 2020;7(2):1-13. doi:10.30476/intjsh.2020.84914.1049.
18. Hart SR, Stewart K, Jimerson SR. The Student Engagement in Schools Questionnaire (SESQ) and the Teacher Engagement Form-New (TERF-N): Examining the preliminary evidence. Contemporary School Psychology. 2011;15(1):67-79. doi:10.1007/BF03340964.
19. Zahed A, Karimi Yousefi SH, MoeiniKia M. Psychometric Properties of the Scale of Interest in School. Educational and Scholastic studies. 2013;2(4):56-70. [In Persian]
20. Mogharab M, Nzteghi K, Sharifzade GR. Effects of lecture and team member teaching design on nursing student's learning and academic motivation. Modern Care Journal. 2013;10(3):173-82. [In Persian]
21. Hatamifar K, Kakoojooybari AS, Sarmadi MR. A Study of Students Satisfaction with Student Services at Payam Noor University. Quarterly Journal of Research and Planning in Higher Education. 2023;19(4):117-39.
22. Ouweneel E, Le Blanc PM, Schaufeli WB. Flourishing students: A longitudinal study on positive emotions, personal resources, and study engagement. The Journal of Positive Psychology. 2011;6(2):142-53. doi:10.1080/17439760.2011.558847.
23. Rand KL, Shanahan ML, Fischer IC, Fortney SK. Hope and optimism as predictors of academic performance and subjective well-being in college students. Learning and Individual Differences. 2020;81: 101906. doi:10.1016/j.lindif.2020.101906.
24. Snyder CR, Shorey HS, Cheavens J, Pulvers KM, Adams Iii VH, Wiklund C. Hope and academic success in college. Journal of Educational Psychology. 2002;94(4):820-6. doi: 10.1037/0022-0663.94.4.820.
25. Khoroushi P, Nili MR, Abedi A. Relationship between "Cognitive and Emotional Engagement of Learning" and "Self-Efficiency" of Students Farhangian University of Isfahan. Educ Strategy Med Sci. 2014; 7 (4): 229-34. [In Persian]
26. Sohrabi Z, Ghovati F, Mirhosseini F, Hosseini F. The relationship between achievement motivation and time management and academic achievement Undergraduate Medical University of Medical Sciences. Razi Journal of Medical Sciences. 2016;23(150):35-45.
27. Aghamirzayi T, Salehi Omran E. Analysis of the effective factors on student progress: A Case Study in the Mazandaran University of Sciences & Technology. Higher Education Letter. 2013;5(20):117-40. [In Persian]
28. Bayanfar PD, F, Partonejad N, Tabatabaee PD. Predicting Students' Academic Engagement Based on Academic Support and Family Emotional Climate: The Mediating Role of Academic Emotions. Quarterly Journal of Family and Research. 2022;18(4):31-48. [In Persian]

Table 1. The demographic characteristics of participants according to frequency and percentage (N = 315)

Variable	Variable subgroup	n (%)
Gender	Male	139 (44.1)
	Female	176 (55.9)
Age	Below 20	88 (27.9)
	20-25	197 (62.5)
	Above 25	30 (9.5)
Marital status	Single	298 (94.6)
	Married	17 (5.4)
Father's education level	Below diploma	14 (4.4)
	Diploma	62 (19.7)
	Bachelor's degree	112 (35.6)
	Master's degree and above	127 (40.3)
Mother's education level	Below diploma	28 (8.9)
	Diploma	85 (27)
	Bachelor's degree	115 (36.5)
	Master's degree and above	87 (27.6)
Semester	1	22 (7)
	2	31 (9.8)
	3	13 (4.1)
	4	35 (11.1)
	5	10 (3.2)
	6	41 (13)
	7	11 (3.5)
	8	40 (12.7)
	9	15 (4.8)
	10	39 (12.4)
	11	16 (5.1)
	12	42 (13.3)

Table 2. Descriptive statistics, Pearson correlations, and Cronbach's alpha of academic and individual factors and academic engagement (N = 315)

	E1	E2	E3	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
E1	1												
E2	0.55***	1											
E3	0.46***	0.50***	1										
F1	0.41***	0.32***	0.44***	1									
F2	0.44***	0.33***	0.29***	0.34***	1								
F3	0.59***	0.41***	0.43***	0.52***	0.47***	1							
F4	0.21***	0.11*	0.11*	0.24***	0.27***	0.29***	1						
F5	0.49***	0.32***	0.17**	0.13*	0.39***	0.37***	0.24***	1					
F6	0.35***	0.28***	0.12*	0.09	0.31***	0.31***	0.07	0.67***	1				
F7	0.29***	0.22***	0.13*	0.11*	0.22***	0.26***	0.19***	0.57***	0.64***	1			
F8	0.34***	0.31***	0.25***	0.18***	0.21***	0.30***	0.16**	0.60***	0.34***	0.32***	1		
F9	0.34***	0.27***	0.19***	0.24***	0.18***	0.29***	0.18***	0.62***	0.46***	0.45***	0.67***	1	
F10	0.28***	0.23***	0.22***	0.05	0.24***	0.20***	0.10	0.46***	0.34***	0.34***	0.56***	0.60***	1
Mean	18.56	20.17	29.85	26.49	25.15	21.12	26.68	94.62	13.22	12.26	21.92	24.54	19.36
SD	6.72	6.57	8.66	5.03	6.92	5.11	5.24	18.56	5.25	3.98	6.32	6.83	5.29
[Min, Max]	[2,35]	[5,40]	[0,44]	[7,35]	[8,40]	[6,30]	[7,35]	[50,154]	[5,25]	[4,20]	[8,40]	[9,45]	[7,35]
Cronbach's alpha	0.91	0.85	0.94	0.88	0.87	0.88	0.84	0.94	0.95	0.91	0.86	0.83	0.89

*P < 0.05, **P < 0.01, ***P < 0.001

E1: Emotional engagement; E2: Behavioral engagement, E3: Cognitive engagement, F1: Self-efficacy, F2: Time management, F3: Hope, F4: Support from family and friends, F5: Learning-teaching environment, F6: Servant leadership, F7: Staff-student interaction, F8: Equipment, F9: Welfare amenities, F10: Scientific and extracurricular spaces, SD: Standard deviation, Min: Minimum, Max: Maximum

Table 3. Effects of academic factors on academic engagement

	B[1]	Se[2]	Z[3]	P-Value[4]
Total	0.55	0.05	10.42	<0.001
Total indirect	0.35	0.06	6.38	<0.001
Specific indirect 1				
Academic factors → individual factors → academic engagement	0.35	0.06	6.38	<0.001
Direct				
Academic factors →academic engagement	0.20	0.06	3.16	0.002
Individual factors → academic engagement	0.74	0.06	12.84	<0.001
Academic factors → individual factors	0.49	0.06	8.83	<0.001

[1]Standardized coefficient; [2]Standard error; [3]Z-test statistics; [4]Two-tailed p-value

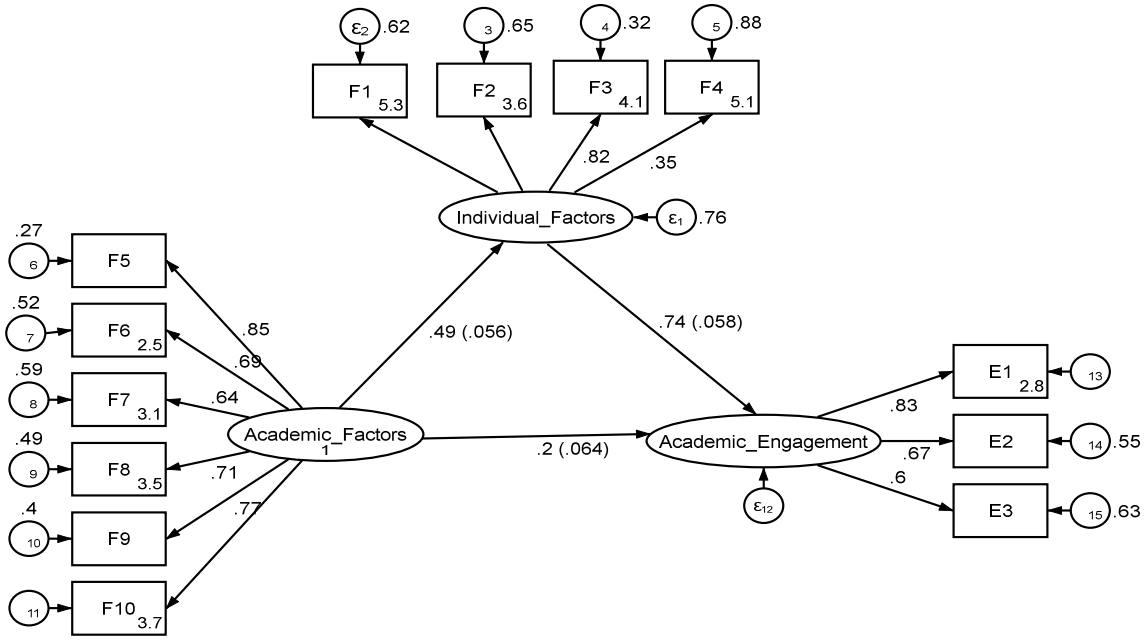

Figure 1. Structural equation modeling of academic factors and individual factors on academic engagement

E1: Emotional engagement; E2: Behavioral engagement, E3: Cognitive engagement, F1: Self-efficacy, F2: Time management, F3: Hope, F4: Support from family and friends, F5: Learning-teaching environment, F6: Servant leadership, F7: Staff-student interaction, F8: Equipment, F9: Welfare amenities, F10: Scientific and extracurricular spaces. All coefficients are significant (P < 0.05).