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Predicting University Success in Mongolia: The Roles of Admission Tests and Prior Academic Achievement

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ABSTRACT: This research investigated the factors predicting academic success in Mongolian universities, focusing on university admission test scores and prior academic achievement (high school grade point average). Using data from 21,186 undergraduate students who graduated from major Mongolian universities between 2014 and 2024, the study examined how these factors relate to undergraduate grade point average. Results indicate that admission test scores show a statistically significant, albeit weak, association with undergraduate performance, whereas high school certificate scores demonstrate a stronger predictive effect. A model that includes high school certificate score, admission test score, and third-year grade point average demonstrates the strongest predictive power for final undergraduate grade point average. These findings suggest the need to re-evaluate admission criteria, placing greater emphasis on high school academic performance and reassessing the predictive validity of the national university admission examination. The results highlight the importance of strengthening pre-university education and creating supportive learning environments to enhance students' academic success.

KEYWORDS: Academic preparedness, Academic performance, Predictive validity

1. Introduction

Developing countries, including Mongolia, require a highly qualified workforce, making the quality of higher education crucial for national development. The basis for gaining good quality education at the undergraduate stage depends on the quality of high school level. Knowledge and skills that acquired at the high school level and the earlier levels of education plays important role for the higher involvement and achievement in the undergraduate level of education. This paper is an extended version of the work originally presented at the International Symposium on Computer Science and Educational Technology, ISCSET 2024 [1]. It extended in the sense that the authors added data of students of National University of Mongolia graduated between 2022-2024 and conducted extended analysis using predictor variables.

Higher education enrollment in Mongolia has been increasing steadily since the 1990s, aligning with global trends [2]. However, despite the increasing enrollment rates, the employment rates of graduates have declined, leading to criticism over the high unemployment rate among graduates in the country. Contributing factors include low socio-economic development and limited job opportunities in the labor market. A country's socio-economic development has a significant impact on students' academic achievement. Furthermore, the quality of graduates plays a crucial role in determining the employment rate, which subsequently has a substantial role on the economic development of the country. Higher levels of education among citizens tend to contribute to greater socio-economic development [2,3].

A high school graduate or someone from a higher educational institution who has passed the General University Admission Examination (GUAE) is eligible to apply to Mongolian higher education institutions (HEIs). The GUAE includes a mandatory Mongolian language exam and additional subject-specific tests, selected by the student based on the requirements of the intended university major. In this research, the authors considered GUAE scores and high school grade point average (HGPA) as quantitative measures of student academic preparedness, while the undergraduate grade point average (UGPA) reflected academic performance or achievement at the university level.

The overarching goal of the research is to examine the relationship between the academic achievements of undergraduate students in Mongolian HEIs and their prior educational performance. Specifically, it focused to analyze the relation between students' undergraduate grade point averages (GPA) with their scores on the general university admission examinations, high school graduation certificate scores and other possible scores. To achieve this objective, the authors conducted correlation and regression analyses to explore the relationships among these variables across different student groups. It examined the relationships between undergraduate GPA, entrance examination scores, high school achievement scores, and first-year GPA. Additionally, the study aimed to develop a simple predictive model to estimate students' undergraduate GPA based on these factors.

The specific research objectives of the paper are:

- To assess the correlation between undergraduate GPA and entrance exam scores, high school certificate scores, and GPAs during the periods of undergraduate study.
- To develop a model that accurately predicts undergraduate GPA using the aforementioned variables.

The authors used data from undergraduate students at the National University of Mongolia (NUM), Mongolian University of Life Sciences (MULS), University of Finance and Economics (UFE), and Mongolian State University of Education (MSUE), who graduated between 2014 and 2024. A total of 21,186 students participated in this study. The University of Finance and Economics is a leading private university in the country, while the remaining institutions are public universities.

2. Review of Literature

Defining academic performance or achievement at any level of education and accurately measuring it remain challenging issues that continue to be central focus areas for educational researchers. According to [4], academic achievement is defined as the performance outcomes in intellectual areas studied at educational institutions such as universities. It is a fundamental indicator of intellectual development and is regarded as a critical determinant of individual and societal progress.

Several researchers primarily conceptualize academic achievement as a student's ability to complete specific academic tasks [5,6]. It is commonly evaluated through Grade Point Average (GPA) or other officially documented academic records [7,8]. In this research we use UGPA as a main estimate of academic performance of undergraduate students.

In some cases, scholars have also attempted to assess academic achievement using non-academic outcomes [9]. While both approaches encompass essential dimensions of academic success, they are not entirely interchangeable [6].

Academic preparedness is a pivotal factor in students' academic success. In the context of Australian universities, authors in [10] demonstrated that students with low academic preparedness face greater difficulties in their studies.

Another critical aspect of academic preparedness that directly influences students' academic achievement is their high school internal assessment scores. In [11], it analyzed data from first-year students in New Zealand and concluded that, for social science and humanities subjects, school-based assessments are better predictors of academic achievement at the university level. Conversely, external assessment or entrance examination scores more effectively forecast university performance in disciplines of natural sciences. Similarly, in [12], the authors studied the relationship between secondary education outcomes and academic achievement for educational science students case in Finland. It has shown that, the overall entrance examination results explained 15% of the variance in study success of Finnish Educational Science students.

A study in [13], it also showed the importance of high school-based grades of major subjects for their future study at the university. They used a sample of 113 students graduated from international Baccalaureate (IB) high school and 314 ordinary high school leavers of Holland, determined a predictive validity of grades of high school major subjects for university academic achievements [13]. They targeted to predict academic performance of these students in the first and fourth years of study at the university based on the results of three major subject's assessment results in the last year of the high school using the t-test and multiple correlation analysis. As a result, the GPAs of the first and fourth year of undergraduate study of the students was more relevant to the mean of the scores of three main subjects with highest value, than to the student's high school GPAs. Besides, for alumni who graduated from the IB, the GPA of the beginning year of the undergraduate study and the GPA of the high school had the highest influence on the GPA at the undergraduate graduation.

Using regression analysis in 1998, in [14] it identified a positive but weak correlation between undergraduate students' SAT scores and their academic rankings within the classroom. Similarly, in [15], authors investigated the potential of predicting undergraduate academic success through SAT scores, finding a weak correlation between admission test scores and academic performance in both studies. Notably, the latter study employed multidimensional correlation analysis.

The assessment of entrance examination scores' predictive validity for academic achievement extends beyond the undergraduate level. Numerous studies focus on determining whether scores from globally recognized exams, such as the GRE, can forecast students' academic success at the graduate level.

A meta-analysis in [16], utilized a sample of 1,753 academic records from 85,000 graduate students to explore whether academic achievements are influenced by GRE scores and UGPA scores. As a result, they concluded that these scores are valid predictors of graduate GPA. Further research in [17], as well as in [18], authors examined the relationship between GRE scores and academic performance among master's and doctoral students across various departments. All these studies consistently revealed a weak correlation between GRE scores and graduate academic success.

3. Research Methods and Research Results

3.1 Research methods

The research analyzed data collected from graduates of NUM, MULS, UFE, and MSUE, covering the period from 2018 to 2024. The dataset included academic records of 12,030 students from NUM, 3,015 students from five different schools and faculties within MULS, 853 students from UFE, and 5,288 students from MSUE, making a total of 21,186 undergraduate graduates. During the study, the relationships between known and unknown variables were systematically examined, the form of their correlations was identified, and the expected values of the dependent variables were estimated.

The researchers employed the GUAE score, the average high school certificate score, the first-year GPA (FYGPA) of students, and a moderator variable as predictor variables, with the undergraduate GPA (UGPA) of graduates serving as the dependent variable. During the analysis of the relationships, the scope of the outcome variables was adapted in various ways depending on the specific context. Regression analyses were performed individually for each case, field of study, and university. Data processing was conducted using SPSS version 29 and Microsoft Excel 2019.

Moderating effects are commonly conceptualized as interaction effects, where a moderator variable alters the strength or direction of the relationship between an independent variable and a dependent variable. This interaction may strengthen, weaken, or even reverse the relationship. In regression analysis, moderating effects are typically assessed by incorporating an interaction term—defined as the product of the independent variable and the moderator variable—into the regression model. A statistically significant interaction term indicates the presence of a moderating effect.

Our moderator variable, denoted as 't' in the models, is a composite three-way interaction term. It was constructed by multiplying the standardized z-scores of these three predictor variables (GUAE, HGPA, and FYGPA).

The inclusion of this specific interaction term as a moderator was driven by the theoretical premise that the combined influence of these foundational academic indicators (pre-university preparedness and early university performance) might not be simply additive, but rather interactive. We hypothesized that the predictive utility of one factor (e.g., GUAE scores) for overall university success might depend on the levels of other factors (HGPA and FYGPA). For instance, a student with a lower GUAE score might compensate through strong HGPA and FYGPA, or conversely, the benefits of a high GUAE score might be amplified or diminished depending on subsequent academic performance. This complex interplay aims to capture a more nuanced and holistic understanding of academic success predictors than individual variables alone.

Preliminary analyses revealed normality assumption for UGPA and GUAE results was failed, as indicated by the Kolmogorov-Smirnov test, which produced a significance level of less than 0.001, below the accepted threshold of 0.05. To compare UGPA and GUAE scores across different universities and fields of study, the Kruskal-Wallis test was applied, revealing statistically significant differences between groups. Specifically, UGPA scores among graduates varied significantly across universities ($\chi^2 = 483.1$, $p < 0.05$), while GUAE results also showed significant variation among universities ($\chi^2 = 5380.6$, $p < 0.05$). When the authors analyzed the differences in UGPA and UGEA scores across different graduation years, the results confirmed their statistical significance, with $\chi^2 = 260.6$, $p < 0.05$ for UGPA, and $\chi^2 = 915.9$, $p < 0.05$ for GUAE. Accordingly, suitable regression models were selected to analyze these relationships, and their statistical significance was rigorously assessed. The following section summarizes the models employed in this study.

The study employed several statistical models, notably multiple regression analysis and analysis of variance (ANOVA), to examine the impact of predictor variables such as HGPA, UGEA, and additional moderating factors on UGPA across various contexts.

Student majors were categorized into six broad fields of study: Natural Sciences (NS), Social Sciences and Education (SSE), Humanities (H), Business Studies (BS), Engineering and Technology (ET), and Legal Studies (LS). This categorization was based on the order approved by the Minister of Education regarding the approval of the names of professional fields/programs. For instance, the Natural Sciences (NS) group includes majors such as Physics, Chemistry, Biology, and Mathematics. The Social

Sciences and Education (SS) group comprises disciplines like Sociology, Psychology, Economics, Teaching and Education. Humanities (H) includes fields such as History, Philosophy, and Literature. Business Studies (BS) covers subjects like Accounting, Finance, and Marketing. Engineering and Technology (ET) incorporates Computer Science, Civil Engineering, and Electrical Engineering. Lastly, Legal Studies (LS) includes Law and Criminology.

A graduate here is understood as graduates of undergraduate study. The correlation between the UGPA and GUAE results was determined, and in order to predict the UGPA of the students based on the GUAE scores the authors developed following statistical models as shown in table 1.

Table 1: Models Used in the Study

Models	Dependent variable	Independent variable	Sample
Model 1	UGPA	GUAE score	20868
Model 2	UGPA	HGPA	7229
Model 3	UGPA	HGPA and GUAE	7229
Model 4	UGPA	GPA of years of study	
Model 5	UGPA	HGPA, GPA of 3rd year of study	4825
Model 6	UGPA	GUAE, GPA of 3rd year of study	5678
Model 7	UGPA	HGPA, GUAE, GPA of 3rd year of study	4825
Model 8	UGPA	HGPA, GUAE, GPA of 1st year of study	1667

3.2 Results

We present the overall statistics of the graduates' GPA and their entrance exam scores in the table 2.

Table 2: Descriptive statistics for UGPA and GUAE

Variable	n	Aver-age	Median	mod	s.dev	Variance
UGPA	21186	3.01	3.09	3.1	0.56	0.312
GUAE	21186	612.9	620.2	800	79.74	6358.5

Variable	Skew-ness	Kurtosis	Range	min	max
UGPA	-0.658	0.513	3.16	1	4
GUAE	-0.358	0.016	564	236	800

The correlation coefficient between the GUAE score and graduates' GPA was 0.256, indicating a weak but positive relationship as shown in table 3. Additionally, a significance level with $p<0.05$ for all universities confirms statistical significance of the relationship. The R^2 value of 0.066 suggests that GUAE scores account for 6.6% of the variance in future UGPA. According to the analysis of variance, each regression model predicts graduate GPA based on GUAE scores with statistical significance, and all regression coefficients are significant.

Table 3: Correlation Between UGPA and GUAE Scores, by Academic Fields of Study

Fields	N	R	R^2	b_0 P	b_1 P
NS	5371	0.289	0.083	<0.001	<0.001
	Regression: y=1.743+0.002x				
SS	4481	0.347	0.121	<0.001	<0.001
	Regression: y=1.97+0.002x				
H	3967	0.232	0.054	<0.001	<0.001
	Regression: y=2.14+0.001x				
BS	3363	0.216	0.047	<0.001	<0.001
	Regression: y=1.946+0.002x				
LS	551	0.119	0.014	<0.001	0.005
	Regression: y=2.592+0.001x				
ET	3135	0.215	0.046	<0.001	<0.001
	Regression: y=1.304+0.002x				
Total	20868	0.256	0.066	<0.001	<0.001
	Regression: y=1.895+0.002x				

While the correlation between GUAE scores and UGPA ($r = 0.25$) was statistically significant ($p < 0.05$), likely due to the large sample size, it suggests only a weak practical relationship. This indicates that GUAE scores explain a relatively small proportion of the variance in undergraduate GPA.

The similar picture can be seen with the relationship between graduate's UGPA with HGPA. The UGPA depends on high school grade point average weakly but this relation is statistically significant.

The correlation coefficient between the HGPA score and graduates' GPA of all students is 0.378, indicating a weak but positive relationship as shown table 4. Additionally, a significance level of $p<0.05$ for all fields of studies confirms statistical significance. The R^2 value of 0.143 suggests that GUAE scores account for 14.3% of the variance in future GPA. According to the analysis of variance, each regression model predicts graduate GPA based on HGPA scores with statistical significance, and all regression coefficients are significant.

The next analysis is the correlation of UGPA with HGPA and GUAE by student's academic field of study as shown in table 5.

Table 4: Correlation Between UGPA and HGPA Scores

Fields	N	R	R^2	b_0	b_1
				P	P
NS	2830	0.422	0.178	0.557	<0.001
	Regression: y=0.067+0.032x				
SS	2543	0.336	0.113	<0.001	<0.001
	Regression: y=0.838+0.026x				
H	1413	0.315	0.099	0.001	<0.001
	Regression: y=0.638+0.027x				
BS	387	0.482	0.232	0.302	<0.001
	Regression: y=-0.318+0.037x				
ET	56	0.412	0.17	0.693	0.002
	Regression: y=-0.371+0.036x				
Total	7229	0.378	0.143	<0.001	<0.001
	Regression: y= 0.36+0.03x				

Table 5: Correlation of UGPA With HGPA and GUAE, by Academic Fields of Study

y=UGPA, x = HGPA, z = GUAE score, t = moderator						
Fields	N	R	R2	beta		
				x	z	t
NS	2830	0.491	0.241	0.393	0.256	0.092
	Regression: y = -0.633 + 0.03x + 0.002z + 0.03t					
SS	2543	0.44	0.193	0.284	0.284	0.048
	Regression: y = 0.328+0.022x+0.001z+0.012t					
H	1413	0.387	0.149	0.283	0.172	0.121
	Regression: y = 0.342 + 0.024x + 0.001z + 0.051t					
BS	387	0.502	0.252	0.411	0.147	-0.045
	Regression: y =-0.523+0.031x+0.001z-0.025t					
ET	56	0.428	0.184	0.32	-0.027	-0.166
	Regression: y = 0.507 + 0.028x + 0.001z -0.121t					
Total	7229	0.455	0.207	0.318	0.258	0.052
	Regression: y=-0.064+0.025x+0.001z+0.019t					

Correlation coefficient of UGPA with HGPA and GUAE of all students is 0.455 indicating positive but weaker relations. However, this relation is statistically significant. For students of Business study, The UGPA depends on HGPA and GUAE moderately, while for students of other subjects this relation is weak.

Based on the results presented in Tables 3-5, the authors conclude that GUAE and HGPA scores are not strong predictors of students' UGPA as shown in table 6. In search of other factors that may contribute to a more accurate model to predict UGPA in conjunction with HGPA and GUAE scores, the authors checked the correlations of UGPA with student's yearly GPAs.

Table 6: Correlation UGPA with GPA Scores of Years of Study

Years of study	N	R	R^2	ANOVA	b_0	b_1
				P	P	P
1	14659	0.528	0.279	<0.001	<0.001	<0.001
	Y=1.623+0.492x					
2	8550	0.847	0.718	<0.001	<0.001	<0.001
	Y=1.092+0.657x					
3	10185	0.852	0.726	<0.001	<0.001	<0.001
	Y=1.032+0.673x					
4	10223	0.821	0.674	<0.001	<0.001	<0.001
	Y=1.022+0.654x					

Surprisingly, the first-year GPA was the weakest predictor of graduation GPA, while the second and third-year GPAs proved to be stronger indicators. This contradicts with findings in [1], where the first-year GPA was the most significant predictor of graduation success. The expanded dataset from NUM appears to have influenced these correlations. Consequently, it is important to analyze the correlations among HGPA, GUAE scores, and the GPAs of the first and third years of study to better understand their respective influences on UGPA. This examination can provide insights into how early academic performance and entrance exam results relate to overall university success.

To identify the most effective models for predicting graduate GPA, the authors analyzed the relationship of UGPA with various combinations of HGPA, GUAE and student's first- and third-year's GPAs as shown in table 7, 8 and 9.

Table 7: Correlation of UGPA with HGPA and 3rd Year GPA, by Academic Fields of Study

x = HGPA, z = 3rd year GPA, t = moderator						
Fields	N	R	R2	beta		
				x	z	t
NS	965	0.875	0.765	0.15	0.808	0.019
	Regression: y = -0.2+0.013x+0.694z+0.009t					
SS	2487	0.833	0.693	0.089	0.803	0.045
	Regression: y = 0.558+0.007x+0.647z+0.02t					
H	1373	0.893	0.798	0.077	0.862	0.034
	Regression: y = 0.399+0.007x+0.699z+0.016t					
Total	4825	0.859	0.738	0.090	0.825	0.038
	Regression: y=0.409+0.007x+0.677z+0.017t					

Table 8: Correlation of UGPA with GUAE, 3rd Year GPA, by Academic Fields of Study

x = GUAE score, z = 3rd year GPA, t = moderator						
Fields	N	R	R2	beta		
				x	z	t
NS	965	0.872	0.761	0.135	0.800	0.007
	Regression: y = 0.484+0.001x+0.687z+0.003t					
SS	2487	0.834	0.695	0.103	0.806	0.023
	Regression: y = 0.842+0.001x+0.65z+0.009t					

H	1373	0.893	0.798	0.078	0.872	0.009
	Regression: y = 0.733+0.001x+0.707z+0.003t					
BS	853	0.887	0.787	0.209	0.793	0.033
	Regression: y =0.001+0.002x+0.652z+0.018t					
Total	5678	0.854	0.729	0.078	0.831	0.019
	Regression: y=0.775+0.001x+0.681z+0.008t					

Table 9: Correlation of UGPA with HGPA and GUAE Scores, 3rd-year GPA by Fields of Study

x = HGPA, z = GUAE score, k=3rd year GPA, t = moderator							
Fiel-ds	N	R	R2	beta			
				x	z	k	t
NS	965	0.878	0.771	0.19	0.1	0.79	-0.005
	Regression: y = -0.229+0.01x+0.001z+0.668k-0.002t						
SS	2487	0.836	0.699	0.07	0.09	0.78	-0.017
	Regression: y = 0.458+0.005x+0.001z+0.628k-0.005t						
H	1373	0.895	0.800	0.05	0.06	0.86	0.01
	Regression: y = 0.431+0.004x+0.001z+0.695k+0.004t						
Total	4825	0.861	0.741	0.06	0.08	0.81	-0.003
	Regression: y=0.39+0.005x+0.001z+0.666k-0.001t						

The p value of the ANOVA is less than 0.001 for all cases, which shows the statistical significance of this Model.

The findings indicate that a model combining a student's HGPA, GUAE scores, and 3rd-year GPA is a better predictor of UGPA than other combinations of these factors. It's important to note that all these relationships are strongly positive. This is because academic performance in a student's penultimate year (3rd-year GPA) inherently reflects a more stable and mature pattern of academic engagement and accumulated knowledge. It is temporally closer to the final graduation GPA, thereby capturing current academic aptitude and effort more accurately than earlier indicators such as admission test scores or even first-year GPA, which may reflect initial adjustment phases rather than sustained performance.

From the viewpoint of the practicality, the combination of HGPA, GUAE, and 1st-year GPA also provides a reasonably accurate prediction of student UGPA as shown in table 10.

Table 10: Correlation of UGPA with HGPA, GUAE and First Year GPA, by Academic Fields of Study

x = HGPA, z = GUAE score, k=first-year GPA, t = moderator							
Fields	N	R	R2	beta			
				x	z	k	t
NS	3555	0.858	0.737	0.006	0.197	0.739	0.018
	Regression: y=0.391+0.001x+0.001z+0.605k+0.006t						
SS	8255	0.805	0.648	0.041	0.037	0.778	-0.001
	Regression: y=0.776+0.003x+0.001z+0.657k-0.001t						
H	4887	0.759	0.577	0.075	0.051	0.728	-0.02
	Regression: y=0.35+0.007x+0.001z+0.616k-0.009t						
Total	16667	0.788	0.620	0.039	0.042	0.76	0.001
	Regression: y=0.706+0.003x+0.001z+0.642k-0.008t						

The p value of the ANOVA is less than 0.001 for all cases, which shows the statistical significance of this Model.

The results of the multiple regression analysis demonstrate a strong positive relationship between HGPA, GUAE, first-year GPA, and UGPA for students in the Natural Sciences and Social Sciences. A positive association is also observed for students in the Humanities, although to a lesser extent.

4. Conclusions and Discussions

4.1 Discussions

Although the regression models 1-8 were statistically significant, the observed R^2 values, lower than 12% (Table 3 and 4), indicate that the independent variables explain only a small fraction of the variance in UGPA. This suggests that while these models identify statistically significant relationships, their practical utility for accurately predicting individual student performance remains limited. This underscores the importance of considering the factors identified by these models in shaping student academic performance.

For other Models, the findings are particularly relevant for education policymakers, agencies within the Ministry of Education, and university admissions officers. The analysis reveals that high school certificate scores (HGPA) demonstrate a stronger influence on graduates' GPA compared to GUAE scores. Consequently, a re-evaluation of admissions criteria, with increased emphasis on HGPA, may be warranted.

Our finding that GUAE has a weak predictive validity aligns with the Finnish case in [12].

Strongest relations of graduate's UGPA with GUAE and HGPA of students from the fields Social Sciences. Which doesn't follow the findings in [11].

While Model 7, which incorporates 3rd-year GPA, demonstrated higher predictive power for graduation GPA due to its temporal proximity to the outcome, Model 8, utilizing first-year GPA alongside HGPA and GUAE scores, offers distinct practical advantages. Its strength lies in its early detection value for identifying students at potential academic risk much earlier in their university careers. By providing predictive insights after the first year, Model 8 enables timely and proactive interventions, such as targeted academic advising, tutoring, and support programs. This allows institutions to address emerging academic challenges before they escalate, thereby maximizing the window of opportunity for student support and potentially improving overall retention rates. Furthermore, the availability of first-year GPA data also enhances administrative convenience, facilitating more efficient resource allocation and informed policy decisions regarding student success initiatives. Thus, despite a potentially slightly lower raw predictive accuracy compared to Model 7, Model 8's utility in fostering a proactive and responsive educational environment makes it a highly valuable tool for practical application.

4.2 Conclusions

Based on the findings highlighting the limited predictive power of GUAE scores and the more significant influence of high school academic achievement (HGPA) on undergraduate academic performance, we propose the following recommendations aimed at enhancing student success and educational quality in Mongolia:

I. Reforming University Admissions and Assessment Policiy:

- Revise the content and structure of the GUAE to move beyond mere factual knowledge assessment towards evaluating critical thinking and problem-solving skills.
- Increase the weight placed on high school based assessments (HGPA) and incorporate other supplementary criteria (e.g., portfolios, essays, interviews) into the university admissions process.

II. Strengthening Pre-University Education:

- Promote continuous professional development programs for high school teachers to enhance teaching quality.
- Update pre-university level curricula to ensure better alignment with university needs and requirements, fostering a seamless transition for students.
- Emphasize the development of students' learning strategies and critical thinking skills at the pre-university level.
- Foster greater collaboration and communication between high schools and universities to align expectations and curricula.

III. Adopting International Best Practices:

- Conduct further studies on international best practices in university admissions and pre-university education, adapting relevant strategies to the unique Mongolian context.

While this study provides valuable insights into factors predicting academic success in Mongolian universities, it is important to acknowledge certain limitations that warrant consideration and highlight avenues for future research. Firstly, our analysis was primarily limited to academic variables such as admission test scores and prior academic achievement. We did not incorporate crucial non-academic factors like psychological variables (e.g., motivation, self-efficacy, learning strategies) or socio-economic background (e.g., family income, parental education), which are known to significantly influence student success and could offer a more comprehensive understanding. Secondly, although our study included a large and diverse student population across multiple universities and majors, the findings may still exhibit possible differences across majors and universities depending on specific institutional policies, pedagogical approaches, or disciplinary characteristics that were not disaggregated in this analysis. Future research could explore these variations in greater detail. Finally, due to the correlational nature of our research design, we are unable to infer direct causal relationships between the identified predictors and academic outcomes. Our findings indicate associations and predictive power, but they do not definitively establish that these factors cause subsequent university performance. These limitations, however, open important avenues for more nuanced and experimental future investigations.

Conflict of Interest

The authors declare no conflict of interest.

References

[1] A. Amarzaya, J. Ankhbayar, and M. Narantuya, "A study of the predictive validity of Mongolian university admission tests," in *Proceedings of the International Symposium on Computer Science and Educational Technology*, Laubusch, Germany, 2024.

[2] R. A. N. Al-Tameemi, C. Johnson, R. Gitay, A.-S. G. Abdel-Salam, K. Al Hazaa, A. BenSaid, and M. H. Romanowski, "Determinants of poor academic performance among undergraduate students: A systematic literature review," *International Journal of Educational Research Open*, vol. 4, Art. no. 100232, 2023, doi: 10.1016/j.ijedro.2023.100232.

[3] K. Hayat, K. Yaqub, M. A. Aslam, and M. S. Shabbir, "Impact of societal and economic development on academic performance: A literature review," *IRASD Journal of Economics*, vol. 4, no. 1, 2022, doi: 10.52131/joe.2022.0401.0064.

[4] B. Spinath, "Academic achievement," in *International Encyclopedia of the Social and Behavioral Sciences*, Elsevier, 2012, pp. 1–8, doi: 10.1016/B978-0-12-375000-6.00001-X.

[5] M. Maqableh, M. Jaradat, and A. Azzam, "Exploring the

determinants of students' academic performance at university level: The mediating role of internet usage continuance intention," *Education and Information Technologies*, vol. 26, no. 4, pp. 4003–4025, 2021, doi: 10.1007/s10639-021-10453-y.

[6] L. Caixia, Z. A. Bakar, and X. Qianqian, "Self-regulated learning and academic achievement in higher education: A decade systematic review," *International Journal of Research and Innovation in Social Science*, vol. 9, no. 3, pp. 4488–4504, 2025, doi: 10.47772/IJRISS.2025.90300358.

[7] H. Jossberger, S. Brand-Gruwel, M. W. J. van de Wiel, and H. P. A. Boshuizen, "Exploring students' self-regulated learning in vocational education and training," *Vocations and Learning*, vol. 13, no. 1, pp. 131–158, 2020, doi: 10.1007/s12186-019-09232-1.

[8] D. J. Madigan and T. Curran, "Does burnout affect academic achievement? A meta-analysis of over 100,000 students," *Educational Psychology Review*, vol. 33, no. 2, pp. 387–405, 2021, doi: 10.1007/s10648-020-09533-1.

[9] G. Yaxin and Z. M. Noordin, "Study on the effect of peer relationships on academic achievement among college students," *International Journal of Academic Research in Progressive Education and Development*, vol. 13, no. 1, 2024, doi: 10.6007/IJARPED/v13-i1/20780.

[10] C. Baik, R. Naylor, S. Arkoudis, and A. Dabrowski, "Examining the experiences of first-year students with low tertiary admission scores in Australian universities," *Studies in Higher Education*, vol. 44, no. 3, pp. 526–538, 2019, doi: 10.1080/03075079.2017.1383376.

[11] M. Johnston, B. E. Wood, S. Cherrington, S. Boniface, and A. Mortlock, "Representations of disciplinary knowledge in assessment: Associations between high school and university assessments in science, mathematics and the humanities and predictors of success," *Educational Assessment*, vol. 27, no. 4, pp. 301–321, 2022, doi: 10.1080/10627197.2022.2088495.

[12] J. Vulperhorst, C. Lutz, R. de Kleijn, and J. van Tartwijk, "Disentangling the predictive validity of high school grades for academic success in university," *Assessment and Evaluation in Higher Education*, vol. 43, no. 3, pp. 399–414, 2018, doi: 10.1080/02602938.2017.1353586.

[13] J. Kunnari, J. Pursiainen, and H. Muukkonen, "The relationship between secondary education outcomes and academic achievement: A study of Finnish educational sciences students," *Journal of Further and Higher Education*, vol. 47, no. 9, pp. 1155–1168, 2023, doi: 10.1080/0309877X.2023.2222263.

[14] W. G. Bowen and D. Bok, *The Shape of the River: Long-Term Consequences of Considering Race in College and University Admissions*, 20th Anniversary ed. Princeton, NJ, USA: Princeton University Press, 1998.

[15] B. Bridgeman, J. Pollack, and N. Burton, "Predicting grades in college courses: A comparison of multiple regression and percent succeeding approaches," *Journal of College Admission*, 2008.

[16] N. R. Kuncel, S. A. Hezlett, and D. S. Ones, "A comprehensive meta-analysis of the predictive validity of the Graduate Record Examinations: Implications for graduate student selection and performance," *Psychological Bulletin*, vol. 127, no. 1, pp. 162–181, 2001, doi: 10.1037/0033-2909.127.1.162.

[17] N. W. Burton and M. Wang, "Predicting long-term success in graduate school: A collaborative validity study," *ETS Research Report Series*, vol. 2005, no. 1, pp. i–61, 2005, doi: 10.1002/j.2333-8504.2005.tb01980.x.

[18] B. Bridgeman, N. Burton, and F. Cline, "Understanding what the numbers mean: A straightforward approach to GRE predictive validity," *ETS Research Report Series*, vol. 2008, no. 2, 2008, doi: 10.1002/j.2333-8504.2008.tb02132.x.

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