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Precollege Academic Achievement and Interest Major Congruence: As Related With First Year Academic Achievement in Haramaya University, East Hararghe Zone, and Oromia Regional State, Ethiopia

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Abstract **Original Research Article**

This study was aimed to analyze the relationship between pre-college academic achievement and interest in college major with first year academic achievement at Haramaya University. In order to analyze the contribution of pre-college academic achievements in predicting first year GPA, 496 students' pre-college academic achievements were correlated with the students' first year GPA. One way analysis of variance was used to analyze the difference in first year GPA of the three academically comparable groups of students were placed in their respective departments by their first choice, second choice and third choice. The key findings of this study are: (1) there is statistically significant difference in first year academic performance between the three comparable groups of students in their precollege achievement indicating that placement of students into different departments without considering their interest has an impact on the academic performance of students (2). The combination of entrance exam and preparatory GPA. As predictors of college GPA, yielded multiple regression coefficients accounted for 30.2% that was significantly larger than that was obtained from the independent regression of entrance exam score whose sole contribution was only 11.1%. The paper concludes that, firstly, interest-major congruence has a significant impact on students' college performance. Secondly, the students' preparatory exam scores and entrance exam scores, if used together, have higher predictive weight than using one of them alone.

Keywords: Pre-college academic achievement, interest and University academic successes.

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INTRODUCTION

Background of the study

In the "Introduction to Landmark Early Review of Interest Measurement by Fryer 1931", as cited in [1], both the amount and direction of one's life accomplishments are largely determined by the factor of ability and interest. Among the major factors considered in college major choice, interest in the subject, prior academic performance, guaranteed employment, expected earnings in the field, and a prestigious career were ranked respectively); with interest in the subject and prior academic performance stood first [2]; Allen & Robbins[3, 4]. Similarly) Robin [5] also stated that, Student's college performance will be best when they follow courses of study that much their abilities and interest. This is why, in most of the world, student's aptitude scores and their interests are considered in job selection and course placement. Thus, according to [1], vocational interest and aptitude measurement results should be used effectively and fairly, so that no individual or group would be disadvantaged through their use.

Similarly, in Haramaya University, those students who have better entrance exam scores are placed based on their interests while the rest are randomly placed to different departments depending on the availability of the resource. Thus, interest of low achieving students is not being considered in departmental placements.

Many colleges and universities use college admission test scores, in conjunction with high school grades and course taking, to predict students' likelihood of success at their institution, and thousands of studies have been conducted to validate the use these two achievement indices for this purpose. From thousands of studies addressing the validity of the SAT for predicting college out comes, only a few have acknowledged the use of SAT and other standardized tests as the only determinants of student's placement. In

addition, exams that are focused on achievement rather than aptitude may carry more predictive power. For instance, study conducted at university of California found that students' scores on SAT II - subject-specific achievement tests were notably more powerful predictors of academic success than scores on standard SAT, which is an aptitude exam [6].

Aside from examination, the most frequently considered factors in admission & placement process is student's high school academic performance. In terms of its predictive power high school grades are the strongest predictors of success in tertiary education and this power is enhanced when considered in combination with other factors, such as exam scores [5-9].

These findings were revealed that preparatory school average score has significant weight for predicting college achievement compared to other factors.

Findings from numerous studies conducted on this topic are best summarized in meta-analysis by Allen, Robbins, Casillas, & Oh [3]. According to their analyses:

> *Studies of first-year college GPA suggest that ACT scores and high school grades should carry approximately the same weight if an institution wants its admission criteria to reflect expected level of first-year academic performance. The combination of ACT Composite score and high school GPA provides greater accuracy of admission decisions for most groups of students than using either measure alone.*

As indicated by [5]:*"Considering a candidate's high school grades provides a picture of his/her ability and qualifications over multiple years. This process allows institutions to better assess the candidates fit with the institutional programs so that students, who fit best with the program at the process of selection and placement, are likely to succeed academically, and contribute to society and the labor market."*

This has also been supported by a number of studies, for instance, predictive-validity studies undertaken at a broad range of colleges and universities [10, 11] showed that HSGPA is consistently the best predictor of freshman grades. Standardized test scores do add a statistically significant increment to the prediction, so that the combination of HSGPA and test scores predicts better than test scores alone and HSGPA accounts for the largest share of the predicted variation in freshman grades.

Examining data on the predictive validity of factors believed to be significant predictors of success in medicine [12] also found that, previous academic performance accounted for 23% of the variance in undergraduate achievement and 6% of the variance in postgraduate competence.

The extent to which predicted academic performance is lower for female students was also discussed by [13, 11, 10]. The result of these research showed that, when freshman samples were splited by sex, the prediction of college GPA proved to be less for females.

Because colleges and universities use both SAT scores and HSGPA to make admission and placement decisions, it is acknowledged that students' academic achievement in their first two years at university is a complex mix of factors and students' placement is not to be determined by a single measure (e.g Ethiopian Higher Education Entrance Examination) alone that accounts for three - to- four hour block of his/her time. Thus, studies confirm that, it is incremental to consider student's preparatory school academic record in to the process of students' selection and placement.

Difficulties in any of these areas could lead to low exam scores that does not actually reflect actual achievement, aptitude, or ability to succeed in university level [5].

In this study, the researchers were interested to include both measures (*Higher Education Entrance Certificate Examination score and two year preparatory school average)* as predictor variables and allows for the assessment of their predictive validity when used together.

The researchers were also interested to investigate whether placing students to different fields of study with their interest and without their interest have a significant effect on their college achievement in Haramaya University context so that the results can assist in future student placement, admission and carrier counseling.

Statement of The problem

At present, the university entrance scores, aptitude test scores and preparatory school GPA are the three achievement measures used by Ministry of Education to enroll students having completed preparatory program into forty five public universities. These measures have also expected to be used for departmental placement at each university .However it is rare to find the consideration preparatory school and students interest at Haramaya University where student placement is done based on college entrance test alone. Students with a higher entrance Examination scores have had the advantage of being placed in departments of their interest and Students who were excelled by others in entrance examination were placed in

departments against their selection priority. Thus, the placement mechanism may have an impact on their performance.

Thus, to test this, we have tried to find answers to the following research questions.

- Do students having comparable Entrance Exam scores placed in a college major of their first choice, second choice and third choice show a significant difference in their first year college achievement?
- Does preparatory school scores account for a significant proportion of variance increment in first year university GPA beyond what is already explained by entrance exam scores and standardized aptitude test score?
- Which pre college achievement factor is relatively the most important in predicting students' first year university GPA?

THEORETICAL FRAMEWORK

Decision theory

According to the decision theory as described by Keeves [1], test based decision typology is based on the use of flow charts to define different types of decision making. Keeves stated that in each decision problem, three common elements can be identified: (a) the test that provides the information is based on, (b) the treatment with respect to which the decision is made, and (c) the criterion by which the success of the treatment is measured.

HOLLAND'S THEORY OF CAREERS

Several studies have applied Holland's theory of carriers [14] to further our understanding of the importance of interest major fit in relation to academic major choice. The basic premise of Holland's theory is that human behavior is a result of the interaction between individuals and their environments.

Applying Holland's theory, Allen and Robbins [3], suggests that congruence between students and their academic environment is critical for successful student outcomes. And academic performance and interest-major fit are key constructs for understanding major persistence behavior [2].

RESEARCH METHODOLOGY

Design of the study

Based on the stated objectives, this study is mainly co relational research design.

PARTICIPANTS

Participants were first year students enrolled to Haramaya University in 2018/19 academic year. In predictive part of the study, all Haramaya University College of Education and behavioral Science and College of Computational science students (N =496:301 Male and 195 Females) were purposively used as a sample since more number of students enrolled in these two colleges in as first year students and in addition it was observed that most of the students in those colleges students achievement was inconsistent. A sample consisting of 60 students having comparable total Entrance Exam scores was also drawn from the total member of participants by maximum variation sampling and used to generate data for variance analysis between academically comparable students who were placed by their first choice, second choice and third choice.

VARIABLES

Independent variables

In this study, Pre-college achievement measures (two year preparatory school average and University Entrance which contains standardized achievement test scores on six subject and scholastic aptitude test) and students' interests in the department were considered as independent variables.

The PHSGPA used in this analysis was students' average scores across all subjects thought during the two year preparatory program. University Entrance Exam score is students' score in Scholastic Aptitude Test (SAT) and a series of six subject specific academic achievement tests (ACT).These required for university admission were used for prediction of first year college academic performance.

Outcome measure

The study employed fist year cumulative grade point average as indicator of students' success and has considered as the criterion variable.

PROCEDURES OF THE RESEARCH

Since highly confidential students' academic and placement records were used as the data source, the study was conducted with the consent of University administrators. Therefore, the data collection procedure was carefully planned. Accordingly all information of 2018/19 first year regular students was obtained from registrar's offices of Haramaya University. The score of all individual students obtained in college entrance examination (EHEECE) preparatory average score and first year first semester college GPA were entered in to SPSS software for predictive analysis.

Then the second activity was to select students having comparable University Entrance Exam score who were placed by their first choice, second choice and third choice. This is done step by step. Firstly the researchers identified those departments in which at least three comparable students were placed based on their first choice, second choice and third choice. The pre-college achievement difference was controlled by random assignment of matched students to the three groups. Then, pre-college achievement difference between the three groups was tested by conducting one way ANOVA and achievement difference between the three groups in college achievement would not be due

to the pre-college achievement difference. After controlling pre-college achievement difference between the three groups, we have conducted the main study using choice of the students as independent variable and first year college GPA as dependent variable.

To determine the independent contribution of Entrance examination when it combined with PSGPA, multiple regression analysis and automatic regression analysis were employed. For the total sample of students, sub sample of male and female for each the specific department, separate multiple regression analysis were performed and run into two models of predictor variables. The first model was designed to determine the variance accounted by for Entrance examination scores in predicting first year first semester university GPA. The second model was designed to find the incremental effect of the PSGPA, when it is combined with Entrance examination scores. Finally, automatic regression analysis was conducted or total sample to compare the predictive importance of the total Entrance examination scores and two year preparatory school.

RESULTS AND DISCUSSION

Results

Analysis of variance

We begin by displaying & discussing the first results of (ANOVA) which we used to test whether significant difference in first year college academic achievement exist between students having comparable University Entrance Exam score who were placed by their first choice, second choice and third choice.

Table-1: Summary of ANOVA displaying the difference between there academically comparable choice groups in colleges GPA.

	Department choice	N	Mean	SD	F
Entrance Exam Score	First	20	312.92	20.58	.56
	Second	20	304.08	22.32	
	Third	20	311.50	23.06	
	Total	60	309.50	21.73	
First Year GPA	First	20	3.050	.486	10.96*
	Second	20	2.233	.356	
	Third	20	2.487	.462	
	Total	60	2.590	.549	

Note: p > 0.01

The one way analysis of variance results revealed that the difference between the three groups in their entrance exam scores is not significant, F (2, 57 = .56 P > 0.01). From this result we can observe that the pre-college academic achievement difference between the three groups has been controlled, in other words, there was no significant difference in the pre-college academic achievement (entrance exam scores) before placement in the departments. Using First Year GPA as dependent variable, achievement difference between the three groups in college achievement was tested by the same procedure. The second analysis, ANOVA results show that the difference between the three groups in first year college GPA is significant, F (2, 57) = 10.96, p < 0.01). These results reveal that interest-major fit has a significant impact on first year college GPA. Turkey's post hoc multiple comparison analysis result reveals that first choice group (M = 3.050, SD = .486, N = 20) significantly outperformed both second choice group (M= 2.233, SD= .356, N= 20) and third choice group (M= 2.487, SD= .462, N= 20)

Results of multiple regression analysis

To determine whether preparatory school average score can account for significant amount of variance in the prediction of first year of college GPA beyond what is already explained by University Entrance scores, we have used Entrance Examination scores (SAT II - the sum of six subject test SAT - standardized aptitude test results) and preparatory school average scores as predictor variables to predict the size of the multiple correlation of entrance exam and the combination of entrance scores and PSGPA with FYGPA. Table. 2. Displays the standard regression coefficient (beta) and other pertinent statistics.

Table-2: Standard Multiple Regression Showing R^2 change of FYUGPA Independently With Preparatory Average and Co efficient (Beta)

	Standardized regression coefficients(Beta)								
	Model	**PHSAV**	**ACT**	**SAT**	**Reg-MS**	**Res-MS**	**Ad R2**	**%explained Variance**	**F- ratio**
All	1	-	.337**	.014	9.501	297	.111*	11.1	32.003*
N=496	2	.447**	.241*	.018	16.852	.233	.302	30.2	72.225**
Female	1	-	242	-023	1.543	..268	.047	4.7	5.758
N =195	2	.333**	.219*	-.003	3.034	.238	.154	15.4	12.756*
Male	1	-	.265	.042	3.267	.279	.067	6.7	11.694
N =301	2	.496	.161	.025	9.197	.209	300	30	43.919**

*Note: **p < .001 *p < .005, reg MS=regression mean square, res MS=residual mean square*

1st year GPA= α P S A.V + β ACT + ϕβSAT

The result of multiple regression analysis showed that, entrance examination: subjects achievement entrance-test scores (beta =.337); SAT (beta = .014); to gather, accounted for 11.1% (R^2 = .111, F, (2, 493) = 32.003.002, P, < .00I) of the total variance in the prediction of students' first year university GPA. The amount of variance accounted for this model is larger for the total participants than the observed variance across both gender The percentage of variance explained by this model (model-1)was only 4.7% (R^2 = .047) for Female and 6.7% (R^2 = .067) for Male students.

Second, it is evident that the combination of entrance exam and preparatory GPA (see Model 2) yielded multiple regression coefficients that were significantly larger than that obtained from the analysis of entrance exam alone. Thus, both predictor variables combined - preparatory school average score and Entrance examination scores in the mode accounts for 30.2% (R^2 = .302, F (3, 493) = 72.225, P < .001) for the entire sample. When we see across both gender, this model is accounts for 30% (R^2 = .300, F (3, 292) = 43.919, P, < .001) and 15.4% (R^2 = .154, F(3, 192) = 12.756, P < .005) for male and female respectively. This shows that, the addition of PGPA provided a meaningful improvement in the prediction of first year student's performance. After taking entrance examination scores in to account, preparatory school average increases the explained variance in the prediction of student's FRGPA by about 18.1, 10.7, 23.3 percentage points (ie. from 11.1% to 30.2% for the whole student, 4.7% to 15.4% for female, and from 6.7% to 30% for male counter parts. It have also shown that, the addition of preparatory school average score as a predictor resulted in the remarkable reduction of the residual mean-square (Res-MS) and correspondingly increases the regression mean-square(Reg-MS) in the second model for the whole students with the same pattern across both gender.

Looking at the standardized regression coefficients of all predictor variables with the body of table 2, again it is evident that preparatory school average score has the greatest predictive weight in all cases. standardized regression coefficients (Beta) weights show the number of standard deviations that dependent variables (in this case First Year university GPA) changes for each one standard deviation changes in a given predictor variable controlling for all other predictor variables in the regression equation. As shown across all second models in table 2, preparatory school average has the largest predictive weight of (r = .447,.333, .496) respectively for the whole sample, Female and Male sub-samples.

The same pattern is also evident across four pioneering Departments and in college CEBS of Haramaya University as shown in table 3.

Table-3: Relative contributions of preparatory school result and entrance exam scores in predicting first Year CGPA by departments and CEBS

	Standardized regression coefficients(Beta)							
	PHSAV	ACT	SAT	Ad R^2	df	N	F	% E.V
Software Engineering	.501**	.197	.034	.349	3, 173	177	32,446**	34.9
statistics	.502**	.238	-.075	.397	3,221	125	28,192**	39.7
ICT	.387**	.267	.030	.198	3,143	147	13,009**	19.8
CEBS	.539**	.075	-.008	.272	3,43	47	6.719*	27.2

*Note: **p < .001 *p < .005*

1st year GPA= α PHS A.V + β ACT + ϕβSAT

Looking at the standardized regression coefficients in the table-3, again it is evident that Preparatory high school result has the greatest predictive weight (Beta) across departments, followed academic achievement tests. However, standardized scholastic aptitude test (SAT) had the lowest predictive

weight in all cases. Moreover it had lowest predictive weight for both College of Education and behavioral sciences and computational science. Thus, scholastic aptitude test has no statistically significant contribution in the prediction of student's college grades in all cases.

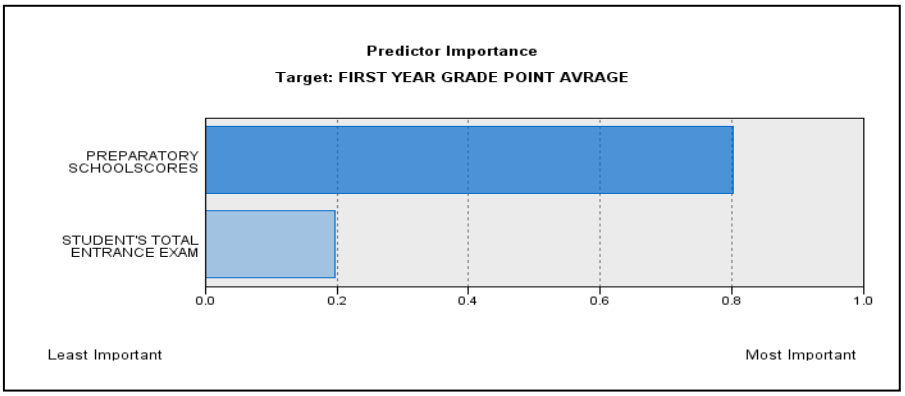

Fig-2: Summary of automatic liner regression analysis showing the predictor importance

Finally, we have used an automatic regression analysis in order to examine the most important per-college achievement measures, and the results are presented in figure-1. As indicated by the shaded regions, preparatory school score have 0.80 (80%) of predictive weight in the model with only 0.20 (20%) is shared by the total Entrance Examination score. this shows that the addition of PGPA have a remarkable incremental predictive importance over what is shared by the total Entrance Exam point.

DISCUSSION

The objectives of this study were twofold: (1) to test whether academically comparable students entering Haramaya University and chose a college major of their interest and of no their interest show a significant difference in their college achievement (2) to compare the contribution of preparatory school grade and the Ethiopian Higher Education Entrance Certificate Examination scores in predicting the success of first year University GPA. The major findings of the study reported in the result section are thoroughly interpreted and discussed in line of these objectives. In terms of the first objective, our findings support the proposition that students are more likely to flourish in academic environments that fit their ability and interest. The analysis of college academic performance revealed that those students placed in their departments by their first choice showed better performance than those placed out of their priorities' interest.

With respect to the second objective, the impact of preparatory school grade and the Ethiopian Higher Education Entrance Certificate Examination scores on university achievement has been thoroughly investigated. Our findings highlight the importance of pre-college academic preparation as Key predictors of college success. The result of this study confirmed that preparatory school average yields statistically significant improvement in predicting first Year College outcomes, beyond which is provided by entrance examination scores. Multiple regression analysis for the entrance examination alone (model-1) accounts for only 11.1% of the variance in university GPA. The model also accounted for 0.67% (for male), 0.47% (for female) of the variance in the criterion measure.

Used together entrance examination (SAT I and ACT scores) and preparatory school scores, account for about 30.2 percent of the total variance in first year college grades and the, model explains more of variance than is possible with a separate entrance examination alone. An explained variance or "R square" of this magnitude is generally considered by many researchers such as [3, 6] as a strong result in predictive-validity research, where R-squares of 30 percent or even less are usually considered sufficient to "validate" use of a particular selection criterion in college admissions or other educational decisions. Accordingly, Studies of first-year college GPA by [13, 3] suggest that ACT scores and high school grades should carry approximately the same weight if an institution wants its placement criteria to reflect expected level of first-year academic performance. The combination of admission decisions for most groups of students than using either measure alone. Some recent studies of the same year [6] also questioned the use of standardized test score alone as postsecondary admission process; this briefly shows that both entrance exam scores and high school grades enhance the prediction of college success.

It should be noted that PHSGPA accounts for a greater proportion in the prediction of first year GPA than entrance examination scores. The superiority of PGPA in contributing the larger prediction weight in college out comes is consistently evident across students in all two pioneering colleges in Haramaya University, is in agreement with previous finding [10, 6, 8, 15]. The possible explanation is that preparatory school achievement reflects students cumulative

performance in various subjects that essentially prerequisite for college level courses.

A gender difference was observed in the current study. Predictor variables explains larger variance in first year university GPA for male than for female students .This implies that entrance exam was weaker for predicting first year university GPA for female than males.

CONCLUSION AND RCOMMENATIONS

Conclusion

- Student's placement on the bases of singe variable (e.g Ethiopian Higher Education Entrance Certificate Examination scores alone) works against students interest and affects college academic performance of students with similar prior academic background. Once students have been admitted to University, the most determinant factor of achievement in university is their preparatory school grades than entrance exam scores. The combination of test scores and high-school record provides better prediction than using either factor alone.
- Secondly the findings of the study indicate that placement of students without their choice/interest has a significant effect on their college achievement.
- Additionally gender differences were observed. Predictor variables accounted larger variance in first year university GPA for male than for female students.

RECOMMENDATIONS

This study has the some important practical implication that relates to decisions made while students are still studying at secondary school. Secondly, the results of this study hold important implications for colleges and universities. In the view of the results identified in the study, the following recommendations are given:

- students should strategically navigate their ability through both preparatory school performance and EHEECE
- universities Student affairs, counselors, and faculty members should Assist students in making informed decisions about the selection of a major
- Student's placement should base on comprehensive information of students, derived from multiple sources including student HSGPA (preparatory high school transcript, EHEECE Assessment scores score), as well students interest. Colleges and universities can use assessment data to diagnose student needs, and ensure that all students are being reached (Pathways to College Network, 2004). For example, HSGPA and ACT Assessment scores and course placement tests help colleges and universities design and develop their admissions policies, orientation programs, student placement [3].
- Any prediction of college success need to take group difference in to consideration specially females and males should not be predicted using one general model
- Standardized interest-major inventory tests should be developed in Ethiopian context, so that the institutions can measure their students' interest in departments during procedures of student placement. Steven and Robins [2] stated that the interest-major composite can be calculated for anyone with a set of vocational interest scores (or related measures of Holland types) and with a planned entering major that belongs to one of the major groups (CIP families). Since the interest-major composite predicts persistence in major, it could be used by institutions to identify the students most likely to change majors. This information could aid institutions and academic departments in their mission of helping students find the environment most consonant with their interests, ultimately helping them succeed in college.

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Appendices

Appendix. 1. Descriptive statistics and correlation Matrices of predictor and outcome variables

Note: Values above the diagonal are for Female (N=195) and values below the diagonal are for Male (301) and values with bold face are for all students (N=496)

**correlations are significant at .01 levels (2 tailed)

*correlations are significant at .05 levels (2 tailed.

Appendix.2. Multi co linearity Tolerances of predictor Variables in the study

Variables	Shared Variance	Co linearity statistics	
	(R^2)	Tolerance	VIF
PSSAV	.049	.953	1.049
SBEES	.060	.943	1.060
APTITUDE	.011	.989	1.011

Shared variance is the R^2 that results from regression each predictor variable on all of the other predictor variables.

Source: first year entering Haramaya University for whom data were available on all predictor variables. N = 496.