

A Method For Standardizing High School Score From Different Curricula

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Abstract: High school performance was considered as relevant predictors of students' current academic performance. High School Curriculum and high school score were identified as significant factors associated with academic score in undergraduate studies. This study would wish to set appropriate admission criteria for students' high school score corresponding to different curricula. Commonly, high school score vary according to their high school system and those data may not be useful for analysis unless they are in a standard form for comparison. In order to make analysis on such variables, high school score must be standardized to a uniform unit which require an appropriate standardization method. The current paper introduces a method for standardization of high school scores as an admission criterion and further exploration for research.

Index Terms: admission criteria, high school score, high school curricula, pass mark, standardization, standard score, UAE curriculum.

1. INTRODUCTION

Auniversity consists of large number of students from various curricula. Students are selected for their undergraduate education based on different factors. Factors includes their high school score, availability of subject interested, IELTS score, entrance test score, performance in the interview etc. There are many studies presenting association of students' demographic characteristics and high school curricula with performance in undergraduate professional examinations. Reference Paul George et al. [1] reported that highly distinct curricular and valid admission criterion has significant impact on the medical school outcomes and residency placement. Students' high school performance is naturally considered as a strong predictor of their success in higher education [2]. Among all the determinants, higher secondary school scores are considered as a potential determinant of future academic performance [3], [4], [5], [6]. But high school score of students are recorded in the institutional documents with respect to their high school curriculum from which they passed out. Since the scores differ according to the difference in their curriculum, a reliable method needs to be introduced to convert high school scores of various school systems to the standard score in one curriculum. Once the high school scores are standardized, those scores can be used for comparison and further analysis. As an admission requirement, a method of standardization is presented in this article to calculate a standardized score.

If curriculum 'A' has a pass mark of 70%, whereas the cut off pass mark may be 80 for curriculum 'B'. In this case, a valid comparison of student high school scores may not be possible. In order to compare two curricula A and B, either A or B should be standardized to a uniform score (standard score). In this context, the objective of the paper is formulated as to find a method of standardization to convert students' high school scores of various curricula to one standard score.

2 MATERIALS AND METHODS

Since high school score is an important component that helps in making a decision regarding the selection of a student for an education program, the score has to be standardized. In the current study, variable of interest is 'high school score'. It usually varies according to curriculum. The assessment methods differ in different curricula and hence the cut off pass mark also varies. Since the aim is to convert scores of different curricula to one standard score, the dependent variable is considered as the standard score of UAE curriculum. Independent variable is the student score of other high school curricula. Dependent variable is estimated with the help of a basic expression which includes two constants and two variables. Constants in the basic expression can be estimated when the pass mark (fixed cut off) of both high schools are substituted. The standard score of a given high school system is calculated by substituting the mentioned constants as well as the variable of high school score that to be converted. Finally, an equivalent score will be obtained using a standardization method proposed in this article. An example is also given to verify adequacy of the proposed method.

3 A METHOD OF STANDARDIZATION FOR STANDARDIZED SCORE

The following theory is used to estimate the standardized score of High school system.

$$a+100b = 100 \quad (1)$$

Equation (1) provides a mechanism to estimate the standardized score according to the high school score of various curricula. As per the equation, a maximum score of 100 will be obtained on both the sides of the equation if 'a' is zero and 'b' is one. From the equation (1), 'a' will be obtained as follows

$$a = 100(1-b) \quad (2)$$

Instead of maximum score 100, consider pass mark of the universities of interest on both sides of the equation (1). The high school pass mark for which the score of other curriculum needs to be converted can be denoted by HPs. For the pass mark of other

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schools with different curriculum is notated as HP_C . Then the equation (1) can be rewritten as,

$$HP_S = a + b (HP_C) \tag{3}$$

Among the constants a and b , expression for ' a ' is already derived and now ' b ' has to be estimated for the line of best fit. This line of best fit will minimize the sum of squared residuals. In order to estimate the value of ' b ', ' a ' in equation (2) is substituted in equation (3).

$$\begin{aligned} HP_S &= [100(1-b)] + b(HP_C) \\ &= 100 - 100b + b (HP_C) \\ &= 100 - b(100-HP_C) \\ HP_S - 100 &= -b(100-HP_C) \end{aligned}$$

$$\text{Hence } b = (100-HP_S) / (100-HP_C) \tag{4}$$

which gives the ratio of variance between pass mark set by the high school of interest and the other school with different curriculum, from the maximum score of 100.

Consider the expression $y = a + b x$ (equation 5) which provides a mechanism to estimate the standardized score according to the high school score of various curricula. Here Y is the standardized score which is to be calculated for each value of ' x '. ' x ' is the variable that represents scores of students who come from another curriculum. ' a ' and ' b ' of equation (2) & (4) gives constant values which will be submitted in equation (5).

$$y = [100(1-b)] + [(100-HP_S) / (100-HP_C)] x$$

y is the standardized high school score which is a variable that varies according to the scores in the other schools (x) of different curricula. For different values of ' x ', the standardized score (y) corresponding to each score of other curricula will be obtained. This equivalent score can be used for comparison and further statistical treatment. In order to verify the applicability of proposed method, a scenario is given below. Pass mark in each high school system are presented in table 1, as mentioned in WES tool [7]. The high school score of each student corresponding to their high school system are depicted in table 2. The constants ' a ' and ' b ' are calculated by substituting the pass marks of each high school curricula. Here the scores of different curricula are converted to score in the UAE curriculum, where pass mark in the UAE curricula are considered as 60 (HP_S). Variable 'standard score' is calculated using the values of constants (' a ' and ' b ') and the high school score of each student according to the high school curriculum they come from (x). From table 2, a standardized score can be observed for a student who comes from the American high school system with a high school score of 76.7. Since the pass mark in the American^a and the UAE curriculum is 60%, the standardized score in the UAE will be same as that of the American system. While matching the score of curricula of International Baccalaureate to the UAE curriculum, 79.3 is found to be the standardized score corresponding to the score of 69 (Table 2). Students from the high school system of International Baccalaureate, the score of 45 will be equivalent to 63.3 in the UAE curriculum using the proposed standardization method. Difference between the scores of given curricula and the score of the UAE curriculum reduces when students obtain higher scores. Here the difference in the conversion is noticed to be 18.3. Whereas conversion for the higher scores of 95 are 96.7 with a difference of 1.7. Results in Table 2 also depict standardized scores for the scores corresponding to Canadian and Indian curricula. In the Indian High school system, the score of 25 will be equivalent to 55.2 in UAE curriculum as per the proposed

standardization method. Two students have failed when considering the pass mark in Indian curricula^d as 33. Their standardized score in the UAE curriculum also reports a failure with a score less than 60, the pass mark of the UAE (HP_S).

Standardized high school scores for the students applying from Iran and Pakistan Curriculum shows the same trend. The information required for applying the proposed method includes the pass mark of both the high school system and the scores gained by the students in their high school examination. Hence the proposed standardization method helps in getting an equivalent score in a required curriculum. Once the standardized scores are available, the converted variable can be used for further application of statistical methods.

TABLE 1
PASS MARK IN DIFFERENT CURRICULA

Type of curriculum	Pass mark
^a American curriculum	60
^b International Baccalaureate curriculum	40
^c Canadian curriculum	50
^d Indian curriculum	33
^e Iranian curriculum	50
^f Pakistan curriculum	35
^g UAE curriculum	60

TABLE 2
STANDARDIZED HIGH SCHOOL SCORE FOR THE STUDENTS FROM DIFFERENT CURRICULA

Type of Curriculum	High School		Standard Score according to UAE system	
	Score	Fail/Pass	Score	Fail/Pass
American curriculum ^a	76.7	P	76.7	P
	78.4	P	78.4	P
	86.8	P	86.8	P
	86	P	86	P
	91.4	P	91.4	P
International Baccalaureate ^b	45	P	63.3	P
	69	P	79.3	P
	75	P	83.3	P
	88	P	92.0	P
	95	P	96.7	P
Canadian Curriculum ^c	35	F	48.0	F
	43	F	54.4	F
	59	P	67.2	P
	68	P	74.4	P
	90	P	92.0	P
Indian Curriculum ^d	25	F	55.2	F
	32	F	59.4	F
	59	P	75.5	P
	68	P	80.9	P
	98	P	98.8	P
Iranian Curriculum ^e	33	F	46.4	F
	48	F	58.4	F
	52	P	61.6	P
	83	P	86.4	P
	99	P	99.2	P
Pakistan Curriculum ^f	29	F	56.3	F
	39	P	62.5	P
	58	P	74.2	P
	81	P	88.3	P
	94	P	96.3	P

4 DISCUSSION

Del Siegle from the University of Connecticut reported that standardization is an important process in education system for making comparisons among the scores. The need of standardization has been explained by meaningful comparison of the score in one test with a score in another test considering how many standard deviations each score is far from its mean level. Hence standardization method makes comparisons of scores which are originated from different bases [8]. A

columnist Bhatia [9] has reported in his article that one of the important indicator in the University of California is 'standardized test score' which uses for assessing admission applications, though there were disagreements among the students regarding efficiency of standardized scores in the university in serving the purpose. It is a challenging step for such renowned universities as they have large number of students from ten thousands of institutions with their own scoring and grading systems [9]. The existing procedures discusses about standardized scores which are generated based on the normality assumed standardization methods. Instead of standardized scores, there are many universities in the United States depends on standardized tests for comparing the scores of students across different countries. Studies are also available which have developed various statistical models that uses multiple standardized test scores for predicting academic performance in future [10]. Current paper has introduced a method of standardization for obtaining standard score for students come from different assessment methods in different curricula.

5 CONCLUSION

High school score is an important component in the admission process of any university in selecting students for their academic programs. The current paper proposed a standardization method for converting score of any high school system to a standard score in the required high school curriculum. The method will benefit most universities irrespective of the discipline of choice.

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