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GRADING STUDENTS PERFORMANCES IN A DIFFICULT EXAMINATION

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ABSTRACT

Difficult examination often result in mass failure. In such situations an examiner seeks for a way of remedying the situation. In this paper a technique for grading students performances in a difficult examination that will yield the least performance improvement relative to the existing grading system is proposed and illustrated with example.

KEY WORDS: *Grading, Difficult Examination, Least Performance Improvement.*

INTRODUCTION

In the academic sector, examiners are often faced with the problem of how to solve the problem of mass failure in examinations. Some examinations often result in mass failure not because students do not adequately prepare for them but rather because the examinations are too difficult. In such situations the examiner must seek for a way through which the results could be improved.

Students are often categorised into broad bands of achievement giving those that score within a certain range of specific classification a grade (Holiday and Cohen, 1984). A student score in an examination may be graded as, A - excellent, B - very good, C - good, D - fair, E - pass; and F - fail.

In most situations the scores or grades distribution is normal. This is particularly true when the examination is fair, that is neither too difficult nor too simple. When the scores distribution is normal, the rationale behind the standardisation of scores is always used to construct grading scale.

In some cases when the examination is too difficult the scores distribution will departs from normality. In fact, the distribution will be positively skewed. In this case the existing technique of grading fails.

This paper suggests a possible solution to this problem by constructing an 'N - grade scale' contrary to the existing grading scale adopted by most institutions of higher learning.

2. THE PROPOSED TECHNIQUE

Let X denote marks scored in an examination. In order to improve the result, the distribution curve is truncated on the right at the point X_{N+1} on the X - axis such that,

$P_i = \frac{i}{2} X_{i,N+1}$, where i is a positive integer less than 100 satisfying the inequality $P_i \leq 50$ and P_i is the ith percentile.

Now to construct an 'N - grade scale', the interval $[\,0, X_{i,N+1}\,]$ is divided into N subintervals of equal width, W. Thus the width of each subinterval is given by

$$W_i = \frac{X_{i,N+1}}{N}, \text{ for each i.}$$

Based on this width the following grade boundaries are obtained:

Table 1

Grade	A	B	C	...
Limit	$X_{i,N} - X_{i,N+1}$	$X_{i,N-1} - X_N$	$X_{i,N-2} - X_{i,N-1}$	...

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Definition 1:

The quantity P_i is called the reference point.

It is important to note that the sequence of reference points, P_i, P_{i-1}, P_{i-2}, ... will generates grade distributions in an increasing order of performance improvement. Of particular interest is that reference point P_{i^*} that satisfies the following two conditions:

(i) If A_* is the existing lower boundary for an A - grade, then the proposed lower boundary for an A grade cannot exceed A_*. That is, $X_N \leq A_*$.

(ii) For any other reference point $P_{i^*+1} \leq 50$, the proposed lower boundary X_N for an A - grade is higher than the existing lower boundary for an A - grade, That is $X_N > A_*$.

Definition 2

The reference point P_{i^*} satisfying the above conditions is called the least performance improvement reference point (LPIRP).

Now, using P_{i^*} as the least performance improvement reference point, the boundaries X_j and hence the limits can be estimated from:

$$X_j = P_{i^*} + \frac{R}{2}(2j - N - 2), \quad j = 1,2,\ldots,N+1.$$

Remark

Without loss of generality any mark scored which is greater than X_{N+1} should be graded A. That is to say, in the final analysis, the upper limit for an A grade should be adjusted to 100.

Illustration

The table below shows the scores distribution of 332 students in an examination. The scores are over 100.

Table 2

MARKS	NO. OF STUDENTS
0 - 9	90
10 - 19	69
20 - 29	61
30 - 39	36
40 - 49	36
50 - 59	14
60 - 69	16
70 - 79	6
80 - 89	2
90 - 99	2
100 - 109	0
TOTAL	332

From the above table it is observed that the distribution is positively skewed implying that the examination was extremely difficult. The grade distribution using the existing grading system of the University of Calabar is shown below.

Table 3

Grade	A	B	C	D	E	F	Total
Limit	70 - 100	60 - 69	50 - 59	45 - 49	40 - 44	0 - 39	
No. of Students	10	16	14	17	19	256	332

To construct a 6 - grade scale using the proposed technique, we set N = 6 and $A_* = 70$. Taking P_{70} as a reference point, $P_{70} = 33.6 < 50$. Then $X_{N+1} = X_7 = 67.2$ and W = 11.2. From equation (1), we obtain, $X_6 = 56.0 < A_*$, $X_5 = 44.8$, $X_4 = 33.6$, $X_3 = 22.4$, $X_2 = 11.2$, $X_1 = 0$. The distribution of grades and the performance improvement in percentages relative to the existing grades distribution is given in table 3.

Table 4

Grade	Limit	No. of Students	% Improvement
F	0 - 11	104	59%
E	12 - 22	73	284%
D	23 - 33	57	235%
C	34 - 44	40	186%
B	45 - 55	26	63%
A	56 - 67	32	220%
		332	1047%

Now taking P_{79} as a reference point, $P_{79} = 41.2 < 50$. Then $X_{N+1} = X_7 = 82.4$ and $W = 13.73$. From equation (1), we obtain, $X_6 = 68.67 < A_•$, $X_5 = 54.94$, $X_4 = 41.21$, $X_3 = 27.48$, $X_2 = 13.75$, $X_1 = 0$. The distribution of grades and the performance improvement in percentages relative to the existing grades distribution is given in table 5.

Table 5

Grade	Limit	No. of Students	% improvement
F	0 - 13	116	55%
E	14 - 27	88	363%
D	28 - 41	58	241%
C	42 - 54	36	157%
B	55 - 68	22	38%
A	69 - 82	12	20%
	Total	332	874%

Now, taking $P_{80} = 42.6$ as a reference point, we have, $X_{N+1} = X_7 = 85.2$, $W = 14.2$, and $X_6 = 71 > A_•$. Thus P_{79} satisfies the condition of being selected as the least performance improvement reference point.

DISCUSSION OF RESULTS AND CONCLUSION:

In table 4, we have seen that the overall performance improvement based on P_{70} as a reference point is 1,047%, while in table 5, the overall performance improvement based on P_{79} is 874%. This is the least performance improvement one can obtain in this situation. Choosing any other reference point greater than P_{79} will worsen the situation.

When performances in an examination is very poor the smallest assistance that the examiner can offer, devoid of biasness, is to adopt the technique proposed in this paper. The proposed technique would save the examiner the cost of re-examination.

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