Mixed Radix Approach towards Qualitative Assessment in Management Education

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Mixed radix concept comes from number system concept in which the base of digits at various positions in a number do not remain same. Qualitative assessment of student's performance in management education is based on various parameters. These parameters can have different values. Number of possible value-ranges of a parameter is like base of digit at a position in a number. This paper discusses a mixed radix approach by representing various parameters of assessment by different positions of a number in which the base at positions vary as per the possible value-ranges of the parameter. It creates great learning environment.

Keywords: Management Education, Quantitative Approach, Qualitative Assessment, Performance Evaluation

1. Introduction

Management education is not only about teaching various subjects to students and evaluating their learning but it also has great responsibility of building good value system among students so that they can build a good working environment and great society wherever they go. Meaning of a good value system may differ from person to person and over time but certain basic values are must. For example, some hesitation in using unfair means, allowing the system to work decently, respecting the space of others etc. are some minimal values that shouldn't be compromised.

Latest research in the area of learning and development has led to various innovative methods of teaching and evaluation. While practicing such methods we need to ensure that students don't get encouraged to use unfair means. For example, if the system is of relative grading of students; evaluation parameters should guard students with good ethical values against being overtaken by students using unfair means. It is not easy to achieve this but imagine, what a failure of education system would be if students with good ethical values start thinking of using unfair means to get their performance evaluation grades in accordance with their performance.

Most of the Management Institutions assess the performance of students by quizzes, group work, projects, tests etc. Scores assigned on these are mostly in numbers. Then the final numeric score is converted to some alphabetic grade. This conversion can be simply based on the score ranges. That means students scoring in a pre-announced score range will get same grade. Somewhere, this conversion can be based on relative score of the student in the group. So, a student may perform well in all the assessment parameters but if his colleagues scores better than him by any means, his grade goes down. These alphabetic grades are again converted to some numeric values based on credits to different subjects and numeric points on different grades.

At the end, what does these alphabets or numbers mean? How do they communicate anything about the student? Is it possible to get a good alphabet or number without focusing on learning? Does the system encourage grade snatching (getting a better grade in undeserving way by pushing the grade of deserving students down)? There can be several such questions. But, assessment system in management education must have decent answers to such questions.

This paper discusses about a mixed radix concept for assessment of students overall performance in management education and tries to get some good answers to the questions raised above.

2. Methodology

In this system, various parameters used for evaluation are represented by various positions in numbers. Number of parameters decides the number of digits in numbers. Possible value ranges in a parameter are represented by the base of the position representing that parameter. Positional weights of various parameters in the evaluation system become similar to positional weights of various positions in the number. Combination of student's performance in various parameters is represented by a number in this mixed radix system. This number is converted to its decimal equivalent.

The number of possible combinations of student's performance is equal to the product of bases of all the positions in the number. Basically, it is product of number of possible value ranges of various parameters used in evaluation. Grading policy can be formulated as per the kind of value system and the learning environment the management education system wants to build. Accordingly, each number in the mixed radix system represents one of the possible performance combination which gets converted to decimal equivalent and the associated grade.

This system can bring quantitative approach in qualitative assessment. For example, one parameter in performance evaluation can be class involvement of the student. This is a very important contributor in building a good learning environment. A student's class involvement can be rated in letter grades depending on how much he contributed in the class by asking good questions or by remaining disciplined or by creating nuisance values etc. Suppose, it is rated in four letter grades. Z may mean that student demonstrated unethical values and showed resistance to change on this front, Y may mean

that student seriously disturbed the class environment or created nuisance on at least two occasions, X may mean that he remained mostly disciplined enough to keep the class environment good and showed inclination towards improvement whereas W may mean the best kind of class involvement indicating active participation and good ethical values.
Similarly, there can be more parameters for performance evaluation that can be qualitatively rated. These letter grades can be strategically planned to encourage building a good learning culture. Final grade of a student in a subject will depend on the combination of letter grades of the student on various evaluation parameters in the subject. Such grading policies can be made that encourage certain values and discourage some unwanted values. For example, one can have a policy that a student rated as Z in class involvement will not get better than the last two grades in the subject irrespective of his rating on other evaluation parameters. This will discourage use of unethical practices drastically.

It may look a very subjective kind of evaluation but with prompt, effective and continuous feedback system, this evaluation can be done in very objective way. Present day collaboration and communication technology has made such task even easier. And, the mixed radix algorithm being discussed in this paper makes the logic of grade computation easy and eliminates any possibility of computational error.

3. A Grading Policy

Let there be an evaluation policy based on three parameters – 1. End term examination, 2. Quizzes and 3. Class involvement. Students are provided with questions carrying 30% weight of the end term examination in advance and they know that the same questions will be asked in the examination. However, for remaining 70% marks, few questions with conceptual variations on already assigned questions are asked. Students get plenty of time to learn the concepts based on the 30% questions. They can take help from colleagues, teachers and all other resources. Everyone should do well in that. But, if someone fails to do these questions in the end term examination, he is definitely not serious about his studies. Such students are rated Z in this parameter. Those students who complete this part up to the satisfaction level are rated as X or Y depending on their performance in remaining 70% part. These questions are based on the pre-declared questions itself. So, those who have understood the concepts well would do well in these parts and get an X rating. But those who demonstrate basic conceptual understanding but fail to apply them satisfactorily get Y rating. This builds an environment of collaborative learning and filters out non-students. Also, instead of trying to get some marks by writing anything arbitrary they need to learn few things from the pre assigned questions. It encourages some basic learning.

The second parameter of evaluation is based on online quizzes and subsequent verification. Large number of multiple choice online quizzes are conducted that students can take from anywhere by logging in to the quiz platform. The grading is done by the system itself. It also generates useful data related to sequence in which students attempted the quiz, time spent on quiz, students answering the same combination of questions right, students picking the same wrong choices in the questions etc. These data are analyzed to rate the students' performance in quizzes as Z, Y and X. Z rate for those who used unfair means, Y for those who worked honestly and performed average while X for those who worked honestly and performed better than the average. By analyzing the data, students using unfair means can easily be filtered out.

The third parameter, class involvement is rated in four later grades Z, Y, X and W as explained earlier as an example. Thus with three evaluation parameters having 3, 3 and 4 rating grades respectively, this system will have 3 * 3 * 4 = 36 combinations of performance rating.

A grading policy is formulated to finally assign a letter grade for student's performance in the subject. For example, it can be that a student getting two Zs or more will be graded at D or F depending on his grade in remaining parameters. Students getting at least two X or better and no Z will be graded as A+. Such grading policies can be translated into grading matrix and checked for completeness and consistencies. Any incompleteness and inconsistencies are removed by focusing on reasons causing them. For example, a grading matrix may look something like

Here, the subject grades are A+, A, A-, B+, B, B-, C+, C, C-, D and F. These grades carry grade points as 10, 9, 8, 7, 6, 5, 4, 3, 2, 1 and 0 respectively. 10 being the best and 0 the worst.

Having high penalties associated with Z and safeguarding the grade in A and B for those who don't get any Z promote a healthy and ethical learning environment. Following conversion method to convert a number in mixed radix system to decimal number system eliminates the scope of error in implementing this concept. A decimal number score is directly associated with the grade of the student in the subject as per the table given above.

Mixed radix decimal scores are assigned as follows

A student getting W in class involvement is assigned 0 score.
A student getting X in class involvement is assigned 1 score.
A student getting Y in class involvement is assigned 2 score.
A student getting Z in class involvement is assigned 3 score.

A student getting X in quizzes is assigned 0 score.
A student getting Y in quizzes is assigned 4 score.
A student getting Z in quizzes is assigned 8 score.

A student getting X in end term examination is assigned 0 score.

A student getting Y in end term examination is assigned 12 score.
A student getting Z in end term examination is assigned 24 score.

These scores have been obtained by taking positional weights of various parameters like class involvement, quizzes and end term examination as 1, 4 and 12. Positional weights are equal to product of base of digits on the right of the position under consideration. So they depend on how they are being arranged in the table and in no way suggest anything about the weight being given to various evaluation parameters in the system.

Sum of scores of a student in the three parameters gives the mixed radix score that finally gives the grade in the subject. For example, if a student gets X, Y and X in class involvement, quizzes and end term examination respectively then his score would be 1 for class involvement + 4 for quizzes + 0 for end term examination. Total being 5, he gets an A grade in the subject as per the grading policy shown in Table 1.

Table 1 *A Grading Matrix*

End Term Examination	Quizzes	Class Involvement	Mixed Radix Decimal Score	Grade
X	X	W	0	A+
X	X	X	1	A+
X	X	Y	2	A+
X	X	Z	3	C+
X	Y	W	4	A
X	Y	X	5	A
X	Y	Y	6	A-
X	Y	Z	7	C
X	Z	W	8	C
X	Z	X	9	C
X	Z	Y	10	C-
X	Z	Z	11	D
Y	X	W	12	A
Y	X	X	13	A-
Y	X	Y	14	B+
Y	X	Z	15	C
Y	Y	W	16	B
Y	Y	X	17	B
Y	Y	Y	18	B-
Y	Y	Z	19	C
Y	Z	W	20	C
Y	Z	X	21	C
Y	Z	Y	22	C-
Y	Z	Z	23	F
Z	X	W	24	C
Z	X	X	25	C
Z	X	Y	26	C
Z	X	Z	27	D
Z	Y	W	28	C
Z	Y	X	29	C-
Z	Y	Y	30	C-
Z	Y	Z	31	F
Z	Z	W	32	D
Z	Z	X	33	D
Z	Z	Y	34	F
Z	Z	Z	35	F

4. Results and Discussions

Implementation of such grading policy associates high penalty with using malpractices, creating nuisance in the system and not respecting the system. On the other hand it also safeguards sincere, honest and hardworking students against falling below a grade level. Students are made to understand that getting involved in collaborative learning, helping each other and being honest are the best strategies for securing a decent grade even if they are not very meritorious in the subject. Deviating from these will reduce the grade.

It may be said that such system can be misused by faculty members in harming the students they personally don’t like. That is why, it is necessary to use technology and justify each rating in various parameters with substantial data. Present day technology for communication and collaboration can help in building a transparent system with timely evaluation and feedback.

Similar system can be built for any number of evaluation parameters with any number of ratings. However, the number of combinations will be equal to product of number of ratings in various parameters. If there are 5 parameters with 4 ratings in each then there will be 1024 combinations. Making a complete and consistent grading policy may become difficult. So, it is recommended to keep these numbers small and manageable.

The benefits of such systems outweigh the difficulties in design and implementation. Also, technology is available to handle design and implementation issues.