Factors Underlying Marks in Madhyamik Examination of West Bengal

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The secondary education serves as a bridge between primary and higher education and also as entry into the higher education. All the students enrolled under the West Bengal Board of Secondary Education (WBBSE) participate in a challenging standard based curriculum. First public school leaving examination i.e., Madhyamik Examination which is conducted by the WBBSE at the end of class X in West Bengal. Factor analysis of Madhyamik curriculum subjects score of the students for a particular year 2000 was done considering marks of all subjects and separately for oral part of respective subjects. Three factors were extracted from there. They may be identified as i) descriptive scientific factor ii) language and logical factor and iii) oral or verbal factor. Factor analysis was also done by considering eight subjects. Oral marks were included with the marks of respective subjects. In this case, only one factor was emerged which may be identified as scholastic factor.

In a student's school life the interim period between primary school level and higher secondary level is called secondary stage and the education at this stage is called secondary education. Secondary education has a vital role to play in any programme of education for the community. It is the stage which in all countries marks the completion of education for the vast majority. Even the minority which goes for higher education cannot take full advantage of the wider opportunities offered by the universities unless they have received their grounding in a system of sound secondary education. The main objective of secondary education is to develop among the pupils qualities of leadership needed in different walks of life. Elementary education seeks to provide the basic information and skills needed for survival. Higher education seeks to extend the boundaries of knowledge and is often an end in itself. Secondary education is the connecting link between these two and also serves – or at least should serve – to select those who are to provide higher leadership to the community. Those who complete their education at this stage must acquire knowledge and competence and also develop qualities of leadership and character. Moreover, this stage may be broadly equated with the period of adolescence. Adolescents are neither children nor adults, and what is more disturbing pass from one phase to the other with bewildering speed. They are then passing through psychological changes of profound significance to the individual and the community. This is the period through which children are growing into adults, and the growth passes through many phases. It is too early to take a decision about future life on the basis of the emergence of any particular trait. A final decision about future profession at this stage may thus lead to grave mistakes. Hence the

full benefit from secondary education cannot be derived if the curriculum at this stage has been incomplete or defective. As curriculum is planned and guided by the school for learning and a set of documents for implementation, that should be implemented effectively, whether it is carried on in groups or individually, inside or outside the school. A curriculum is an attempt to communicate the essential principles and features of an educational proposal in such a form that it is open to critical scrutiny and capable of effective translation into practice (Stenhouse, 1975). And it is essential to see the curriculum as much more than a mere collection of subjects and syllabi.

Secondary school leaving examination that calls Madhyamik Examination in West Bengal serves as a basis to achieve several aims. For this reason, the importance of this examination has an enormous effect on students' existence and also for their future programme. This examination is conducted by the West Bengal Board of Secondary Education (WBBSE) and by this examination students' attainment level is evaluated after completing study of consecutive ten years. Students are followed by a scheduled curriculum ascertained by WBBSE to appear in this examination. Students must take the examination in seven compulsory subjects i.e., i) Bengali (two papers, Beng I and Beng II), ii) English (Eng), iii) Mathematics (Maths), iv) Physical Science (Ph.Sc), v) Life Science (L. Sc), vi) History (Hist) and vii) Geography (Geo). These seven subjects are again divided into three major groups. These are as follows: Language group (Beng I and Beng II , Eng), Science group (Maths , Ph Sc and L Sc), and India and her people group (Hist and Geo).

Apart from these seven subjects one can opt for one additional subject. It is necessary to mention here that in Madhyamik Examination, two types of subjects are available as additional such as (i) Pedagogical subjects like Additional Mathematics, Mechanics, Physics, Biology, Fishery, Logic,

etc. and (ii) Work education, Music, etc. According to the criteria of WBBSE, besides English and Mathematics, all the subjects contain a oral part of 10 marks and the students have to appear for oral examination also. The performance of the students is evaluated on the basis of a total marks of 100 for each subject (90 marks in written and 10 marks in oral) except Bengali . In Bengali, students have to score out of 200 marks in two papers (180 marks in written and 20 marks in oral). In English and Mathematics, students have to score out of 100 (only written). Though the curriculum of the Madhyamik Examination is broad and diverse , the essential areas related to this curriculum of various subjects are interconnected and students can progress through this curriculum. Curriculum is planned and guided learning (Kelly,1983,1999). As it has been discussed earlier, the curriculum of Madhyamik Examination should include those programmes which will help the students to develop the qualities necessary in different spheres of life. Hence the vision and mission of the present curriculum of this examination need to be set. For this purpose it is necessary to locate the significant components being pertinent to the certain objectives of the curriculum. The above scenario depicts that it would be a major assignment if the factors inherent to the marks of Madhyamik Examination can be ascertained. Further, this study can be extended to extract the existing aptitude of the students.

Keeping in mind the above discussion the purpose of the present article is to find out the inherent factors of the marks of Madhyamik Examination and to predict the type of ability of the students according to his / her marks obtained in different subjects.

Method

Sample:

Multistage stratified clustered sampling design was adopted in this study . In the first stage , all 18 districts of WB were divided into

4 strata. First stratum was Calcutta. Beside this, other 17 districts were stratified into 3 strata. Two districts from each stratum were selected by Rao, Heartly and Cochran (1962) scheme . Thus seven selected districts are as follows:

- Stratum 1 Calcutta
- Stratum 2 Jalpaiguri and Malda
- Stratum 3 Howrah and Hoogly
- Stratum 4   Midnapore and Bankura

The name of the schools and the number of schools have been obtained from a List of recognised schools published by WBBSE (1989). Selection of schools from selected districts was done following simple random sampling without replacement (SRSWOR). Fifteen boys' schools and ten girls' schools were selected randomly from each selected districts. In the case of Calcutta and Midnapore twenty four boys' schools and twelve girls'

schools were selected as the number of schools in these two districts are more than other districts. As a result, 197 schools were selected for the purpose of this study. All total the number of students was 17978 in the year 2000. The medium of instruction in all the schools was Bengali.

Measures

The marks obtained by the students in their Madhyamik Examination 2000 was considered as the academic achievement score and detailed marksheets were collected from WBBSE.

Results and discussion

At this level it was tried to obtain a picture of how well the students have performed in all the subjects under this curriculum and the Mean, SD and full marks of each subjects of the students are presented in Table 1.

Table 1:Mean, Standard Deviation and Full marks of the students for Madhyamik subjects

Subjects	Written			Oral		
	Mean	SD	Full marks	Mean	SD	Full marks
Bengali	84.43	37.33	200	15.33	5.43	20
English	31.03	17.72	100	-	-	-
Mathematics	37.78	22.15	100	-	-	-
Physical Science	41.19	20.88	100	8.13	2.15	10
Life Science	47.88	22.74	100	8.18	2.24	10
History	39.18	19.07	100	7.87	2.75	10
Geography	38.78	20.68	100	7.87	2.75	10
Additional subjects	49.80	30.06	100	-	-	-

case of additional Subject, the average is about 50 and SD is as high as 30. It has already been reported earlier that in Madhyamik Examination, two types of subjects are available as additional such as (i) Pedagogical subjects like Additional Mathematics, Logic etc. and (ii) Work education, Music etc. In the case of the latter, high marks are easily available in comparison to the first one. As a result, the SD becomes relatively large and two different distributions are combined into one.

In the case of oral examination, average marks are around 80%. The discrepancies of averages between oral and written examinations indicate certain shortcomings in teaching-learning and evaluation method. Correlational analyses for the fourteen subjects (variables) indicate that there are some significant positive relationships among the variables. The results are presented in Table 2.

Table 1 that average scores in Bengali, English, Mathematics, Physical Science, History and Geography vary between 30 and 40 out of 100. Average score and SD is minimum in English. English appears to be the most difficult subject in Madhyamik Examination. Bengali being the mother tongue of maximum students, they consider English as foreign language. And also Bengali being the medium of instruction they can easily avoid English. The other discrepancy may lies with the educational system and teaching-learning procedure. In the Science group, it is revealed that in Life science the average score is near about 48. In Madhyamik examination the students have scored high in Life Science in comparison to Mathematics and Physical It is clear from the results presented in Science. Similarly, in case of India and her people group , the average scores in History and Geography of the students are more or less same . In the

Table 2 :Correlations among the subjects under study

Serial No	Subjects	Beng I	Beng II	Oral	Eng	Maths	Ph.Sc	Oral	L.Sc	Oral	Hist	Oral	Geo	Oral	Additional subject
1.	Bengl	-													
2.	BengII	.90	-												
3.	Oral	.75	.78	-											
4.	Eng	.96	.99	.83	-										
5.	Maths	.83	.84	.65	.90	-									
6.	Ph.Sc	.93	.94	.66	.93	.95	-								
7.	Oral	.57	.59	.55	.63	.71	.68	-							
8.	L.Sc	.63	.63	.27	.68	.75	.91	.59	-						
9.	Oral	.41	.42	.42	.45	.60	.53	.93	.52	-					
10.	Hist	.71	.72	.39	.77	.79	.94	.56	.89	.46	-				
11.	Oral	.62	.62	.35	.67	.70	.82	.57	.78	.50	.76	-			
12.	Geo	.44	.45	.43	.49	.62	.57	.92	.56	.91	.50	.53	-		
13.	Oral	.65	.66	.40	.76	.76	.86	.66	.82	.61	.80	.71	.63	-	
14.	Additional subject	.73	.74	.51	.79	.80	.90	.69	.80	.61	.80	.71	.64	.77	-

All the values are significant at .01 level

Next, factor analysis was done considering the marks of all the fourteen subjects (above mentioned main subjects including oral part of the respective subjects and additional subject). The factor analysis was done with a notion to identify the common factors underlying these fourteen subjects. The principal component method including varimax rotation was applied. Table 3 presents the sorted rotated factor loadings of the above mentioned subjects.

Table 3: Factor loadings and their squares for 14 subjects

Subjects	Factor 1	Sq. of F1	Factor 2	Sq of F 2	Factor 3	Sq. of F 3
Bengali I	.487	.24	.786	.62	.167	.03
Bengali II	.477	.23	.818	.67	.173	.03
Oral	.043	.00	.870	.76	.282	.08
English	.523	.27	.863	.75	.187	.04
Mathematics	.602	.36	.601	.36	.362	.13
Physical Sc.	.800	.64	.638	.41	.237	.06
Oral	.325	.11	.354	.13	.821	.67
Life Sc.	.930	.86	.172	.03	.277	.08
Oral	.249	.06	.157	.03	.972	.95
History	.852	.73	.334	.11	.205	.04
Oral	.717	.51	.279	.08	.286	.08
Geography	.297	.09	.184	.03	.927	.86
Oral	.723	.52	.302	.09	.389	.15
Addl. Sub.	.672	.45	.429	.18	.391	.15

Table 3 indicates that there were three factors underlying the fourteen subjects. Mathematics, Physical science and Life Science had high loadings on Factor1. These subjects mainly measure scientific ability of the individual and hence Factor 1 may be termed as descriptive scientific factor. History, History-oral and Geography-oral have considerable loadings in Factor 1. Bengali-oral has high loading on Factor 2 and Physical science-oral, Life Science-oral and Geography have high factor loadings in Factor 3. This effect may be due to the arbitrariness of oral marking. Table 3 shows that Bengali and English have lower factor loadings and Mathematics, Physical Science and Life Science have high factor loadings in Factor 1.. At the same time History, History-oral and Geography-oral have considerable factor loadings in Factor 1. History and Geography may be identified as descriptive science. The lower factor loadings of History and Geography in Factor 2 also support this conclusion.

Bengali 1st and 2nd paper including oral part and English have high loadings on Factor 2. These two subjects require knowledge of language to express. So Factor 2 may be identified as language factor. There was a third factor. Mainly oral parts had high positive loadings on this factor. This factor is identified as oral or verbal factor.

The factor loadings given in the Table 3 also represent the correlation of each subject with the factors. These correlations are called the factorial validity of each subject (Anastasi, 1976). From Table 3 it can be mentioned that the factorial validity of Bengali as a measure of mathematical and scientific factor is .487, language factor is .786 and verbal factor is .167. The factorial validity of Bengali I , Bengali II , Bengali oral and English , in terms of

language factor are .786 , .818, .870 and .863 respectively . The factorial validities of Mathematics, Physical Science and Life Science in terms of mathematical and scientific factor are .602, .800 and .930 respectively. The first four subjects have less validity as the measures of descriptive scientific factor

Since each factor loadings represents the correlation between the subject and the factor, the square of the factor loadings gives the proportion of common variance between the subject and that factor. Thus, it can be found from Table 3 that in Bengali I and II, 24% and 23% variance is attributable to the descriptive scientific factor and 62% and 67% variance is attributable to the language and logical factor . In English, 27% of the variance is attributable to the descriptive scientific factor and 75% to the language and logical factor. It may be stated that Bengali and English have greater language factor structure. It can be revealed in such a way that one student may have greater language ability to score high in Bengali and English. In the case of Mathematics, the percentage of variance attributable to the descriptive scientific factor and language and logical factor is same and it is only 36%. So the proportional contribution of the descriptive scientific factor and language and logical factor is same in the case of Mathematics. It may be represented in such a way that the student who scored high in Mathematics has both language and scientific ability. Again in Physical Science and Life Science 64% and 93% of the variance is attributable to the descriptive scientific factor and 41% and only 3% to the language and logical factor. This result also reveals that the students who have high score in Physical Science and Life Science have greater scientific ability. And according to that ability one student may select any one stream like Science, Arts, Commerce etc. in future. In the case of history, 73% of the variance is attributable to the descriptive scientific factor and 11% to the language and logical factor.

Geography has negligible percentage of variance to the descriptive scientific factor and language and logical factor. But the variance attributable to the oral or verbal factor in Geography is 86%. This discrepancy may come from certain shortcomings in evaluation method.

Any individual's performance on these subjects depends on the amount of each of the relevant factors he or she possesses as well as the relative weight of these factors in the particular subject. It states that if a student scores high in Bengali or English, he or she has more language ability. Again high scores of a student in Physical Science and Life science reveal that he or she possesses more scientific ability. Thus, if a student's score is expressed in the same units in scientific, language and oral or verbal factor then each score can be weighted by multiplying it by the corresponding factor loading. The sum of these three products would provide an estimate of the student's score on the factor.

Thus, if a student secure very high score in language and logical factor, this would help him much more on Bengali and English than on Physical Science or Life Science. Similarly, if a student scores very high in descriptive scientific factor, this would help him much on the Physical Science and Life Science. Of these three factors, language and logical factor would have the greatest effect on Life Science and oral or verbal factor have the greatest effect on Life Science oral.

There are eight subjects in the Madhyamik Examination. The result shows that all the subjects can be represented by only three factors (mentioned above). In the case of 14 variables, 91.5% of the variance in the data space is explained by three latent factors.

In the next phase, factor analysis has been done by considering eight subjects as indicated in the mark-sheet (seven core subjects and an additional subject). Oral marks have been included with the marks of

respective subjects. Factor loadings of 8 variables are presented in Table 4. In this case only one factor has emerged. This can be identified as the scholastic factor. The variance explained is 81%. This indicates that a Madhyamik student who performs

Table 4 : Factor loadings on one factor extracted from 8 variables

Subjects	Loadings
Bengali	.885
English	.856
Mathematics	.861
Physical Science	.919
Life Science	.916
History	.858
Geography	.906
Additional Subject	.993

well in one subject is likely to perform well in other subjects also.

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