AN ANALYSIS OF SECONDARY SCHOOL EXAMINATION SYLLABUS, PUBLIC EXAMINATION TEST ITEMS AND STATISTICAL LITERACY LEVEL OF THE STUDENTS

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The primary purpose of the study was to determine the extent to which the public examination test items in statistics reflect the syllabus aims and assessment objectives. In addition to this, the nature of responses of a group of final year secondary school students, to selected non-routine and routine items in statistics was also studied. The aims of the syllabus and assessment objectives as well as the suggested methodologies place emphasis on problem solving skills, discovery learning and application of learned concepts in real life situation where as examination items do not reflect these objectives. Students' responses to non-routine tasks too confirm their inability to handle anything that is not routine. Currently, certification is based on one shot examination, where items are routine in nature, which implies that teaching is geared towards preparing the students for the public examination. Certification, instead of depending on just one external examination, should move towards incorporating continuous assessment component thereby providing the opportunity to use projects and open - ended tasks as part of teaching and learning.

IINTRODUCTION

This paper examines the public examination test items in statistics in terms of the skills tested and how these match with the syllabus and assessment objectives as well as the suggested methodologies.

It is pertinent to mention that, in this particular context, scores in public examination is the only yard stick used for certification which makes teaching more examination oriented. Graue (1993) quoted by Shepard (2000, p4) says " assessment and instruction are often conceived as curiously separate in both time and purpose". This was specific to classroom assessment while the focus of this paper is assessment for certification where the opposite is true. In the system where this study is conducted, mainly due to the weighting given to public examination grades in certification, classroom assessment is a preparation for the public examination hence it follows the same pattern as public examination. Here, concepts are taught mainly to pass examination and obtain a certificate but use beyond the classroom is not emphasized, which makes learning a waste. Shepard in his article mentions that tests, early in the century, emphasized recall which is true here even today. One cannot blame the public examination system because for objectivity in scoring, it is necessary to give more structured items but at certification level, if continuous assessment is given credit, then more open ended items and project work that involve higher levels of cognition could be incorporated into classroom assessment. According to Flewelling & Higginson (2001) rich tasks provide the opportunity to use their discipline and non-discipline skills in an integrated and often creative fashion for a purpose. This is something that is missing in the system where this study is conducted, which is revealed in the classrooms, where teachers dominate the scene and students are at the receiving end (Chacko, 2001a). Students inability to handle non-routine problems was empirically established (Chacko,2001b) which suggests that their learning is more superficial.

METHODOLOGY

Background Information

In this system, at the secondary school level, mathematics is optional. In the first four years of the secondary school, statistics is taught, as a part of mathematics and in the syllabus, it is one of the six components and one of the smallest, in terms of content coverage. Mathematics is examined using two forms of a syllabus namely the calculator and the non-calculator versions. This paper looks at the non-calculator version, which is taken by the majority of students. Topics

in statistics include collection and classification of data, data representation, measures of central tendency, cumulative frequency and probability.

Instruments & Sample

The items in statistics in the non-calculator version of the essay papers in mathematics for the period 1995 to 2001, mathematics examination syllabus and a short test with non-routine and routine items formed the instruments for the study. Non-routine items were simple but slightly different from the usual ones in the sense that some had more than one correct answer while some had incomplete data. The test was administered to a sample of 125 final year or O-level students.

Data Analysis Procedure

Items in statistics in each of the papers were scrutinized and categorized as non-routine or routine and the specific content tested was identified. Various sections of the syllabus was studied to identify the syllabus aims, assessment objectives and expected methodology which are compared to the test items in terms of attainment of the objectives. Responses of the students to the test items are grouped under two major categories as non-routine and routine where percentage scores are used as indices of performance.

RESULTS AND DISCUSSION

The syllabus has ten specific aims starting with understand at the lowest level going up in hierarchy to interpret and communicate mathematical information in everyday life and ending with appreciate the process of discovery and the historical development of mathematics as an integral part of human culture.

There are ten assessment objectives starting with recall, recognize and use mathematical symbols, terms and definitions moving up to apply and interpret mathematics in daily life situations. The suggestions under methodology to be used, among others cover concept development, identification of problems in the environment, translation of these into mathematical form and solutions using project work.

It is correct to conclude that the objectives of the syllabus and assessment as well as the methods suggested emphasize the application of the knowledge in other subject areas as well as in real world situation, which is a move in the right direction.

Mathematics at O-Level is examined using two papers. Paper one is short answer type while paper two is essay type with two sections, which is the focus of this study. Section A of paper two has five items, which are compulsory and section B has five to six items, of which three are to be answered.

Items from statistics always appear in section B, which means that learning statistics is not a must to obtain a good grade in the exam. This also gives the opportunity to the teachers to skip the statistics part of the syllabus. As the next component to be looked at is the examination items, analysis of the public examination items is given in Table 1.

This table reveals the fact that the test items focus on routine tasks, which encourages rote learning. There is a lot of repetition in the tasks tested, which could be due to the limited content covered in statistics. All same, it is possible to vary the tasks tested, as well as go beyond the data in asking questions (Curcio, 1987). Also items that lead to multiple answers that the students need to solve and interpret or identify error in the data are examples of items that could be marked with objectivity yet encourage thinking, which should form part of the examination.

As continuous assessment is not included in the final score, which leads to certification, it is natural that there will be *teaching for the test*. In order to prevent this and encourage use of rich learning tasks like projects, it is necessary to incorporate a percentage of in-school assessment into the final score. In fact projects that involve data collection, organization and interpretation would go a long way in getting the students learn about various types of data and methods of data reduction and interpretation. This will provide the opportunity for the teachers and students to work together and be partners in the learning process instead of the current situation where students are passive participants, whose major activities are listen, copy or transfer information from the chalk board into note books and respond to the teacher whenever called for.

Table 1
Analysis of the test items for 1995 to 2001

Year	%Mark	Nature of the item	What is given?	Task
2001	4	Routine	Probability	Reading the data and reading between the data
2000	12	Routine with a difference of using graph to answer questions on probability	Grouped frequency table and part c.f. table & item on probability	i. Copy & complete c.f. table ii. Draw c.f. curve iii. From c.f. curve estimate the median iv. Reading the data and reading between the data
1999	12	Routine	Grouped frequency table	i. Construct histogram ii. Given mid points of the classes & frequencies, compute the mean
1998	12	Routine	Grouped frequency table	i. Draw frequency polygon ii. Compute the mean iii. Reading the data and reading between the data
1997	14	Routine	Probability	Reading the data and reading between the data
1997	5	Routine	Histogram	Name of the diagram Read off values for the median & the mode.
1996	12	Routine	Grouped frequency table & incomplete c.f. table	i. Copy & complete c.f. table ii. Construct c.f. curve & read off values like the median iii. Reading the data and reading between the data
1995	12	Routine	Grouped frequency table	i. Draw histogram & read off values ii. Compute mean iii. Reading between the data

How do these students handle anything that is slightly different from the routine tasks that are close ended that always have one correct answer? The results of the responses of 125 students to selected non-routine and routine items are presented in Table 2.

Table2
Students' responses to non- routine and routine items

Type of item	Non-routine				Routine			
Item	1	2	3	4	5	6	7	8
Frequency of correct responses	31	16	17	8	71	87	84	53
Percentage	25	13	14	6	57	70	67	42

Item 1 had two possible answers, which the students are not used to which made them to identify only one answer while item 2 had incomplete data, which majority did not notice and provided an answer. Items 3 and 4 were open ended, which were badly answered. Items 5 to 8 were routine in nature where they had to compute various statistics, which they are used to and answered more correctly. Although the sample is taken from one school, the results in table 2 support the fact that non-routine problems rarely appear in classroom teaching. The responses of the students also suggest that statistics is taught as something that handles numbers but the

contextual aspect of these numbers had not been brought to the students hence their problem to see it differently. Concepts learned, without the ability to apply these in life problems does not make one literate in the area, which is applicable to these students.

CONCLUSION

It is difficult to change teaching and classroom assessment without changing the forces that determine these and in this set up, one of the dominating factors is the dependence on one shot public examination for certification, which has to change first. Therefore the recommendation is to the Ministry of Education to search for ways to incorporate continuous assessment component into the certification grades. There is also an urgent need to shift from using routine items in testing to those that challenge the reasoning, thinking and communication skills of the learners. This is further supported by Gal and Garfield (1997), who states that

> ...an adequate assessment of student outcomes is not possible by using only multiple choice or short answer questions. These types of items are all too often divorced from context and focus on statistical computations, correct application of formulae (p6).

It may not be easy to use more open- ended items in an examination situation but it is possible to introduce this in classroom assessment. For teachers to do this, continuous assessment component should be given its place in the certification grade. Responses to non-routine items indicate that most students learn statistics as a set of rules, isolated from reality, which makes learning unrelated to the context. It also means that the learners are not yet literate in the subject. As mentioned earlier, the public examination system encourages this hence the need to start the change from there and proceed to change teaching strategies that encourage manipulative skills at the expense of application in novel situation to solve real world problems.

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