Chapter 4 Assessment

Purposes of Assessment

It is generally agreed that teachers need to evaluate the work of their students and assess all aspects of their teaching. Assessment involves collecting, judging and interpreting information about student performance and can be formative or summative.

- Formative assessment is to measure students' achievement so as to find out what students know and can do. The information collected is used as feedback to modify the learning and teaching activities in which students and teachers engaged. Formative assessment should be regular and ongoing and could be done in a number of ways including observations and discussions in the classroom and written work of students done in class or at home.
- Summative assessment is to measure students' overall performance at certain intervals such as the end of a term, a school year or a key stage. It is mainly used for providing a comprehensive and summary description of performance and progress in students' learning.

The purposes of assessment include:

- providing reliable information that can be used to improve learning and teaching;
- providing feedback to students about their progress; and
- generating information to be used in reporting processes.

Both formative and summative assessments are needed to achieve the said purposes. However, for diagnostic purpose aiming to identify students' strengths and weaknesses, it is imperative to make assessment on a regular basis. Therefore, formative assessment becomes more and more important in the learning and teaching process. There is nothing new as all teachers make regular assessments in the classes they teach. Most teachers would ask students questions, request them to attempt some questions either on the blackboard or at their seats, hold discussions, organize class activities, etc. All these are formative assessments. What highlighted here is that information should be collected regularly for making improvements to both learning and teaching and eventually raising standards. In general, assessment should not be seen as a separate entity, but as an integral part of the learning and teaching cycle.

Assessment Criteria and Strategies

Student performance cannot be accurately described by only a single set of scores or single type of assessment activity. Evidence of learning should be collected through various modes of activities. The following two points should be noted:

- Assessment (particularly the "formal" test/examination) may cause students' anxiety and undue pressure, and in extreme cases, students may lose the confidence and interest to learn.
- Excess assessment may reduce learning and teaching time in class, increase teachers' workload unnecessarily and hence pose pressure to both students and teachers.

Schools have to formulate their own assessment policy/program according to their culture and needs. It should be borne in mind that the main purpose of assessment is to gather information to enhance the learning and teaching process.

Within an assessment program it is important to consider the selection of assessment strategies in relation to the outcomes being assessed. The most appropriate method or procedure for gathering information are best decided by considering the purpose for which the information will be used and the kind of performance that will provide the information required. In Additional Mathematics, student performance on the following three criteria are essential:

Criterion 1 Communication skill

Criterion 2 Mathematical techniques which include

(a) learned results and mathematical procedures; and

(b) use of instruments in mathematics.

Criterion 3 Applications which include

(a) applying mathematics in life-related situations (real or simulated);

(b) applying mathematics in mathematical contexts; and

(c) justifying the solutions to the problems provided.

The following briefly illustrate some essential points when student performance is assessed on the said criteria:

Criterion 1 Communication skill

It is a two-way process which forms an integral part in all activities/tasks organized in every lesson of Additional Mathematics. Information of student achievement for this criterion should be collected by a global consideration of the communication skill evident in responding to the activities/tasks in class. Questioning/Answering (e.g. Can you describe what will happen to the chord PQ when Q approaches P, both P and Q being points on the

same curve?) and discussion with/among students (e.g. Why can we say that a proposition P(n) is proved, but in fact we have only proved that P(1) is true and whenever P(k) is true, P(k+1) is true?) are very effective means for collecting this type of information.

Criterion 2 Mathematical techniques

It focuses on the recall of facts, results and procedures and the use of learned skills in familiar situations. Mathematical techniques in Additional Mathematics could be reflected in students' work in solving routine problems. Students could be requested to present clearly and logically their solutions to the problems concerned as they usually do in homework and class practice. They may sometimes be requested to give only the strategy (e.g. differentiate a given function to get the extremum points, test the points for maximum or minimum, find the x- and y-intercepts and then sketch the graph, etc.) to save time in class. The problems for this criterion should

- have different levels of difficulties to suit different abilities of students and to reveal the strengths and weaknesses of students;
- require the appropriate use of a variety of mathematical skills;
- involve applying mathematics in familiar, life-related situations as well as in a mathematical context; and
- allow students to demonstrate that they have achieved the communication criterion.

Criterion 3 Applications

It focuses on applying mathematics in unfamiliar situations. This criterion could be assessed through applications in both life-related and mathematical situations. Moreover, assessment of the justification of answers should be incorporated into the problems.

In planning assessment, opportunities for all students to demonstrate the full range of their individual capabilities including high order thinking skills should be provided. Therefore, a wide variety of activities such as tasks or exercises covering the comprehensive range of learning objectives is necessary. Some common assessment activities in Additional Mathematics include:

- class discussions or oral presentations (e.g. discussing why two vectors are perpendicular if their scalar product is zero);
- observations of students' performance during class time;
- classwork and homework;
- project work (e.g. matching graphs of original functions and their derivatives) ;
- short quizzes;
- investigations (e.g. Pascal Triangle, the idea of limits, the volume of the earth obtained when its shape is assumed to be a sphere or an ellipsoid);

- research topics (e.g. packing a product for sale so that the quantity of materials used is kept to a minimum); and
- tests and examinations.

In summary, a balanced assessment program including a variety of valid assessment activities is necessary for assessing achievement of the general objectives.

Feedback from Assessment

Feedback from assessment can be in verbal or in written form. Without proper feedback, assessment becomes meaningless. Teachers should note that, to realize the spirit of assessment for learning, the evidence collected from any assessment activities should be used for improving students' learning and adjusting teachers' teaching strategies and pace. Feedback to students should be related to the particular qualities of their work with advice on what they should do to improve and comparisons with other students should be avoided. Immediate feedback, if possible, is more effective and should be adhered to formative assessment activities during class time. Homework should be marked as soon as possible with clear indications on students' misconceptions. Extra efforts can be paid to improve areas of common weaknesses. On the whole, teachers can use the information collected in the formative assessment activities to adjust teaching strategies, decide whether to include further consolidation activities or introduce enrichment topics in subsequent day-to-day teaching.

Feedback from summative assessment activities can provide information for students to plan their subsequent phase of study and teachers to plan the teaching sequence, the breadth and depth of the curriculum in the subsequent term or year. This information can be very useful for schools to adjust their aims and strategies of the school-based curriculum of Additional Mathematics.

Effective and efficient communication between teachers and parents is essential for synchronizing learning in both school and home. Some parents consider "practice makes perfect" and rote memorization important in their children's learning. This will lead to over-drilling and hence overlooking of the fostering of high order thinking skills. An informal involvement in different home-school activities or a formal written report on students' progress could be used as a channel of communication. Based on the evidence collected from the assessment activities, more information on how to improve children's learning could be provided to parents through these channels.