

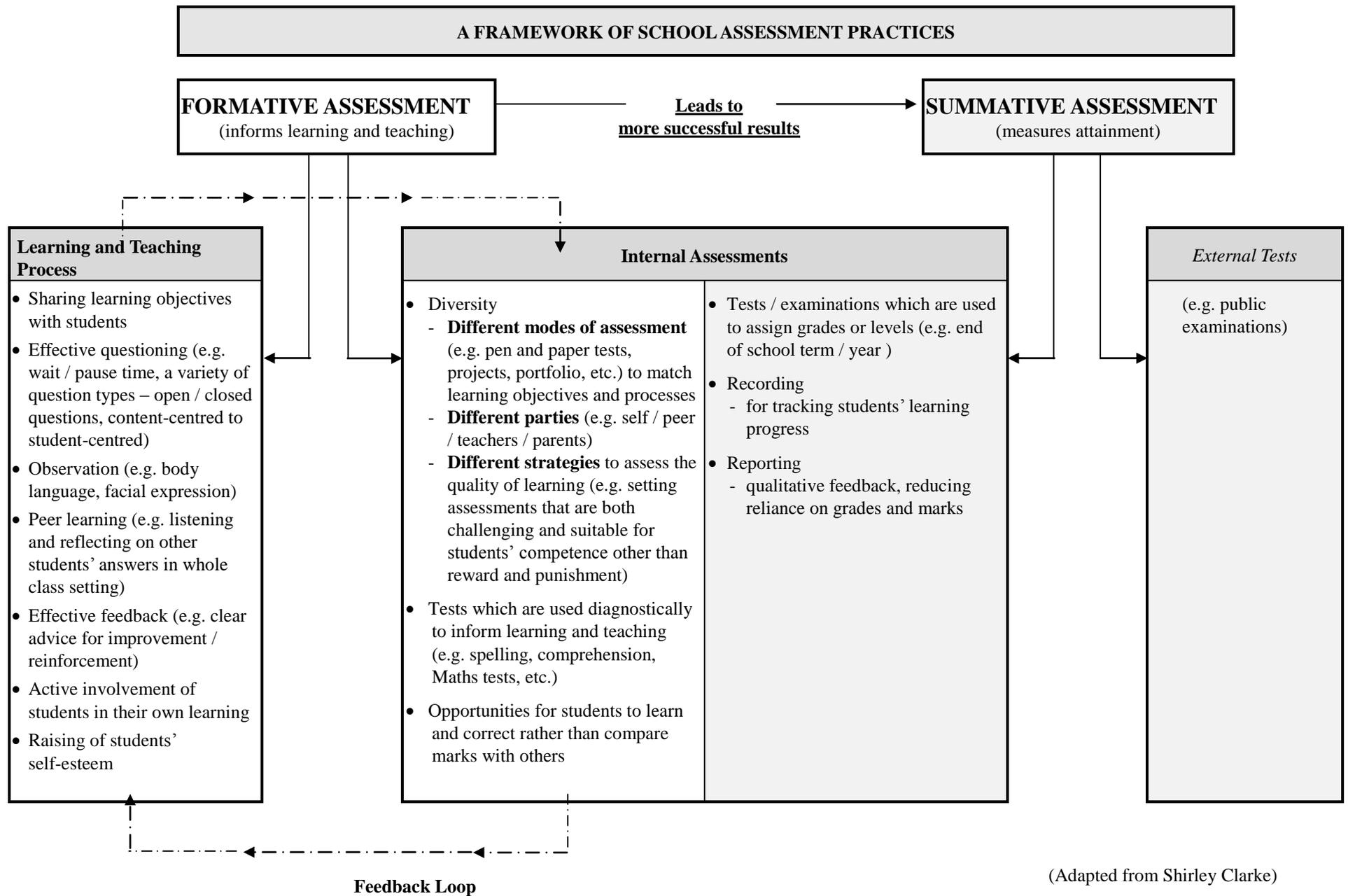
5.1 Guiding Principles for Assessment

It is generally agreed that teachers need to evaluate the work of their students and assess all aspects of their teaching to enhance students' learning and improve their own performance. Assessment includes collecting, judging and interpreting information about students' performance. It is not a separate add-on activity but an integral part of the learning and teaching process. Its purpose is to provide reliable information and feedback to improve and enhance the quality of learning and teaching. Suitable assessment enables

1. students to understand their abilities and hence improve their ways of learning;
2. teachers to understand the performance of their students so that suitable and timely measures can be provided; and
3. parents to understand the performance of their children so that they can, in collaboration with teachers, provide suitable support to help the learning of their children.

The assessment framework shown in Figure 5 shows that learning and assessment should be interrelated. As reflected in the mathematics curriculum, both learning process and content of mathematics are important in mathematics learning. Therefore, to obtain a complete picture of students' performance, assessments should be aligned with the aims and objectives of the curriculum. In general, assessment in mathematics should not only focus on the answers provided by students in solving problems, but it should also reflect students' learning process, the skills used in solving mathematical problems and the development of thinking abilities and attitudes. A balanced and diversified assessment is definitely helpful to obtain a comprehensive view of students' achievement and performance, but teachers should note the following points when collecting information about student performance through different assessment activities.

Suitable Assessment	Unsuitable Assessment
<ul style="list-style-type: none"> • Helps students develop confidence and interest • Enables teachers to provide immediate feedback to enhance learning and teaching • Addresses different teaching objectives 	<ul style="list-style-type: none"> • Causes students' anxiety and undue pressure, and in extreme cases, students may lose confidence and interest in learning • Reduces learning and teaching time in class, increases teachers' workload unnecessarily and hence poses pressure on both students and teachers • Overemphasizes drilling



(Adapted from Shirley Clarke)

Figure 5

Schools should have a policy as far as possible to get a better balance across assessment for learning and assessment of learning. The policy needs to be discussed, negotiated and agreed by all teachers in the schools. It should include the selection of assessment strategies in relation to the outcomes being assessed. For example, what are the expected learning outcomes at the level concerned? What assessment activities will be adopted in assessing students' performance in the various aspects of mathematics? Will they include out-of-school activities like mathematics contests and Mathematics & Science Trail? What assessment criteria will be used in activities like projects, class observations, etc? What is the number of tests/examinations in the school year? Assessment activities aim at improving learning and teaching. Assessment in appropriate frequency is useful to inform student learning rather than disrupting learning and teaching and causing overburden to students and teachers. In planning assessment policy, enough space and time have to be reserved for students' learning and teachers' teaching. Over-assessment should be avoided. (School may refer to Booklet 5 of the *Basic Education Guide – Building on Strengths (2002)* for more ideas on school policy on assessment.)

5.2 Modes of Assessment

Different modes of assessment serve for different purposes. Assessment for learning, which is usually formative, focuses on the learning process and learning progress. Assessment of learning, which is usually summative, focuses on the product of learning. As both the learning process and product are important in the mathematics curriculum, different modes of assessment in the form of various assessment activities are necessary.

Various assessment activities are needed to provide teachers with opportunities to collect, judge and interpret information about students' performance. Some common assessment activities in mathematics include:

Class discussion or oral presentation

Class discussion and oral presentation are effective assessment activities. In the learning and teaching process, discussion, questioning and answering between teacher and students (or among students) are often involved. Therefore, they are not new to teachers. Discussion in class not only enables teachers to discover what students understand about a particular topic, but also provides opportunities for students to present their views. It helps foster their communication skills. Topics suitable for discussion include: Why $\frac{1}{2} + \frac{1}{3} \neq \frac{2}{5}$ and $(x + y)^2 \neq x^2 + y^2$? How can the height of the school building be

estimated? How can estimation be used in daily-life? Are the areas of figures with the same perimeter equal? How can a right-angled triangle be constructed by using a straight rule and a pair of compasses? How can statistics be misused?

Observation of students' performance in class

Observation of students' performance in class is a useful assessment activity. It is not easy to judge progress and achievement in the development of thinking abilities (e.g. critical thinking skills) and attitudes, both of which are emphasized in the mathematics curriculum, through traditional tests and examinations. However, through observation (particularly long time observation), teachers can develop an ever-clearer picture of students' performance. Some criteria may be used for assessing students during observation. These include: Are students able to answer the questions raised by teacher and peers? Can students present their solutions properly when required to? Can they explain how they got to the solutions they have put forward and what strategies they have employed? What is the degree of their participation in class? Do they know how to raise questions? Do they raise questions actively?

Classwork and homework

It is a common practice for teachers to give assignments to students including classwork and homework. These can help students consolidate concepts in mathematics (see Section 4.4) and help teachers assess the performance of their students. There is nothing new, but what is important is to give appropriate amount of assignments and to ensure that they are at a suitable level of difficulty. Moreover, each assignment should be appropriately related to specific objectives. It is inappropriate, for example, to give students an assignment on the drilling of addition and subtraction while the aim is to assess the application of addition and subtraction. Finally, assignments should not be confined to routine mathematical problems. They should include such things as reading and preparatory work for discussion in class. For example, newspaper cutting on the uses of statistics in daily life can be used for discussion on the misuse of statistics, containers marked with volume in litre collected at home can be used for measuring activities in school.

Project work

Project is a useful activity to assess students' performance. In addition, project learning is an effective learning and teaching strategy to promote self-directed learning and enable students to connect knowledge, skills, values and attitudes. It can also foster students' critical thinking skills, creativity and problem solving skills. Teachers should note that projects can be done individually or in groups depending on their nature. For example,

collaboration and communication skills will be more effectively developed by projects done in groups. Teachers may assess student performance using the following criteria:

1. comprehension of the project;
2. use of strategy and approach;
3. coverage, depth, accuracy of content;
4. presentation and communication; and
5. attitude.

It should be noted that students' reflections and peer assessment can be an integral part of assessment and parents can also contribute their views. Typical examples of project work include investigating students' favourite extra-curricular activities, comparing the heights of boys and girls in the school, an investigation into the relationship between students' eyesight and time spent watching TV, story of π , model making, application of binary system, Euclidean Geometry, conic section, sports and mathematics, etc. Detailed exemplars can be found at the end of this Guide (Exemplars 8 – 10).

Short quizzes

Short quizzes can be in oral form and conducted at the beginning of a lesson as revision. They function like class discussion, oral presentation and classwork. Teachers can pose one or two simple problems on the topics previously taught (such as calculating the percentages of students who are absent and present on that particular day) and assess from students' solutions their understanding on that topic (such as whether the students recognize the sum of the “absent” percentage and “present” percentage is equal to 1).

Investigations

Investigation is one type of class activity. Through getting students to conduct investigations teachers can look at students' problem-solving skills and collaboration skills (if the activity is conducted in groups). Students' performance during investigations can be assessed through observation. Criteria include comprehension of the problem, the use of strategy and approach, the degree of participation and attitude, etc. Typical examples of investigations include symmetry and transformation of figures, properties of figures, relationship between even and odd numbers, cross-sections of solids, pyramids and prisms, area of triangle, Pythagoras' Theorem, etc.

Tests and examinations

Generally, there are both tests and examinations in schools. Nevertheless, teachers should

pay attention to the following points when setting tests/examination papers.

- The coverage in the paper should be complete and the item format should be diversified
- Each item should have clear assessment objective(s)
- The item difficulty level should reflect students' abilities
- The number of items in each paper should be small
- The language used in the paper should be simple and clear

Before setting a test/examination paper, teachers should prepare a table of specifications and a marking scheme. In the table of specifications, marks allocation on the learning units being assessed should be clearly shown. Appropriate amount of marks should be allocated so as to reflect the aims and focus of the paper and to ensure the proper coverage of the topics being assessed. The paper should embrace various types of item, like essay-type items, fill-in-blank items, multiple-choice items, etc. to assess students' knowledge in various aspects of mathematics. Open-ended questions should also be included to assess students' thinking abilities like critical thinking, creativity and communication. Examples of open-ended questions can be found at the end of the Guide (Exemplars 11 – 13).

The most appropriate method or procedure for gathering information is best decided by considering the purpose for which the information will be used and the kind of performance that will provide the information required. No matter what kind of assessment activities are adopted in collecting information of students' learning, it should be borne in mind that the main purpose of assessment is to enhance the learning and teaching process.

5.3 Formative Assessment

Assessment can be formative or summative. Formative assessment is designed to measure what students know and are learning as they go along. The information collected is used as feedback to plan the future learning and teaching activities in which students and teachers are to be engaged. Formative assessment should be regular and ongoing and can be done in a number of ways including observation, discussion and examining at the written work of students done in class or at home.

However, for diagnostic purposes aiming to identify students' strengths and weaknesses, it is imperative to undertake formative assessment on a regular basis in order to have as

complete a picture of student learning and performance as possible in order to plan for improvement. Based on students' strengths and weaknesses, teachers can adjust their teaching plan and provide timely measures to further consolidate students' knowledge.

Assessment activities, such as project work, class discussion, oral presentation and observations of students' performance during lessons, can be integrated with other classroom activities. There is nothing new in this as all teachers do this implicitly or explicitly in the classes they teach. All teachers would ask students questions, request them to answer them either at the blackboard or at their desks, hold discussions and listen to what they say, organize class activities and observe their performance, etc. They have already made use of formative assessment to assess their students.

5.4 Summative Assessment

Summative assessment is designed to measure students' achievements and performance at certain intervals in time, such as at the end of a term, a school year or a key stage. It is mainly used for providing a comprehensive and summary description of student performance and progress in learning.

Formative assessment and summative assessment serve different purposes, hence, both formative and summative assessments are needed. However, teachers should borne in mind that the final aim of both is to enhance learning and teaching.

5.5 Reporting

Feedback is a crucial component of any learning and teaching cycle. Without proper feedback, assessment becomes meaningless. However, it should be noted that feedback does not mean "praise" or "blame" and is not the same as "guidance". Effective feedback must be able to help students know what they can and cannot do and where their strengths and weaknesses lie, and it must also tell them what to do to improve.

Feedback from assessment can be in verbal or in written form and should be related to the particular qualities of their work with advice on what they should do to improve. Comparisons among students should be avoided. Immediate feedback on the basis of formative assessment should be given wherever possible, as it is effective. For example, homework should be marked and promptly returned to students with appropriate comments whenever necessary.

Feedback from summative assessment activities can provide information for students to plan their subsequent study, and for teachers to plan the next teaching sequence, and to adjust the breadth and depth of the mathematics curriculum for the subsequent term or year.

Effective and efficient communication between teachers and parents is essential for integrating learning across school and home. Some parents consider “practice makes perfect”. They emphasize rote memorization in their children’s learning. This may lead to over-drilling and negligence of the fostering of HOTS. 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 assessment activities, more information on how to improve children’s learning could be provided to parents through these channels. Through the feedback from teachers, parents can better collaborate with teachers to support children's learning.

In sum, schools need to formulate their assessment policy according to their context, teachers’ experience and students’ needs and interests. The assessment policy should be balanced in terms of assessment activities and reporting of the information collected. Learning objectives, learning activities and assessment tasks should be aligned to ensure that what is intended will be properly taught and successfully learned.