10. INTERVIEWS WITH TEACHERS

10.1. Participants and procedure

Fourteen mathematics teachers from 5 primary schools and 20 mathematics teachers from 5 secondary schools were invited to participate in the teacher interviews. They were asked to comment on (a) the strengths and weaknesses of mathematics learning among students, (b) the strengths and weaknesses of the current mathematics curriculum and how it could be improved, (c) how individual differences in learning mathematics could be addressed, (d) how information technology could be incorporated into the teaching of mathematics and (e) the support needed for such innovations. A semi-structured format was adopted. The interviews were audio-taped, transcribed and content-analysed.

10.2. Responses of primary mathematics teachers

10.2.1. Students' strengths and weaknesses in mathematics learning

In general, teachers agreed that students were competent in mechanical computation and memorisation (e.g., memorising the multiplication table). Academically strong students had a great sense of success in the subject. The students were able to apply learning in new situations, and they asked questions and were willing to think. Also, the students were able to handle large numbers as well as difficult and complicated computation.

In general, teachers found students weak in conceptual understanding and handling problems that involved higher order thinking. Their attention span was short. Weak students had difficulty dealing with large numbers and complicated computation. One mathematics department head said weak students had difficulty expressing themselves in mathematical language that led to great frustration. These would be students who did not have a strong mathematics foundation and were generally unable to apply learning to new situations. Also, these students had little interest and low confidence in mathematics.

In regard to problems encountered by students in mathematics learning, a P.5 mathematics teacher thought that such problems could be overcome in the following ways:

(a) If teachers have more time to prepare teaching aids and materials, that would help students understand abstract mathematical concepts.
(b) Students should be allowed more time to digest new concepts.

(c) The teacher-student ratio should be lowered so that teachers could deal with individual differences better.
(d) Mathematics teaching should play down the importance of assessment of mechanical computation. More emphasis should be put on the mathematical process.

10.2.2. Comments on the curriculum

In general, teachers found the primary mathematics curriculum bulky, packed and difficult. Also, teachers found some of the content impractical and unrelated to life. For instance, teachers in one school found the topics of abacus as well as Chinese and Roman numerals impractical and unrelated to life. A teacher from another school found the topic of factors unrelated to life. In addition, teachers found that the curriculum put too much emphasis on mechanical computation (e.g., multiplication and division involving decimal numbers) and that there was not enough emphasis on thinking skills.

Most teachers thought the P.1 syllabus was more reasonable in length but the P.5 curriculum was the heaviest. Compared to other grade levels, the P.4 and P.5 curricula were found to contain the most difficult topics. Teachers also found that there was a big difference in the difficulty level between the P.4 and P.5 curriculum content. For instance, teachers thought the P.5 topics of formulas, percentages, direction, graphs, 3-dimensional patterns and mensuration (e.g., weight) difficult. This view was in direct contrast to the view reflected by students (note that we only conducted surveys among P.6 students, not P.5). The topic of quadrilaterals was found to be exceptionally long. There was one teacher who found the senior primary (P.4 to P.6) mathematics curricula difficult. This teacher thought that the curricula for these grade levels failed to match students' cognitive development. As a result, students, especially those of average and low academic standards, had great difficulty understanding the content and this had great impact on their confidence and interest in learning mathematics.

The lengthy curriculum and tight teaching schedule allowed teachers very little time to focus on some important topics or to use activities in teaching on a regular basis. In general, teachers found it important to spend more time with students to help them build a good solid foundation in mathematics. Teachers said that even curriculum tailoring offered very little help in alleviating the problems imposed by a tight teaching schedule. The teachers reflected that because parents expected everything in the curriculum to be covered, it was very hard to tailor the curriculum.

In addition, teachers found it hard to decide what to include and what to leave out, because they found that topics in mathematics were closely interrelated.

In general, teachers felt that conceptual understanding was more important than mechanical computation/drilling. One mathematics department head said that P.1 to P.5 were important foundation years in mathematics learning and among them, P.5 was the most important foundation year. To this teacher, P.1 to P.5 should be devoted to the establishment of foundation in mathematics, and P.6 should be devoted to the in-depth study of some topics and application exercises.

Continuity between the P.1 and P.2 syllabuses was of great concern to some teachers. These teachers found that much of what was taught in kindergarten was repeated in the P.1 curriculum. As a result, P.1 students had a relatively easy mathematics curriculum, but they might find the P.2 mathematics curriculum much more difficult.

Teachers of P.5 and P.6 were very concerned about the time students had to spend on preparing for the Academic Aptitude Test. Moreover, preparing P.6 students for the Academic Aptitude Test incurred extra workload for teachers. In fact, one teacher found that most students were not benefiting from the drilling exercises before the Academic Aptitude Test, and too much drilling had a negative impact on students' motivation in learning.

10.2.3. Suggestions for changes of the current curriculum

In general, teachers were looking for a more manageable curriculum in terms of length and degree of relevance. In terms of length, most teachers were in favour of trimming down the current primary mathematics curriculum to make time for better teaching and learning. Teachers were in need of more time to do lesson preparation and to provide guidance to students. Students were in need of more time to digest materials and understand important concepts. As regards to topics, some teachers suggested trimming down certain topics in the curriculum, including quadrilaterals, magic squares, recurring decimals, and positive and negative numbers. In terms of degree of relevance, teachers were looking for a curriculum that was interesting, practical and related to life.

Some teachers were in favour of reshuffling the topics in the first three years of primary schooling. They suggested moving some P.2 topics to P.1 and some P.3 topics to P.2. in the hope that students would grasp the concepts of addition and

subtraction early in P.1 and the concepts of multiplication and division in P.2, and then they would be able to work with the four rules at P.3.

There was also a suggestion of moving some P.5 topics (e.g., factors, multiples, greatest common divisor, least common multiple) to P.4 in order to ease up the very tight P.5 curriculum.

With the introduction of the use of calculators in higher primary grade levels, most teachers queried the necessity of engaging students in complicated computation involving large numbers and complicated procedures (e.g., involving a large number of steps). They thought mechanical drilling should avoid unnecessary complexity. Instead, computation exercises should be more related to life.

Concern was raised about the continuity between P.6 and S.1 as teachers found considerable overlapping in the two curricula. Some suggested moving some of the P.6 topics to S.1 since those topics will be covered in S.1 anyway.

In general, teachers thought curriculum change should follow a holistic approach, which took into consideration the continuity between kindergarten, primary, secondary and tertiary levels. Also, teachers thought that curriculum change should take care of two important areas in mathematics teaching/learning, viz., (a) fostering students' interest in mathematics, and (b) helping students establish a solid foundation in mathematics.

10.2.4. Dealing with individual differences

At the instruction level, teachers addressed individual differences through providing additional help and guidance to individual students before or after school, or during recess. However, the tight teaching schedule as well as heavy teaching and non-teaching workload made it hard for teachers to provide adequate help to students with learning difficulties in the subject. Many teachers also encouraged peer tutoring in their classrooms, with brighter students helping weaker ones.

At the school level, individual differences were addressed mostly through streaming and the placement of weaker students in remedial or special needs classes.

Teachers of one school expressed that they were trying to address individual differences at the assessment level through incorporating about 5% of more

challenging questions that required higher order thinking in test and examination papers. Teachers of another school thought that at the assessment level, individual differences could be addressed only through looking at the process (e.g., how students went about solving mathematical problems).

At the curriculum level, teachers generally thought the current primary mathematics curriculum had done little to address the issue of individual differences. Teachers of one school thought that a curriculum with core and extended content areas was not going to work because teachers would treat everything as core content areas. One P.6 teacher from the same school thought that only two topics in the current P.6 curriculum had an extended component. A P.6 teacher from another school found it extremely difficult to implement a curriculum that catered for students of different ability levels in one classroom. To this teacher, the situation would be like having students of different grade levels in one classroom, and this was going to bring about tremendous difficulty in managing the class.

On the other hand, most teachers agreed that the Target Oriented Curriculum was able to address individual differences. Since the Target Oriented Curriculum tasks were graded, brighter students could attempt more challenging tasks, whereas weaker students could work on more basic tasks.

10.2.5. Encouraging higher order thinking

In general, most teachers tried to promote higher order thinking in students through encouraging students' participation in their own learning process. This was done through engaging students in activities that would encourage them to raise questions about the learning situations and then find answers to their own questions. Some examples of these learning activities were mathematical games, pair work, project work, discussion and experiments. While it was important to provide students with opportunities to engage in stimulating activities, most teachers felt it was equally important to help students establish a good solid foundation in mathematics, because that foundation would become the basis for developing higher order thinking skills. In addition, most teachers thought that the most basic and important step should be to promote students' interest in learning mathematics. Only then would students find fun to learn mathematics and have the motivation to pursue higher level learning. One way to raise students' interest in mathematics is through designing learning materials and activities that are interesting, useful and related to life.

10.2.6. Information technology

All the schools that participated in the teacher interviews were at a very preliminary stage of information technology implementation. Most teachers said that information technology was something very new to them and they were not really sure what information technology was. Some of the schools were at the stage of setting up a computer room and exploring relevant computer programmes (software) to be used in mathematics teaching. In one school, the mathematics department organised lunchtime workshops to share materials on information technology and relevant computer programmes that would be used in mathematics teaching. Some schools already had a computer club set up to provide students with extracurricular activities in which they could learn something about computers, whereas schools which did not have a computer club yet were planning to have one set up in the coming year. In most schools, teachers had a chance to attend training courses on information technology. In general, teachers agreed that information technology could help teaching and learning in mathematics. They perceived information technology as a tool in teaching, but were very convinced that information technology could not replace the role of the teacher. Most teachers saw the potentials of information technology in arousing and promoting students' interest in mathematics learning, providing concrete imageries, provoking thinking, and consolidating conceptual understanding. Using information technology in areas such as complicated computation, data analysis, drawing, and pattern making was also mentioned.

In most schools, teachers were trying to incorporate information technology in their teaching. These teachers were very concerned about the time spent in setting up equipment in the classroom and the availability of relevant computer programs to be used in teaching. Most teachers mentioned the CD-ROMs provided to their schools by the Education Department. However, it seemed that teachers were in need of more of these software programmes to be used in teaching.

Teachers were looking for further support in implementing information technology in teaching.

(a) Equipment (hardware). Teachers found it essential to have a well-equipped computer room in their schools. Also, for information technology to be used in day-to-day classroom teaching, they needed to have access to a computer, a projector and a screen, and most teachers were in favour of a permanent set-up of this essential equipment in each classroom.

(b) Computer programmes (software). Teachers said that availability of relevant and user-friendly computer programmes was very important. They thought the currently available programmes were not adequate.

(c) In-service training. Teachers were looking for more general as well as tailor-made, subject-specific training courses. Most teachers thought that teachers' ability and readiness to use information technology should be taken into account in information technology implementation. In one school, teachers found existing information technology training courses too packed, too rushed, and impractical. They thought that information technology training courses should provide step-by-step guidance to teachers and allow them access to computers while they were attending the courses. In addition, relevant software programmes should be introduced to teachers in information technology training courses and teachers had a chance to try out those programmes in the courses. In other words, teachers were looking for practical information technology training courses.

(d) Time. Time was the number one concern for most teachers trying to incorporate information technology in their teaching. They hoped to be released from teaching for preparatory work and for attending training courses.

10.2.7. Other teacher concerns

(a) Time was a big concern for teachers. Teachers reiterated time and again that they lacked the time to address individual differences in teaching, to help students develop higher order thinking, and to use information technology in teaching.

(b) Teachers made the following comments on the Target Oriented Curriculum:

  (i) The implementation of Target Oriented Curriculum incurred extra work for teachers. For instance, teachers had to prepare tasks of a range of difficulty levels for groups with different abilities. Also they had to prepare a lot of worksheets and exercises for students. In other words, implementing the Target Oriented Curriculum demanded extra time and teaching resources.

  (ii) It was difficult to find the right task situations to be used in test papers.

  (iii) Teachers found that sometimes task situations were not necessary.

  (iv) Teachers found that poor results might be due to children's inadequate reading and comprehension abilities.

  (v) Children's short concentration span posed another problem to the use of situations involving lengthy descriptions.

  (vi) The use of situations might pose problems for younger (P.1-2) students.

(vii) Teachers found that the Target Oriented Curriculum was able to address individual differences.

(viii) Teachers were concerned about the tedious record-keeping in the Target Oriented Curriculum, and they found it meaningless if assessment findings were not followed up.

(ix) Teachers saw the Target Oriented Curriculum as an add-on to the current curriculum.

(x) Teachers found that the Target Oriented Curriculum was not matched by a corresponding change in the curriculum, and basically teachers had not changed their teaching approaches. Teachers said that changes in teaching strategies should be matched with corresponding changes in the curriculum.

(c) Teachers expressed concerns over the Academic Aptitude Test. They were concerned about the large amount of time they spent on preparing students for the Test. Also, students disliked the drilling, and less able students actually lost interest in doing drilling exercises. Moreover, the time spent on drilling students for the Academic Aptitude Test was at the expense of the regular curriculum time. Some teachers suggested replacing the Academic Aptitude Test with subject-based tests.

(d) It was found that collaboration between teachers was scarce. Sharing of workload was discussed and decided before the start of a new academic year mostly in the following areas only: writing of teaching schedule and setting of test and examination papers.

(e) At the instruction level, teachers were concerned about how to raise students' interest in mathematics, how to address individual differences in students, and how to be effective in classroom management.

10.3. Responses of secondary mathematics teachers

10.3.1. Students' strengths and weaknesses in mathematics learning

10.3.1.1. General comments

In general, students at the secondary level showed low initiative in their studies. Some teachers said that in general their students were not taking learning seriously. Generally, students were found to be lacking in interest in mathematics and lacking a good, solid foundation in the subject.

Most teachers found their students passive in learning and some of them simply lazy. There were occasional disciplinary or behavioral problems, but the most common problem was the students' lack of concentration. Some teachers found

that their students lacked a sense of belonging to the school.

As far as students' mathematical ability was concerned, teachers found that students in general were weak in logical thinking, comprehension power, manipulation ability (ability to solve mathematical problems) and ability to discover. They found that students were not used to thinking and that some students were too reliant on calculators even in doing simple computation. Students were also found to be weak in language usage, particularly when it came to problem interpretation.

Some teachers were concerned with the fact that most students were very dependent on their teachers in their learning and that this dependence had become a learning habit.

On the whole, teachers mentioned more weaknesses than strengths in students in the interviews. Only one group of teachers from one school felt that their school had a very good study atmosphere and that students were motivated to learn.

In the interviews, teachers mentioned a number of ways they had used to improve student learning which included persuading students to work hard (e.g., through individual counseling), getting help from parents, establishing rapport with students and making topics related to daily life situations. Teachers felt that promoting students' initiative in learning was more important than curriculum innovation.

10.3.1.2. Junior secondary

In general, junior secondary students showed low learning initiative. They also lacked a good, solid foundation in mathematics. They were weak in comprehension and application (e.g., using learned materials in new situations). Teachers found S.1 students particularly weak in fractions and algebra. Some teachers were concerned that behavioural or disciplinary problems in junior secondary forms interfered with teaching and learning.

10.3.1.3. Senior secondary

In general, senior secondary students were found to be weak in basic mathematics. Comparatively speaking, science stream students performed better than arts stream students in the subject, but performance of science stream students was still largely unsatisfactory. Arts stream students were found to be very weak in analysis. On the whole, most students were weak in geometry and algebra. Copying homework was a common problem among these students. Some S.4 teachers expressed the

concern that behavioural problems in S.4 classes had affected student learning. Teachers had tried many ways to raise students' standards in mathematics (e.g., providing students with a lot of practice opportunities, helping them see the importance of doing well in mathematics for their future studies at the university). One group of teachers found a sudden drop in interest in mathematics in S.5. Another group of teachers found most S.5 graduates below standards. Most teachers found students not adequately prepared for materials in higher grade levels, with the result that teachers had to re-teach a lot of materials learned in the previous year (e.g., S.5 teachers had to re-teach equations of a straight line in coordinate geometry, a topic in S.3).

10.3.1.4. Sixth-form

In general, teachers found the mathematical standards and motivation in learning to be extremely low in sixth-form students. Some students lacked concentration in their studies. One group of teachers said that their sixth-form students were weak in algebra. Teachers said that because their junior secondary students were weak in conceptual understanding they would have difficulty in mathematics learning in senior secondary levels. There were no particular behavioural or disciplinary problems for these senior secondary forms.

10.3.2. Comments on the curriculum

10.3.2.1. General comments

In general, teachers found the curriculum packed, boring and unrelated to real life. Some teachers said that the curriculum was obsolete as it catered only for elite students and did not reflect societal changes. Teachers said that some students queried the usefulness of some topics (e.g., logarithm, equation of a straight line). Some teachers found a little overlapping in the syllabuses of Mathematics and Additional Mathematics in four topics, viz., inequality, quadratic equations, coordinate geometry, and circle. In general, teachers were in favour of trimming down the current curriculum to make mathematics learning a more pleasant experience for most students.

In one school, teachers found the distinction between tailored syllabus and whole syllabus useful. They found the tailored syllabus worked in their school and that it did motivate and help student learning. These teachers found that curriculum tailoring allowed them to spend more time with their students. Teachers from other schools expressed concerns over curriculum tailoring. They thought that expectations of students and parents had made it difficult for teachers to cover only

the tailored part, with the result that the whole curriculum had to be taught.

Some teachers complained that university entrance requirements were dictating the content of their teaching.

Some teachers expressed concerns over the continuation between the three cluster groups, viz., junior secondary, senior secondary and sixth-form.

10.3.2.2. Junior secondary

Teachers found the S.1 curriculum short and simple but it repeated some of the materials taught in P.5-6. They thought the overlapping in the curricula might help explain the drop in results in S.2, because the S.2 curriculum had not been covered before. Teachers said that the S.2 curriculum was very tight, and consisting of 13 to 14 topics, making it difficult for them to cover the entire syllabus. They also found the S.3 curriculum long.

Some teachers found that the junior secondary curriculum repeated some of the P.5-6 materials, but it meant that students understood some of the topics better because of broader and more in-depth study. However, the latter objective (i.e., better understanding) might be hindered by the low ability of students. So in the end, students might not really benefit from the repetition.

Some teachers in a school that admitted "bottom ten students" (i.e. students in the lowest 10% of academic achievement) felt that the tailored syllabus took time for its intended outcomes to be achieved. However, by the time they could see some effects, most S.3 students in such schools had been screened out of the system. The effect of curriculum tailoring by such means therefore needs further research. We advise further investigation to ensure its successful implementation and to find out what peripheral support is necessary.

Teachers said that junior secondary mathematics was related to mathematics learning in senior secondary levels and therefore a good foundation was important.

A common problem among junior secondary students was that they found interpreting word problems difficult.

10.3.2.3. Senior secondary

Teachers felt that the continuity between the S.3 and S.4 curricula and between S.5

and S.6 curricula needed to be strengthened.

One group of teachers felt that foundational work in mathematics should be training of the mind and drilling, a method which they thought could strengthen this foundation.

Teachers strongly felt that teaching and learning in senior secondary level was highly examination-driven. They suggested that any change in the senior secondary curriculum had to go hand in hand with reform of the examination syllabus.

One mathematics department head found certain topics in the senior secondary mathematics too easy and this might make it difficult for students to handle materials in sixth-form mathematics.

One group of teachers found the Additional Mathematics curriculum relatively long when compared to the Mathematics curriculum.

One group of teachers found the mathematics part of AS Level Mathematics and Statistics very similar to the Additional Mathematics curriculum. Most of the students taking the Mathematics and Statistics syllabus were from the arts stream and they found the syllabus difficult to handle, especially in topics dealing with abstract ideas (e.g., limit, binomial theorem, exponential functions).

10.3.2.4. Sixth-form

Poor continuity between the senior secondary and the sixth-form curricula was a concern to most senior secondary teachers. Moreover, they felt that there was inadequate preparatory work in senior secondary, with the result that students had tremendous difficulty following the sixth-form curriculum.

Teachers found the A Level Pure Mathematics curriculum very abstract, difficult and lengthy. They barely had time to cover all the topics - a situation which did not allow deeper understanding and exploration of those topics. Teachers were in favour of trimming down the curriculum so that more time would be left for helping students develop higher order thinking.

Some teachers found AS Level Mathematics and Statistics quite useful, interesting and related to other subjects, like economic and geography. However, some

teachers said that AS Level Mathematics and Statistics was not suitable for students in the arts stream. They thought science stream students could better handle AS Level Mathematics and Statistics.

10.3.3. Suggestions for change of the current curriculum

10.3.3.1. General comments

Most teachers did not favour separate mathematics curricula for arts and science stream students. They contended that some arts students were not weak in mathematics and they might want a broader exposure in mathematics to prepare them for future studies. In this case, a "simplified" mathematics curriculum for arts stream students might limit their opportunity to learn more.

Some teachers wanted to see an easier CE Mathematics curriculum and suggested moving difficult topics in Mathematics to Additional Mathematics so that the average students, especially weaker students, could take the subject. Students who were really interested in mathematics could take Additional Mathematics.

Teachers from one school suggested that a simplified and easier curriculum for the bottom 10% of the student population would be practical.

One group of teachers said that it was important to change students' attitudes towards learning in general and the subject in particular.

In general, teachers liked the idea of using multi-media in teaching, including information technology.

10.3.3.2. Junior secondary

Teachers felt that the overlapping between the P.6 and S.1 curricula needed to be addressed. Teachers found the S.1 curriculum short and simple but it repeated some of the materials in the P.5-6 curriculum. They suggested moving some S.2 topics to S.1 (e.g., equations and plane geometry such as angles of triangles).

In general, teachers were in favour of evening out the junior secondary topics in three years, so that each level had more time for activities in teaching. Teachers liked to see more extracurricular activities for the subject (e.g., activities that introduced the history of mathematics to students, games). One suggestion was to move the topic of angles of triangles in S.2 to S.4 or S.5.

A S.3 teacher found students too reliant on calculators even in easy computation; she suggested emphasizing the training of computational skills at junior levels.

10.3.3.3. Senior secondary

Most teachers favoured one curriculum for both arts and science stream students in S.4-5 if the mathematics for the arts stream would block further mathematics studies in the sixth-form.

There were teachers who were in favour of separate mathematics curricula for arts and science stream students. For arts stream students, the current curriculum should be trimmed down and with certain topics taken out (e.g., trigonometric functions and 3-dimensional problems). For commerce students in the arts stream, they suggested putting more emphasis on application and mathematical concepts that would be useful for upper form economics (e.g., discount, arithmetic and geometric sequences), but taking out topics that were not relevant to commerce (e.g., geometry). They found the topics of statistics, functions and their graphs relevant to commerce students. For science stream students, they suggested putting more emphasis on the learning of logic (including symbolic logic and set theory), because it would help the learning of mathematics and other science subjects.

Some teachers suggested trimming down the S.5 curriculum and moving the topics of 3-dimensional geometry and methods of bisection to Additional Mathematics.

10.3.3.4. Sixth-form

Teachers suggested trimming down the sixth-form curriculum and moving difficult topics in Additional Mathematics (e.g., integration, complex numbers, vector) to Pure Mathematics. Also, they thought the sixth-form curriculum should be made more relevant to daily life.

10.3.4. Dealing with individual differences

At the classroom level, individual differences were addressed mostly through individual guidance in class work.

At the school level, individual differences were addressed through streaming and remedial teaching. However, some teachers found remedial teaching not useful mainly because students lacked initiative to learn.

At the assessment level, individual differences were addressed through the provision of two sets of examination papers (e.g., Levels 1 and 2) for students of different ability levels.

At the curriculum level, individual differences were addressed through curriculum tailoring with a compulsory core component and an optional extended component.

10.3.5. Encouraging higher order thinking

Teachers mentioned the following methods to promote students' higher order thinking in mathematics:

(a) strengthening conceptual understanding,
(b) strengthening student knowledge in mathematical theory,
(c) asking students to interpret the situation presented in the question, rather than focusing on the working steps,
(d) establishing a sound foundation in junior secondary levels,
(e) promoting interest in the subject matter,
(f) giving students a sense of success,
(g) good questioning,
(h) quizzes and tests,
(i) linking lessons to real life situations and using life-related examples,
(j) engaging students in their own learning process (i.e., teachers providing less guidance).

10.3.6. Information technology

In general, teachers thought that the use of information technology in teaching was a good innovative step. Some teachers said that they welcomed the information technology component. Most teachers thought the major role of information technology was in promoting student interest in learning. However, they said that information technology could not replace traditional teaching approaches (e.g., offering of proofs).

At present, most schools have a well-equipped computer room with up-to-date hardware. In one school, the computer room was equipped with over 20 computers and there were 60 more computers coming. However, the same school expressed the concern about where to place those computers. The present situation for most schools is that they have only one room equipped with a projector and a screen, where they can use information technology in teaching.

In using information technology in teaching, most schools are in need of on-site technical support. For instance, some schools said that they needed a technician on site to provide help with the computer set up. Besides, schools are in need of ready-to-use, subject-specific software and practical information technology training courses (preferably graded to cater for beginning, intermediate and advanced learners).

Time was the biggest concern expressed by teachers when they considered incorporating information technology in teaching. Most teachers found using information technology in teaching demanding and time-consuming. Some teachers were sure that they would not use information technology if they did not have enough time to cover the syllabus. They complained that the biggest problem with using information technology in teaching was that it involved a lot of preparation time (7-8 times more than using traditional teaching approaches) and it also involved a lot of set-up time before lessons.

In connection with the issue of time, most teachers said that they could hardly afford the time to develop their own programmes for teaching. They felt that there was not enough quality software programmes available. Most teachers were in favour of a centralized resource centre organised by the Education Department, where they could find relevant software, teaching aids, and a data bank containing exercise and test questions. These teachers suggested that there should be a section in the Education Department responsible for the centralised development of software for schools.

Other concerns expressed by teachers included the availability of financial support for the maintenance of information technology equipment.

10.3.7. Other concerns expressed by teacher

(a) Most teachers expressed concerns over their heavy teaching load (e.g., over 30 periods per week) and non-teaching duties (including taking attendance roll, collecting tuition fee, collecting reply slips for various activities).
(b) In general, teachers were concerned about the large classes (or high teacher-student ratio), which made it difficult for them to take care of individual students.
(c) Some teachers felt that the crowded work environment led to low teacher morale. One teacher expressed the view that the poor working environment in schools led some people to think that teaching was not such a respectable profession.

(d) Declining status for teachers was another concern expressed by the teachers themselves. They felt that the modern trend of advocating student rights and student-oriented school programmes resulted in diminishing teachers' influence on student learning. To a certain extent, teachers found that they were playing a lesser role in student learning.

10.4. Summary

Teachers seemed to stress students' weaknesses rather than their strengths in the interviews. The prevailing view among teachers was that students' learning difficulties might be attributed to a weak foundation but they offered no suggestion as to how and when a solid foundation should be built. However, the teachers' interviews revealed a prevalent belief that students' interest in mathematics declined as they moved up the grade levels. At the primary level, students were found to be good at mechanical computation though they were weak in conceptual understanding and higher order thinking. A short attention span was commonly seen as the major learning problem at that age. The problems of students being passive, unable to take the initiative and not being serious enough about learning began to emerge at the secondary level. Disciplinary problems became more disturbing too. Secondary school students were found to be lacking in a foundation solid enough to allow them to proceed further with their learning. They were particularly weak in comprehension, logical thinking and problem solving, especially in solving word problems. These weaknesses continued to the sixth-form. Teachers complained that copying homework had become a common practice at senior secondary levels.

Almost all teachers pointed out that the existing mathematics curricula at all levels were too packed and this hampered in-depth discussion and accommodating individual differences. Students need time to digest their learning. The mathematics curriculum needs to be trimmed down and the level of sixth-form mathematics has to be re-adjusted. The mathematics curriculum is generally found to be boring, impractical and unrelated to real life. However, it is worth noting that confining mathematics learning to artificially created "life situations" may deprive the students of genuine mathematics learning. Computational skill has to be de-emphasised because of students' easy access to calculators. Higher order thinking can also be enhanced by promoting interest and student engagement. A solid foundation is a prerequisite to all learning. In sum, in revising the mathematics curriculum, attention should be drawn to promoting students' interest in mathematics and to helping them build up a solid foundation.

Continuity of syllabuses at all levels, not only across key learning stages (kindergarten to primary, primary to secondary, junior secondary to senior secondary and senior secondary to sixth-form), but also from year to year, must be given priority attention, especially when the language barrier at S.1 is now removed for most schools. Though teachers offered some suggestions on the rearrangement of various topics in the syllabuses, contents and level of difficulty should be reorganised to ensure a logical flow and to match the cognitive development of the students. To this end, we need a strong theoretical framework on which to base the reorganisation of the content.

Most of the secondary mathematics teachers did not favour separate mathematics curricula for arts and science stream students simply because they assumed that students taking mathematics in the arts stream would have missed the opportunity for studying mathematics in the sixth-form.

At the primary level, curriculum tailoring does not seem to work since the notion is in conflict with parents' anticipation. Parents expect the schools to teach everything, though a core part of the curriculum may be identified. Some primary school teachers said that, alternatively, differentiated tasks should work, though they did not imply that the Target Oriented Curriculum should be adopted. Mathematics teachers reflected that the idea of core and extended curriculum should work better at the secondary school level, though they still anticipated some resistance from the parents. However, the effect of curriculum tailoring by such means need further research. It would be advisable to investigate viable ways to ensure its successful implementation and to find out what peripheral support is necessary.

Teachers generally showed high regard for information technology. However, they firmly believed that it could not replace the role of teacher but it was useful in promoting interest in learning mathematics. At present, information technology is more widely used at the secondary level, and primary school teachers are just beginning to understand what information technology means. Few have recognised that the integration of information technology may generate a brand new kind of mathematics experience for students that would have strong influences on their ways of knowing and understanding mathematics. Teachers do not have the expertise to develop software and those available in the market are poor in quality. Thus, provision of equipment, programmes, training courses and on-site technical

support are urgently needed. Teachers said that using information technology in their teaching was time-consuming. They needed a lot of time in lesson preparation and in the setting up of equipment.

Examination-orientedness was another issue of concern. Teachers expressed their wish that the correctness of answers should not be taken as the only point of consideration. Lengthy computational problems should also be played down in tests and examinations. Most primary teachers complained that the Academic Aptitude Test was disruptive to their teaching.

The time factor was a big concern. Teachers need more time to prepare teaching materials. The teacher-student ratio, class size and teaching workload need to be reduced and the crowded workplace, professional morale and social recognition of their profession must be improved. It is also found that collegiate exchange among mathematics teachers was not popular. On the other hand, the implementation of a new curriculum would be demanding on the teachers. They are expected to teach in a more lively manner to maintain students' interest, to promote their confidence in doing mathematics and to give them a sense of success. The teachers should also possess the ability to handle individual differences. They should address higher order thinking and help students develop their problem solving abilities. Mathematics teachers should incorporate sensible information technology in their teaching to make mathematics learning more effective. Teachers' conception of mathematics and of mathematics learning should be widened too, possibly through wider exposure that can enrich their mathematical experiences.

All these cannot be done without the enhancement of teacher professionalism. In this regard, teacher training and support are important. Teachers need guidance on various issues such as curriculum tailoring and the use of information technology. Collegiate exchange among mathematics teachers both within schools and in the wider mathematics education circle should be encouraged - something which is lacking at the present time.

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