Mathematics in Government Primary and Secondary Schools of the Cayman Islands

Taken from 2004 - 2007 reports

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Main findings

This is a theme report drawing on findings from evaluations of government mainstream primary and secondary schools since 2003. It aims to bring together, in one document, the state of mathematics in government schools in the Cayman Islands in 2007.

The last theme report for primary mathematics was published in 2003; the last one for secondary in 2004. Unfortunately, there has been little, if any, improvement since that time. There has been no systematic attempt to address the issues highlighted in those reports. Schools and mathematics departments have received little effective support to improve key areas in teaching and learning. It is not surprising therefore, that the findings are very similar.

Mathematics in Government Primary Schools

Standards of achievement

Overall, the standards of students' achievements in mathematics are below expectations in government primary schools.

In general, students are proficient at written calculations but cannot apply these skills in meaningful ways. For example, students can work out 25 - 12 when it is presented as a written calculation in a vertical format but they do not know what calculation they need to do if asked questions such as 'what is the difference between 25 and 12?'; or 'what change would you get from a $25 note for an item costing $12?'. Students are also unable to derive associated number facts such as 125 - 112 or 12 + 13.

Students are over-reliant on inefficient calculation strategies. They are limited to formal written strategies or counting on their fingers. This means that they cannot do calculations such as the example above mentally, they do not recognise 25 as a 'near double' of 12 and use this fact and they do not use a number line or other mental or informal strategies. This lack of awareness of numbers and poor recall of number facts means that students use formal written strategies even when these are inefficient and inappropriate, and make common errors.

Standards of achievement in areas of mathematics other than calculations are even lower. Students have little knowledge and understanding of geometry and statistics, and their measuring skills are weak. Their understanding of other areas of number is also weak. Students' problem-solving and reasoning skills are poor.

Standards of students' achievement in mathematics are consistently lower than the same students' achievements in language arts. Higher ability students make less progress than students of middle and lower ability.

Curriculum

The mathematics curriculum taught by schools is unsatisfactory, generally being too narrow and poorly planned.

There is unsatisfactory coverage of different areas of mathematics. Areas such as estimation and geometry are often left until the end of the year and are frequently missed out due to shortage of time. When the curriculum guidelines from the Department of Education Services are used, they are not usually adapted or developed into a scheme of work, but followed as a list of topics to be covered in a specified order. Students have long periods of time between topics such as place value and so cannot remember their previous work. Too often the text book is used as a basis for what is taught, rather than the Cayman Islands Mathematics Curriculum.

Schools have not developed schemes of work to ensure that different areas of mathematics are visited each term and that ensure progression between year groups. Teachers cover topics such as 'multiples' in different year groups, sometimes at the same level of difficulty.

The time allocated by schools to mathematics varies widely both between schools and within schools, often within the same year group. Guidelines from the Department of Education Services are not consistently followed. Sometimes students do not have a mathematics lesson of appropriate length every day.

Many schools take part in 'mathematics week' with some taking advantage of the opportunity this provides for doing more interesting activities with students. However, too often the activities are not well-planned and do not expose the students to different areas of mathematics or enhance and extend their school work.

Assessment

The quality of marking of students' work is unsatisfactory. Some teachers mark every piece of work, others mark very rarely. Either way there is little written feedback to students which helps them understand how they are doing and what they need to do to improve. Comments are limited to encouraging praise such as 'good job' and do not relate to the extent to which the student has achieved the learning objective. Targets are not set for individuals and students are not given guidance on how they need to improve.

Students take tests in mathematics on a regular basis. However, the results of these tests tend not affect the next steps in students' learning. Results are recorded as lists of percentages and do not indicate what a student can and cannot do. Consequently, it is difficult for students and teachers to know what particular areas students need to improve and what particular areas they have understood.

Tests usually consist of narrow questions on recent work, whether they are from the textbook scheme or written by the teachers. They tend not to require students to apply their learning to different situations. Results therefore only give a limited picture of the level of a student's knowledge, skills and understanding of a particular topic.

Teaching and learning

The teaching and learning of mathematics overall are unsatisfactory.

Many teachers lack confidence in teaching mathematics. Many have weak subject knowledge and a lack of understanding of how children learn this subject. More confident teachers plan lessons that give the children the chance to explore what they are learning, to try out different ideas and to ask questions. As a result, students in these lessons develop a good understanding of the work and use it in different contexts. Unfortunately, these lessons are the exception.

Students are passive learners, exposed only to a narrow programme of mathematics. They are rarely encouraged to explain and justify their answers and are not given enough opportunities to solve mathematical problems or apply their learning in different situations even within their mathematics lessons. There are very few planned opportunities for students to use their mathematics in other subject areas.

Teachers generally employ a narrow range of teaching strategies and pitch the work too low. Their questioning tests recall rather than development of understanding, and invites choral responses rather than being targeted at individuals. The teaching does not develop students' problem-solving and reasoning skills. Very few 'why?' or 'how do you know?' questions are asked of students. Very occasionally students are asked to make up questions for their classmates, but this is not commonplace.

Very occasionally, teachers focus on developing students' understanding rather than merely learning a process. In these lessons, students make very good progress as a result of being challenged to think carefully about what they are doing. For example, in a Year 4 lesson, the teacher made sure that the students understood that fractions were parts of equal size before setting up practical activities where students realised that 2/4 is the same as 1/2 and so on. The teacher used a wide range of visual, auditory and practical stimuli, such as cutting up a cake, to cater for students' different ways of working. The discussions that the teacher encouraged helped to reinforce what had been learnt and students quickly developed a firm and confident grasp of the topic.

In general, resources are not used well to support students in building mental models and images through the year groups. Manipulatives such as base ten blocks and cubes are used in some lessons. Resources that are seen less often include number lines, place value cards, mini white boards and displays of mathematical vocabulary.

There is little use of ICT in the teaching of mathematics. An individualised program, 'Destination Math', is used in some schools but is not well planned for or monitored effectively. Not enough use is made of ICT resources by teachers to motivate students, make lessons more interesting and explain mathematical concepts. There is little use of subject-specific software to develop students' understanding of mathematics and students have little opportunity to use computers themselves. Students do not use spreadsheets or databases as part of their mathematics lessons.

Teachers generally are very dependent on the textbook scheme, but do not follow the teachers' manuals to gain best use of this resource. Students rarely complete the 'problem-solving' sections of the book, spending their time instead on repetitive, low-level tasks.

Typically mathematics lessons are slow-paced and all students have the same work to do, irrespective of their ability or prior knowledge and understanding. It is rare to see any differentiation that caters effectively for students' needs - that stretches the most able and supports the least able.

Leadership and Management

The management of mathematics in government primary schools is satisfactory, but leadership is unsatisfactory.

Some schools have a mathematics 'coordinator'. This person is usually a full-time class teacher whose main responsible is organising resources. Schools are generally well-resourced, although the quality and usefulness of some resources, and guidance on how best to use them are often lacking. The coordinator generally does not have responsibility for monitoring the quality of teaching and learning of mathematics in the school, for supporting teachers in improving their practice, for developing schemes of work and for monitoring curriculum coverage. No one has an overview of mathematics in the school and too often there are inconsistencies in schools and even within year groups. For example, sometimes classes in the same year have different amounts of time dedicated to mathematics during the week.

Schools do not have a clear enough idea of what a 'good' mathematics lesson looks like. They rarely have policies for mathematics and numeracy in place.

Progress since the last theme report

Overall, the issues highlighted in the last theme report published in 2003 remain issues today. No systematic progress has been made in improving mathematics in government primary schools in the Cayman Islands. Most schools do not have the capacity to improve without a significant amount of targeted external support.

Mathematics in Government Secondary Schools

Standards

Overall, standards in mathematics are too low.

Results indicate that students consistently perform below expectations in mathematics. In 2006, only 31% of students in their final year at government high schools achieved a higher pass in mathematics compared to 53% of students in English. There is no clear trend in results, with the percentage of students gaining higher passes generally around the high twenties and low thirties. However, students consistently do better in English than in mathematics. They are also consistently more successful on Cayman Brac compared to Grand Cayman.

Progress is slow in Key Stage 3 as teachers do not build enough on the knowledge, skills and understanding that students bring from their primary schools. Teachers' expectations are not high enough and usually lessons are pitched too low.

In government secondary schools, higher ability students achieve quite well. They are particularly good at algebraic manipulation and transformations and older students can carry out

complex calculations when solving problems. Many able students show confidence when tackling demanding work and demonstrate higher order skills in solving problems and handling advanced concepts. Reasoning skills of all students are less well developed. Most students are good at written or calculator computations, but their mental skills are weak.

The middle and lower ability students make too little progress during their secondary years. By the time they reach the end of their schooling many students are not entered for an exam which gives them access to a higher grade pass at CXC[1], GCSE[2] or IGCSE[3]. For example, in 2006, 64% of the students at the main government high school were not entered for such an exam.

Curriculum

The mathematics curriculum in government secondary schools is satisfactory. It is suitably broad and balanced, covering an appropriate range of mathematical topics.

In all three government secondary schools, there are issues around curriculum planning. Planning for content is good and teachers are clear about what it is they need to teach. However, how they are to teach this content, and the order in which the content should be taught, are less well planned. In addition there are common issues around transition between schools. In the first year of all schools, there is too much repetition from previous years which affects students' motivation. Work for the average and below average ability students is pitched too low. Expectations of the lower ability students in particular are not high enough.

In terms of planning 'how to teach' various topics, schools do not have an agreed approach. Teaching approaches are not shared and it is not explicit in the curriculum how teachers are to develop students' reasoning and problem-solving skills. There are some examples of group work and some interactive teaching, but generally, teaching methods are not well-matched to students' learning needs, particularly in lower sets. Although teachers plan for content, they do not plan activities and the use of practical resources to help students' understanding.

The curriculum is presented as a list of topics to be covered during a year. This results in some topics being taught exhaustively over a sustained period of time and then not being revisited. Students inevitably forget previous work when they only encounter a topic once every year or two. Sometimes the order of topics does not take into account the underlying conceptual hierarchy. For example complex manipulative algebra is tackled before some students are aware of the links between number operations and algebra.

Assessment

The effectiveness of assessment varies across the three mainstream government secondary schools but is satisfactory overall.

In the best cases, good use is made of diagnostic tests to identify students for intervention and work is regularly marked with an indication to the students of how well they have performed. Generally though, diagnostic tests are not used to identify specific weaknesses or set targets.

[1] Caribbean Examination Council
[2] General Certificate of Secondary Education
[3] International General Certificate of Secondary Education

In most cases, work is marked but with little feedback to the student on what they have done or what they need to do to improve.

In one school, reports at the end of each cycle indicate a student's strengths and weaknesses and give a clear picture of how the student is progressing through the course.

Teaching and Learning

Teachers in all three schools have good subject knowledge, are enthusiastic and keen to improve through professional development. They are committed to helping their students and give generously of their time providing lots of support to students outside lesson time. The effectiveness of the teaching in terms of its impact on students' learning is inconsistent between and within schools.

In Cayman Brac High School the high proportion of good teaching makes a positive contribution to the progress made by students. All lessons seen during the evaluation were at least satisfactory and half were at least good. Lessons are well planned with no time wasted and there is good use made of ICT.

In the two secondary schools on Grand Cayman the picture is more mixed. Teaching is much better in higher ability sets in both schools. Generally, in both schools, there is a lack of consistency in approaches to teaching. There is not a common understanding of what constitutes a 'good' mathematics lesson. In John Gray High School, well structured materials mean that students know what is expected of them, but often objectives are not shared with the class, or consist of activities rather than what students are going to learn. On the George Hicks campus, teachers tend to rely too much on textbooks. In all three schools there is rarely an opportunity planned at the end of a lesson to review what students have learnt.

In the schools on the George Hicks campus, there is a heavy emphasis on teaching mechanical skills and students rely on half remembered rules rather than a full understanding of the topics. In lessons often too long is spent on one activity such as listening or copying from the board. Too few lessons are structured to include a number of different activities to cater for students' different modes of learning. Occasionally there are good examples of open questioning with opportunities for students to explain their thinking, but these are not typical of lessons, particularly in lower sets. Students are motivated and well behaved, but girls are not participating fully. There is a lack of differentiation in all ability sets which impedes students' progress.

Leadership and Management

Leadership and management of mathematics overall is satisfactory with some good features.

In individual departments, the leadership and management are generally good. Teachers have plenty of resources and are well supported in strong teams. There is a willingness to undertake professional development, and many teachers even fund this themselves. There is usually a clear vision for mathematics within the school and clear curriculum plans so teachers know what they should be teaching.

Across schools, there is a lack of a coherent approach to teaching secondary mathematics and not enough opportunity for mathematics teachers from all schools to have professional development and plan together. There are no agreed approaches to teaching mathematics.

There are not enough links between schools to smooth the transition from Year 6 to Year 7 and, on Grand Cayman, from Year 9 to Year 10. The curriculum used in primary schools does not dovetail into the curriculum in Year 7 and the same applies to the Year 9 curriculum with Year 10. Much work is repeated and students lose motivation. In Years 7 (on both islands) and 10 (on Grand Cayman) the expectations of middle and lower ability students are not high enough.

Although heads of department monitor teaching and learning particularly through lesson observations, they are often not given the resources in terms of time and support to help teachers improve. The lack of consistency in the quality of teaching is a leadership issue. Not enough is being done to close the gap between the best and worst teaching.

Progress since the last theme report

Overall, progress since the last theme report is unsatisfactory, with few of the recommendations being acted upon.

Most of the strengths have been maintained, for example students' behaviour and motivation, but the vast majority of the areas that were identified as needing improvement are still common issues.

Leadership of mathematics is one area that has improved. The last theme report noted that heads of department were unclear of their roles and needed to strengthen their monitoring skills. This is no longer the case. Heads of department now regularly observe lessons to monitor teaching. Some received training from the Schools' Inspectorate 'Subject Leader Development Programme' or from undertaking joint observations with an inspector. The issue now is for heads of department to help teachers improve their practice and to monitor the performance of students more closely.

References

The following reports published by the Cayman Islands Schools' Inspectorate:

Mathematics in Secondary Schools in the Cayman Islands: A review of findings from school inspection reports 1997 – 2004

Mathematics in Primary Schools in the Cayman Islands: A review of findings from school inspection reports 1997 - 2003

Inspection reports for:

Cayman Brac High School	March 2004
Creek and Spot Bay Primary	October 2005
East End Primary	June 2004
George Hicks High School	February 2003
George Town Primary	January 2007
John A Cumber Primary	April 2007
John Gray High School	November 2006
North Side Primary	October 2006
Prospect Primary	March 2007
Red Bay Primary	November 2005
Savannah Primary	February 2004
West End Primary	November 2006

George Hicks High School, report from development week, October 2004 (internal, not published),