

An Roinn Oideachais agus Scileanna

Department of Education and Skills

**Subject Inspection of Mathematics
REPORT**

**Our Lady of Mercy College
Beaumont, Dublin 9
Roll number: 60870T**

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**AN ROINN DEPARTMENT
OIDEACHAIS OF EDUCATION
AGUS SCILEANNA AND SKILLS**

REPORT
ON
THE QUALITY OF LEARNING AND TEACHING IN MATHEMATICS

SUBJECT INSPECTION REPORT

This report has been written following a subject inspection in Our Lady of Mercy College, Beaumont. It presents the findings of an evaluation of the quality of teaching and learning in Mathematics and makes recommendations for the further development of the teaching of this subject in the school. The evaluation was conducted over two days during which the inspector visited classrooms and observed teaching and learning. The inspector interacted with students and teachers, examined students' work, and had discussions with the teachers. The inspector reviewed school planning documentation and teachers' written preparation. Following the evaluation visit, the inspector provided oral feedback on the outcomes of the evaluation to the principal, deputy principal and subject teachers. The board of management of the school was given an opportunity to comment on the findings and recommendations of the report; the board chose to accept the report without response.

SUBJECT PROVISION AND WHOLE SCHOOL SUPPORT

Our Lady of Mercy College, Beaumont has an enrolment of 296 girls. Timetable provision for Mathematics and timetable arrangements for level choice are good. Mathematics lessons are timetabled concurrently for second, third, fifth and sixth year groups where students are assigned to levels. This good practice provides students with the flexibility to change level at any time throughout the year if the need arises.

There is good practice in relation to student allocation to level groupings. First year students are assigned to mixed-ability classes for the duration of the year. Higher and ordinary level class groups are formed in all other years with the exception of Transition Year (TY). The TY programme is optional and there is one mixed-ability group for Mathematics. Students are encouraged to study Mathematics at the highest level possible for as long as possible. An additional teacher is provided to second, third, fifth and sixth year groups to facilitate the achievement of this aim. The additional resource permits the formation of smaller class groups. This is evidence of the school's commitment to ensuring that students reach their full potential in the subject.

There are six teachers of Mathematics. Teachers are deployed by school management in accordance with their experience and expertise. The teaching of higher level Mathematics is assigned to three of the six members of the department. In the interest of maintaining the capacity to teach Mathematics at this level within the school the number of teachers experienced at higher level should be increased. It is good that this is an issue which has been identified by the school for attention and that there are plans to address it. The school is encouraged in this regard.

Resource provision for Mathematics is good. These include 3-D shapes, trundle wheel, geometry equipment and the resources provided for the introduction of *Project Maths*. The information and

communications technology (ICT) facilities provided include good access to the computer room and to data projectors on a booking system and the availability of personal computers in some classrooms. There are plans to increase the provision of ICT equipment through funding from the National Centre for Technology in Education (NCTE). In addition there is wide availability of overhead projectors. In one lesson observed buttons and stickers were used to explain the main mathematical concept. To build on this very good practice it is recommended that teachers use everyday objects and materials to illustrate the common uses of Mathematics and to expose the underlying concepts. Objects of various shapes and sizes, household bills, dice, playing cards and student-generated resources such as clinometers are examples of materials that provide many opportunities for learning in Mathematics and are suggested for consideration.

Appropriate procedures are in place for identifying students who have learning support needs in Mathematics. Support is provided through small group withdrawal, and the creation of smaller class groups for Mathematics. Team teaching is also used to provide support for students in Mathematics. Overall, good arrangements are made for students experiencing difficulty with the subject.

Students are encouraged to participate in a variety of extracurricular and co-curricular mathematics activities. These include involvement in the *Team Maths Challenge* and in the celebration of *Maths Week* each year. Providing opportunities such as these for students to experience Mathematics for fun is a very valuable way of encouraging an interest in the subject and in providing additional challenge for students with a talent for Mathematics.

PLANNING AND PREPARATION

Planning time for Mathematics is provided twice a year as part of the whole school planning process. Agendas are set for these meetings and minutes are kept. In addition, the mathematics teachers of each year group meet formally on a regular basis. The members of the mathematics department work very well as a team and in addition to formal meetings, informal mathematical discussions routinely take place. Very good induction supports are provided for teachers new to the subject or to the school. This support is ongoing and their colleagues appreciate the invaluable assistance and advice provided on a regular basis by the more experienced members of the department.

It is evident from the review of the minutes of mathematics department meetings that much time is spent on organisational issues. While this is an important function of department meetings, it is recommended that some planning time be set aside for mathematics teachers to review the teaching and learning plans provided by the *Project Maths* development team. A suggested format might be that each teacher would teach one of the lessons outlined in the teaching and learning plans and then report their experience back to the whole group. The aim of this review should be to develop the mathematics department members' capacity to create their own teaching and learning plans.

Good progress has been made on planning for Mathematics. Policies on assessment, homework, and providing for students with special educational needs are examples of the policies that are contained within the planning documentation. In addition, it is good that a list of effective methodologies is included in the plan. The subject plan also contains a comprehensive analysis of the school's performance in the certificate examinations compared to national norms and to the students' assessment data on enrolment. This analysis provides the mathematics department with

a good profile of attainment and performance in the subject and enables the members to plan more accurately for the needs of their students. This is very good practice.

Common programmes of work have been developed for each year group and level. In some cases these are set out in terms of learning objectives linked to resources, methodologies and assessment which is very good. In other cases they comprise a list of topics to be covered within set timeframes. A notable feature of all of the lessons observed was the strong focus on student learning outcomes; this was central to the success of the lessons. It is recommended that the very good practice in relation to the programmes of work for some year groups, as described above, be extended to the programmes of work for all year groups. This measure will ensure that this very good aspect of classroom practice is reflected in the programmes of work. The teaching and learning plans provided in preparation for *Project Maths* and the information received at the workshops attended should be used to guide this work.

The TY plan comprises topics from the Leaving Certificate course and project work. As part of the TY programme students conduct statistical surveys and then analyse the data collected. While this is good practice, there is scope for the inclusion of a broader range of material and an increase in the diversity of activities undertaken in TY Mathematics. The study of financial Mathematics, Chaos theory, Fibonacci sequences, and basic number theory are suggested as topics that are not on the Leaving Certificate course but worthy of inclusion to add variety of mathematical experience for students. A module of Applied Mathematics focusing on road safety could also be included.

TEACHING AND LEARNING

The quality of learning and teaching was very high in all of the six lessons observed. In all cases teacher explanations and instructions were clear. Teachers related the work of lessons to prior knowledge and where it was appropriate to real life. In some lessons students were given more than one approach to solving the problems at hand and were encouraged to choose whichever method appealed to them most. Teachers were careful to include all of the steps in worked examples and to present material in a variety of different ways to facilitate repetition while maintaining student interest. The lively pacing of all lessons ensured that lessons were stimulating and the good balance between teacher talk and student activity contributed to high levels of student engagement. All of this very good practice contributed significantly to the success of the lessons observed.

The main methodology used was teacher exposition. While very effective teaching through this methodology was observed there is scope for an increase in the variety of activities used in mathematics lessons. With a small shift in approach, lessons could be adapted to incorporate investigation or discovery. Surveys and analysis of the resulting material are currently used in TY and are suitable for other year groups. Similarly the *Project Maths* approaches are suitable for year groups that are not currently taking *Project Maths* papers in the certificate examinations and for sections of the course that are not included at present. Activities that use everyday objects and concrete materials are very suitable for learning in Mathematics. These activities are recommended for inclusion in mathematics lessons.

Very good use was made of a variety of valuable questioning strategies. This variety included quick questions used to involve and include students; open questions that encouraged students to examine the underlying concepts presented and questioning that formed part of teachers' assessment of student understanding. There was a strong emphasis on the use of probing

questions to facilitate students in explaining their reasoning and to ensure students gained full understanding of the key ideas of the lessons. Students also contributed to their own learning by asking questions. A strong sense of teamwork existed in each of the classrooms visited as teachers and students collaborated in working out problems together through discussion. This is all very good practice.

Links were carefully created between related topics on the syllabus. This strategy was of particular note in a fifth year lesson on solving quadratic equations. The link between the algebraic solutions and their graphical representation was very clearly made in this case. The reason why there were two solutions, for example, was carefully highlighted in the teaching. This strategy was important in contributing to students' full understanding of the material presented and provided good preparation for *Project Maths* examination questions which will exploit the connections between concepts.

There was very good practice in relation to differentiation of learning. Although students are taught Mathematics in level groupings, the range of abilities in each classroom visited was quite wide. Teachers have developed very good strategies to ensure the lesson's learning objectives were achieved by all students. These strategies included providing graduated worksheets that increased in difficulty; ensuring that explanations were sharp; the use of repetition with variety and encouraging students to work ahead where necessary. In addition teachers provided individual assistance to students while the remainder of the class was engaged in completing individual tasks. These strategies contributed to ensuring that students were challenged and stimulated while simultaneously ensuring that additional attention was available for any student who needed it. The students themselves made a valuable contribution to each other's learning in all of the lessons observed as they were very active in providing assistance for their fellow students. This proved an excellent way of differentiating learning and provided both students involved in the exchange with a very positive learning experience. It was evident that these creative strategies have arisen from the teachers' genuine focus on student learning outcomes.

There was much evidence of students being encouraged to take responsibility for their own learning. This took the form of expecting students to consult their notes or examples in the textbook before looking for teacher assistance and also expecting them to identify and correct their own mistakes. Students were encouraged to think for themselves as teachers provided encouragement and general advice, when asked to provide help, rather than full answers or instructions. By adopting these strategies teachers provided appropriate levels of support for students.

A very warm classroom atmosphere was evident in all of the lessons visited. In all cases students were observed to be working with their teachers towards a common goal with commitment and enthusiasm. Teachers were affirming, supportive and motivational in their dealings with students and students responded very well to this. The levels of engagement and participation were very high and it was evident that students were enjoying the subject. In interactions with the inspector the students demonstrated that they were confident in discussing mathematical ideas and were comfortable in using mathematical language.

ASSESSMENT

There is good practice in relation to assessment. All year groups are assessed in October and at Christmas. First, second and third year students sit summer tests in May. 'Mock' examinations are held in the spring for students preparing for the certificate examinations. Common

examination papers are set within levels for each year group which is good practice. Reports are sent home on foot of these assessments and parent-teacher meetings are held annually. The subject copybooks and student journals are also used as a valuable means of communicating student progress to parents.

Student progress is very well monitored on an ongoing basis. Class tests are set at the end of each topic studied. It was evident that some teachers are using tests to identify areas of the course that need to be revisited or that need further exploration. This is very good assessment practice. Teachers assess progress very well through observation and oral questioning. In the team-teaching lessons observed the provision of a second teacher made for very high quality assessment and this made a significant contribution to meeting students' needs.

The standard of the students' work in the copybooks reviewed was very high and students are making steady progress in Mathematics. This is borne out by the analysis of the school's performance in the certificate examinations which indicates that the school is performing well.

The assessment policy outlined in the mathematics plan incorporates some principles of Assessment for Learning (AfL) such as the use of comment only marking in some circumstances and the provision of differentiated homework. The spirit of this policy is cognisant of the potential of assessment to encourage and motivate students. There was evidence of this in classroom practice with the provision of advice and encouragement through the correction of student work and the motivation provided for students through oral assessment in class.

SUMMARY OF MAIN FINDINGS AND RECOMMENDATIONS

The following are the main strengths identified in the evaluation:

- Timetable provision for Mathematics and timetable arrangements for level choice are good and there is good practice in relation to student allocation to level groupings.
- Good arrangements are made for students experiencing difficulty with Mathematics.
- Good progress has been made on planning for Mathematics.
- The quality of learning and teaching was very high in all of the six lessons observed.
- Very good use was made of a variety of valuable questioning strategies and teacher instructions and explanations were very clear.
- There was very good practice in relation to differentiation of learning. This was positively influenced by lesson activities focusing on students' learning outcomes.
- A very warm classroom atmosphere was evident in all of the classrooms visited. The levels of engagement and participation were very high and it was evident that students were enjoying the subject.
- There is good practice in relation to assessment.
- Students are making steady progress in Mathematics. This is borne out by the analysis of the school's performance in the certificate examinations which indicates that the school is performing well.

As a means of building on these strengths and to address areas for development, the following key recommendations are made:

- The number of teachers teaching higher level Mathematics should be increased.
- Some planning time should be set aside for mathematics teachers to review the teaching and learning plans provided by the *Project Maths* development team. The aim of this

review should be to develop the mathematics department members' capacity to create their own teaching and learning plans.

- Teachers should include a broader range of teaching and learning strategies in mathematics lessons.

A post-evaluation meeting was held with the teachers of Mathematics and with the principal and deputy principal at the conclusion of the evaluation when the draft findings and recommendations of the evaluation were presented and discussed.