

**An Roinn Oideachais agus Scileanna**

**Department of Education and Skills**

**Subject Inspection of Mathematics  
REPORT**

**Loreto College  
Swords, County Dublin  
Roll number: 60810B**

**Date of inspection: 14 September 2010**



**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 Loreto College, Swords. 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 and examined students' work. 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. The board of management was given an opportunity to comment in writing on the findings and recommendations of the report; a response was not received from the board.

## **SUBJECT PROVISION AND WHOLE SCHOOL SUPPORT**

Loreto College, Swords currently has an enrolment of 628 girls. An adequate number of class periods per week are allocated to Mathematics. Timetable arrangements for level choice are good with mathematics lessons timetabled concurrently for second, third, fifth and sixth years; in each of these year groups students study the subject at higher and ordinary levels. This good practice facilitates students in changing level where necessary.

Students are assigned to mixed-ability class groups for all of first year; this is a good arrangement. They are then divided into higher and ordinary level classes at the beginning of second year. Where there is more than one group at a particular level, the students are assigned places on a mixed-ability basis. This means that each mathematics class contains students from a similar range of ability for that level. This valuable approach makes a positive contribution to the level of teacher and student expectations. Transition year (TY) is optional and appropriately there is one TY mixed-ability mathematics class. These very good arrangements allow for students to be encouraged to study Mathematics at the highest level possible for as long as possible.

There are ten mathematics teachers in the school. Teachers are deployed by school management in accordance with their experience and qualifications. There is good rotation of levels in the junior cycle, however, there are just two teachers currently involved in teaching Leaving Certificate higher level Mathematics. In the interest of maintaining capacity to teach Mathematics at this level in the school it is recommended that this number be increased.

School management encourages and facilitates teacher attendance at continuing professional development (CPD) events. All teachers have attended the *Project Maths* CPD courses. Many teachers have engaged in CPD in their own time, in areas such as probability and statistics. Teachers are actively involved in the Irish Mathematics Teachers' Association (IMTA) and regularly participate in information nights organised by the IMTA. This participation is evidence

of teachers' openness to embrace new methodologies and ideas and of their enthusiasm for the subject.

Resource provision for Mathematics is very good. The resources available include 3-D geometrical solids, geometry equipment, 'Geostrips', probability kits, dice, angle dominos, and number line packs. These are very well organised, are kept in a central location and are shared amongst members of the teaching team. There has been good discussion around the acquisition of a range of resources and the development of their use at subject department meetings. Teachers have created stimulating mathematical environments through displaying commercial posters, student projects and student and teacher generated posters on the walls of their classrooms. All of this is evidence of teachers' commitment to ensuring that the subject is interesting for students.

The quality of provision of information and communications technology (ICT) resources is very good. A personal computer is provided for all classrooms and most rooms are fitted with a ceiling-mounted data projector. There are two mobile data projectors available for use also. In addition, mathematics lessons are timetabled in the computer room for some class periods each week; access for mathematics lessons is facilitated by concurrent timetabling. The mathematics department makes use of a wide range of internet websites of mathematical interest and software to support learning is also available. In particular *Geogebra* and *Solid Works* were observed to be very effectively integrated into appropriate lessons during the evaluation. Overall, Mathematics is very well supported in terms of resource provision and timetabling; this is evidence of school management's commitment to the subject.

Students in need of support in Mathematics are appropriately identified. Support is provided through individual and small group withdrawal. An additional teacher is provided where necessary to facilitate the creation of smaller class groups. This is of particular value in providing a supportive environment for students experiencing difficulty with the subject and allows them to be taught all of their mathematics lessons by a subject specialist. A high level of support is provided for students who have been identified as requiring support with Mathematics.

Good opportunities are provided for students to experience Mathematics outside of the classroom. Students participate in the *Irish Junior Mathematics Competition* which is very valuable in providing challenge, stimulation and reward for the better able student. Each year *Maths Week* is celebrated as a significant event and visiting speakers are invited to the school to speak about mathematical topics. This very good practice encourages students to experience Mathematics for fun and is very worthwhile.

## **PLANNING AND PREPARATION**

The mathematics department members have engaged well in planning. Subject department meetings are held three times per year as part of the whole school planning process. Agendas are set for these meetings and minutes are kept within the subject planning documentation. There is a co-ordinator for the work of the department, this position is filled on a voluntary basis and rotates amongst mathematics teachers periodically, which is good practice. Much informal planning takes place with teachers regularly meeting and engaging in discussion about Mathematics. In addition, provision is made for teachers who have engaged in CPD to share this expertise with the team as a whole.

The minutes of mathematics department meetings indicate that good use is being made of planning time. Topics such as the evaluation and monitoring of progress; the identification of

needs and resources; and the reviewing of difficulties that have arisen are routinely addressed at planning meetings. All of the relevant policies have been developed for Mathematics and are included in the planning documentation. However, with the introduction of *Project Maths*, it is recommended that the teaching and learning plans provided by the *Project Maths* development teams be put on the agenda of planning meetings. 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 group as a whole. This measure would support the very good planning practice and collaboration that was evident in the lessons evaluated and would help the mathematics department to plan for the development of the subject in the school.

Common programmes of work have been developed for each year group and level. These are expressed in terms of topics to be taught within agreed timeframes. It is good that the minutes of meetings outline a plan for the first and fifth year programmes of work to be reviewed and adapted to include the *Project Maths* new material. It is recommended that this review, in addition to the new material, take full account of the spirit of *Project Maths*. This would mean developing programmes of work that would interpret the syllabus in a way that exploits cross-topic links, for example. They should also be set out in terms of student learning outcomes with particular emphasis on including experiential learning activities and the use of concrete materials to expose underlying concepts and to assist students in understanding them. It is suggested that this task be divided amongst members of the mathematics department and that the information provided at the *Project Maths* workshops be used to guide this work.

The TY plan focuses on providing an experience for students that is different from that of the certificate examination years and concentrates on encouraging an interest in the subject. This is in keeping with the spirit of a very good TY plan. The programme for TY describes a diverse range of mathematical material and methodologies for delivering them. The topics include Pascal's Triangle, binary numbers, Sudoku, Cryptography, magic squares and modulo arithmetic. The methodologies used are investigation and discovery; discussion and debate; problem solving and group work. This very well thought out plan provides students with many opportunities to experience the wonder of Mathematics while simultaneously developing essential skills that will serve them well in their future studies.

## **TEACHING AND LEARNING**

Overall, the quality of teaching and learning observed during the evaluation was very good. All of the nine lessons progressed within a well established structure and were set at a pace that was appropriate to the students' ability. A good balance was achieved, in every lesson, between teacher input and student activity. It is good that in all cases teachers provided an oral introduction to the work of the lesson. In some cases teachers explained to students what they would be expected to know by the end of the lesson; this practice contributed to the focus of the learning activities remaining on student achievement of the learning outcomes.

A variety of teaching and learning strategies was used in the classrooms visited. They included investigation, discovery, and teacher exposition. Teachers used investigative questioning, for example by asking students to try something they had not previously encountered and to explain their results; this proved very effective in allowing students to apply learning in unfamiliar situations. In three of the nine lessons *Geogebra*, geometry software, was used to clarify explanations and to illustrate concepts; this was observed to be very effective. *Solid Works* geometry software was used in one lesson to demonstrate the volume of rotation of a line about the X-axis. This involved a student performing the demonstration for her classmates. In keeping

with very good practice ICT was used as an integral element of the learning activities. In addition, it was very encouraging to see the high level of expertise shown by the students themselves through their interaction with ICT in the classroom. While there was some variety in the learning experiences observed, there was scope for the use of active learning and group work.

All teacher instructions and explanations were clear. Most teachers related the work of lessons to prior learning; this good practice allowed students to situate the new ideas presented. In some cases teachers used the connections between different topics in explanations, for example, the link between complex numbers and co-ordinate geometry was used in one lesson. This approach is very important in providing an overview of learning in Mathematics and provides an opportunity for students to appreciate the interdependencies across mathematical ideas. It is recommended that teachers identify links in this way, where possible, and exploit them in their explanations. In addition, this measure would help students to prepare for *Project Maths* examination questions.

Various types of questioning approaches were taken to encourage students to engage with the material presented in lessons. Teachers used quick questions to assess and involve students and in some cases probing questions were used to encourage a deeper exploration of mathematical concepts. Some teachers frequently used open questioning strategies and discussion. Students were instructed to explain their reasoning or to anticipate answers in many cases. These approaches contributed positively to the depth of treatment of lesson material and encouraged students to examine the concepts presented fully. In a small number of lessons observed the focus of learning was on the development of procedural competence through repetition and practice. It is recommended that strategies that focus on application of learning be favoured over those that focus on recall of knowledge.

Effective strategies were used to differentiate learning. Teachers provided individual attention to students while the remainder of the class group worked on individual exercises and allowed students to work ahead where they had finished the assigned tasks. In addition, students were encouraged to provide assistance for their classmates, where appropriate. Teachers also presented material in a variety of different ways to allow for the repetition necessary for students to fully understand concepts. A combination of these approaches was used in most lessons; however, there is scope for an extension of their use. It is recommended that teachers consider preparing a bank of challenging and interesting material to provide additional challenge for students and to reward students for finishing their work quickly.

The excellent TY lesson observed was very suitable for a mixed-ability TY class group. The lesson opened with a vibrant discussion about Pythagorean Triples in which students participated enthusiastically. This progressed to exploring through investigation the theorem of Pythagoras. The historical significance and practical applications of the theorem were discussed fully. This led to an examination of specific number patterns which involved identifying Primitive Pythagorean Triples. The students concentrated very hard on what was a difficult task and demonstrated a thorough understanding of the concepts presented by correctly completing the exercise. The quality of the material chosen and the depth of its treatment made this an exemplary lesson.

There was strong evidence that students were making steady progress and that the quality of learning was high. Students participated and engaged very well with the work of lessons and showed enthusiasm for the subject. Students were encouraged to take responsibility for their own learning and teachers facilitated independent learning by providing appropriate levels of support. This was achieved by delivering advice in the form of general encouragement rather than full

answers and contributing to students' ability to demonstrate the confidence to think for themselves.

In all cases the standard of student behaviour was very high. Classroom atmosphere was conducive to developing student confidence in the subject and in all cases the quality of relationships between the students and the teachers was excellent. There was a very strong sense of warmth and care in all of the classrooms visited. Students responded well to the affirmation and praise frequently supplied by their teachers. In all cases it was clear that students and teachers work very hard together as a team.

## **ASSESSMENT**

There is good practice in relation to assessment. All year groups are assessed through in-class tests at Christmas. First, second, fifth and transition year students sit summer tests in May. 'Mock' examinations are held in the spring for students preparing for the certificate examinations. Reports are sent home on foot of these assessments and parent-teacher meetings are held annually.

Common examination papers are set within levels for each year group which is good practice. It is good that the standard of the questions on examination papers graduates in difficulty. This is valuable in providing an accurate assessment of performance while ensuring that as many students as possible have a chance of doing well. The mathematics department is cognisant of the potential of assessment to encourage and motivate students and uses every opportunity to optimise this potential.

Students' progress is well monitored in class through observation and oral questioning. The standard of students' work in the copybooks reviewed was very high and students are making steady progress in Mathematics. The mathematics department completes a very thorough analysis of students' performance in the certificate examinations. It is very good that this is discussed at department meetings and is used to inform planning for Mathematics. The analysis indicates that the school is performing well in Mathematics.

## **SUMMARY OF MAIN FINDINGS AND RECOMMENDATIONS**

The following are the main strengths identified in the evaluation:

- Mathematics is very well supported in terms of resource provision and timetabling; this is evidence of school management's commitment to the subject.
- A high level of support is provided for students who have been identified as requiring support with Mathematics.
- The mathematics department members have engaged well in planning.
- The programme for TY describes a diverse range of mathematical material and methodologies for delivering them.
- Overall, the quality of teaching and learning observed during the evaluation was very good.
- Effective strategies were used to differentiate learning.
- There was strong evidence that students were making steady progress and that the quality of learning was high.

- There was a very strong sense of warmth and care in all of the classrooms visited.
- There is good practice in relation to assessment.

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 Leaving Certificate Mathematics should be increased in the interest of maintaining the capacity to teach the subject at that level within the school.
- The teaching and learning plans provided by the *Project Maths* development teams should be put on the agenda of planning meetings with a view to teachers creating their own plans, over time.
- There is scope for the use of active learning and group work in the interest of providing a greater variety of learning experiences to students.
- Teachers should identify links across mathematical topics, where possible, and exploit them in their explanations.

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