

An Roinn Oideachais agus Scileanna

Department of Education and Skills

**Subject Inspection of Mathematics
REPORT**

**Loreto Secondary School,
Letterkenny, County Donegal,
Roll number: 62840U**

Date of inspection: 20 April 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 Secondary School, Letterkenny. 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. 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

Loreto Secondary School, Letterkenny is an all-girls' school with a current enrolment of 929 students. Timetable provision for Mathematics and timetabling arrangements for level choice are good. Concurrent timetabling is provided for mathematics lessons in all year groups except first year; this is valuable in facilitating a change of level where necessary.

First year students study Mathematics in mixed-ability class groups, with the exception of one very small group of students who have been identified as requiring additional support with the subject. In keeping with good practice, all first year classes follow the same programme of work and sit a common examination at the end of the year. Students are then assigned to higher and ordinary-level class groups at the beginning of second year.

There are sixteen mathematics teachers in the school. There is good rotation of levels in the junior cycle; however, there is a need for an increase in the number of teachers with responsibility for Leaving Certificate higher level, as there are currently only four teachers with responsibility for teaching at this level. Teacher continuing professional development (CPD) is facilitated by school management. Teachers have attended a variety of courses and workshops, inside and outside school time and there are plans for those who have attended CPD events to provide in-service for their colleagues. This is a very valuable approach to sharing expertise. Courses attended include information and communications technology (ICT), *Project Maths* workshops, and courses organised by the Irish Mathematics Teachers' Association (IMTA).

Access to a variety of resources for teaching and learning in Mathematics is very good. Very good provision is made for ICT; most classrooms are fitted with computers and data projectors; broadband internet access is available throughout the school, and two computer rooms are available on a booking system. Through participating in the '100 Mbps' project in conjunction with the National Centre for Technology in Education (NCTE), the school will receive a number

of laptop computers for use in mathematics lessons. A list of useful websites is available in the mathematics plan and *Geogebra* geometry software has been installed on the school's computers.

Resources such as *Geostrips*, probability kits, playing cards, clinometers, folding geometric shape kits, magnetic geometry sets, and class sets of geometry equipment have been provided for mathematics lessons. These are kept in the staffroom and can be shared easily amongst the teaching team. It is recommended that teachers increase the use of these valuable concrete materials and ICT in their lessons.

Students requiring additional support in Mathematics are appropriately identified. Support is provided through the creation of smaller class groups, and individual and small group withdrawal. It is recommended that team-teaching be considered as an additional method of providing learning support in Mathematics. Communication between the learning support teachers and mainstream mathematics teachers is very good and every effort is made to ensure that individual students' needs are appropriately addressed. The common syllabus in first year means that students, who may initially need some support, can progress to higher level Mathematics after first year. This progression to higher level has occasionally occurred, and it is good that the arrangements made are flexible enough to provide all students with a route to higher level in this way. Overall, students are very well supported in Mathematics.

Students are provided with the opportunity to participate in extracurricular mathematical experiences. These include participation in the *Irish Junior Mathematics Competition* organised by the IMTA and the *Team Maths Challenge*. *Maths Week* is celebrated each year and visiting speakers are invited to the school to speak on mathematics-related topics. Participation in mathematical activities outside the classroom is very worthwhile as it raises the profile of the subject within the school and allows students to have a positive experience of Mathematics.

PLANNING AND PREPARATION

Planning time is provided at least four times per year as part of the whole-school planning process. Meetings also take place at lunch time and mathematics teachers engage in much informal discussion of their subject. Minutes are kept of all formal meetings and a template is provided for this purpose. The task of co-ordinating the work of the mathematics department is undertaken by the members in rotation in line with good practice. Each year group also has a co-ordinator; this is valuable in ensuring the involvement of many of the teaching team. The minutes of planning meetings suggest that much time is spent on discussing organisational issues. While this is an important function of the subject department it is recommended that time be set aside also for the sharing of ideas around teaching and learning in Mathematics. This will facilitate the plans afoot to share experience gained from attendance at CPD events and courses.

There is very good practice in relation to planning for Mathematics. Significant progress has been made and a comprehensive plan is in place. The plan opens with the department's aims and objectives; these are well thought out and are closely linked to the Loreto educational ethos and to classroom practice. Policies are included on homework, assessment, and teaching students with additional educational needs. A list of appropriate teaching methodologies is also contained within the planning documentation. The department's intercultural policy and the section of the plan concerning cross-curricular links have been particularly well developed and it is evident that a lot of effort has been invested in this work. An analysis of the school's performance in the certificate examinations is completed each year and this is included in the plan.

There is scope for the further development of the good programmes of work, for each year group and level that form part of the planning documentation. These are described in terms of material to be covered within agreed timeframes. It is recommended that they be extended to include learning objectives linked to methodology, resources and assessment. As a means of preparing for the upcoming syllabus changes, it is also recommended that mathematics teachers use these programmes of work to engage in the development of teaching and learning plans. 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 transition year (TY) programme is well designed and is suitable for mixed-ability teaching. TY is optional and there are three mixed-ability class groups. The programme includes a good combination of syllabus content and material not on the Junior or Leaving Certificate courses. The syllabus content is delivered using a variety of approaches. The TY lesson observed provides a good example of this, with the students placing their idea of the probability of the occurrence of various events on a probability continuum. The projects completed in TY include the construction of a 'Hexaflexagon' and the exploration of 'Napoleon's Theorem'. This is keeping with the spirit of a good TY programme.

TEACHING AND LEARNING

Ten lessons were observed during the evaluation and in all cases the quality of teaching and learning was good. The main methodology used was teacher example followed by student exercise. ICT was used in two cases; through the use of a *PowerPoint* presentation in one case and the use of *Geogebra* geometry software in another. Three lessons involved student activities, such as, measuring, cutting out shapes, and students working at the board. In four of the ten lessons teachers provided opportunities for students to work in pairs and in a trigonometry lesson an investigative approach was taken to Pythagoras' Theorem. While these examples represent some variety of approach there is significant scope for an increase in the use of these and a wider range of methodologies. Investigation, discovery, activities, group work, pair work, and a greater diversity of ICT use are recommended for strong consideration and regular inclusion in lesson planning.

The good teaching practices observed included very clear instructions and explanations; relating the work of lessons to real life and student experience; examining links between connected areas of the course; lively pacing of lesson activities; and achieving a good balance between teacher talk and student activity. In most cases lessons opened with sharing the learning objectives with the students. Best practice in this regard occurred where the learning objectives were written on the board at the beginning of lessons and where progress towards their achievement was assessed on an ongoing basis. This assessment was then used to inform some of the learning activities. It was evident that teachers invest considerable effort in working towards best outcomes for learners and that this is driven by a genuine sense of care for students.

In some cases a very high level of support was provided for students. This mainly took the form of teachers providing a step-by-step breakdown of the strategic elements of the problems to be solved and by providing students with ideas for their completion. Given time, the students may have been able to discover these strategies to problem solving for themselves. In other instances students were prepared for exercises before they had a chance to try them independently. These approaches can limit the students' valuable experience of learning to think for themselves and can

lead to an over-dependence on teacher input. It is recommended that teachers work together in developing teaching strategies that facilitate independent learning. This can be developed by allowing students to solve previously unseen problems, by; providing a minimum amount of mathematical assistance to students while encouraging them to rely on their own thinking skills and by facilitating students in exploring ideas through the use of probing questions. This is of particular importance in light of the introduction of *Project Maths* where students will need to develop the skills to apply mathematical knowledge in unfamiliar situations.

Good practices were evident in relation to differentiation of learning. These good practices were observed in lessons that were designed to allow students to work at their own pace. Teacher help was provided only where required and in the provision of various levels of class work and homework. It is recommended that these good practices in differentiation of learning be more widely adopted. The greater use of graduated worksheets that provide for the less able student and contain challenging material for the more able is also recommended. Encouraging students to provide assistance for each other or to work ahead, where appropriate, should also be considered as a means of differentiating learning. Teachers should create a bank of challenging material to be distributed to students who require additional challenge. It was very good to note that, in some cases, students spontaneously provided assistance for their classmates; this is evidence of the spirit of team work that existed in all of the lessons visited.

There was strong encouragement provided for students to freely and fully contribute to lessons. This was true in all cases but was of particular note in the TY lesson observed where lively classroom discussion provided a high quality learning experience. Students engaged well, in general, and participated in asking and answering questions. However, there was some variation in the effectiveness of the questioning strategies used. Some questioning focused solely on expecting students to recall learned facts or to make simple calculations. In more effective examples of questioning, probing questions were frequently included to facilitate deep exploration of mathematical concepts; and it was in these lessons where the quality of learning was highest. It is important to be aware that the frequent use of open questions by teachers can encourage students to explore the underlying mathematical ideas in a way that allows them to reach a deep understanding of the concepts presented. It is recommended that this aim become a central element of learning activities.

In all cases the standard of student behaviour was exemplary. Classroom atmosphere was conducive to developing student confidence with 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. Stimulating mathematical environments have been created, with student-generated projects and posters as well as commercial posters displayed on classroom walls. In all cases it was clear that students and teachers work very hard together as a team.

ASSESSMENT

The practice in relation to assessment is good. Formal examinations are held for first, second, fifth and transition year students at Christmas and in May. The progress of third and sixth year students is monitored by continuing assessment throughout the year and 'mock' certificate examinations take place in February. In keeping with good assessment practice common examinations are set, within levels, for each year group. Student progress is communicated to

parents through reports which are sent home twice a year and through annual parent-teacher meetings.

It is mathematics department policy to set tests at the end of every topic studied. Ongoing assessment takes place in class through oral questioning and teacher observation. A high level of in-class monitoring of student progress was noted in all cases. Homework is set regularly and usually corrected as part of the following lesson. In some cases, teachers prepared students in advance for homework by providing them with comprehensive outline of the solutions to the questions given. It is recommended that students be allowed to attempt homework questions without help, as was observed in most cases. This would lessen an over-dependence on teacher help and instruction. Overall, it was evident that teachers know their students very well and are committed to assessing progress on an ongoing basis to ensure that student needs are met.

It was evident from the review of students' copybooks that the standard of presentation of work is very high. Teachers routinely communicate the need for high standards in relation to written work and this has contributed to the high standards that were observed.

The school is justifiably proud of its students' achievement in the certificate examinations. The analysis of the school's performance compared to national norms indicates that the uptake of higher-level Mathematics in both the Junior Certificate and Leaving Certificate examinations is high.

SUMMARY OF MAIN FINDINGS AND RECOMMENDATIONS

The following are the main strengths identified in the evaluation:

- Timetable provision for Mathematics and timetabling arrangements for level choice are good.
- Access to a variety of resources for teaching and learning in Mathematics is very good.
- Significant progress has been made in planning for Mathematics and a comprehensive plan is in place.
- Teachers invest considerable effort in working towards best outcomes for learners and this is driven by a genuine sense of care for students.
- There was strong encouragement provided for students to freely and fully contribute to lessons. Students engaged well, in general, and participated in asking and answering questions.
- In all cases the standard of student behaviour was exemplary. Classroom atmosphere was conducive to developing student confidence with the subject and in all cases the quality of relationships between students and their teachers was excellent.
- The practice in relation to assessment is good. Teachers know their students very well and are committed to assessing progress on an ongoing basis to ensure that student needs are met.
- The school is justifiably proud of the students' achievement in the certificate examinations. The analysis of the school's performance compared to national norms indicates that the uptake of higher-level Mathematics in both the Junior Certificate and Leaving Certificate examinations is high.

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 in order to ensure the capacity to teach all levels is maintained.
- As a means of preparing for the upcoming syllabus changes, mathematics teachers should use the existing programmes of work to engage in the development of teaching and learning plans similar to those provided at the *Project Maths* workshops.
- Teachers should increase the variety of methodologies used in teaching and learning in Mathematics and should collaborate on including ICT as a regular feature of lessons.
- Teachers should work together in developing teaching strategies that facilitate independent learning.
- Teachers should use open questions, routinely and frequently, to encourage students to explore the underlying mathematical ideas in a way that allows them to reach a deep understanding of the concepts presented.

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.