

**An Roinn Oideachais agus Eolaíochta
Department of Education and Science**

**Subject Inspection of Mathematics
REPORT**

**Ashbourne Community School
Ashbourne, County Meath
Roll number: 91495T**

Date of inspection: 17 September 2008

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REPORT ON THE QUALITY OF LEARNING AND TEACHING IN MATHEMATICS

SUBJECT INSPECTION REPORT

This report has been written following a subject inspection in Ashbourne Community School. It presents the findings of an evaluation of the quality of teaching and learning in Ashbourne Community School 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 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

Ashbourne Community School caters for 536 boys and 465 girls. Timetable provision for Mathematics is very good. In the junior cycle five mathematics lessons per week are allocated to first, second, and third year groups. Transition Year (TY), which is optional, is timetabled for four class periods of Mathematics per week. In the case of the Leaving Certificate (Established) six class periods per week are provided for fifth and sixth year groups. Leaving Certificate Applied (LCA) students have four class periods of Mathematics per week both for year one and year two of their programme. In keeping with good practice, mathematics lessons are evenly distributed across the week and the day. Concurrent timetabling occurs from second year through to sixth year. This is intended to provide students with flexibility in changing levels. This level of provision for the subject, together with the timetabling arrangements, is very good.

The mathematics department has invested considerable effort in devising the optimum system for allocating students to class groups, one that allows each student to maximise his or her potential. At present, first year students are assigned to one of seven mixed-ability classes. In second and third year there are seven class groups three at higher level, three at ordinary level and one at foundation level. At the beginning of second year, students are assigned to one of these class groups, based on the results from common first year examinations. TY comprises four mixed-ability classes. In each of fifth and sixth year, there are two higher level classes, four ordinary level classes and one foundation level class. In these years, students are assigned to class groups according to performance and to any personal preferences they have regarding levels. The method of dividing students into classes is subject to regular review and can be revised to suit the requirements of a particular year group. Students are encouraged to study the highest level possible for as long as possible. Change of level takes place in consultation with class teachers, parents, the mathematics department co-ordinator and the guidance counsellor where necessary.

The mathematics department comprises thirteen teachers. Management assigns teachers to class groups in close consultation with the teachers themselves. It is mathematics department policy and practice that levels, at both junior and senior cycle, are rotated among all members of the mathematics teaching team. Each mathematics teacher is also given the opportunity to teach TY and LCA mathematics classes. The enabling of all mathematics teachers to gain experience of teaching all levels and programmes in Mathematics is very worthwhile since it helps to maintain high levels of expertise within the mathematics department. Teachers retain the same class groups from second year to third year and from fifth year to sixth year. Such continuity is good practice.

Teachers make use of a wide variety of teaching resources. These include overhead projectors and calculators, Venn diagram sets, algebra tiles, geometry equipment, clinometer, theodolite, probability kits, and number lines. The members of the mathematics teaching team are currently compiling a bank of notes and handouts that will be used as a shared resource in the teaching and learning of Mathematics. Mathematics teachers have access to information and communications technology (ICT) through the timetabling of mathematics lessons for the school's computer rooms. Laptops and data projectors are also regularly used to incorporate ICT into mathematics lessons. Formal induction is provided for newly appointed teachers and a mentoring system has been established to support new teachers in their first year in the school. Teacher continuing professional development (CPD) is fully facilitated. Teachers are encouraged by management to attend in-service courses and time is allocated at subject meetings for the provision of feedback from CPD courses. The school provides a high level of support for Mathematics.

Students who require learning support in Mathematics are identified through pre-entry assessment, communication with feeder primary schools and ongoing teacher observation. Support for students experiencing difficulty with Mathematics is provided through individual and small group withdrawal from subjects other than Mathematics and the creation of smaller class groups. Commendably, in-class support is also provided in mathematics lessons, this is of particular benefit to students since they can discreetly receive the help they need in a timely and accurate way while remaining with their peers. Students who need numeracy support have access to a wide range of puzzles, games and computer software, all designed to support learning in Mathematics. Very good communication exists between members of the mathematics department and the teachers providing numeracy support. This takes place formally at subject department meetings and also on a regular informal basis.

Reassessment takes the form of in-house testing and ongoing teacher observation. A high level of support is provided, by members of the mathematics teaching team and the learning support team, to students who find Mathematics challenging.

PLANNING AND PREPARATION

The mathematics plan is reviewed and updated at formal planning meetings held on school planning days at the beginning and the end of the academic year. In addition, frequent mathematics department meetings are scheduled throughout the school year. Planning meetings for Mathematics also take place at lunchtime where necessary. Records are maintained of all formal meetings that take place. Copies of the minutes of meetings are kept by the principal and deputy principal. The role of mathematics co-ordinator rotates among members of the teaching team. Mathematics teachers routinely collaborate and co-operate, this has created a strong spirit of collegial support within the subject department. It is evident that some sharing of ideas and discussion of teaching strategies and methodologies takes place. This is commended as it can be of particular benefit to new teachers or to teachers new to areas of the curriculum, for example LCA or TY. It is recommended that the collaboration around classroom activity that takes place be continued and built upon over time.

It was evident from the review of the subject department plan that good progress is being made on planning for Mathematics. The plan contains policy documents on allocation to levels, assessment, homework and learning support. The minutes of mathematics department meetings, lists of resources and details of extra-curricular mathematics activities are also contained within the planning document. Following the certificate examinations the mathematics department compares the results achieved in the school in Mathematics to the national norms and they use this analysis to inform future planning for Mathematics. All of this is good practice. It is recommended however that planning for teaching Mathematics to students for whom English is an additional language be further developed and that the resulting policy be included in the mathematics department planning documentation.

The mathematics department plan contains schemes of work for each year group. These consist of lists of topics to be covered within agreed time frames. It is recommended that the schemes for higher and ordinary levels in each year group be co-ordinated so that the same topics are studied by students at both levels at the same time, where it is feasible. This will ensure that students who need to change level will have covered the same course material as the group they are joining. It is clear from the observation of lessons and the wide range of resources available that active, discovery and investigative teaching methodologies are used in practice. ICT was also observed to be used effectively in teaching and learning in Mathematics. It is therefore recommended that this variety in teaching strategy be reflected in the subject department planning documentation.

The TY plan comprises eight modular units. Each teacher teaches two units and classes rotate every four weeks. The mathematics department has created a course designed to be taught in a mixed-ability setting. The TY plan strikes a good balance between Leaving Certificate course content and material that is not on the Leaving Certificate course. The schemes of work for TY are set out in terms of lesson objectives, learning outcomes and strategies to be employed. All of this is excellent practice as the TY plan is clearly in keeping with the underpinning principles of TY. It is evident from the TY plan that students are encouraged to experience Mathematics for pleasure and gain an appreciation for the real life applications of the subject. It is suggested that, in the further development of this very good plan, a module of Applied Mathematics might be considered.

TEACHING AND LEARNING

In all of the lessons observed there was evidence of good advance planning. Teachers had prepared handouts, *PowerPoint presentations*, and a variety of materials necessary for the active lesson activities organised for the students. In all cases the materials were well chosen and supportive of learning. Lessons had a clear aim and good continuity was maintained with previous lessons by linking with and building on students' prior knowledge. At the beginning of most of the lessons

observed the teacher shared the learning objectives with the students. Best practice in this regard occurs where the lesson objectives are written on the board at the start of the lesson and checked at the end to ensure that they have been achieved. This can encourage students to take personal responsibility for their own learning and can help to increase motivation and a sense of achievement on reaching the lesson goals. It can also alert the teacher to any areas that have proven difficult for some students and need to be revisited in the next lesson. It is therefore recommended that the learning objectives be explicitly shared in this way.

Teacher instructions and explanations were very clear in all of the lessons observed. The pace of lessons was lively yet appropriate to the ability level of the students. Teachers used a variety of questioning strategies to involve students and to assess learning in class. There was evidence of teachers using higher-order questions, requiring reflection and consideration to help students to engage with their course material. Since this type of questioning is so beneficial to learning in Mathematics it is recommended that it be employed at every opportunity. In general there was a good balance between teacher input and student activity. Allowing students plenty of time to solve mathematical problems independently is very worthwhile since it can enable students to develop confidence in their own problem-solving skills and can lead to a great sense of personal satisfaction. Teachers covered lesson content in a comprehensive way. This was particularly evident in a lesson on integration where the teacher was careful to accept the wide variety of correct student answers presented and to work each through fully, with student contribution, without showing preference for any one method. This very good practice helped the students to thoroughly explore and to gain a deep understanding of the ideas covered in the lesson.

During the majority of the lessons observed, students were given opportunities to actively engage in the learning process. The LCA class visited provides a very good example of this. The lesson opened with an introduction to probability presented in *PowerPoint*. The students were then expected to mathematically calculate the probability of throwing a certain number on the roll of a die and then to experimentally investigate the same probability. The students participated enthusiastically and fully in this activity and were supported with a well-designed handout that guided them through the exercise with ease. This handout also served to consolidate the mathematical aspect of the activity and with individual help from their teacher each student was able to complete the task. In this lesson the teacher very patiently ensured that all of the students were completely involved and engaged in the activity throughout the lesson.

Teachers make effective use of ICT in teaching and learning in Mathematics. In the TY lesson observed the students worked in pairs to research the life of a famous mathematician that they had chosen for their projects. This module in TY will conclude with student presentations on the lives of their chosen mathematicians. This type of methodology is in keeping with the spirit of the TY programme and is commended. TY in Ashbourne Community School is optional and all mathematics groups in TY are of mixed ability. The mathematics department has designed a well-balanced course that is challenging enough for the more able student and is accessible for those who find Mathematics difficult and offers a range of mathematical experience. In the TY lesson observed the students demonstrated an interest in and an enthusiasm for Mathematics. It is suggested that in the teaching of the Leaving Certificate course material that is part of the TY programme that more group work, pair work, active, investigative and discovery methodologies be incorporated into TY lessons. This will help to consolidate the very good work that is being done in TY and will contribute to the continuation of the high level of student interest in the TY mathematics programme.

Teachers demonstrated a genuine concern for students' understanding of the concepts taught and considerable effort was made to ascertain individual student perspective and to build explanations around the students' own interpretation of particular problems. The Junior Certificate geometry lesson observed provided an excellent example of this. The study of geometry theorems can provide students with a very good opportunity to develop their reasoning and thinking skills. In the lesson observed the teacher maximised the potential of this opportunity by taking the students carefully through each thought process with probing questions and by encouraging the class to engage in logical argument and discussion. Throughout this lesson, individual students worked at the board and engaged with the remainder of the class group to tease out the ideas presented. The teacher facilitated learning by guiding the students towards the full understanding of each concept and by persisting until the students could demonstrate that full understanding had been achieved. The content of this lesson was specifically chosen to address difficulties that had arisen out of the previous

night's homework and the lesson concluded with a consolidating physical demonstration to illustrate the concept in a concrete way. The learner-centred focus and the comprehensive treatment of the lesson content observed in this case were exemplary.

Classroom management was generally good. The atmosphere in the classrooms was warm and the rapport between teachers and students and among the students themselves was very good in all cases. Teachers tended to move around the classroom to give individual attention; in most cases, they were careful to simultaneously monitor the class group as a whole, a practice which is essential for successful class management. Students responded well to the affirming manner of their teachers in all cases and in one class students demonstrated a good sense of fun in their approach to the subject.

ASSESSMENT

It is evident from the review of student copybooks that the standard of student work is high and that the majority of students are making steady progress in Mathematics. Teachers model good presentation and include all the steps of worked examples. This attention to detail is reflected in student work. Teachers routinely monitor student work in class. Homework is set regularly and usually corrected as part of the following lesson. Some teachers are taking this valuable opportunity to provide students with critical feedback and positive reinforcement. The use of *assessment for learning* (AfL) principles in this way is very good practice and it is recommended that AfL practices be extended to all mathematics classes. More information on AfL is available on the NCCA website (www.ncca.ie).

All students with the exception of those in third, sixth and TY year groups are formally assessed at Christmas and in May. Examination classes are formally assessed in October and sit 'mock' examinations in spring. TY students are continuously assessed throughout the year. Reports are sent home on foot of these formal examinations and parent-teacher meetings take place once a year. Achievement is routinely assessed through end-of-topic tests, oral questioning in class and ongoing teacher observation.

The mathematics department organise *Maths Week* events in the school, including participation in the *PRISM* mathematics challenge. Mathematics students in the school take part in training for the International Mathematics Olympiad. The mathematics department are also engaged in the setting up of a mathematics web link within the school's internet website. Participation in mathematics-related extra-curricular activities is good practice as it can help to generate interest in the subject and can encourage students to experience mathematics for pleasure.

SUMMARY OF MAIN FINDINGS AND RECOMMENDATIONS

The following are the main strengths identified in the evaluation:

- Mathematics is well supported in the school and timetable provision for the subject is very good.
- A high level of support is provided, by members of the mathematics teaching team and the learning support team, to students who find Mathematics challenging.
- Good progress is being made on planning for Mathematics.
- The TY programme for Mathematics is very good and is in keeping with the spirit of TY.
- High-quality teaching and learning was evident in the lessons observed and student participation and engagement were high.
- The relationship between students and teachers was observed to be mutually respectful.

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

- A policy for teaching Mathematics to students for whom English is an additional language should be developed.
- The employment of active, investigative and discovery methodologies and the incorporation of ICT, group work and pair work in lessons should be continued and extended over time.

Post-evaluation meetings were held with the teachers of Mathematics and with the principal at the conclusion of the evaluation when the draft findings and recommendations of the evaluation were presented and discussed.

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