An Roinn Oideachais agus Scileanna

Department of Education and Skills

Subject Inspection of Mathematics
REPORT

Ó Fiaich College
Dundalk, County Louth
Roll number: 71770D

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AN ROINN OIDEACHAIS AGUS SCILEANNA | DEPARTMENT OF EDUCATION 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 Ó Fiaich College, Dundalk. 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 and the Chief Executive Officer of the Vocational Education Committee. The board of management was given an opportunity to comment in writing on the findings and recommendations of the report, and the response of the board will be found in the appendix of this report.

SUBJECT PROVISION AND WHOLE SCHOOL SUPPORT

Ó Fiaich College is a second level school under the patronage of County Louth VEC; it also offers a substantial range of Post Leaving Certificate (PLC) courses; these did not form part of the evaluation. There are 224 boys and 127 girls enrolled in the mainstream school. Timetable provision for Mathematics is good. Concurrent timetabling of mathematics lessons is provided in second, third, fifth and sixth year; this provides the flexibility for students to change level in Mathematics without having to change class group for any other subject and is worthwhile.

Students are assigned to ability-based class groups on entry into first year. The majority of students remain in these class groups for the duration of their junior cycle years for all of their compulsory subjects. Provision is made by the school where a student is identified as requiring a change of level for Mathematics. This necessitates a change of base class for any first year student in this position which means they have to join a new class for most of their subjects. It is recommended that the school review how it assigns students to classes in first year. Consideration should be given to placing as many students as possible in mixed-ability class groups and deferring level decisions until the beginning of second year. There would be a number of benefits in taking this approach. It would avoid providing students with an explicit statement of expectation from the outset and it would provide students with time to settle into the school before level decisions are made. It would also allow teachers to have a greater input into decisions regarding level choice. In undertaking this consideration the school should review the research carried out in this area; the publication 'Moving Up' and the longitudinal study of students' experiences of curriculum in the post-primary school, carried out by the Economic and Social Research Institute (ESRI), may prove helpful in this regard.

There are nine teachers in the mathematics department and there is a very high level of mathematics qualification amongst the team. There is good rotation of levels in the junior cycle and currently one teacher is responsible for teaching higher level Leaving Certificate

mathematics. The capacity to teach higher level Leaving Certificate mathematics is, however, maintained within the department, to some degree, with a number of members teaching level 6 PLC mathematics courses, which include mathematics topics at a similar level to higher level Leaving Certificate. This is very positive as the teachers involved with the PLC courses bring a wide range of valuable experience to the mathematics department.

The school strongly supports teachers' continuing professional development (CPD). Whole-school events in areas such as teaching students with special educational needs, providing for students whose first language is not English, and school development planning, have been organised for all teachers. In addition mathematics teachers have attended the workshops provided in preparation for *Project Maths*. There are a number of teachers who are new to the mathematics department and while there are good supports provided for these teachers, it is suggested that the mathematics department formalise this support by establishing a mentoring system for teachers new to the school.

Resource provision for Mathematics is very good. Each classroom is fitted with a personal computer (PC) and ceiling-mounted data projector. High speed broadband internet access is available throughout the school and some teachers have been provided with tablet PCs. Class sets of electronic notebooks and laptop computers are available to support learning for students who experience difficulty with Mathematics and a range of suitable software is also provided. The internet is used as a valuable resource with research forming part of class work and homework assignments in some cases. There is timetabled access to the computer room for Mathematics and it is also available on a booking system. Overall, there is very good access to information and communications technology (ICT) resources for teaching and learning in Mathematics.

Teachers have created stimulating learning environments with a range of mathematical posters and teacher-made displays such as number lines and key word charts. Geometry equipment and class sets of calculators are available and are kept in a central location for use by mathematics teachers. Some teachers are creative in the use of everyday materials and it is common for items found in the classroom to be used as resources, for example cylindrical pencil cases. It is recommended that this good practice be built upon by teachers using everyday objects to create active learning experiences for students. Containers of various shapes, stopwatches on mobile phones, dice and playing cards, and scientific measuring instruments such as overflow cans, clinometers, and trundle wheels are offered as suggestions.

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

Students are provided with opportunities, outside of the classroom, to experience Mathematics for fun. *Maths Day* is celebrated as a significant event each year and students participate in the *Junior Mathematics Competitions* organised by the Irish Mathematics Teachers' Association. *Maths Week* coincided with the inspection visit and there was much evidence that it was celebrated enthusiastically. An interesting mathematical display greeted students at the school's entrance and the mathematical puzzles and facts found on the electronic notice board attracted much student attention. *Maths for Fun* activities were organised for the week including tackling encryption puzzles through code breaking. Participation in events such as these is very valuable in providing positive mathematical experiences and additional challenge for students, and in raising the profile of the subject within the school.

PLANNING AND PREPARATION

The mathematics department has engaged well with planning and there is a strong sense of teamwork amongst members. The subject department is currently co-ordinated by an experienced member of the teaching team. The co-ordinator's role includes maintaining and updating the subject plan, convening formal meetings of the teaching team and assisting new teachers.

The mathematics department have produced e-learning resources that can be accessed on the school's website; these comprise recorded key lessons. Currently these are just available for PLC students but there are plans to develop similar resources for the mainstream school. Mathematics teachers are active in sharing expertise within the department and there are plans to share this e-learning experience with another school in the County Louth VEC scheme. It is recommended that this very good practice be extended by adopting a similar approach to examining the teaching and learning plans provided for the introduction of *Project Maths.* It is suggested that each teacher would teach one lesson described in the teaching and learning plans and report their experience back to the group as a whole. This is recommended with a view to teachers, over time, creating their own plans similar to those provided. Many of the lessons observed in the evaluation would be very suitable for sharing through this format.

A comprehensive mathematics plan has been developed and it is maintained in electronic form in a shared folder. This is valuable in ensuring that it is accessible to all members of the teaching team. The folder is also used as a means of sharing resources. All of the policy documents relevant to Mathematics have been developed and are included in the planning documentation. A consistent approach to the implementation of policies such as the homework policy and the assessment policy were observed in the classroom visits which is very positive.

Seven second level lessons were observed as part of the evaluation. Five of the seven lessons were very well planned and were well thought out. Planning in these five lessons centred strongly on the achievement of clearly defined student learning objectives. In these cases learning activities and teaching strategies were driven by teachers' plans to ensure that students achieved the learning outcomes. High quality material was prepared for these lessons and was well chosen to support students' deep understanding of the concepts presented. The strategies employed were planned to encourage student participation and to attract student interest. It is recommended that the very good lesson-planning practice observed be extended to all lessons.

The transition year (TY) plan describes a good combination of syllabus and non-syllabus content. Examples include, *Airline Maths*, calculator use, mathematical games and puzzles. A module on budgeting, 'Get smart with your money', using the Money Advice and Budgeting Service (MABS) resources is an example of where the TY mathematics programme provides a very valuable experience for learners. The year plan begins, however, with a substantial amount of arithmetic. It is recommended that ways to integrate arithmetic across other topics be explored. A project to compare the cost of purchasing a car in Northern Ireland and in the Republic of Ireland would provide a good way to practise the key arithmetic skills through project work and might be more attractive for students. A practical project using trigonometry; making and using clinometers is also suggested for consideration.

TEACHING AND LEARNING

The quality of teaching and learning in five of the seven lessons observed was very high. There was scope for improvement in some aspects of the remaining two lessons. The success of lessons was directly proportional to the quality of the planning and the amount of thought put into preparation. Most lessons opened with sharing the learning objectives explicitly with the students. In some cases this practice was tied in with revisiting the work of previous lessons; the achievement of the learning objectives was checked at the end. This very good practice set lessons within a clearly defined structure and provided students with a sense of success at having achieved a manageable amount of learning. In two cases the focus of the lesson was on the completion of a quantity of material. It is recommended that student learning outcomes be at the centre of all classroom activities.

A variety of teaching strategies was used in the lessons observed. These included teacher-led instruction, open discussion, and investigation. They were underpinned by the use of very clear, and in most cases, conceptual explanations. Where it was appropriate, teachers acted as facilitators of learning by allowing student contribution to dominate classroom activities. This contributed to the good balance between student activity and teacher talk that was a feature of all lessons. While teachers were very supportive of student effort they carefully avoided creating a learning environment where students could become over dependent on teacher assistance. This was achieved by providing help in the form of general advice and by expecting students to think for themselves. A strong spirit of teamwork existed in the classrooms visited where teachers and students collaborated on achieving a common goal. However, there was scope for the use of active methodologies in the lessons observed.

ICT was used in over half of the classrooms visited. In all cases it was effectively integrated into the work of the lesson and was used to illustrate and clarify the concept presented. In some cases this took the form of attractively designed *PowerPoint* presentations that provided an alternative focus for student attention. In other cases, where it was appropriate, geometry software was used very well. The students of one class group visited were expected to research complex numbers on the internet prior to the teacher's introduction of the topic. This was very good practice. The subject department members are committed to developing the use of ICT in mathematics lessons and there are plans for key mathematical examples to be recorded and posted on the school's website. This plan is encouraged as it would provide a valuable revision aid for students.

In most cases teaching focused on exposing the underlying concepts in the material presented. However, in some cases the learning activities concentrated on students practising mathematical procedures without understanding the underlying concept. Two lessons on co-ordinate geometry of the line were observed. In one of these lessons the students were expected to find the midpoint of a line segment using the formula; a number of examples were completed on the board and students then practised finding the midpoint. The other lesson also covered the midpoint; however, in this case, in addition to completing examples using the formula, the points were illustrated on a graph using *Geogebra*, geometry software. The initial examples chosen in this lesson were deliberately picked to expose the underlying concept. Before attempting each exercise given, the students were expected to estimate the midpoint from the graph. This estimate was then checked using the formula. A significant positive difference in the quality of learning was observed in the second lesson described. The students in this class group demonstrated a deeper understanding of the concept. It is recommended that strategies, like this, that encourage a deeper understanding of mathematical ideas be included in lesson planning wherever appropriate.

Very good use was made of various types of questioning in all of the lessons observed. The variety included quick questions that were used to involve students; open questions that were used to encourage students to examine the underlying principles and concepts; and questioning that formed part of teachers' assessment of understanding throughout lessons. In many cases students were expected to explain their reasoning and to explore concepts through open discussion. This was of particular note in a lesson on correlation where many examples relating to student experience were discussed. Students also engaged very well in asking questions; in most cases teachers' attention to answering students' questions accurately and to ensuring that students were satisfied with explanations was exemplary.

In general, the quality of learning was very high. This was demonstrated in the high level of student engagement and participation that was observed. The numbers of students in most of the classrooms visited was quite small and this meant that teachers could provide significant individual attention and support for students. In addition, teachers were very aware of the potential for student difficulties and adapted lesson activities to address any issues that arose as the lessons progressed. This resulted in individual student needs being very accurately met. In a minority of instances there was a need for students to be provided with additional work to keep them active and engaged. It is recommended that teachers create a bank of challenging and interesting material to be given to individual students as a reward for finishing their class work quickly.

A high standard of student behaviour was observed throughout the evaluation and classroom atmosphere was very positive. Teachers were affirming, encouraging, supportive and motivational in their dealings with students and were warm in their interactions. The students responded very well to this. Overall, the relationships between students and their teachers were characterised by a strong sense of care and teamwork.

ASSESSMENT

Overall, the practice in relation to assessment is very good. It is mathematics department policy to set class tests at the end of each topic studied which is in line with good practice. In some cases students are required to complete a feedback form on their performance in class tests. This involves students making a personal comment on how they could improve. Students are also encouraged to include, for example, areas of the topic that they had found difficult and would like to see revisited. This is an excellent form of information for teacher self-evaluation and it is very good that teachers are open to using it in this way. This is further evidence of mathematics teachers working in partnership with students in the common goal of encouraging every student to achieve to his or her potential.

Formal examinations, with reports sent home, are held at Christmas and in May. Parent-teacher meetings take place annually. Students who are entitled to reasonable accommodation in the certificate examinations also receive similar support in the school's in-house examinations. This is valuable in providing them with examination practice in a realistic setting.

Homework is given regularly and is usually corrected as part of the following day's lesson which is appropriate. The student journal is effectively used as a means of communicating with parents as they are required to sign it each week. It was very good to note, in the review of student journals, that they are used as a way of providing positive feedback to students with the inclusion of notes from teachers rewarding good student behaviour and performance. The school offers the

Junior Certificate School Programme (JCSP) and regularly sends post cards home to report positive progress to parents of JCSP students.

Common examination papers are set within levels for each year group which is good. It is recommended that the school's review of student assignment to levels in first year include a review of the assessment tests that would be used to divide students in second year. Consideration should be given to including questions that graduate in difficulty so that it would be possible for each student to pass the examination. This approach would also contribute positively to the quality of the information to be gained from the examination results.

Student progress was assessed very well throughout lessons. This was achieved through keen observation and oral questioning. In many cases teachers used ongoing assessment to inform their teaching by adjusting and adapting lessons to address students' individual needs accurately. This is very good practice. Student work was well presented in the copybooks reviewed and it was clear that teachers demand high standards in this regard. Students included all of the steps in the exercises completed, for example. In keeping with very good assessment practice teachers include advice and encouraging comments in the correction of student work. It is very good that teachers use assessment as a means of setting high expectations for students and as a way of motivating and supporting them.

TY students are continually assessed on the basis of their work ethic and participation in class, their progress and effort, the presentation of their copybook and folder and through project work and assignments. The module on budgeting is assessed in a similar way with the addition of credits given for the completion of a learner journal. TY students also sit a formal examination and the result of this forms part of their overall assessment mark. This is in keeping with very good TY assessment practice.

The school conducts an analysis of the students' performance in the certificate examinations against national norms. This analysis is used to inform planning for Mathematics which is good. The school participates in Delivering Equality of Opportunity in Schools (DEIS), the Department of Education and Skills action plan for educational inclusion, and in keeping with good practice the analysis carried out also informs DEIS action planning and target setting. It is suggested that a similar analysis be carried out of certificate examination achievement against student intake assessments. This measure would provide the school with an additional measure of the effectiveness of the many valuable interventions made to improve student performance.

SUMMARY OF MAIN FINDINGS AND RECOMMENDATIONS

The following are the main strengths identified in the evaluation:

- There is very good whole-school provision for Mathematics in terms of resource and time allocation.
- There is a very high level of mathematics qualification amongst the teaching team.
- The mathematics department has engaged well with planning and there is a strong sense of teamwork amongst members. Their collaboration has resulted in a comprehensive mathematics plan.
- Overall, the quality of teaching and learning was very good. A variety of teaching strategies was used in the lessons observed and these were underpinned by the use of very clear and in most cases conceptual explanations.

- Teachers made very good use of various types of questioning in all of the lessons observed. Students also engaged very well in asking questions; in most cases teachers' attention to answering student questions accurately was exemplary.
- In general, the quality of learning was very high. This was demonstrated in the high level of student engagement and participation that was observed.
- A high standard of student behaviour was observed throughout the evaluation and classroom atmosphere was very positive.
- Overall, the practice in relation to assessment is very good; teachers use assessment as a means of setting high expectations for students and as a way of motivating and supporting them.

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

- The school should review how it assigns students to classes in first year. Consideration should be given to placing as many students as possible in mixed ability class groups and deferring level decisions for Mathematics until the beginning of second year.
- The members of the mathematics department should examine the teaching and learning plans provided for the introduction of *Project Maths* and those on the *Project Maths* website. They should then set to work on creating their own plans in a similar format.
- The very good lesson planning practice observed in most lessons should be extended to all lessons.
- Student learning outcomes should be at the centre of all classroom activities and these should concentrate on students fully understanding the concepts presented. This was the case in most lessons observed and should be extended to all lessons.

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

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Appendix

SCHOOL RESPONSE TO THE REPORT

Submitted by the Board of Management

Area 1: Observations on the content of the inspection report

The College management and mathematics department are affirmed by the supportive manner in which the evaluation was conducted. The mathematics department has met since the evaluation to discuss the main findings of the report and to plan for the implementation of its recommendations.

Area 2: Follow-up actions planned or undertaken since the completion of the inspection activity to implement the findings and recommendations of the inspection

- The mathematics department has made a submission to the Principal and Deputy Principal requesting complete mixed class groups in first year mathematics
- The Transition Year Mathematics Programme is being reviewed to incorporate more mathematical applications.
- It was a recommendation of the mathematics department meeting that all teachers would attend the Assessment for Learning Continuing Professional Development Programme provided by Co Louth VEC.
- It has been agreed to standardise lesson planning and delivery as much as possible.
- Active learning methodologies and self directed learning to be incorporated into all maths lessons.