REPORT ON THE QUALITY OF LEARNING AND TEACHING IN SCIENCE AND BIOLOGY

SUBJECT INSPECTION REPORT

This report has been written following a subject inspection in Marist College, Athlone. It presents the findings of an evaluation of the quality of teaching and learning in Science and Biology and makes recommendations for the further development of the teaching of these subjects 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 the 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

Marist College is a secondary school for boys and has a current enrolment of 487 students. The school provides the Junior Certificate, Transition Year (TY) and Leaving Certificate (Established) programmes.

Science is a core subject for all junior cycle students and all of the science subjects, Agricultural Science, Biology, Chemistry and Physics, are available to students at senior cycle. The school’s Transition Year (TY) cohort also follows a programme in the sciences. The school is commended for maintaining such a wide range of science subjects on the curriculum.

Third-year and TY students and their parents are well supported by the Guidance counsellor and by subject teachers in choosing their subjects for fifth year. Subject option lines for fifth year are based on students’ choices and on demand. The number of students choosing Biology is very encouraging.

The time allocated to Science is in line with syllabus recommendations. Junior cycle science classes are allocated five single periods per week and are based on mixed-ability groups, with some setting of students in third year. The decision to timetable science classes for single periods only should be kept under review and should be underpinned by a clear rationale based on what is most appropriate for students, bearing in mind that the junior Certificate science syllabus recommendation includes the provision of a double period each week, to facilitate practical work. TY science students are provided with a double and a single period each week. There are two mixed-ability biology classes currently in fifth-year and, in sixth year, there are three class groups, one at each of higher and ordinary level and one mixed ability. All biology classes are generously allocated one double and four single periods each week, which is above syllabus requirements. Class periods are well distributed throughout the school day and week.

At present, seven teachers of science subjects, all deployed in line with their qualifications, are teaching in the school. Teachers are allocated to classes on a rotational basis and continue with their assigned class groups throughout junior or senior cycle, a good practice which facilitates
long-term planning. School management has been supportive of teachers’ continuing professional development (CPD) and teachers have, as relevant to their subjects, attended in-service courses in Science, Biology and the physical sciences. All of the teachers are members of the Irish Science Teachers Association (ISTA)

Three laboratories and a demonstration room, which have been recently refurbished, are available for teaching science. These facilities are well organised and are well provided with ICT equipment, including interactive white boards and data projectors. All students have laboratory access at least weekly. The collaboration and planning among teachers to maximise access for all class groups is commended.

There is a small store room at the rear of one laboratory. This room is neat and well ordered and chemicals are appropriately stored. The layout of the science facilities makes it difficult to mount displays of students work on the walls. However, as the science-teaching facilities are located in the same section of the school buildings, it is recommended that the corridors of this area be used to publicise and promote the sciences. Student project work could be displayed, for example, along with notices of upcoming events in the sciences, courses and careers information, topical articles from newspapers and magazines and photographs of relevant student activities and outings.

Teachers and management support the provision of a range of extracurricular and co-curricular activities, especially at TY level, where students are facilitated to enter the BT Young Scientist and Technology exhibition. It is commendable that the school has developed links with Athlone Institute of Technology to support students in carrying out their project work. In addition, students of Marist College have excelled in recent years in the annual ISTA science quiz.

The school has a health and safety statement which was drawn up with appropriate consultation and which is reviewed annually, in keeping with best practice. Safety equipment available in the laboratories includes first aid kits, gas and electricity isolation switches, fire extinguishers, fire blankets and white laboratory coats. It is recommended that, in order to enhance health and safety provision, simplified safety notices be displayed in a prominent manner in the laboratories.

**PLANNING AND PREPARATION**

There was evidence of a good level of collaboration and co-operation amongst the members of the science team. An active science department is in place, ably led and co-ordinated by a member of the team on a rotating basis. The responsibilities of the co-ordinator include chairing meetings and managing the development of the science plan. The department meets formally on two occasions each year, for planning purposes, and there is constant and ongoing interaction between the team members to deal with more immediate issues.

The science department folders contain planning documents for Science and Biology, following the School Development Planning Initiative (SDPI) format. It is recommended that these documents are now revised and amended to include more detailed schedules for the delivery of courses to all class groups. Course content should be referenced to the science and biology syllabus documents and stated in the form of desired learning outcomes in order that assessments may be closely linked to learning objectives. Schedules should also be designed to facilitate holding common assessments to a greater extent than is currently occurring.

The TY science programme content comprises an innovative set of modules covering topics in Biology, Chemistry and Physics. These modules are designed to engage the students with unusual
and interesting topics and to develop students’ understanding and appreciation science and its applications. In order to enhance the experience of TY students, it is recommended that more detail be included on teaching strategies, in the context of promoting alternative approaches to teaching and learning, and on assessment criteria and methods in order to clearly define desired learning outcomes and to describe the manner in which they are to be assessed. Overlap with Leaving Certificate syllabuses should be minimised. Detailed information is available from the Second Level Support Service (SLSS) website at http://ty.slss.ie/aboutus.html.

In view of the increasing use of ICT by the science teachers, it is recommended that the science department choose one of its members to identify suitable ICT resources, to recommend strategies for their integration into teaching and learning and to source appropriate training. It is suggested, in addition, that a shared folder be created on the schools ICT system to which the science teachers can make available resources to be shared by all the members of the department. It is recommended that all planning documents are similarly placed in these folders. This will make them more accessible and will also facilitate their review and updating.

It is recommended that the members of the science department carry out a detailed annual analysis of students’ performance in the state examinations for all the science-related subjects. Using the information gleaned form these analyses, action plans, focussing on how the level of student attainment might be further enhanced, should be drawn up and implemented.

Individual teacher lesson planning was good. The teachers were well prepared for class and due cognisance was given to the needs and abilities of students in preparing and delivering lessons. Such preparation resulted in good quality lessons. Required resources were prepared in advance, including electronic resources, and the apparatus required for demonstration and student-centred investigative work.

TEACHING AND LEARNING

Good quality teaching and learning was observed in all classes visited, with some very good practice in evidence in a number of instances. All lessons were purposeful and good progress was made. Teachers demonstrated a patient and caring approach and worked hard to create positive, supportive learning environments. Teachers had high expectations of students and supported them well to achieve these expectations. Classroom management was good and students behaved well at all times. The topics addressed during the lessons included the plant structure, atomic structure, measurement, acids and bases, respiration, excretion and states of matter.

A variety of teaching methodologies was in evidence, including the use of questioning of students, teacher presentations and explanations, the use of ICT, demonstrations, discussion, student writing, and the use of worksheets and handouts. An encouraging level of student-teacher interaction was evident in most lessons, with students’ input being sought and valued by the teacher. There were a number of examples of students asking incisive and probing questions, for which they were well affirmed. With few exceptions, students were interested and engaged well in the learning process.

Teachers used questioning well in almost all of the lessons observed to establish levels of prior knowledge and to assess the quality of learning as lessons progressed. There was a good distribution of questions amongst students and a good mix of directed and global questioning techniques was used. Questions ranged from simple, lower-order, recall-type questions to more difficult higher-order questions which encouraged students to think at a deeper level. Students responded knowledgably and with confidence in almost all instances.
While the balance between teacher-centred and student-focussed phases was good in some lessons, it is recommended that teachers, in some instances, include more opportunities for active learning in their lessons. For example, in one lesson, PowerPoint slides were used in conjunction with questioning to encourage student engagement and to highlight important points of information. Other examples might include students being asked to note down new key words and terms in their copybooks and look up the definitions of these words as part of their homework; students taking notes during teacher presentations; giving students a short questionnaire to complete when watching a video; and asking students to explain points raised during the lesson.

It is commendable that new material was taught in an obviously structured manner in a number of instances, moving from the general to the specific, with good reference to prior learning and building on students’ experiences whenever possible. Reinforcement of learning, in the form of learning checks, at appropriate stages of the lesson, was a feature of some classrooms visited and teachers are encouraged to adopt this method as a useful tool for enhancing students’ learning. However, in order to improve lesson structure in general, it is recommended that the objectives of each lesson are outlined to students at the beginning of the lesson and that these objectives are used as a basis for reviewing learning at the close of the lesson.

The level of differentiation was generally good during lessons and teachers tailored and adapted their presentations to accommodate individual students’ needs. There was a good level of teacher movement throughout the classroom apparent in most lessons observed and this served to enhance the level of differentiation through monitoring and supporting individual students as necessary.

Textbook use was minimal and consistent with good practice, with reference to appropriate passages in textbooks being used on occasion to reinforce learning. Previously assigned homework was checked at the beginning of some lessons. Students were assigned homework at the conclusion of all lessons. This homework was appropriate to the lesson content and was designed to assist each student in learning and understanding the topic in question. It is recommended that the school’s homework policy be amended to reflect the role of the teacher in correcting students’ homework in a timely manner and in giving constructive feedback to students.

ASSESSMENT

There is a good system of formal and informal assessment and reporting in place in Marist College. All junior and senior cycle students, with the exception of those in TY, are formally assessed at Christmas and are issued with progress reports. TY students are subject to continuous assessment and they also receive Christmas reports. Certificate examination students sit mock examinations in the spring, following which progress reports are issued and non-examination classes sit summer examinations, after which they receive progress reports. The end-of-year assessment for TY students is based on the folders and portfolios they have compiled during the course of the year, following which they receive a final report. Additional testing is at the discretion of individual teachers.

The quality of students’ learning, as evident from their interactions with teachers, the questions they asked and the quality of their answers during in-class questioning, their overall level of engagement and the quality of certificate examination results, was good. Students displayed a good level of knowledge and understanding during interaction with the inspector.
Teachers used questioning, examination of homework and general observation of students, to assess students’ performance on an ongoing basis. Students were frequently affirmed for their efforts during class. The quality of students’ laboratory notebooks was very good in some cases. However, overall, the quality was uneven and the level of monitoring and provision of feedback was not consistent. It is important that students’ written work is affirmed and that their copybooks and laboratory notebooks are regularly monitored and feedback provided in order to encourage improvement. It is recommended that teachers agree common standards for students’ written work and implement a common approach to monitoring and correcting this work and to providing quality feedback to students.

Good practice by teachers in relation to monitoring and recording student attendance and attainment was evident. Sufficient information is recorded, by teachers to enable the provision of accurate and comprehensive reports at parent-teacher meetings, which are held annually for each year group.

**SUMMARY OF MAIN FINDINGS AND RECOMMENDATIONS**

The following are the main strengths identified in the evaluation:

- Science is well supported by school management in Marist College, with very good provision of resources.
- Science is a core subject for all junior cycle students. The school’s Transition Year (TY) cohort also follows a programme in the sciences.
- Timetabled provision for Junior Certificate Science is good and is very good at senior cycle.
- Very good ICT infrastructure is available to support the teaching of the sciences.
- An active science department is in place and science and biology folders have been compiled and are maintained by the members of the science department.
- Good quality teaching and learning was observed in all classes visited, with some very good practice in evidence in a number of instances.
- A variety of appropriate and well-chosen methodologies were put into practice in lessons.
- Arrangements for assessing and monitoring student progress and achievement are appropriate.

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

- It is recommended that planning documents are revised and amended to include more detailed schedules for the delivery of courses and to reference course content to the science and biology syllabus documents.
- In order to enhance planning for TY, it is recommended that more detail be included on teaching strategies and on assessment criteria and methods.
- It is recommended that the members of the science department carry out a detailed annual analysis of students’ performance in the state examinations for all of the science-related subjects.
- It is recommended that teachers, in some instances, include more opportunities for active learning in their lessons.
- It is recommended that the objectives of each lesson are outlined to students at the beginning of the lesson and that these objectives are used as a basis for reviewing learning at the close of the lesson.
- It is recommended that teachers agree common standards for students’ written work and implement a common approach to monitoring and correcting this work and to providing quality feedback to students.

Post-evaluation meetings were held with the teachers of Science and Biology 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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