

An Roinn Oideachais agus Scileanna

Department of Education and Skills

**Subject Inspection of Science and Biology
REPORT**

**Mount Sackville Secondary School
Chapelizod
Dublin 20
Roll number: 60120W**

Date of inspection: 23 March 2010



**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 Mount Sackville Secondary School. 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 the 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, 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 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

The school provides the Junior Certificate, the Transition Year (TY) programme, which is compulsory for students, and the Leaving Certificate established. 680 students attend the school.

Good provision is made for the science subjects on the school's curriculum. Three sciences: Biology, Physics and Chemistry are provided in senior cycle. For all three programmes, class groups are arranged on the basis of mixed-ability. Management maintains class sizes of no more than twenty-four students for the science subjects.

Both Science and Biology have a high profile on the school curriculum and are clearly valued by students. All first-year students study Science and the subject is optional for the remainder of junior cycle. The numbers of students that choose to keep studying Science is very high at ninety-two percent. The uptake of Biology for senior cycle is very high also and it is currently being studied by sixty-eight percent of TY students and eighty percent of Leaving Certificate students. The school's guidance counsellor provides advice and support to students and their parents on subject choice.

Access to Science and Biology is very good as all students have the opportunity to choose the subjects each year without any restrictions or preconditions. It is commendable that students can sample Biology during TY and that they are free to choose the subject for Leaving Certificate whether they took the subject during TY or not. It is also possible for students to choose at least one other senior science subject. Leaving Certificate option bands vary from year to year in accordance with an assessment of students' preferred subject choice and this is best practice. Currently there are five groups studying Biology in both fifth year and sixth year.

With the exception of first year, good timetable provision is made for the subjects. Junior Certificate Science is allocated four periods per week in second and third year, TY Science is allocated three periods and Biology is allocated five periods per week in both fifth and sixth year. Each allocation includes one double period in line with best practice. First year Science, however, is only allocated two periods per week, as a double lesson, and this falls significantly short of syllabus recommendations of four periods per week. In addition, students only have contact with the subject once per week. The rationale for the first-year curriculum is to allow students to study all subjects for one year prior to making choices. However, this means that students are studying a very considerable number of subjects and the timetable provision for all subjects is diminished. It is recommended that serious consideration be given to redressing the timetable provision for Science in first year within the context of reviewing the whole first-year curriculum.

There are three laboratories and one classroom used for teaching and learning in the sciences. Laboratory use is maximised and access for class groups is fairly good. There is sizeable demand on the school's three laboratories as there are thirty-eight class groups for the sciences. Laboratory access is organised by teachers during a meeting at the start of each year. It is not always possible to allocate weekly access to each class group for the double lesson as sometimes more than three class groups are timetabled at the same time. Management is urged to make every effort to restrict the number of concurrent science classes when formulating the timetable. Most class groups, however, are scheduled for one weekly double lesson in a laboratory and teachers make ongoing arrangements to exchange rooms when practical work is intended. Teachers reported that this works quite well for them and such collaboration is commended. The situation is assuaged as some single lessons are held in laboratories and the science classroom is adjacent to a preparation room, allowing some group work and teacher demonstrations to take place there.

The laboratories and classroom presented as very stimulating learning environments. The subjects are very well resourced for practical work and the purchasing of stock is arranged through the subject co-ordinator. Storage is well managed and resources are very well organised for ease of access during lessons. Chemicals are stored according to proper and up-to-date safety standards. Teachers put much time into laboratory and resource organisation. Given the high usage of the laboratories this is both necessary and mutually beneficial. The level of organisation noted throughout the science areas supports teaching and learning and is highly commended.

All teachers were allocated laptop computers by the board of management. In-house training took place for teachers in the use of these computers and the applications of information and communication technology (ICT) in their everyday work. Some portable data projectors are available in the school and these were used in some lessons visited. It would be ideal if a data projector could be permanently fitted in each laboratory and the science classroom so that teachers could make full use of available technology and the multitude of very suitable resources on the internet for teaching and learning. Data logging equipment is available in the school and it is suggested that contact be made with the national Discover Sensors project so that greater use could be made of the equipment in Science and Biology for some of the practicals. Audio-visual facilities are available to support the use of educational DVDs during lessons.

The science department demonstrated a progressive attitude to development and a considerable interest in participating in opportunities for continuing professional development (CPD). Senior management strongly supports this and also supports membership of professional organisations. In-service courses in the revised syllabuses were widely attended and the benefits of these were evident in teaching and learning. Management arranges whole-staff CPD annually and most recently this has included the areas of ICT, differentiation, learning styles and TY. Current and existing additional education and training among science teachers include special needs

education, school development planning and ICT. Such participation is and will be immensely beneficial for the science department and the whole school. Teachers are encouraged to continue to disseminate their learning and expertise in these areas and in any new areas in the future.

PLANNING AND PREPARATION

A cohesive and collaborative subject department exists. Subject department planning is facilitated by school management and formal meetings between all science teachers are held each term. A position of co-ordinator for the subject department is undertaken with dedication and vigour and this is clearly facilitating development and the progressive approach noted.

As well as working through the many organisational issues to be dealt with at each meeting, the science department has also undertaken development planning. For example, science teachers collectively decided to focus on strategies for increasing the number of 'A' grades in the Junior Certificate examination in Science. As an outcome of discussions, science teachers implemented some changes including an increased focus on revision tests, a different text book and the use of marking schemes with class groups to make performance in tests more productive. Significantly, the changes also involved taking insight from teachers who were involved as external examiners for certificate examinations. This further exemplifies science teachers' willingness to learn and apply best practice. It is suggested that teachers focus next on strategies to deal with the very small but existing proportion of students who persist in taking the higher level paper in Biology against better advice and fail at this level.

A substantial subject department plan has been developed. The plan details much organisational planning as well as agreed approaches to areas such as assessment, record keeping and safety that ensure consistency of practices across the sizeable subject department of twelve teachers. The plan also contains a large section with common assessments used by teachers in both subjects for key in-school examinations. This is just one example of how collaborative planning has had a productive effect on classroom practice. The plan also includes a policy on coursework A in Science. It is recommended that a statement of commitment to the application of the investigative approach be included in this policy.

A culture of self-evaluation is established. Teachers review and develop the plan annually. Part of the evaluative process involves an analysis and discussion of student outcomes in the certificate examinations. As already outlined, this has brought about changes which will yield beneficial outcomes for students and is commended.

As part of the subject plan, common programmes of work have been developed for year groups and teachers use these as a basis for lesson planning. The curriculum plans for Science are exemplary in lay-out as they are based on a matrix that enables topics to be integrated with student learning outcomes as well as methodologies, assessments, timing and revision. To further embed the investigative approach to Science it is recommended that teachers highlight the verb 'investigate' in each relevant learning outcome and that the set of skill development objectives of the syllabus be integrated into the planning matrix with the appropriate learning outcomes.

Exemplary planning by science and biology teachers for students with special educational needs (SEN) reflects the commitment to productive planning as well as to the school's ethos. A file has been prepared by science teachers on all students with SEN studying the sciences. The file was developed in liaison with the learning support department of the school, and benefits from the training being undertaken by a science teacher in this area. This is a working file as well as a

reference as it contains an educational profile for each student in need of extra assistance in learning as well as information on specific learning disorders. Science teachers have added their own notes to each profile indicating the precise strategies they will use in their lessons to assist these students. This is very highly commended as it maximises learning opportunities for all students in each class group. In addition, the use of differentiated work sheets with class groups is strongly advocated in the science plan. Differentiated work is shared and stored for all science teachers in the science folder and on the school network. Teachers are encouraged to maintain their proactive approach to teaching students with SEN and to continue to learn about effective strategies and apply these in lessons.

Active and ongoing co-curricular planning takes place and teachers support students in taking part in competitions such as the Young Scientist and Technology Exhibition and some olympiads. A Science Club for first years is established and Science Week is celebrated annually. Photographs and articles celebrating these events feature in school annuals.

The TY plan for Biology outlines the aims, teaching methods, assessment and project work for the year-long course. It is commendable that this plan is agreed by all in the science department and implemented as planned by all three teachers currently teaching the course. A set of resources to match the course has been developed and this is shared and stored centrally for all to use. The curriculum content of this plan, however, should be revised as almost all of the topics included feature on the Leaving Certificate biology syllabus. There is no valid rationale for this. While different approaches and resources may be in use for these topics, it is strongly recommended that teachers redesign the plan to include revised areas of study. Possible and diverse topics were discussed at length with the team of teachers during the evaluation including those with an interdisciplinary and cross-curricular nature and some ideas from TY Science plans observed in other schools. It is also recommended that teachers consider, when revising the plan, means of incorporating more opportunities for self-directed learning, student-centred learning and broader skill development that would provide foundation experiences in learning at senior cycle through the new topics. These could be expressed as desired learning outcomes in the new plan. The revised plan for TY Biology should then be reviewed annually following an evaluation by students and teachers.

A very good range of resources for teaching and learning in the subjects has been built up. In some instances, use is made of ICT to plan lessons and to source ideas and visual material. There was evidence that resources are placed in shared folders for the benefit of all teachers. The continued expansion of this practice is encouraged, particularly the sharing of electronic resources and website links on the school network as ICT facilities are developing in the school.

TEACHING AND LEARNING

Eight lessons, including single and double lessons, were observed during the evaluation covering Science, Leaving Certificate Biology and TY Biology. The quality of teaching and learning observed during the evaluation was generally very good and exemplary practice was noted when a facilitative and student-centred approach was taken and teachers were enthusiastic about the topic in their lesson delivery. The purpose of lessons generally matched the requirements of the relevant syllabus or programme, although some adaptation is needed in a few instances in relation to self-directed learning in TY Biology and the investigative approach in Science.

The pace of lessons was dynamic and very appropriate. There was clearly the expectation that students would concentrate and apply themselves to their fullest in each lesson and consistently

students rose to this challenge throughout. Teachers circulated frequently to check the progress of all students and support learning. Very effective differentiation was noted in the teaching observed, particularly through effective teacher questioning, and all students were challenged according to their individual potential. At each stage of the lessons learning was consolidated before moving on to engagement with new concepts.

Well-established routines were followed in lessons and students knew what was expected of them and what was to be achieved in their lessons. Teachers made very good and ongoing use of the board. ICT presentations, live web links and overhead projector slides were used to maximum effect to illustrate topics and provide visual references for learning. Students frequently took notes from the board during lessons and this combined with ongoing questions from the teacher maintained their focus. Text books were used for reference and homework and their use never dominated lessons. In all but one instance, when the text of the handout was unnecessarily theoretical, the supplementary materials were useful and supported learning.

In all lessons teachers incorporated variety or a student activity into the structure of the lesson. This included practical work, educational games, and problem-solving activities in genetics. In two lessons, group work was employed and in one of the lessons this was followed by a debate on a contemporary biological issue. These occasions enabled students to access and develop a broad range of skills and provided an opportunity for co-operative learning in a secure and enjoyable setting.

A very high standard of presentation was evident by students in both their verbal contributions and their written work. Students organise their written work very well and notes, worksheets and tests are kept neatly in folders. In order to build on the excellent attitude to learning demonstrated by students, teachers are encouraged to focus on strategies that support self-directed learning, particularly in encouraging students to make out their own summary notes on topics and to build knowledge through independent context-based research on topics. These skills are important in developing student competencies as independent learners and could be integrated into lesson structure at appropriate times and particularly in TY.

For each class group a practical experience of learning about Science and Biology is applied. All prescribed practical activities are completed by the students and this is usually facilitated in small groups for the subjects. Students approach this work with diligence and they very much enjoy this part of the learning process. Junior and senior cycle students demonstrated very well-developed laboratory skills including very good procedural understanding, very good skills of observation, the ability to draw and interpret graphs and the ability to write good quality laboratory reports. At times, however, teachers should place greater emphasis on the investigative approach to practical work in junior Science. In order that a particular practical is not predetermined in procedure or outcome, teachers should give thought to strategies that facilitate students in designing their own investigations. Support in the development of this technique is available from the Second Level Support Service (SLSS). Local courses should be accessed and the information disseminated and discussed as part of subject department planning.

Students demonstrated a very high standard of learning in their interactions with the inspector and were able to speak confidently and accurately about a range of topics in Science and Biology. They also demonstrated the ability to apply their learning to new contexts. All students actively participated in all phases of their lessons and responded productively to the challenges set by their teachers in questioning and tasks. The uptake of higher level in certificate examinations for both Biology and Science is exceptionally high and the outcomes for students at both ordinary and higher levels are generally very good. Attendance patterns for students are very good. Classroom

management was excellent and teachers have successfully engendered excellent attitudes among students to learning, to the school, and to the subjects. The high quality learning environment was enhanced by the excellent quality of the relationships and dialogue between students and teachers and among students themselves.

Achievements in the sciences including co-curricular activities, TY projects and examination performance are recognised during the school's awards ceremony. A perpetual trophy is awarded to the student group who have contributed to the promotion and involvement of students in Science in Mount Sackville.

ASSESSMENT

Very good formative and summative assessment practices are employed. These practices are ongoing and they fruitfully inform students about their progress, achievements and areas for improvement. Ongoing assessment of learning and assessment for learning is carried out through good quality questioning, examination of homework, frequent class tests, formal school tests, assessment of project work and observations of student performance in set tasks including presentations. Strong focus is placed on preparation for the certificate examinations and very good use is made of past certificate examinations questions in combination with marking schemes with the examination-year groups. As well as ongoing formative feedback, teachers give constructive written feedback to students on homework, tests and laboratory reports.

Homework is allocated regularly and is challenging in nature. Research-type activities are allocated at times. Students complete their homework to a very high standard. Homework is usually corrected collectively by the students themselves during a plenary session held at the start of lessons and this enables teachers to circulate and review the work of individuals. Teachers are encouraged to vary the mode of homework correction at times and use peer correction periodically.

Formal school tests are held at Christmas and summer for non-examination groups and mock examinations are held for the examination classes. Common tests are administered to all class groups within each year at these key times and this is excellent practice in a mixed-ability setting as it ensures consistency of standards. Tests are professionally designed and they match the format of the certificate examinations. Reports are sent home to parents on student progress following the formal tests. Students are awarded ten percent of the overall grade for Science in school reports based on their individual performance in practical coursework and the completion of laboratory reports. This is commended as it reflects the way marks are awarded in the Junior Certificate examination.

SUMMARY OF MAIN FINDINGS AND RECOMMENDATIONS

The following are the main strengths identified in the evaluation of Science and Biology:

- The subjects have a high profile on the school curriculum and are chosen by a significant number of students.
- A progressive approach to development exists among science teachers and this is supported by ongoing engagement in CPD and the sharing of innovative ideas.
- Planning is exemplary in nature and outcome.

- Very effective differentiation is applied in teaching methodologies.
- Very beneficial collaboration with the school's learning support department has led to teaching strategies that maximise learning opportunities for students.
- A dynamic pace is maintained in lessons.
- Students are very responsive to the clear expectation that they focus, participate fully and apply themselves well during lessons.
- Teachers have successfully engendered excellent attitudes among students to learning, to the school, and to the subjects.
- A high standard of learning was evident.
- Very good formative and summative assessment practices are employed.

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

- Serious consideration should be given to redressing the time allocated to Science in first year within the context of reviewing the whole first-year curriculum.
- The existing TY plan for Biology should be comprehensively reviewed.
- At times, greater emphasis should be placed on the investigative approach to practical work in Science and to strategies that support self-directed learning.
- Development of the facilities and resources that would enable the greater use of ICT in teaching and learning is recommended.

A post-evaluation meeting was 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.

Published November 2010.