

**An Roinn Oideachais agus Scileanna**

**Department of Education and Skills**

**Subject Inspection of Science and Biology  
REPORT**

**Saint Columba's College  
Whitechurch, Dublin 16  
Roll number: 60320H**

**Date of inspection: 26 April 2010**



**A N R O I N N | D E P A R T M E N T O F  
O I D E A C H A I S | E D U C A T I O N  
A G U S S C I L E A N N A | A N D S K I L L S**

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

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**SUBJECT INSPECTION REPORT**

This report has been written following a subject inspection in St Columba's College. 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 one day 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**

St Columba's College is a fee-paying boarding and day school for boys and girls. The school ethos incorporates a desire to inspire in its students a love of learning and the school takes pride in high academic standards and achievements. The school follows the core curriculum of the Department of Education and Science for the Junior Certificate, the Transition Year (TY) programme, which is compulsory for students, and the Leaving Certificate. Class sizes for Junior and Leaving Certificate are relatively small.

Science is a core subject on the school's curriculum for Junior Certificate. Biology is one of four science subjects provided as optional subjects for Leaving Certificate in the school, in addition to Agricultural Science, Physics and Chemistry. In addition, students can choose to study Geology for the Trinity College Dublin matriculation examination. Option blocks are arranged so that students can choose any or all of the four senior science subjects. The uptake of the senior science subjects is good; Biology is chosen by approximately two-thirds of students annually and Physics, Agricultural Science and Chemistry by approximately one-quarter. Biology, Chemistry and Physics are included as optional subjects in the school's TY programme. Students can sample Biology during TY and are free to choose the subject for Leaving Certificate whether they took the subject during TY or not. Three distinct class groups are formed for Biology in Leaving Certificate each year. All class groups for the sciences are mixed-ability in formation.

Over the course of three years, appropriate timetable provision is made for Junior Certificate Science: three, four and five periods per week respectively in first, second and third year. Four periods are allocated to the science subjects during TY and this is generous provision. Five periods per week are allocated to Biology in fifth and sixth year, meeting syllabus recommendations. All allocations include one double lesson period in line with best practice.

The science and biology teaching team comprises four teachers. Three members of the team are involved in teaching junior Science, two teachers teach TY Biology and three teachers teach Leaving Certificate Biology. Some of these also teach other senior science subjects. Management

deploys teachers to the senior sciences in line with their qualifications and ensures that classes retain the same teacher from year to year within cycles. While a certain level of continuity and consolidation in the delivery of the subjects is required, a cyclical rotation of teachers to Leaving Certificate Biology would ensure that experience and expertise are developed and maintained.

The level of resources to support both teaching and learning in the subjects is very good. Senior management allocates a generous budget to the subjects. The majority of lessons are conducted in one of the school's four laboratories, one of which is a dedicated biology laboratory. The laboratories and preparation rooms are located in the science building. Each laboratory is fitted with modern information and communication technology (ICT) equipment, including internet access, and digital projection facilities. Teachers make constant use of these facilities. There is a comprehensive science and biology library for use in lesson preparation, and an extensive video and DVD collection. Data logging equipment is present and used. Within the science building, the enhancement of computer facilities for student use is worthy of consideration.

The fascinating world of science is successfully revealed to students in many ways in St Columba's. The school has a very successful science news website, [www.frogblog.ie](http://www.frogblog.ie) containing a range of science articles which aim to enthuse and inform students about wider science stories and issues of the day. It includes articles produced by students. There is also a science department website [www.sccscience.com](http://www.sccscience.com) with sections for subjects containing course notes and examination material for downloading. Corridors in the science building exhibit poster presentations of interesting science facts and there is an extensive display of natural history specimens. Many animals and plants are kept within the biology laboratory in aquariums and vivariums including freshwater species, tropical fish, terrapins and a python, which there is a competition to name. Students are kept involved in the husbandry of these species and observation of their life cycles. In addition, strong respect for and links to the natural environment are evident among both teachers and students. Very good use is made of the college grounds to support learning in the subjects and during lessons. For example, during one lesson, students were asked to participate in the preparation of a guide book to the trees of St Columba's. All of these initiatives are very highly commended.

A significant number of valuable co-curricular activities are organised, including an ecology field trip to the Burren during fifth year, a science trip to Northern Ireland and a natural history trip to London. Some of these are organised in conjunction with other departments, such as Geography, bringing a valuable cross-curricular element. These are important events not only because of their value to the subject but also as a means of student bonding. In addition, participation in a range of national science competitions is encouraged. An annual biology prize is open to all senior cycle students and this competition encourages research into any biology-related topic and develops students' skills of presentation. Project work is promoted strongly in first year and in TY.

Management supports continuing professional development (CPD) and facilitates teachers to attend in-service in the revised syllabuses. Management arranges whole-staff CPD and most recently this has included seminars in ICT and aspects of learning support. Teachers might also benefit from courses in the areas of assessment for learning (AfL) and enhancing the investigative approach to teaching and learning in Science, and these ought to be considered when planning future CPD events.

The academic structure of St Columba's includes a 'form primary' which students can enter at age eleven and which is the equivalent of sixth class in primary school. Science is a core subject for this year. A commendable programme has been developed that reflects the nature of the Primary Science curriculum and the Junior Certificate syllabus; it is based on a series of

investigations using the scientific method. Students complete projects as part of the course, and these are displayed in the laboratory. These projects were completed to a very high standard.

## **PLANNING AND PREPARATION**

A very high level of planning for the subjects was evident in the extensive documentation presented and this is representative of the work of all teachers. A progressive, committed and confident set of teachers work collectively to ensure good outcomes for students in the subjects. Formal meetings between all science teachers are held at the beginning of each term, following which minutes are circulated to the teachers and principal. Discussions at departmental meetings include sharing good practice and organisational arrangements, such as progress with prescribed practical work. Subject plans are discussed and reviewed at meetings at the end of each year.

The school operates a system of heads of departments. There is a head of Science and head of Biology. The positions are firmly established among the school community and the roles entail developing the department as well as monitoring academic outcomes for students. Within subject departments, detailed analysis and discussions take place regarding the outcomes of the certificate examinations for individual students and for the whole group. The outcomes are measured against national norms each year and also against the predicted grades for each student. Outcomes of certificate examinations are published openly.

Subject plans are founded on worthy aims including preparing students for roles in decision making and as responsible and interested members of society. Subject plans also include agreed policies on areas including assessment, field work and co-curricular activities. Each subject plan is supported by a scheme of work for each group. Schemes are based on the appropriate syllabus and allow for the integration of regular student practical work through the application of the scientific process. The science department has designed its own investigation booklets that match the schemes of work and cover the full set of practicals to be completed by students in that year. A number of blank reports are included to allow teachers flexibility in exploring additional investigations. In further developing the subject plans, however, it is recommended that the set of syllabus objectives be integrated with the learning outcomes or topics in the schemes of work. In particular, active learning methods and the investigative approach should be firmly integrated into the scheme for Science.

The current TY plan for Biology has a practical focus, builds on the skills learned in junior Science and includes varied assessment methods. The content and assessment arrangements within the plan are agreed by all science teachers and match the school's TY programme. A commendable feature of the TY Biology plan is that students conduct a special topic assignment on areas of interest and this has yielded some very innovative projects in the past, some of which are posted on the website. The curriculum content of this plan, however, should be revised as many topics feature on the Leaving Certificate syllabus. While different approaches may be in use for these topics, it is recommended that teachers redesign the plan to include revised areas of study. Possible and diverse topics could include those of an interdisciplinary and cross-curricular nature and many of these were discussed with teachers during the evaluation feedback. It is suggested that a broader range of skills, such as those developed through problem-solving and co-operative learning, be considered. Management and teachers suggested that Agricultural Science and Horticulture could be included in the TY programme in the future, either in a cross-curricular way with Biology or as a distinct subject. This is worthy of consideration.

Considerable attention to detail was evident in the creative ICT resources developed by individual teachers to support teaching and learning in the subjects. These are constantly being adapted and

updated in a set of folders on teacher laptops and some are posted on the website. Ongoing expansion and sharing of resources is encouraged through collegial inputs at formal and informal meetings and through an evident shared dedication to exploring further uses of the technology in science education. For example, teachers are currently exploring the potential of science-related mobile phone applications as a learning tool and to stimulate student interest. In addition, some teachers have been involved in TeachNet in the promotion of ICT in education and also in the design of a national website for teachers of Agricultural Science. A commendable science department policy on ICT brings cohesion to the use of ICT across the sciences.

Teachers liaise effectively with the learning support department in the school throughout the year to monitor the academic progress and requirements of students with learning support needs. Some of this work involves the development of flash cards to aid in the reinforcement of specific vocabulary. Science teachers also liaise with teachers of Social, Personal and Health Education so that lessons in human reproduction and personal relationships can be co-ordinated.

All teachers used ICT in lesson preparation. It was clear that teachers put considerable time into preparing electronic slides to accompany each lesson and choosing the most suitable means of presentation with series of interesting illustrations to suit the capabilities of their students.

## **TEACHING AND LEARNING**

Six lessons were observed during the course of the evaluation including Junior Certificate Science, TY Biology and Leaving Certificate Biology. The quality of teaching and learning observed during the evaluation was high. The enthusiasm for and commitment of teachers to their subjects and their students is significant. They displayed considerable knowledge of their subjects often referencing interesting facts or applications from the world of scientific research and industry. In one instance the teacher led the group into a short discussion on the comparisons of fish population densities in two oceans. In another, the teacher used striking video clips to stimulate discussion on the relationship between parasitism and population dynamics. Teachers succeeded in making fungi, ecology, transpiration, acids and mixtures interesting, and got students to speak openly about their views on the topics. Students demonstrated very high levels of interest in the subjects and were clearly stimulated by the teaching styles, the co-curricular opportunities and the enhanced learning environment.

Throughout all lessons, teachers mixed instruction with skilful questions that continually assessed progress. Students were focused and confident and participated very well in their lessons. Students also demonstrated strong curiosity, often asking difficult or higher-order questions themselves about a topic or the application of a scientific process. In one lesson, students' questions were used by the teacher to exemplify points of interest for the whole class. Students have well-developed ideas about Science and Biology. Students coped very well with the Latin-based terminology and technical language of the subject. It was also evident that students placed high value on applying themselves, demonstrating curiosity and achieving a high standard. It is highly commendable that such a flourishing learning environment is successfully maintained.

Lessons were clearly focused, well sequenced and presented at a pace that matched the abilities and motivation of the student cohort. In each lesson, teacher instruction was supported with the use of well-designed electronic slides, usually with matching student notes and appropriate visual media such as video clips and sets of illustrations. In almost all instances, students were very well motivated and often independently added their own sets of bullet points or notes to the handouts throughout lessons.

Teachers demonstrated a strong awareness of the learning potential and the needs of each student and are committed to helping all students to reach that full potential, whether an additional learning need is present or not. Some very good examples of this were evident during the evaluation. However, teachers should explore ways in which note making can be developed over note taking. In particular, teachers should investigate concept mapping and how it could prove beneficial to students in the middle and lower ability ranges, and in meeting the range of learning styles present in each group.

Active learning was enabled during student practical work and a role play activity observed in one lesson. The role play was very creative in helping students place each of the stages of water movement through a plant and the subsequent use of the molecules in photosynthesis. The activity was very much enjoyed by the group and they showed commendable confidence in conducting it. Teachers should continue to explore ways in which educational games, role play, debates and other forms of active learning can be used more frequently in lessons, and could source ideas from the websites of the science and biology support services.

Prescribed practical activities are completed by the students in small groups for both subjects. Very good practice was observed in a junior Science lesson when students were guided through series of teacher questions and discussion to design their own procedure for an investigation into determining the best acid-base indicator from a selection extracted from various plants. During the practical, students worked productively in their groups, appreciated the importance of a fair test and arrived at valid deductions and a conclusion. Students are encouraged to write up laboratory reports in their own words in the investigation booklets and best practice was seen when this work was assessed by teachers with annotated comments included to improve skill development. A review of student laboratory reports revealed, however, that at times a more investigative approach to practical work could have been applied to student practical work in junior Science. Teachers are encouraged to develop this wherever possible and to refer always to the syllabus learning outcome when planning a student practical. It would be useful if agreed practices around the various approaches to student practical work and how students' write laboratory reports could be laid down in the science plan to bring consistency to the area.

## **ASSESSMENT**

Students are given frequent assessments and high quality feedback on all of their work, especially in examination years. The assessment practices and homework allocation observed reflected those laid down in the planning documentation. Students receive regular homework, topic examinations, project assignments, class work assignments and term examinations. These are all used by teachers to carefully monitor students' progress. Very good practice was seen in some groups when teachers facilitated peer correction by requiring students to correct each other's class tests using a displayed marking scheme. This gives students a unique insight into examination technique and adds commendable variety to assessment processes. It merits wider use.

Examination technique and the way examinations are marked are strongly emphasised for students. This is a significant part of lesson structure at times, such as before formal assessments and leading to the mock and certificate examinations. Students are progressively given more frequent written work from past examination papers, and revision is integrated with this work. Teachers make very good use of marking schemes when correcting assessments to illustrate to students how to improve their grade outcomes. Experience of certificate examinations is available within the department and is beneficially disseminated when preparing groups for the certificate

examinations. Students have a clear concept of their own progress, strengths and shortcomings and can develop their learning accordingly.

Significant emphasis is placed on academic performance and the outcomes for students in this regard are excellent. Students are prepared for the examinations in Science and Biology to as high a level as possible. Very few students take the ordinary level paper in the certificate examinations in Biology and only a small number take ordinary level Science. A very high proportion of students receive high grades in the certificate examinations.

Parents receive very good feedback on their child's progress. Regular meetings with parents take place during the year. In addition, teachers write detailed reports for every student at the end of each term, based on a system of continuous assessment where marks are recorded approximately every two weeks. In line with school policy, teachers regularly comment positively on good performance and give advice on areas of weakness to both students and their parents.

### **SUMMARY OF MAIN FINDINGS AND RECOMMENDATIONS**

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

- Management provides very well for the subjects through good timetabling, the provision of excellent campus facilities, good budgetary and resource provision, and support for progressive professional development opportunities.
- A very high level of detail and creativity is evident in collaborative departmental planning and individual teacher lesson planning.
- The science teachers are dedicated to continually exploring the potential of ICT in science education and successfully use it in a variety of ways in lessons.
- The fascinating world of science is successfully revealed to students in interesting ways.
- Strong respect for and links to the environment are evident.
- Students are highly motivated and place high value on learning and the application of that learning.
- Significant emphasis is placed on academic performance and the outcomes for students in this regard are excellent.
- Students are given frequent opportunities for assessment, including peer assessment, and high quality feedback on their work.
- Parents receive very good feedback on their child's progress in subjects.

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

- The TY Biology plan should be reviewed.
- Procedures for practical work should be discussed and set out in the subject plan, particularly in relation to investigations in junior Science and students' writing of laboratory reports.

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.

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