

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

**Subject Inspection of Science  
REPORT**

**Midleton College  
Midleton, County Cork  
Roll number: 62370J**

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## **Report on the Quality of Learning and Teaching in Science**

This Subject Inspection report

This report has been written following a subject inspection in Midleton College. It presents the findings of an evaluation of the quality of teaching and learning in Science and makes recommendations for the further development of the teaching of this subject 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 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, deputy 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**

Midleton College, which was founded by a charitable endowment from Lady Elizabeth Villiers in 1696, is a co-educational, fee-paying boarding and day school, with close historic links to the Church of Ireland. The evaluation of Junior Certificate Science was carried out in one day. Science is in a very strong position in the school. Junior Certificate Science is a core subject. The school's commitment to offering Biology, Chemistry and Physics to all students in Transition Year (TY), and to providing Horticulture as an optional year-long course, is commended, not least because it provides the opportunity to further develop the scientific literacy and science-process skills of the students in a learning-led rather than examination-led curriculum. It also facilitates the study of scientific topics not studied for Junior Certificate. Each student has two lessons per week for each of the Leaving Certificate sciences. This is excellent provision. It is also good to note that Leaving Certificate subject pre-selection does not occur in Transition Year, allowing students an extra year of experience and maturity before making their choices. In addition to Biology, Physics and Chemistry, Agricultural Science was offered as an optional subject for Leaving Certificate during the current year. It is noteworthy that the uptake of all Leaving Certificate science subjects is very good. It is suggested that management and staff continue to be proactive in their encouragement of student uptake of all science subjects.

Midleton College has a very good resource in its science personnel. The science teachers are committed and adopt a collegial approach to their work. It is noteworthy that all science classes at both senior and junior cycle are of mixed ability, thus facilitating the setting of higher expectations amongst the students and consequently better attainment levels. It is commendable that all students are encouraged to study higher-level Science at Junior Certificate and generally final decisions regarding chosen levels are not made until Christmas of third year or on completion of the pre examinations.

The time allocation for the teaching and learning of all science subjects is excellent. Timetabling supports the delivery of the curricula, with each class generally receiving an even spread of classes over the week and at least one double lesson to facilitate practical work. Classes retain the same teacher throughout junior cycle, and again in senior cycle. This is good practice, allowing for a consistent pedagogical approach to be developed in science classes from year to year. A modular system for teaching Junior Certificate Science is in operation in the school, where one teacher teaches Biology and another teaches the Physics and Chemistry components. Teachers are commended on the level of cooperation and collegiality required to ensure the successful implementation of this system. There is some rotation of teachers between levels in the Leaving Certificate science subjects. Again, this is a

positive approach, facilitating the development of a wide skills base across the science department.

Extensive guidance, advice and support are provided to students and their parents to assist them in making appropriate subject choices. The guidance counsellor is centrally involved in this process, having a weekly lesson with all TY students and offering individual guidance. Subject coordinators also provide advice and information to students. Information evenings are held for parents. This is commended. The members of the learning support department and the science department collaborate as necessary. This is good practice.

The school is very well resourced for the teaching of the sciences with a new science block, the Jameson Institute for the Teaching of the Natural Sciences, which opened its doors in 1997.

This is a self-contained building. It comprises three well-equipped laboratories, a lecture room and toilet facilities. The lecture room has a broad range of uses ranging from demonstration purposes to regular classes and lectures. All laboratories provide a visually rich environment, with biological models and scientific posters on display to enhance student learning. It is good to note that the laboratories contain small libraries of science books, a tool to enhance student scientific literacy.

Storage and preparation areas adjoin both the Chemistry and Physics laboratories, and a separate storage and preparation area adjoins the Biology laboratory. There is a high level of safety equipment such as fire extinguishers, safety blankets, safety glasses etc., in the laboratories. Some equipment is stored on shelves and in cupboards in the laboratories, thus facilitating easy student access. It is good to note that considerable work has been done on the storage of chemicals in the laboratories. Building on this good work it is recommended that the chemicals be stored according to storage classifications, thus ensuring the segregation of the oxidisers and the flammable chemicals. It is best practice to store flammable chemicals in a flammable press. Information on the storage of chemicals can be obtained on the Second Level Support Service (SLSS) website, <http://chemistry.slss.ie/>. The school has a Health and Safety Statement, which was reviewed in 2005, in consultation with members of the science department. These safety practices, which are commendable, would be enhanced by the provision of a gas isolation switch similar to the electrical isolation switch already installed in the two laboratories. It is recommended that these matters be addressed as a matter of urgency.

It is good to note that teachers of the sciences are supported financially by management for the updating, repair or enhancement of existing resources and on a needs basis. The laboratories and the lecture theatre contain overhead projectors and TV/VCR units. Similarly, data projectors and a number of computers are also present. Data logging equipment has been purchased for the teaching of science. There is an ICT suite in the school. The school has recently acquired broadband, thus facilitating internet access in the science block. Management is to be commended on the provision of such facilities. The science teachers are encouraged to expand the utilisation of these excellent resources to support the teaching and learning process.

The school is supportive of the continuing professional development of its teachers. All teachers have attended in-career development in the sciences. This is commended. The school is applauded for its support in providing laboratory facilities for the Department of Education and Science in-career laboratory training in both Chemistry and Biology. Whole-staff development days, including those focusing on special needs, ICT and school development planning, have also taken place. It is worthy of note that management encourages the professional development of its teachers and financial support for membership of the professional associations and for further study is provided.

A high level of provision is made for co-curricular and extra-curricular science activities, including fieldtrips, participation in Science and Chemistry quizzes, and visits and entries to the

Young Scientist and Technology competition. Those involved are to be praised for their commitment to facilitating these educational and stimulating activities.

### **Planning and Preparation**

Midleton College is at an advanced stage in school development planning. Among the policies approved by the board of management are those on behaviour, child protection and admissions. The development of curricular policies specific to some subject areas in junior cycle and TY, including Science, has taken place. Management and staff are commended for this work.

It is very evident that the science teachers in Midleton College work well as a team, demonstrate commitment, and engage in the process of collaborative planning. This good practice helps establish a common purpose and direction for the subject, facilitates the sharing of expertise and resources and consequently contributes to a high quality of teaching and learning. Long-term subject planning is underway and common programmes of work have been devised for the sciences. It is good to note that the syllabus forms the basis for the scheme of work. It is commendable that these programmes include content and practical work for each topic. It is suggested that these plans could be further developed to include the resources available for the learning and teaching of each topic, as is the case in some instances, specific timeframes, optional assessment methods and examination preparation, as well as continual revision work, when and where appropriate. Subject syllabuses and 'Guidelines for Teachers' should provide the basis for such detailed planning. This would further enhance the standardisation of learning and teaching of junior Science across the school. It is praiseworthy that these plans are reviewed annually and that necessary changes are applied to meet the needs of the students.

Departmental planning is commendably supported and facilitated by termly formal meetings and ongoing informal collaboration. Items discussed include the common programmes of work, resources and teaching methodologies. Well-stocked laboratories provide evidence of successful planning for resources, management of which is the responsibility of the science coordinator. Those involved are commended on their level of collegiality, including formal and informal collaboration.

Impressive examples of individual teacher planning were observed during the course of the inspection. Several teachers had compiled folders of resources, including resources in electronic format. Preparation for classes was noted as being at a very high standard, including the preparation of crosswords, handouts as well as chemicals and equipment. Some teachers had done excellent preparatory work in terms of the incorporation of computer technology in their lessons. Lessons observed, as well as planned programmes of work, were found to reflect syllabus requirements. The teachers' willingness to share resources that individually they have found effective in the teaching of certain topics is good practice, and supports collaboration and collegiality in the planning and delivery of the curriculum.

### **Teaching and Learning**

There was a very good quality of teaching and learning in evidence in all the Science lessons visited. A variety of lesson types, both practical and theory, were observed. Lessons were well structured, student centred and sequenced with a logical progression from one section of the lesson to the next. In all instances good continuity with previous lessons, building on students' prior knowledge and experience, further developed the topic at hand. Some very effective examples of linking the lesson content to the everyday life experiences of the students, were observed and those succeeded in stimulating student interest and making the subject tangible and relevant.

Diverse teaching styles were employed, to which students responded well. A range of teaching methodologies was used, including teacher elucidation, student practical, ICT and questioning. Teacher instruction was clear, competent and accurate. The blackboard and PowerPoint presentations were used effectively to reinforce salient points. Some good examples of the use of active learning methodologies that were appropriate to students' needs and abilities and which resulted in a good balance between teacher input and student activity were observed in theory lessons. As lessons continued, a variety of resources were used to stimulate and engage students. In some lessons handouts were distributed, covering the main issues in a topic or providing questionnaire-type stimuli based on the lesson content.

Visual stimulus materials were used very effectively in some lessons. Excellent employment of ICT to review and consolidate student learning was observed. It was also effectively used to develop the topic at hand and aid student understanding of difficult concepts. Student use of the internet to research a topic in preparation for a student practical activity in the next lesson and to complete a worksheet is highly commended. The work of the teachers in preparing and compiling resources is to be commended. All teachers are encouraged to build on this exemplary practice to support the teaching and learning process.

Question and answer sessions were employed for revision from the outset of most lessons, to help monitor student learning, and as a central means of developing new content as lessons proceeded. The questioning was also used very effectively to engage students in the learning throughout the lesson. The degrees of difficulty of such questions and the forms they took were well tailored to the ages and abilities of the students concerned. The policy of directing questions to individual students, which generally speaking is employed by the teachers, is noted as good practice, and it is recommended that this be continued and further developed where appropriate. Students' responses indicated good understanding and knowledge.

Practical work was highly organised, and students were supported in their work as their teacher circled the room. In all cases the teacher focused on key aspects of the practical activity, selecting and emphasising particular elements prior to the students performing the investigations. Students worked in pairs or groups of three, were confident and capable in setting up and completing the tasks, and their practical skills were well developed. Due regard was given to safety procedures. In one instance students were involved in carrying out one of the investigations nominated by the State Examinations Commission for the coursework B component of the 2006 Junior Certificate examination. Students were motivated by the sense of autonomy they had over the investigation and showed great imagination in the resources they employed. While there was some evidence of the application of the investigative approach, it is recommended that teachers explore this to a greater extent and plan for greater student self-directed and discovery learning, especially when they are engaged in practical work. In one instance a plenary session was employed on completion of the practical activity to reinforce student learning. This is an excellent *modus operandi*. It is suggested that teachers build on this good practice to enhance the teaching and learning process.

Overall, lessons proceeded at a smart pace, which resulted in a realistic amount of work being completed in the allocated time. Appropriate homework was assigned, which was seen to expand on and enhance the work carried out in class. It is noteworthy that non-conventional homework in the form of crosswords and mind maps was given in some instances.

Classroom management was very good and a pleasant and positive atmosphere was predominant. A good teacher-student rapport existed, and relations were grounded in a sense of mutual respect. The students were attentive, interested and participated well in the learning process. Students received individual attention and affirmation from their teachers and their contributions to the lessons were welcomed and appropriately addressed. The laboratories were enhanced by the display of a variety of educational posters and anatomy models, which provided a stimulating learning environment. Teachers deserve congratulations for their success in instilling in students a remarkable interest in and enthusiasm for the sciences and for their part in generating this warm atmosphere, wholly conducive to good learning.

## **Assessment and Achievement**

A range of assessment modes is used to assess student competence and progress. These include written homework assignments and topic tests. Twice-yearly formal examinations are held for the non-State examination classes, while Leaving Certificate and Junior Certificate classes sit pre-examinations in the spring. Student understanding is assessed on an ongoing basis through questioning in the classroom. This is commended. Midleton College has a homework policy in place. The inclusion of student notes copybooks in the scheme of continuous assessment is commended as it encourages them to keep their notebooks at a reasonable standard.

Students have a laboratory notebook in which they record all their investigative work. On examination of these it was found that in the main, all mandatory investigations to date were written up under suitable headings incorporating well-labelled diagrams and contained results gathered by the students themselves. Such experience is of benefit to the students in developing skills relating to the recording and interpretation of scientific data in accordance with the objectives of the syllabus. It is recommended that the good practice of assessing students' practical work and laboratory notebooks as a component of the end-of-term examinations and which is employed in some instances, be introduced to all year groups. Such practice is encouraged as it reflects the assessment objectives of the Junior Certificate syllabus, and an aggregate mark that includes all components of the examination provides a more accurate indicator of the individual student's ability in the subject. It also ensures regular monitoring of student laboratory work.

It is laudable that in many instances the practice of setting common Christmas and summer examination papers is employed. Such practice is to be encouraged as it helps to establish a common direction for the subject, whilst ensuring consistency and cohesiveness within the department. Consideration should be given to the extension of this practice across all year groups, where appropriate.

Attendance rates and assessment results are systematically recorded in teachers' journals. This good practice helps to build a profile of students' engagement, progress and achievement in the subject over a period of time. State examination results are analysed and a system is in place to identify and monitor under-performing students. This is commended. A good level of contact is maintained between the school and parents. In addition to formal examination reports, which they receive three times a year, ongoing student progress is also given to parents through parent-teacher meetings, information evenings and students' journal. In addition, the school website and the school magazine are also valuable sources of information for parents. Parents may also meet with management and teaching staff by appointment. This is commended. It is noteworthy that celebration of all students' achievements underpins the education ethos in Midleton College.

## **Summary of Main Findings and Recommendations**

The following are the main strengths and areas for development identified in the evaluation:

- There is very good whole school support for the sciences, as evidenced by the provision of Science as a core subject in junior cycle, and Physics, Chemistry and Biology for all students in TY, in conjunction with Horticulture, which is offered as an optional year long course. Chemistry, Biology, Physics and Agricultural Science are offered for Leaving Certificate.
- The school is very well resourced for the teaching of the sciences with the provision of a new science block. The school is commended for its support in providing laboratory facilities for the Department of Education and Science in career laboratory training in both Chemistry and Biology.

- A high quality of teaching and learning was observed in Science. The science staff is dedicated and professional, and members adopt a collaborative and collegial approach to their work.
- Noteworthy formal and informal cooperation has facilitated the development of common programmes in the sciences and the planning for resources. A high level of planning for individual lessons, including the development of electronic resources enhanced the teaching and learning of the sciences in the school.
- Teachers deserve congratulations for their part in generating a warm atmosphere in the lessons, which is wholly conducive to good learning. Student participation was warmly welcomed and encouraged and effective use was made of student affirmation.
- It noteworthy that assessing students' laboratory notebooks as a component of the end-of-term examinations is employed in some instances. As an area for development, this good practice could be built upon and introduced to all year groups.

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

- It is good to note that considerable work has been done on the storage of chemicals in the laboratories. Building on this good work it is recommended that the chemicals be stored according to storage classifications.
- As a matter of urgency, gas isolation switches similar to the electrical isolation switches should be installed in all laboratories.
- Teachers should explore the application of the investigative approach to a greater extent and plan for greater student self-directed and discovery learning, especially when they are engaged in practical work.

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